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BOTSWANA

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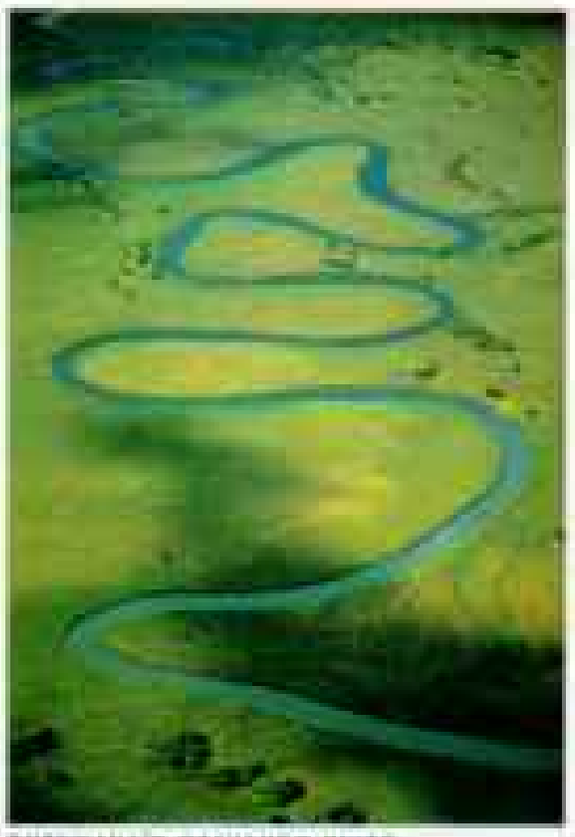
BOTSWANA'S OKAVANGO RIVER


LILLIPUTIAN AMONG THE GIANTS


TRIBAL MEETING IN MOCHUDI


SAN MIGUEL DE ALLENDE CELEBRATES DAWN

COVER: *Perhaps the most dangerous of Africa's wild animals to man, a hippo bursts from its watering hole in the Okavango Delta's Savute River. Photograph by Frans Lanting.*

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BOTSWANA

The quick and the mighty share the relief of a dry-season water hole in sandy scrublands of northern Botswana. Here a last Eden thrives in a little-known country—perhaps the last place where the great herds of game animals synonymous with Africa stand a good chance of arriving at the next century's doorstep intact.

In the following three-part presentation the GEOGRAPHIC views Botswana as both Eden and nation.

First, a photographic portfolio introduces the north's ecosystems and wild inhabitants.

Next, a journey deep into backcountry explores the great Okavango Delta to assess humankind's impact on the land and its animals.

Finally, the prospects for the continued success of democratic Botswana and its breathtaking natural legacy are reported.

A Gathering of Waters and Wildlife

PHOTOGRAPHIC ESSAY
BY FRANS LANTING

During a year in Botswana's wilds I lived eye to eye with its animals, coming to know their most intimate, desperate, and ordinary moments. I was often belly-down in sand, mud, or water, going about my daily work as they went about their daily survival. Elephants and impalas gather at a water hole, their thirst almost palpable. A chameleon raises two feet at a time to bear the heat of Kalahari sand. A bullfrog, his eyes up like twin periscopes, becomes a stoic defender of a rain puddle that just weeks before was a lifeless expanse of sand—with him estivating beneath it, waiting for annual rains to soak the dry lands. Such are the seasons of the Kalahari, the "great thirstland" to its native peoples. For me the seasons turned as if on a great hinge, opening the door to abundant life in the season of rain.

A river rises in mountains and dies in sand and in its dying gives birth to a jewel at the edge of the Kalahari: the Okavango Delta. After the Okavango River, swollen with rain from Angola's distant highlands, crosses into northwestern Botswana from Namibia, it fans out to become the world's largest inland delta. This unique freshwater system is the pulsing heart of northern Botswana's wilderness, growing with the October-to-May wet season, shrinking as dry weather returns.

Hanging over the delta in a small airplane, I was struck by the fragility of the riverine lifeline that sustains these huge wetlands and the multitude of animals dependent on them. I have seen women wade across the river where it enters Botswana. A boy with a strong arm could throw a stone across it. Yet this thread of a river creates an ecosystem of a size and intricacy rivaling any on earth.

From the air I could appreciate the abstract pattern of the winding flow, but at water level I was deep in the wet and bellow of its reality.

When a hippo challenges, you forget its ecological role as keeper of swamps, dredger of channels, and fertilizer of vegetation. At that moment it is a raiser of hair and a merchant of adrenaline.

A sheet of water a few feet deep spreads over the Kalahari sands to create a lush oasis studded with islands that grow when silt builds up around termite mounds.

Here I found an Africa I thought no longer existed. Here was a place where the antelope, the zebras, and I could drink freely from the same waters.

A black egret fans its wings in a circle and fishes in its own shade. After a few seconds in one spot it opens its wings and stalks forward before again closing them. I watched scores of egrets apply this technique.

The advantage? I can only speculate that the darkness within the tenting of wings reduces glare and reflections off the water, allowing the bird a better view of its prey.

The egrets worked impoundments in the drying floodplains, as water evaporated from the delta. Egrets, herons, storks, pelicans, ibis, ducks, geese, eagles, and shorebirds all gather at these banquets, gorging on fish, frogs, and mollusks. I once counted—in just one pool—28 species of birds in such a feeding frenzy.

National Geographic EXPLORER will examine the subject of African wildlife management on Sunday, December 16, at 9 p.m. eastern time on TBS SuperStation.

Striking on the surface, an African fish eagle rakes its talons forward in flight and snatches its prey without pausing. These highly territorial relatives of the bald eagle partition the banks of waterways where fishing is best, jousting with one another in midair skirmishes over fishing rights.

Striking underwater, the anhinga is another good fisher. This one hit a bream and brandished it before turning the fish headfirst and swallowing it whole. Anhingas are also called darters for their sudden plunges from low branches, often startling me when I rounded a bend deep in the delta. But the name I like best is snakebird, for the anhinga's appearance when swimming half submerged.

Skittish zebras bolt at a water hole in Savute, a marsh northeast of the delta, where rains come at the end of the year. Migrating herds, scattered until then, materialize in

huge numbers. Their uncanny timing is perfect for grazing on shoots newly burst into green. When the sweetest grass is eaten, the zebras move on and melt into the bush.

With elephantine grace, a young bull rises from the Chobe River on Botswana's northern border. There I had the privilege of working among the world's largest concentration of

such giants, the last great unharassed elephant herd in Africa. To see them away from the dusty plains, to watch them revel in their semiaquatic world, was a revelation.

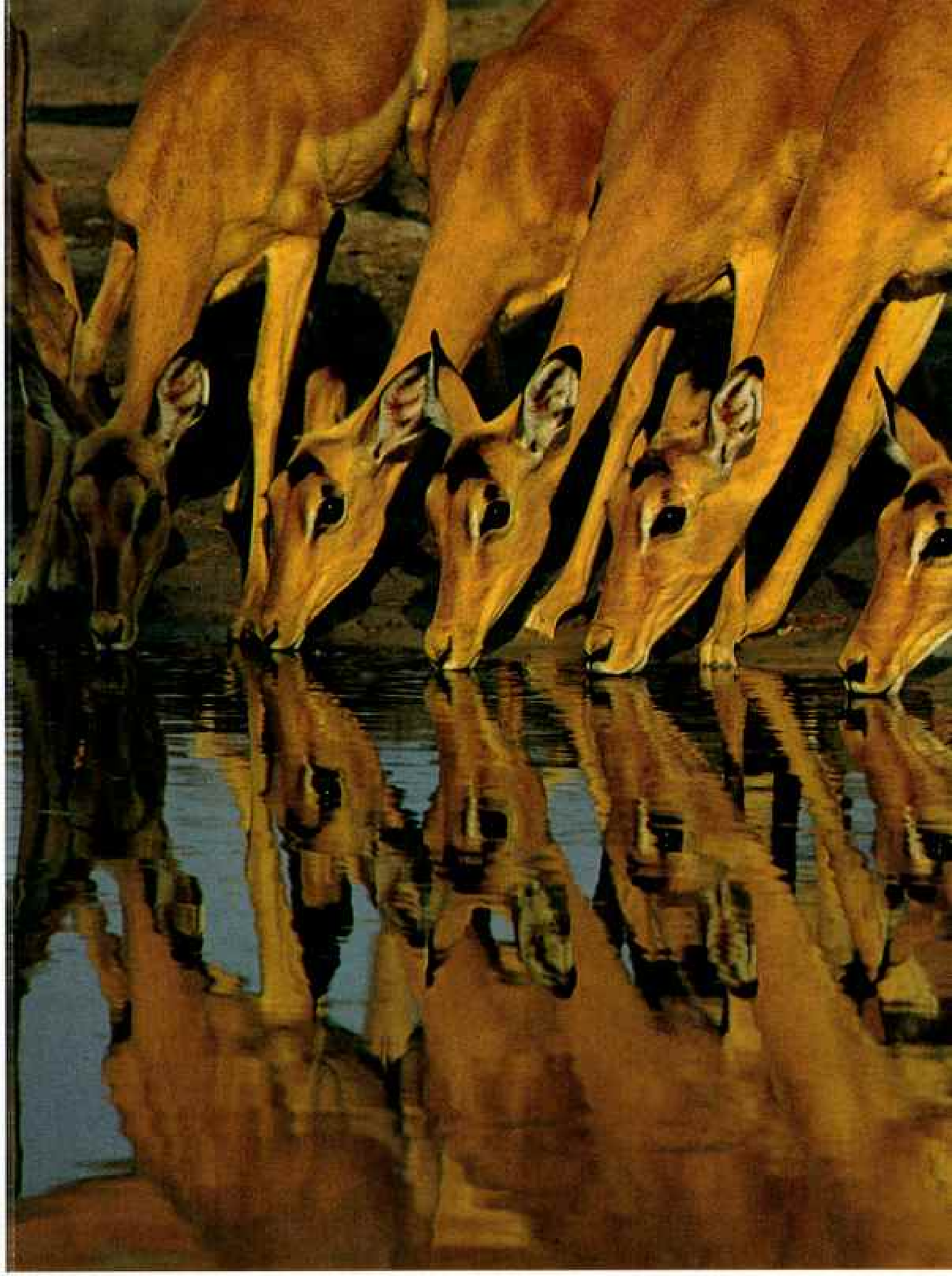
Once a large river-fed lake, the Makgadikgadi Pans now lie saline and empty. In Botswana's wide, flat landscape small stirrings of underlying geology suffice

to alter the course of rivers. When rare heavy rains come, hundreds of thousands of flamingos appear from nowhere to feed as long as water lasts.

The pounding of Cape buffalo reverberates as a herd makes its way to water. Even when you experience that power from the safety of an aircraft, it has the quality of thunder. Well over a thousand made up this herd, and biologists estimate a total population in northern Botswana of 45,000.

Free-ranging herds are always on the hoof, locals will tell you. Buffalo, elephants, and zebras found one day may be gone the next. One thing is certain: In their search for water and fodder, all of them tune in to perfected guidance systems.

My own mental maps were much less developed, and I was always amazed at how countryside empty one day could next morning rumble with hoofbeats that filled the air with dust. Some might call this a mystery, but to me it evoked a freedom that comes from immensity: freedom of flat, open country roofed with an unending sky, freedom of a wilderness so unfettered that it can swallow a herd without a trace.



A rank of impalas slaking their thirst was one reward of time spent lying prone at the edge of water holes. More than once lions walked straight past, intent on their own thirst, ignoring me where I lay exposed. Such are the truces at water. On the clay pans

of the northern woodlands, trails lead like spokes to hubs that hold water. But pans are a part-time resource: The one at left had been recently drunk dry, leaving only such animals as springbok, which do not need to water daily.

At day's end the shift changes. Some animals retreat to roosts or burrows, while others are just beginning a nighttime of activity. At a rookery the final feeding in late afternoon is raucous; an almost grown egret grabs its parent by the bill demanding the disgorging of a meal, which parent birds are increasingly reluctant to do as chicks grow older.

All animals have their own survival specialties. The delta knows catfish that escape the dryness of evaporating ponds by burrowing in the bottom mud, and it knows antelope that escape predators by submerging up to their nostrils in water.

Such behavior patterns may seem fantastic at first. But, of course, they are adaptations to the special circumstances of the Kalahari and the delta.

To learn more, I often started my day at sundown. I would sleep through the stuporous heat of midday and spend the late afternoon preparing for night and what it had to teach. At sunset on a delta lagoon even the flowers change shifts. Day-blooming lilies like this one close; another opens toward evening. I was in new company.

When dusk settles, things begin to happen outside my campfire's circle of light, reaching me as half-heard disturbances. Then muffled screams raise a prickling of hairs. With an unease that perhaps goes back to our own species' beginnings on the savanna, I enter the night. Those abroad know the darkness, but I do not. I do know it is a dangerous world where shadows can eat you.

Sometimes I half-glimpse this world: Here a flock of ibis wing back to their colony like ghosts at nightfall, their eyes for an instant reflecting my strobe lights.

For crocodiles night and day signify the same: meat. Reconnoitering in daytime, I had spotted a hippo carcass and set up my cameras for night work. The crocs did not keep me waiting long.

In the last flush of day impalas pull tighter together and, still feeding, drift toward deeper cover. To get at them, lions will have to move into brush, where the chances

of maintaining silence diminish. For impalas the strategy of living through the night is routine. Come day, they will move back into open terrain and defend by sight.

So it ends for a wildebeest pulled down by lionesses in Savute. I'm along as an apprentice, trying to learn their trade. One night they waited, then got up, walked, trotted, and finally ran straight to an elephant carcass five miles away. What was their clue? Smell? One faint hyena cry?

But another night they seemed unable to get within hunting range of any of a thousand animals, some of which even I, the novice, could locate. Was this bad luck, poor planning, or just the insouciant way of all cats?

Another time, I watched a lioness, torn perhaps between maternity and hunger, park her cubs on a termite mound before joining the hunt. For

the month I lived with the lions, I found myself rooting for those cubs' survival.

Yet even for its top predators, life in the bush is uncertain. One night the cubs were gone, swallowed by the dark, and I never saw them again.

Fast and powerful, an ostrich sprints across the Makgadikgadi Pans. Even here, at the edge of this lonely landscape, the sand is pocked with animal prints. I count myself

fortunate to have left my own tracks beside theirs. And I am fortunate to have been both witness and apprentice to the wild creatures in one of the last best places on earth. □

OKAVANGO

A Mbukushu mother and child cross the Okavango River, whose seasonal floods bring life to a parched land.

Old

DELTA

By DOUGLAS B. LEE
NATIONAL GEOGRAPHIC SENIOR STAFF
Photographs by FRANS LANTING

Africa's Last Refuge

IT IS A LAND OF SIGN, of elephant spoor and lion tracks, of drag marks mapping a final struggle. There are signs of rains to come—flowers blossoming and females gravid in anticipation of water not yet promised by a single cloud. There are signs of a past that is near, rock paintings made by Bushmen who lived in harmony with the land over millennia of constancy and change. There are traces of lakes and rivers long dead and streams born anew each year.

One particular sheaf of grass amid the drowned pathways of Botswana's Okavango Delta is a sign to Tshipariete, a member of the delta's Bayei tribe, that he has found a sure passage. "Here is the road," he says, and we pole and pull our dugout *mokoro* canoes down one more shallow hippo trail into a lagoon where night lilies lie open to the sky.

All day every day for a week we have ridden in mokoros, while the sun blazed an arc untouched by cloud. Now dusk has come like sweet-scented balm and Venus is a torch in the sky. Hippos warn us in deep honking voices that the river is theirs, that we should leave.

I have come to the north of Botswana to make acquaintance with one of the best preserved corners of wilderness left in the world, a place many call the last of Old Africa. Largely unsettled, northern Botswana's pastiche of wetlands and rivers, dry woodlands and savannas covers one-third of a nation larger than France. Within its wilds live some of Africa's last great free-roaming herds of Cape buffalo, zebras, antelope, and above all elephants—elephants 60,000 strong, probably Africa's largest herd.

With a conservation-minded but pragmatic government now forging policies that will decide their future, Botswana's wilds could embody Africa's best hope of delivering such a treasure unspoiled into the coming millennium.

Some days from the mokoros we see no signs that other humans exist, hear nothing except wind in reeds, splashing herds of aquatic antelope, the wild fluting screams of fish eagles. But other times reveal inroads of our species: once lush islands denuded to stumps and ashes by slash-and-burn farming, crude racks for drying meat from animals hunted legally or otherwise, airplanes flying to scattered tourist lodges, footprints of domestic cattle.

My twilight ruminations are shattered when a hippo rears head and shoulders above the water, eyes round in outrage, and roars like a steam engine. The head plunges and arrows toward us, throwing a V-shaped ripple that erupts into foam and pink jaws the size of wheelbarrows.

"If he comes any closer, bash off into the papyrus," says Cecil Riggs, professional hunter and wilderness guide. He has told me that hippos kill more people than does any other animal in Africa. Looking at huge canines like ivory chisels, I understand how. The hippo comes closer and bellows again, eye level with us.

"Right, time to go," Cecil says, stepping from his mokoro onto a mat of papyrus. "Watch this stuff, Doug. Don't break through. There's ten feet

Beds of fast-growing papyrus dominate the permanent swamps and waterways of the Okavango River and its delta (facing page). Papyrus growth can be so dense that it redirects the flow of water through the delta, creating new watercourses.

Swamps are home to the Nile crocodile (below), which breeds mainly in the river's northern section, called the Panhandle. In the 1950s and '60s hunting, now tightly restricted, reduced crocodiles from 50,000 to some 10,000 today. People who venture into the swamps in dugout canoes, called mokoros, *steer clear of the crocodile, which eats whatever—and whomever—it can.*

of water underneath it." Right. I step from my mokoro and hunker waist-deep beside Monnatsepe, a teenage apprentice poler. All four of us crouch motionless as the apparition throws spray across our mokoros and champs its jaws a few feet away from our only means out of this wilderness.

We stay frozen, doing the right thing—nothing. The hippo quiets and stares shortsightedly, and with a final grunt and flick of the ears it submerges out of our lives. I have just seen a face of Old Africa.

Cecil laughs, we all laugh with relief, and Cecil pokes fun: "Monnatsepe didn't know what would get him first, the hippo or a snake!" But he has serious thoughts too, as we steal away. "You can get lost out here. You can disappear, and no one will ever know what happened."

Over a supper of cornmeal cakes and guinea fowl stew, Cecil tells me of running cattle drives across the Kalahari Desert while lions trailed them. Tshipariete murmurs in his Seyei tongue to Monnatsepe as they spread sleeping mats and blankets by the fire. I ask what he is saying.

"He is teaching me how to go in the world," the youngster says. "He tells me to see where we are and remember the islands and trees. I want to learn how is the world made."

This world of his is a vast sweetwater delta far from any sea, made by a river that rises in Angola's highlands and dies deep within southern Africa's interior. Sprawled fan-shaped over northwestern Botswana, the Okavango Delta is big enough to swallow Massachusetts (map, page 47).

Yet it is but a shallow film of water and organic soil perched atop Kalahari sands, sustained by uncertain rains and the umbilical flow of the Okavango River. Floodwaters from Angola cross Namibia's Caprivi Strip to enter the 60-mile-long Panhandle in northwestern Botswana. Some five months later they reach the base of the delta, arriving like solace at the meridian of the dry season in June or July.

The waters fill the Boteti River and in the wettest years reach the lunar surface of the huge Makgadikgadi salt pans—largest in the world. At the best of times water pushes through the Selinda Spillway to connect the delta with a system of rivers and wetlands on Botswana's northern border.

Between these features lie vast forests of acacia and mopani trees and grassy savannas rooted in Kalahari sand. Clay pans in the woodlands

catch water during the wet season, and animals fan out through the bush. When the rains cease and the land dries, the herds seek the permanent waters of the Okavango Delta and the northern riverine border. Plains game and desert animals live cheek by jowl with hippos and crocodiles in a shifting mosaic of migrations and changing habitats.

Only one-twelfth of Botswana's 1.3 million citizens live in its northern regions. But the roads here are soon to be tarred. The delta will then lie a day's drive from Johannesburg, South Africa. Meanwhile planners and engineers look to the Okavango as a resource in a thirsty continent, and cattle owners eye its green grazing. As a result, a developing, primarily agrarian country must weigh demands for land and water against a unique opportunity to preserve its wild inheritance by using it as a renewable resource, through tourism and wildlife harvesting.

The key to all is water. None know this better than the nation's dominant Tswana tribes, who have long lived on the Kalahari's fringes. They call rain *pula*, also the name of the national currency—a word used in greeting, toast, blessing, a slogan of hope on Botswana's official seal.

Stepping gracefully on slender legs, wattled cranes—like these in Cidzira Lagoon (opposite, top)—require shallow water, where they feed on tubers, frogs, and small reptiles. Exclusive to Africa, the cranes thrive only in Zambia and Botswana. With its unspoiled waters and abundant plant and animal life, the Okavango Delta is an important breeding ground for this threatened species.

Gently swaying water lilies worthy of Monet's paintbrush share this shallow-water habitat. Flourishing in lagoons and open waterways throughout the delta, water lilies send delicate stalks spiraling up to the surface, where their buds open. After a few days the stalks retract, pulling the blossoms underwater, where they ripen and release their seeds.

"THEY'RE DESPERATE TO DRINK," says June Wilmot. Our open vehicle sits in the eye of an animal storm beside a pan in Chobe National Park, east of the delta. Doves wheel like autumn leaves in wind, harassed by kites as they alight in relays at the water's edge. Lions lounge beside the pool, then rouse and slouch away as two bull elephants stride into the water, waving their trunks at the cats. Around us are huddled groups of antelope—impalas, kudu, and tsessebes—watching. When the lions leave, they move forward to drink.

It is late in the dry season. Leafless trees lie shattered, bulldozed by elephants seeking fodder. Grazers and browsers have stripped earth and bushes bare around the only surface water for 25 miles, pumped by the government's Department of Wildlife and National Parks. June remembers an even more desperate time, late 1987; the bitter nadir of a drought that ravaged Botswana for seven years.

"Whole square kilometers looked as if a nuclear bomb had hit. Impalas had spontaneous abortions. Tsessebes were keeling over in the heat of the day. And the dust! Out of it would come tsessebes on spindly legs, like cardboard cutouts. Lions and vultures had a field day."

In 1982 the Savute River ran dry; no one is certain why. June and Lloyd Wilmot watched the drama from their tourist camp on the riverbank. "Crocs and hippos crowded into pools that became mud," she says. "Elephants would pick their way among them to drink. Catfish were boiling in this black water, while hyenas fished between the hippos."

Eventually the elephants headed north on ancient trails toward the ever flowing Chobe-Linyanti river system on the border. Many hippos and crocodiles followed. Some reached their goal. All that stayed, died.

June points out evidence of even older changes: wave-cut terraces on rocky hills and a sandy ridge built by an ancient lake, one of many incarnations created as antediluvian rivers came and went across southern Africa. Change is the only constant here, drought the final arbiter.

Lloyd and June daily dug out sandy seeps while buffalo and elephants waited for them to reach water. Finally, in early 1988, rains drenched Botswana, filling pans throughout the abandoned Savute Marsh at the dry mouth of the river. Life returned with pula.

The Wilmots were the first to introduce me to the daily dead-earnest circus of Botswana's bush. With June I followed wild dogs as they coursed a steenbok and devoured it in minutes. We sat in an open truck while lions

slept in our shade, close enough to touch. June knows many by name. At Savute I spent nights following lion prides, watching them glide into position for crescent-shaped ambushes. I listened to the swish of their paws through dry grass and finally, one starlit midnight, heard the rush of running bodies and an impala's quick, despairing cough.

From a bunker by Lloyd's Camp I watch elephant trunks dabble in water a yard from my face. With incredible delicacy they mouth small pebbles, swirl leaves, twine in intimate greeting. Butterflies dance among giant feet, bees clamber at the water's edge. The air is filled with elephanthood, with a rich zoo smell of fodder and manure, with the rumblings of their speech and a sudden trumpet fit to break the walls of Jericho.

I look up at faces like dirt-caked boulders embedded with thick-lashed hazel eyes. They have the knowing look of a race that has seen rivers come and go. In their minds are maps of far-flung clay pans and woodlands and swamps, linked by ancient trails written on the land by the feet of many generations.

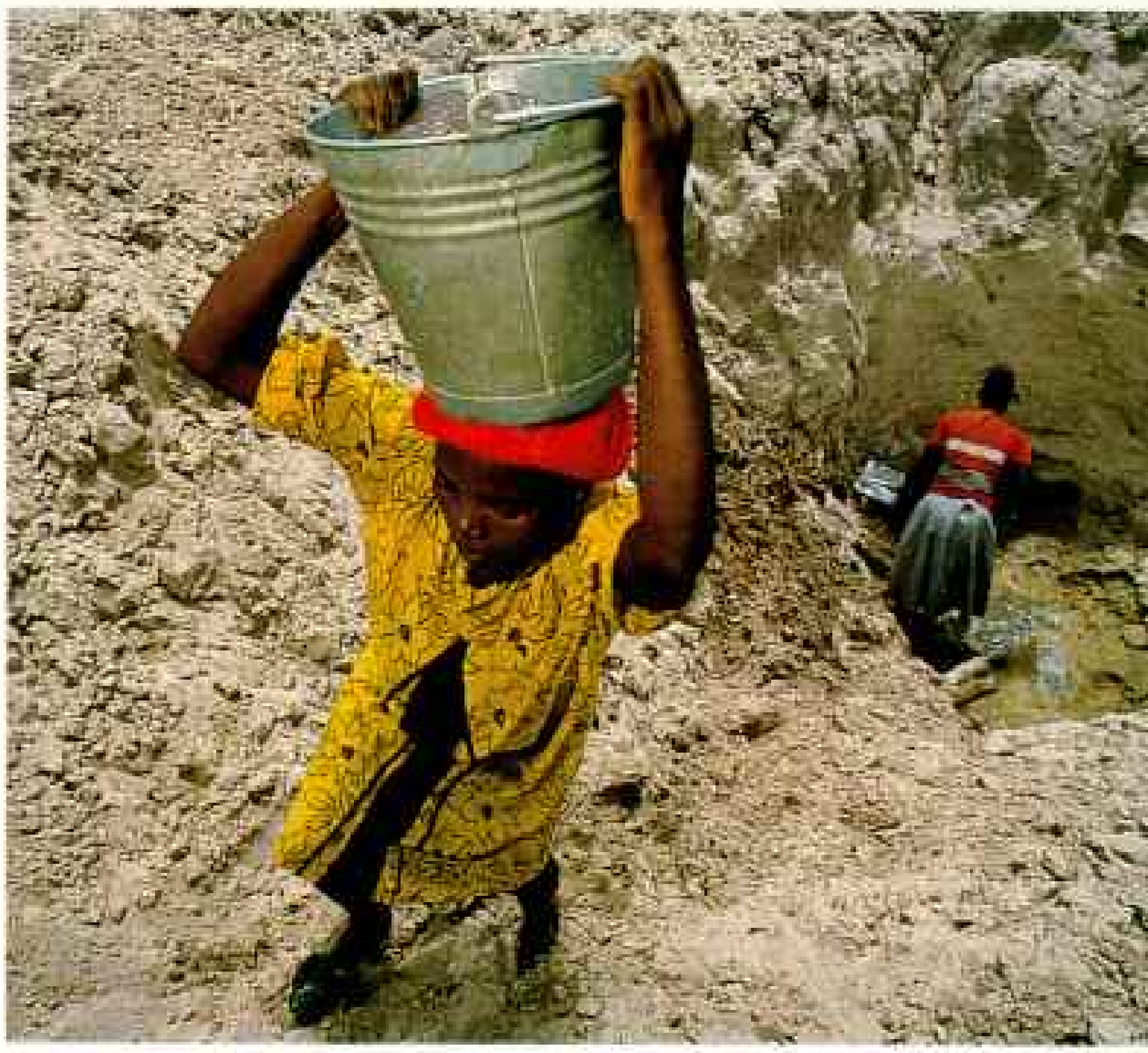
In northern Botswana they have found a haven where broad spaces are still open and where the government in 1983 prohibited all hunting of the species. Their numbers have grown into the healthiest, least molested population in Africa. Reproducing at an estimated 6 percent a year, the maximum the species is thought capable of achieving, the herd may number 67,000. Their success is a heartening note in the doleful litany of disasters for African wildlife.

Yet even here, elephants bring into focus African issues of poaching and the legal culling of overlarge herds; of human populations growing alongside preserves, bedeviled by crop-raiding wildlife; of elephants changing the habitat around them, while concerned parties argue about managed versus natural change.

Botswana's elephants have been beneficiaries of the nation's political stability. One of the world's poorest countries upon independence from Britain in 1966, Botswana has become a successful free-market democracy, underwritten by the subsequent discovery of diamonds. Mineral wealth and a thriving cattle industry have made it into one of the best financed of developing nations.

At the height of the seven-year drought elephants seeking water massed along the northern rivers and swamps. Wherever elephants gather, you will hear the crack of falling trees. Elephantine appetites made kindling of the northern riverine forests. With its wealth of elephants Botswana is considering culling several hundred animals.

It is a proposal full of controversy, especially since the Convention on International Trade in Endangered Species (CITES) has placed elephants on Appendix I of the endangered species list, banning any trade in



Groundwater runs deep beneath Kalahari sands, and women from a village near Ncamaseri have to dig for it (above). Most other villages gain access to water through boreholes. Proposals to draw water from the delta for agricultural, industrial, and domestic use are being studied.

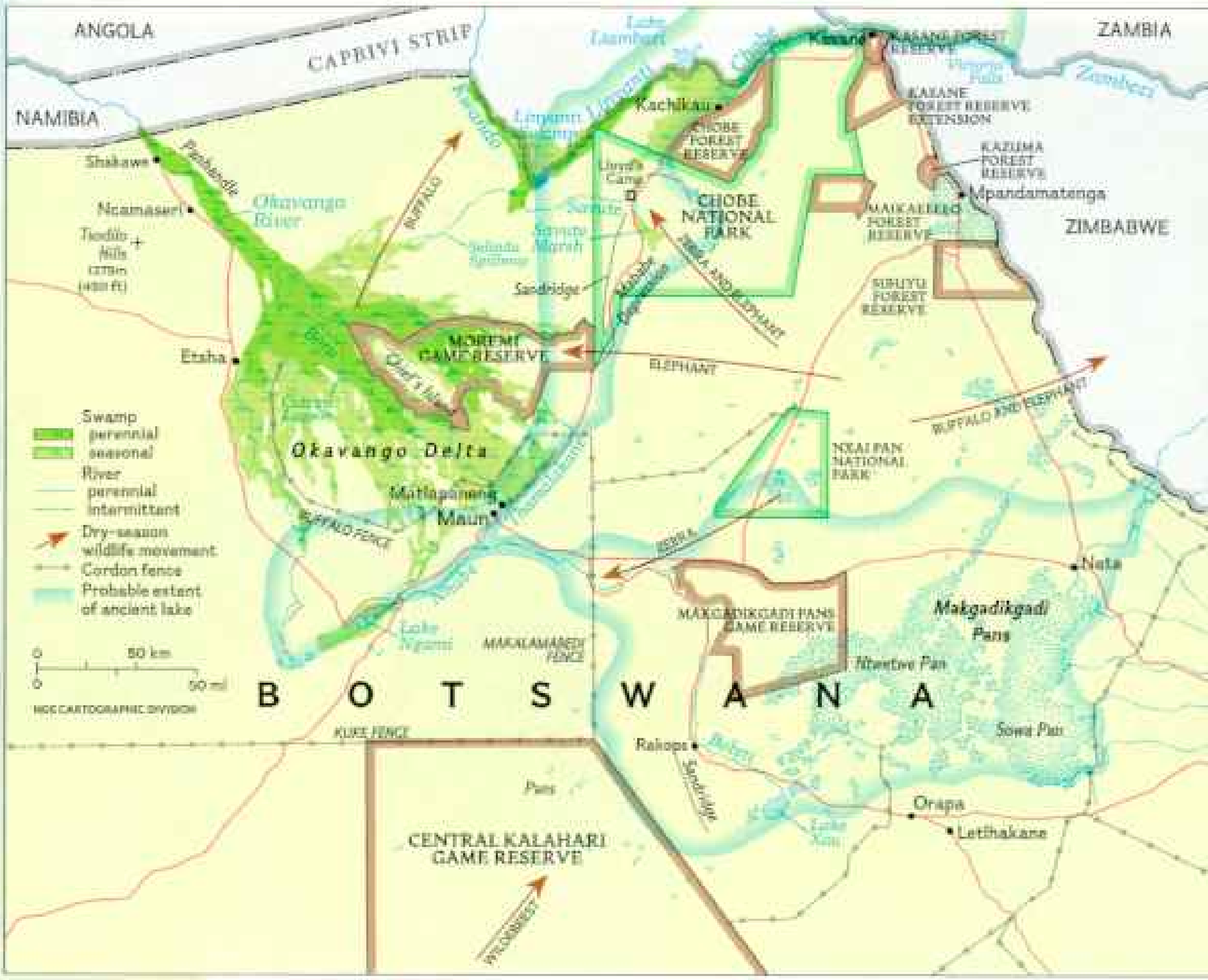
Fires started by lightning, by hunters trying to flush out game, or by cattlemen encouraging new plant growth for their stock, burn as much as 70 percent of the delta's vegetation each year. The fire at left spread uncontrolled for a week along a front some 60 miles long.

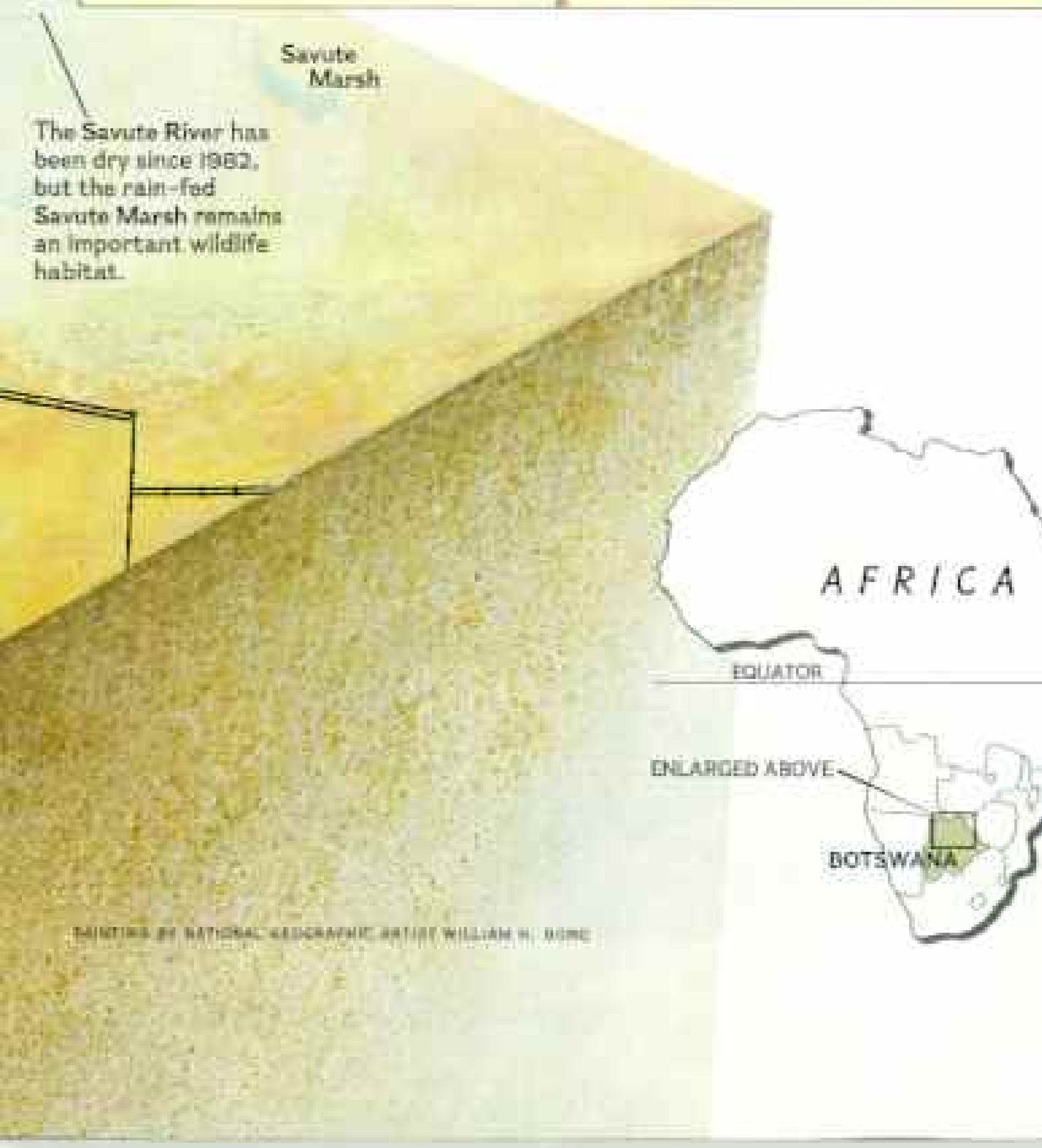
Land of disappearing rivers

FED BY RAINS in the mountains of Angola, the Okavango River flows southeast through Namibia's Caprivi Strip before entering landlocked Botswana. There the river meanders for 60 miles between two parallel faults in the earth's crust, creating the Panhandle floodplain.

Spilling over the Gomare Fault, the river divides into several main channels and a labyrinth of shallower watercourses. In all, seasonal flooding causes some 350 billion cubic feet of water carrying as much as 727,000 tons of sediment to spread out into an alluvial fan, the world's largest inland delta.

Practically all the water evaporates. What little remains runs up against the Thamalakane Fault and flows southeast down the Boteti River toward the Makgadikgadi Pans or southwest toward Lake Ngami.





Botswana has set aside 17 percent of its land as national parks or game reserves, one of the highest percentages of any nation. However, measures taken to protect the cattle industry have sometimes proved disastrous for wildlife.

Beginning in the 1950s the government built fences to control disease in commercial herds, which today must comply with import standards set by the European Community for disease-free beef. Some of these fences restrict wildlife migration to and from traditional water sources. As a result many animals have died—more than 50,000 wildebeests in 1983 alone.

As if snared in their own traps, Mbukushu women return home with the woven baskets they use to catch fish (above). Fishing in the Okavango River is a highly social but risky activity, as the women must watch for crocodiles. Entering the water, the women form two lines facing one another. One line holds the submerged baskets while the other walks toward

it, driving the fish into the baskets.

Using palm leaves, Mbukushu women in the town of Etsha weave baskets with traditional geometric designs (left). More than 15,000 baskets are sold each year, mostly in Botswana; some find their way to Europe or the U. S., where they can fetch more than a hundred dollars each.

elephant products. The United States, among other nations, now bans the import of ivory. Joining ranks with Zimbabwe, Zambia, and Malawi, Botswana is determined to harvest and sell ivory.

"We have managed the resource well," says President Quett K. J. Masire. The southern African four have discussed marketing ivory through a center located in Botswana's capital, Gaborone.

Dereck and Beverly Joubert hope the cull won't occur soon. "Here we have the most natural, free-ranging herd left in Africa," Dereck says. For nine years the couple have lived out of tents filming northern Botswana's wilds. "The change in the forest may be a long-term natural cycle. For scientific reasons alone it's worth holding off. The moment that first cull occurs, everything changes. It's like smashing a pure diamond—there's still lots of little ones, but not in the same state."

Nights by the Jouberts' campfire bring stories about elephants' uncanny senses, their ability to communicate over distances, and a strangely human-like awareness of death. Tales abound of elephants making off with tusks and bones from storehouses and poachers' caches, of elephants burying their dead under branches, of elephants at night visiting a site where herds had been killed, and then moving great distances, apparently understanding the threat.

THROUGH THE NETTING of a tent one night at Savute, I watched the stars disappear as a great bulk loomed up beside my cot. Lying in the dark, separated from the night visitor by gossamer and canvas, I listened to it breathe and chew, and thought how impossible this encounter will be when family herds go under the guns.

Young bulls sport in the Chobe River, gamboling in with swinging trunks for shoulder-deep wrestling matches. They duck and surface like whales, trunk tips up like periscopes. If they chose, they could walk across the river into Namibia's Caprivi Strip. But they stay on this side by day, going over to feed only under cover of night, for they have learned that across the river they are likely to be shot.

"The Caprivians have literally wiped out their animals," says Lt. Gen. Ian Khama, commander of the Botswana Defence Force (BDF), chief of the Bangwato tribe—first among equals of the nation's Tswana tribal groups—and a leading force in the highly active Kalahari Conservation Society. He is also the son of Botswana's founding president, Sir Seretse Khama, who set the country's course of political moderation and made wildlife conservation a plank of national policy.

"We are one of the few countries left with our species intact. On their side, we look, we just see cattle."

Automatic weapons flooded the Caprivi Strip in recent years as fighting flared between South African and insurgent forces. Poaching soared, and reports reached the BDF of armed groups entering Botswana.

"No country can ignore armed men crossing its borders," says General Khama. "We took on the poachers aggressively—we actually shot a few of them."

Though dampened, poaching continues, both cross-border and homegrown. Authorities estimate that 100 to 200 elephants are killed yearly. Most poaching by Batswana—citizens of Botswana—is primarily for smaller game to provide meat for village families. Elsewhere, international crime rings have ravaged much of Africa's wildlife for valuable tusks and horns.

"You know when those people deplete the source elsewhere, they'll start looking toward Botswana," the general said. "And we, of all the

Look fierce and don't smile for the camera: Those were the instructions given by this French television crew to Dzu Bushmen living in the Tsodilo Hills. Today few Bushmen, if any, live as

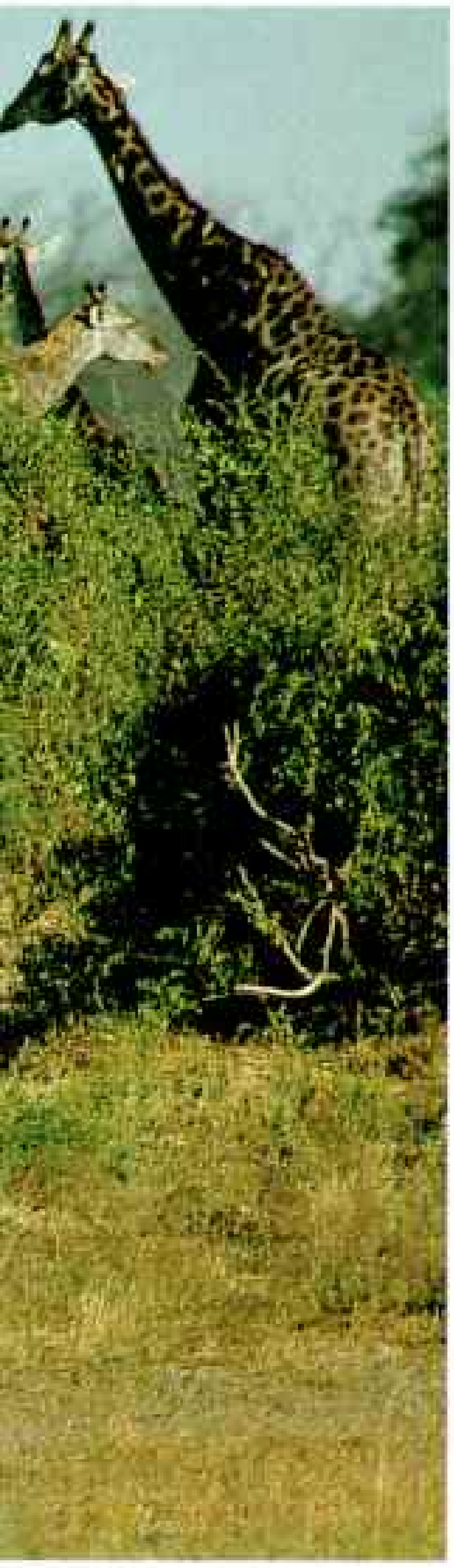
simple hunter-gatherers in the manner of their ancestors. Paid to shed their Western clothes—and to pretend to stalk the crew's helicopter—they are being used to perpetuate a commercial fantasy.

Hub of Botswana's safari industry, the frontier town of Maun (right), with its hodgepodge of huts, houses, and commercial buildings, lies at the base of the Okavango Delta and serves as the gateway to northern wildlife areas.

Modern safari hunting began here in the early 1960s and paved the way for the tourist industry, now the economy's fourth largest earner, after

diamonds, copper-nickel mining, and cattle. In 1988, 306,000 visitors to Botswana brought in 47 million dollars.

Near Kasane a truckload of tourists sizes up a herd of browsing giraffes (below). Some wildlife officials think such photographic safaris, with their influx of people, will overtax the area's resources. Others insist it's a way to exploit wildlife without harming it.



countries in this region, have the smallest wildlife department, the smallest army, with very, very big herds and a very, very big country."

Many Batswana feel indifferent, even hostile, toward both conservation and related forms of wildlife-oriented tourism. "Conservation laws—they were imposed on the people in Africa," explains Sedia Modise, assistant director of the Department of Wildlife and National Parks (DWNP). "These laws prevent people from doing what their forefathers did for thousands of years."

Domestic poaching—traditional meat hunting—has been treated as a minor offense. But there are signs within Botswana of a more sinister trade. A crowd gathered one day before the police station in Maun, the largest of the handful of towns scattered across the north, around a stack of tusks lying like jackstraws on the sand. Posing as buyers of ivory, the DWNP had netted more than 40 illegal tusks, worth perhaps 110,000 pula—$55,000. Some were dark with age; others dirty from being buried to hide them. They seemed unlovely objects to be the cause of so much death. When the case came before a local magistrate, fines totaled less than a thousand pula among seven guilty parties.

"Yes, the fines are too low," said Elias Nkwane, wildlife officer for northern Botswana. "But the law will change soon. People here have seen wildlife just as meat. We are now trying to show that game means fortune. People must understand the need to have these animals."

Long underfunded and short of trained personnel, the wildlife department has frequently been stretched beyond its means by a mandate to administer national parks and game reserves, which cover 17 percent of Botswana—a higher proportion of protected land than almost any other nation. A recent boost in funding and emphasis on training may signal the beginning of a more effective era for the department. This is especially critical as more and more foreigners visit the wilderness.

ALTHOUGH it is northern Botswana's largest private employer, the tourist industry—now welcoming 33,000 visitors a year there—is looked on by some local citizens with suspicion and envy.

"People aren't allowed to hunt in the parks, and they look on them as islands set aside for the benefit of people from outside Botswana," says Sedia Modise. "Except for the few jobs it creates, the tourist industry does not benefit Batswana.

"We need public participation in hunting co-ops, game ranches, game farming," Mr. Modise believes. "That will open up people's minds to conservation. The population of Botswana is growing, and so are people's needs. The government has been under tremendous pressure to open up land to development."

Invariably wildlife comes off second best: Some years more lions and leopards are killed as threats to livestock than for sport. Wild dogs, otherwise protected and recognized as a threatened species, can still be shot for killing domestic animals.

In Kachikau village on the border of Chobe Forest Reserve, Chief Julius Mologasele sat straight-backed in a straight-backed chair beneath a shady tree and spoke: "Lions are eating cattle. Elephants are coming for the destruction of the lands. People think elephants are too much. Some must be shot. We don't want animals to be finished in the country. Animals are food. You can't live without eating meat. We want the reserve to be farther from the lands of the people."

Botswana is among four southern African nations participating in a multimillion-dollar U. S. Agency for International Development project

Struggling to keep pace at a Savute water hole, a baby elephant less than five weeks old adds to a modern dilemma. Although Africa's elephant population is in overall decline, Botswana's herd

of some 60,000 is actually on the rise, forcing wildlife managers to consider whether the habitat can sustain such a large population. If not, it may become necessary to cull the herd.

Felled by hungry elephants, hundreds of mopani trees lie stripped of leaves and bark (above). Lacking ground forage during a drought from 1981 to 1988, Botswana's burgeoning elephant population had no alternative source of food.

Ivory prices have made poaching a lucrative business. In a recent sting operation officials confiscated about 40 tusks valued at $55,000 (opposite, top); local poachers in Maun were fined less than $500.

A rusting sign at Chobe National Park symbolizes the problems of past neglect and present underfunding of wildlife programs.

to bring villagers direct rewards from tourism and wildlife harvesting. One tactic might be to identify the most effective local poachers, hire and educate them as gamekeepers, with legal means of making money by cropping animals on a managed, sustainable yield.

HUNTING is a way of life etched in Botswana's bones. A few bands of Bushmen still hunt the Kalahari with traps, spears, and poison-tipped arrows. But increasingly hunting has become the domain of four-wheel-drive vehicles and high-powered rifles. Opinion is divided as to whether present pressures on wildlife are sustainable.

"If they manage this properly, it could go on forever," says Harry Selby, dean of Botswana's professional hunters, as he grinds his Land Cruiser through a slough on the delta's north flank. By "this" he means both the game country and the business he is in, guiding wealthy international clients in one of the last bastions of the big-game hunting safari.

His goal is not meat but a trophy-size animal. In a high, open-air seat behind the cab sit a Texas oilman and his college-age daughter. Behind them stand two trackers—the elite of a camp support staff that includes skinners, cooks, waiters, drivers, and maids to clean tents, wash daily laundry, and draw hot bucket showers before drinks around a campfire and an immaculately served dinner.

Roughing it this way can cost $1,200 or more a day. As a professional Harry is selling more than a list of trophies; his product is part mystique, and above all exclusivity. "You have to have room to wander around," Harry says. He is hunting a 5,000-square-mile concession leased by Safari

South, one of Botswana's five hunting companies. Yet we have in fact passed other vehicles with citizens, white and black, legally hunting buffalo and zebras for meat and skins.

"From day one the professional is under pressure to produce," Harry said over a lunch of Camembert and cold chicken, spread in the shade of an acacia tree. "The regrettable part, as I see it after 45 years of hunting, is that so much is wanted in such a short time. A safari was once three months; now it's three weeks. It's not that people can't afford the money. It's that they can't afford the time."

Safaris sometimes promise 21 trophy animals in 21 days. Such pressure can lead to cutting of corners: Shooting from the back of a truck is common, although it is outside both the law and the strictest standards of sport hunting. "It comes down to an individual hunter's ethics," Harry said, "his ideas of fair play, of what is fair chase."

The day I rode with Harry Selby, no animal was deemed suitable for a trophy, although impalas ran like red rivers through the green, swampy landscape. Harry is a courtly man, dry-witted, unfailingly polite. But his eyes, always distant, take on a predator's focus when he is stalking, and he doesn't like his prey to get away.

"These zebras are easily spooked," he said as striped herds pounded away, blending with the dappled woodland. "They've been shot at a lot."

Botswana is among the few African countries that make hunting affordable for all citizens, Harry explained. A license to shoot an animal is cheap and can be transferred or sold between citizens—a system designed to aid meat hunters in the bush and outlying villages. By purchasing many licenses, individuals with modern vehicles and weapons can hunt commercially for meat and skins.

"I once found a camp that was a mobile butcher shop, making sausage and transferring it out in freezers," Harry said. "The game scouts checked it, and they had 25 legal buffalo licenses."

Although hunting quotas are set area by area for each species, there is growing concern over legal hunting pressure. Only recently the DWNP has begun to monitor hunting and licensing information by computer.

"It's a remarkable thing for me to say," Harry declared, "but if my

opinion was asked, I would put a total moratorium on the Okavango and allow no shooting, no tourism, for three years, four years, whatever it takes to get it under control. It's too valuable to play with. How many unspoiled places are left in Africa that have the abundance and variety of wildlife of the Okavango?"

Critics of the hunting industry wonder whether the killing of prime males of species such as lion and sable antelope disrupt breeding behavior, survival rates in the young, and, ultimately, gene pools. "Done right," says hunter Cecil Riggs, "the lion you put your client on to is an old male. I'd rather see a lion beautifully mounted and set in somebody's house than torn to shreds by hyenas. A lion with a massive mane of black hair, his genes are already in the pride."

June Wilmot disagrees, telling of prime males shot in hunting concessions on the borders of Chobe National Park, and the effects she believes such losses have had on cub mortality in Savute.

"A male will kill the cubs of another male when he takes over a pride," she says. "So losing several males in a given area denies a lot of females and cubs security." She believes more lion research is needed.

Plans are now under way to reapportion the hunting concessions into more and smaller leases, some designated for safari hunting alone, some for citizen hunting, and others for nonhunting tourism. Many welcome the changes as necessary to bring more black citizens into an industry predominantly run by white citizens and expatriates. Some see an end to the era when the professional hunter was master of a wild fiefdom.

It was late afternoon when Harry lifted his binoculars toward the sable bull. Above a face like that of a goat designed for beauty, four-foot-long

Hunters' reflections framed in its eye, a dead zebra awaits skinning and butchering (facing page). For each such kill Botswana's quota system requires a license, and nonresidents, like this American client (below, at right), must be accompanied by a licensed hunter. Last year in northern Botswana 1,910 game animals were taken legally by foreign hunters, supporting an industry that employed more than 400 people and grossed five million dollars. Wildlife managers see the setting aside of land for hunting as a key to conservation by keeping large tracts of wilderness wild.

horns arced back on either side of the tapering body as he turned and ran through golden grass.

"I haven't seen a sable like that in 18 years," Harry said, mostly to himself. Harry's clients had already shot the sables allowed by their licenses. We watched this one disappear into the woods. "It's drying up and they're coming in from the backcountry. Pardon me, I can't help feasting my eyes. One never knows if one will ever see anything like it again."

MORE SURELY than the bark of a gun, the lowing of cattle and the bleating of goats sound trouble for wildlife. Most of the Okavango Delta was guarded until recently by a fly—the tsetse, carrier of sleeping sickness, harmless to wildlife but deadly to livestock and humans. The fly has all but disappeared now, eradicated by insecticide.

Many in the wildlife community mourn the loss of the insect that, for its role in keeping out livestock and settlement, has been called "the best game warden in Africa." While I rode with one hunter, he rolled down his window and carefully shooed out a fly with the admonition, "Go and breed, you little bugger."

Meanwhile, new water boreholes have opened up more and more free rangeland to cattle, which outnumber Botswana's human population by two to one. Cattle numbered three million before drought and starvation killed a third in the mid-1980s. Carcasses littered the dry riverbed in the middle of Maun; goats climbed atop cars to eat withered leaves on trees, onto roofs to eat thatch. Satellite sensors showed one-fifth of Botswana's surface had been damaged by drought and overgrazing.

"It was becoming desert," says "Uncle G" Sekeletu at his cattle ranch near Maun. "No grass . . . no grass completely."

A year after the drought broke, his cattle are fat and sleek coated, with the calm of well-tended beasts. While his neighbors lost whole herds, Uncle G heeded government advice to sell some of his stock to prevent overgrazing. Reducing one's herd goes against the grain of the Batswana, who reckon wealth and prestige in livestock.

"My relations were complaining, 'Why do you sell your cattle?' I didn't tell my wife because she would be afraid. Government told other farmers, 'You must reduce your herd.' They said, 'We cannot.' Now they are crying. But here you can see the relief. You can see the grass."

Uncle G's approach to management is exceptional. Driving to his cattle post, we had passed others where the earth was swept clean as a billiard table, trees pruned to goat-height above bare Kalahari sand.

"People think if they have many cattle, some will live. But when drought comes, they all die. They all die."

MOST OF BOTSWANA'S cattle run on unfenced free range. In the grip of drought, owners and animals looked desperately for water and fodder, and cattle moved farther into the delta and other wildlife areas, no longer barred by tsetse flies. The only check to a full-scale invasion has been a fence that skirts the lower delta for 150 miles. It was built in 1982 to meet health standards of beef buyers in the European Community (EC) by separating Botswana's cattle from buffalo suspected of carrying foot-and-mouth disease. In its role of protecting cattle, the Buffalo Fence has actually saved the delta (page 65).

On a horseback safari with tour operators P. J. and Barney Bestelink, I rode through a landscape like a dream of wild Africa distilled. Outside the cordon fence we had plodded through dry, dust-blown fields stripped by cattle. Here, with civilization fenced out, wildebeests raised dust like an orange mist, and galloping zebras cast long shadows like ghost herds keeping pace. I thought of the ghost herds of the central Kalahari, where livestock-control fences, growing settlement, and drought combined to wreak havoc on one of Botswana's greatest wildlife treasures.

South of the delta the Kalahari Desert stretches beyond the nation's southern borders. The midriff of this vast, waterless region lies within the 20,000-square-mile Central Kalahari Game Reserve, set aside in 1961 for Bushmen to pursue their hunting and gathering. The reserve and empty lands around it support tens of thousands of desert antelope—gemsbok and springbok—that need never drink, deriving moisture from vegetation and juicy tubers. Lions, leopards, and cheetahs there survive on the body fluids of their prey.

But some of its creatures do need water, notably wildebeests and hartebeests. The 185-mile-long Kuke Fence erected in the 1950s separates the

Two inhabitants of the delta ferry home a sitatunga (opposite, top) they shot under a subsistence hunting license. Splayed, elongated hoofs enable this aquatic antelope to amble across dense beds of papyrus without falling through the plants' floating mass of roots.

With a computer, conservationist Paul Sheller (above, foreground) and Elias Nkwane, chief wildlife officer for northern Botswana, keep track of wild animal populations and hunting license information. Their data aid in law enforcement and help establish hunting quotas.

central Kalahari from the permanent waters of the Boteti and the Okavango. When drought parched the Kalahari in the 1960s and again in the '80s, wildebeests and hartebeests instinctively trekked north toward water, but found fences and farms barring the ancestral route. Funneled by fences toward settled areas, animals died by the tens of thousands.

"In the 1970s there were an estimated 250,000 wildebeests in the central Kalahari," says Paul Sheller, chairman of the Kalahari Conservation Society's Okavango branch. "By 1986 there may have been 2,500. The preserves are not viable ecological units. You can't surround them on all sides and expect them to work."

BY THEIR INNERMOST DESIGN Botswana's wilds are not intended to be measured off and contained—flux is the life beat of their resiliency. Lake Ngami was not a lake when first I saw it, but a shallow bowl of powdery dust littered with bovine bones and skulls. A year later, flying over it with Nigel Hunter, government coordinator for land planning, I watched flights of white pelicans and pink flamingos rise from their own reflections above blue water. Good floods had washed through the delta to fill Ngami for the first time in a decade.

"The lake is more fertile than most of the delta," Nigel said. Despite the delta's lush greenery, its sand underpinnings contain few nutrients. So pure is its water, filtered by papyrus, that away from villages a traveler can drink it with safety. Enriched by cattle dung and carcasses from its long dry spell, Lake Ngami last year drew water birds in the multitudes celebrated since the days of early explorers, some of whom thought the lake was a fabled goal—the source of the Nile.

"We can have people run cattle around the lake, leave the middle for people who want to enjoy the bird life, and set aside part for bird shooting," Nigel said as we swooped above the shallow waters. "The Okavango is recognized as a very special ecological area. But there's no way we can keep it all pristine and unused; there's just too much demand. We have to explore how to protect it while enjoying it and making use of it; give people a share of the cake without destroying it."

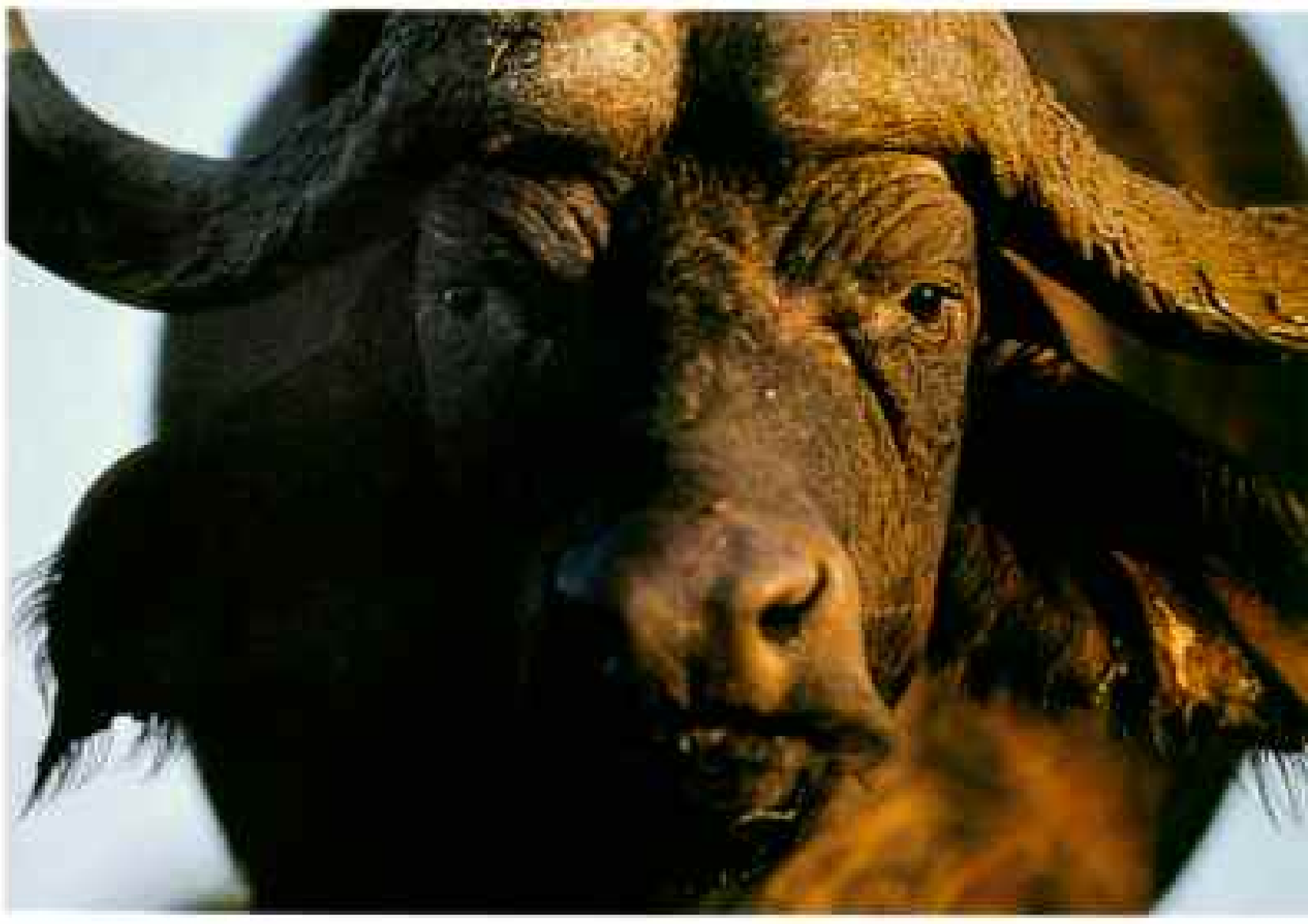
One controversial delta plan is to dredge 20 miles along the lower end of its strongest flowing channel, the Boro River, in order to increase flow to a pair of dams to be built above and below Maun. Reservoirs would allow controlled flow down the Boteti River to the huge and all-important diamond mines near the river's end, which now depend on finite underground sources.

"The delta would have already used the water," said Director of Water Affairs Moremi Sekwale in defense of the plan. "Environmentalists are opposed to any development. That's unreasonable. You can't have a resource you don't touch when people downstream need water."

Not everyone agrees. It is feared that channelization would decrease the

Trophies in the wild: A young male sable antelope shows off his extravagant horns, much coveted by big game hunters; oxpeckers on his back hunt for parasites (facing page). Since the sable population is only 3,600, the 1989 hunting quota was limited to 137.

Prized for its horns and meat, the short-tempered Cape buffalo (below) grazes throughout northern Botswana. A quota of 1,299 in 1989 resulted in 497 recorded kills among some 45,000 animals.



flow into surrounding seasonal swampland. Some see the dredging as a wedge in the government's resolve not to allow development inside the Buffalo Fence.

The real danger may lie upstream, past Botswana's borders. A canal in Namibia could soon divert 3 percent of the Okavango River's flow, perhaps more. But the wild card is Angola, site of the river's source, where political chaos makes the future unpredictable.

"A dam, any system that takes water away from us at the source, is one thing likely to kill the delta," Mr. Sekwale warns.

ONE PURPOSE of dredging is to provide permanent water for Maun. Logistical hub of northern Botswana and, with 20,000 inhabitants, by far its largest town, Maun at the height of the tourist season is a snarl with trucks, Land Cruisers, cattle, and goats. Light airplanes buzz in and out of one of the busiest airports in southern Africa, linking far-flung camps and lodges with the world at large.

But on a lazy Sunday afternoon Maun sleeps like an old dog in the sun. Herero tribeswomen in bright bandannas and ample dresses sit beside rondavel houses of dried clay and sticks—much of Maun is really an extended village. Music blares from cinderblock speakeasies. Hunters, guides, pilots, and the drifting human kaleidoscope of a frontier town gather on the terrace of Riley's Hotel, or under the fans of the Duck Inn, or by the riverbank at the Okavango River Lodge, to swap lies and jokes and stories of uproarious parties and real adventures.

It is possible to bog a four-wheel-drive vehicle in the soft sand of downtown Maun's shopping mall. Every item in its stores has traveled 600 miles from the South African border along a mostly unpaved road.

Such casual chaos binds a startling array of unrepentant individualists into a loose community of the bush. There's more than a touch of the Wild West in Maun, where the Duck Inn's proprietress, Bernadette Lindstrom, can serve a Swiss fondue with South African wine or punch a deserving hunter off his bar stool, when either occasion demands.

Near Maun at tranquil Matlapaneng Bridge, young boys fish under green, overshading fig trees, while four-wheel drives inch patiently across

Cattle, wild buffalo, and the tsetse fly have engaged in a long-standing dance of death and disease in the Okavango Delta. Cattle near Maun are driven along the so-called Buffalo Fence built in 1982 (left), one of many veterinary cordon fences erected to control foot-and-mouth disease. Stretching for 150 miles, this fence keeps cattle out of the delta (opposite, top) and keeps in wild buffalo, suspected carriers of the disease.

Infestation by the tsetse originally kept cattle from penetrating the delta. However, in the 1960s Botswana's government declared chemical war on this pest, beginning with ground spraying. More successful aerial spraying in the 1970s and '80s has resulted in near eradication of the tsetse fly, but ground sprayers still target isolated areas of infestation (opposite, bottom).

With the tsetse fly under control and no major outbreaks of foot-and-mouth disease, pressure is mounting to open up parts of the delta to cattle grazing.

A bird from the bush is worth a thousand dollars in the hand: A farmer cradles an armful of ostrich chicks near Maun. The birds eventually will be sold for their meat, hides, and feathers. Wild game ranching, already a profitable enterprise in many African countries, especially South Africa, is an industry in its infancy in Botswana.

behind donkey carts. Life moves at the pace of walking cattle, of slow swamp currents.

Yet there is an age-old counterpoint to the steady rhythms of life along the river: Each year crocodiles take human victims off the banks, as well as dogs and goats. Ambitiously, they will try for the occasional donkey or horse. Still the riverfront is never empty of women washing clothes, girls fetching water, boys swimming.

I SWAM OFTEN in the delta, usually in clear pools, always keeping a sharp lookout. But I lost my taste for the water when I visited Mike Slogrove's crocodile farm. "There's Nelson, a cattle killer," he said, nodding at a horny-skinned dinosaur stretched like a tree trunk on the bank of a fenced pond. "Two months before we caught him, he dragged an ox into the water."

I had been with Mike collecting eggs as he plunged waist-deep through papyrus to reach nests showing the scaly imprints of 12-foot mothers that slid from the banks as we approached. I had seen crocs on mudbanks, crocs swimming and floating, and once, in a dugout canoe, felt each ridge on the spine of a croc the size of my boat bump beneath the keel. But not until I saw Nelson did I realize just what a crocodile can be.

Nelson roared like a dragon and clamped his jaws into a female crocodile's thigh. She arched her back in agony as he clung to her, unmoving, 16 feet long from his snout to the bitten-off end of his tail. Mike jumped the fence and swung a ten-foot pole at Nelson, who snapped back with the sound of a mighty ax blow. Then the female struck, snakelike, taking a chunk from Nelson's nose. He went into the water bleeding and faced

Mike, who planted his pole on the croc's nose and shoved firmly away.

"He's already killed two in other ponds," Mike said, climbing from the ring. A former game warden and one of a handful of game farmers in Botswana, he began his business by capturing animals and collecting eggs from wild nests. Now he owns 95 breeding females. He sells the skins for shoe and handbag manufacture in Europe.

Had he, I wondered, considered farming something less large, dangerous, and difficult?

"Well," he said, reflecting the spirit that calls certain types of people to live their whole lives in the thorny, dry, ever fascinating Botswana bush, "who wants to raise warthogs?"

Nose to nose on Shane Seaman's crocodile farm outside Maun, Edward Ramsden greets a newborn croc. The government sets yearly quotas on the number of crocodiles and eggs each of two farms in Botswana can take from the wild. This egg was collected from the swamps and incubated until hatching. Regulations require that 5 percent of all crocs successfully hatched be released to the wild.

JACK BOUSFIELD knows all he wants to know about crocodiles. As a young man in Tanganyika he shot and trapped more than 40,000 for their hides. That may explain why he lives so far from water today. Jack's wind-carved visage is turbaned like an elder of the desert as he flies across the Makgadikgadi Pans at full throttle in a four-wheel-drive, all-terrain vehicle. Now in his seventh decade, Jack guides tourist safaris across the vast salt pans where he has spent the best part of his past 25 years.

"At first you think there's nothing out here." He waved at an otherworldly panorama of alkaline flats and pebbled washes. Stalking the plain like a hunting heron, he squinted at the blinding pan. He stooped and held up a stone arrowhead. "Then you begin finding things."

Jack has found stone artifacts dated at 2,000 to 5,000 years old. It is startling to inspect these shards of human presence in a landscape so seemingly barren. But rains bring another reality, of life that creeps and crawls from softening mud, of flamingos from afar that wing in to nest in the millions, of herds of grazers drawn to greenery on the edges of the pans. Jack tells of lion prints far out in the pans' desolation and of skidding elephant tracks where herds panicked as they nearly broke through the thin crust into alkaline goo below. Trucks have disappeared completely, swallowed by the pans.

Jack has looked over the edge himself a time or two: In his day he has weathered blackwater fever, motorbike accidents and crashes in airplanes and ultralights, and a pounding by a young, theoretically tame elephant that tried to hammer him into the ground.

"Out here you get to know yourself," he says. "When all you can see is the curvature of the earth, it cuts you down to size." Nor, in several days with Jack, could I escape the spell the pans can cast: a land of mirages and dust devils a thousand feet high, where wildebeests and springbok waver on the horizon, levitating in the heat like bands of lost spirits.

My first glimpse of the pans had come a year earlier, when Lloyd Wilmot flew photographer Frans Lanting and me to an ancient rocky ridge overlooking their treeless expanse.

His back to a distant past, Gxauwe, a modern Dzu Bushman, displays a postcard of his uncle pointing to one of a few thousand rock paintings found in and around the Tsodilo Hills. No one knows for sure who painted these scenes of eland and giraffes and other animals, but scholars believe that most were painted by desert-dwelling Bushmen hundreds if not thousands of years ago.

The days of the traditional Bushmen are gone. But careful wildlife management will ensure that the animals they depicted on these rock walls will not disappear.

"How does it feel sleeping under a thousand years of history?" Lloyd asked as we spread sleeping bags beneath the rootlike branches of a baobab. The trees can live 2,000 years or more; this one felt as old as the full moon overhead.

"People have camped here for donkey's years," Lloyd said. Bushmen regard the hill as sacred. None of us were unbelievers that night as the moon gilded distant rainwater on the flats below and a breeze brought a salt scent like that of the sea. In other places, camped beneath baobabs, I felt a cathedral-like air, but these sentinels of the pans were more properly earth spirits. Just before dawn I awoke to gaze past muscled branches and white, starlike flowers to the gleaming sash of the southern Milky Way. A breeze had piped across the pans; I listened to the trees whisper secrets to the moon and understood the respect the Bushmen have for the baobab: Pick its flower, they say, and a lion will eat you.

"To hunter-gatherers the natural and supernatural are the same thing," said Alec Campbell, donnish and soft-spoken former director of Botswana's National Museum, also of its national parks. We stood on a ledge looking out across the Kalahari from the Tsodilo Hills—tallest of the handful of rocky outcrops that exist in northern Botswana's tableland. On their lichen-mottled schist, in crevices and crannies and on high rock faces, is Botswana's greatest archaeological legacy, paintings left by Bushmen and black tribes over millennia.

For 25 years Alec has clambered the hills at every opportunity, locating 3,500 individual paintings at 250 sites. Some, he says, may be 2,000 or 3,000 years old; older ones have probably weathered away, for Bushmen have inhabited the Kalahari for perhaps 25,000 years.

On the cliff face beside us, atavistic profiles show an eland, a predatory cat, an ostrich, and horned cattle in pigments of orange and red. "Some of the paintings are situated to look into the distance," Alec said, "to throw their power over the landscape."

WE STRUCK OUT ACROSS THE ROCK toward another site. Topping a ledge, we spotted more paintings on a wall. A rounded beast stood amid other animals, while vertical strokes ran from the animals to boxy geometric figures. Above them were row upon row of tiny marks the size of a child's finger.

"Oh my God," Alec breathed. "I've never seen this one before. Isn't it fantastic! Fingermarks all over it! I'm fairly sure they stand for rain. That's a mythological animal, half hippo and half horse! You see the same one on the Cape of Good Hope; I'm fairly sure it's a rainmaking animal."

Ocher streams spurted from an udder on the beast. "See, the rain is being drawn from the sky by the rainmaking animal and converted into milk. There's a cow next to it, so it brings fertility to the cattle. It pulls the mythological and human and natural worlds into one. It looks out and throws its power over the whole of the desert!"

The Kalahari spread out below us, a forest of treetops just sprouting to the misty green of an English spring. Thunderheads spread cobras' hoods on the horizon, and the air was heavy with the musk of rain-wet earth somewhere up the breeze. There would be lightning that night, flashing on the burnished hills, then wind and finally, perhaps, the water that the whole land craved like a kind of forgiveness, like a blessing long withheld. I sent a prayer of my own out across the landscape, wishing for this wilderness the gift of survival, hoping that some corner of the world can remain trackless and unscarred, savage and blessed. □

BOTSWANA

The Adopted Land

Earnestly attentive, men from the village of Mochudi take part in the kgotla, a forum for discussion of community affairs. Their tribal chief will not make decisions until he has considered the opinions of all who wish to speak. He knows that his power is only as great as their support.

This democratic precedent helped ease Botswana into parliamentary government at independence. In the 24 years since then, free elections have fostered a stability uncommon in Africa. Skillfully managing a diamond boom, the government has promoted modest, practical development to benefit all levels of society.

By ARTHUR ZICH

Photographs by PETER ESSICK

Sunrise meets a train discharging passengers in Gaborone, the capital. The 400-mile-long railway

links Botswana's heavily populated eastern corridor to Zimbabwe and South Africa.

Responsibility weighs early on 12-year-old Mosarwa Dikomang, doing homework and caring for her sister, Lebogang, while their parents work. The family built their Gaborone home with a government loan for people earning less than $150 a month.

Miners at Morupule Colliery earn a relatively good wage, about $425 a month.

CEPHAS MAGWAMBA shut down his electric shovel, climbed up out of Jwaneng, the world's richest diamond mine, and called it a day.

Eight hours a day, six days a week, Magwamba works for De Beers Botswana, loading ore into an unbroken procession of dump trucks. In a typical day this big, hard-muscled man unearths perhaps 1.5 million dollars' worth of diamonds. Without them he would probably have no job, his four-room bungalow would be poorer, and his daughter Dorcus would have no dream of medical school. And this landlocked nation would still be the backwater it was just a quarter of a century ago, before diamonds were discovered at the edge of the Kalahari Desert.

Thanks to that good luck and a knack for good government, Botswana remains an island of stability among its less fortunate, storm-tossed neighbors in southern Africa. Of the more than 150 heads of state in black Africa since 1957, fewer than ten have relinquished power voluntarily.

Botswana's leaders have not been among the fallen. Since independence in 1966 this nation has been a multiparty democracy. It has held no fewer than five open national elections and has enjoyed the freedoms of speech, religion, and assembly. Its press is small but voluble. Blacks and whites work side by side from top to bottom of the government.

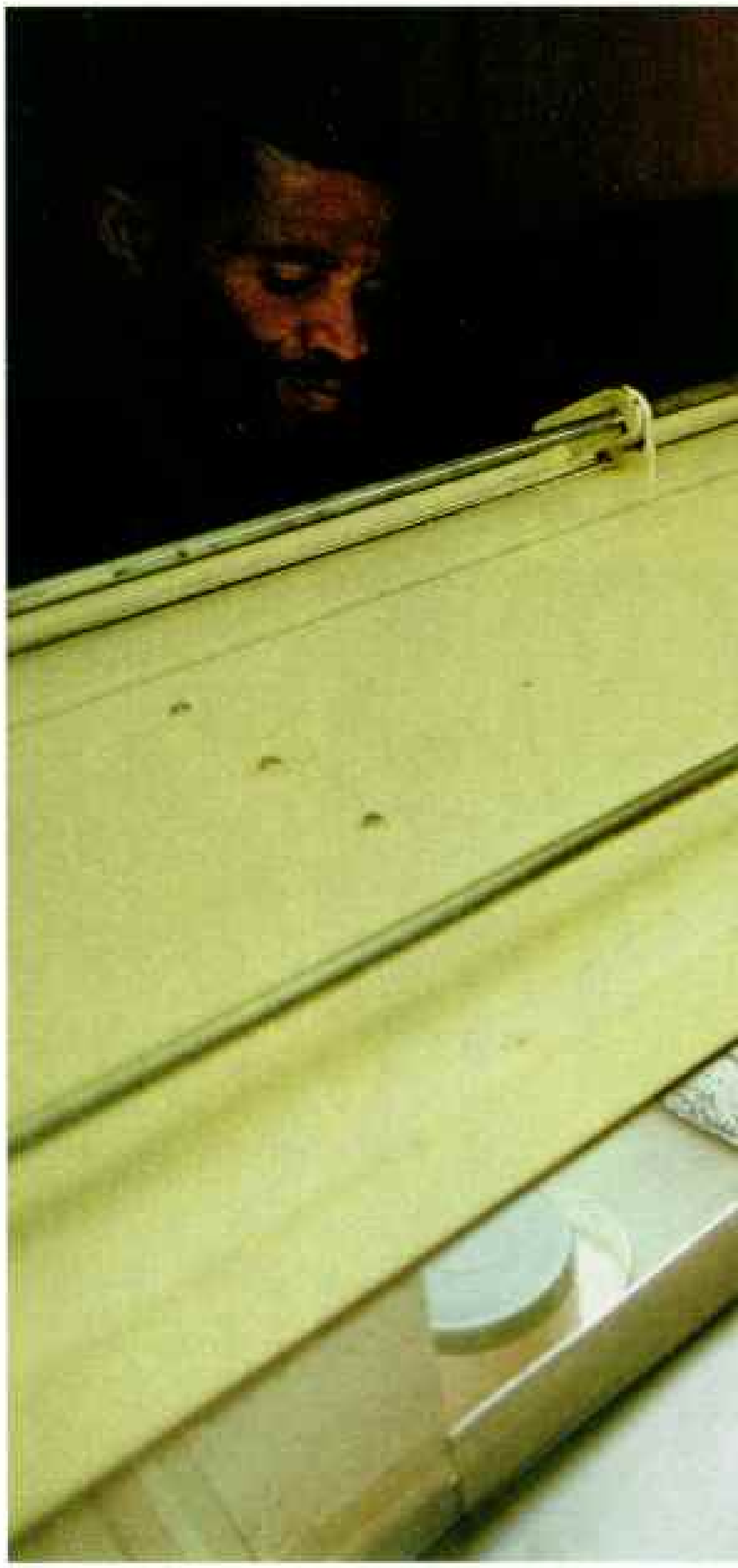
Botswana's economic growth has averaged around 13 percent a year, among the most successful in the developing world. The life expectancy of its people is among the longest on the continent; the infant mortality rate one of the lowest. Potable water, health clinics, and public schools have been brought to virtually every village in the land. In the 1980s, when a devastating drought left a trail of starvation and death across much of the rest of the continent, Botswana's sound planning and food-distribution programs carried it through without loss of a single human life. Today its treasury boasts reserves in excess of two and a half billion dollars, stashed away in foreign banks against another not-so-rainy day.

Through all this Botswana has stood by its principles—and not without risk. The nation's economic fortunes are inexorably tied to South Africa's roads, rails, and ports. "Most everything you eat, wear, sleep in, or ride upon here comes from or through South Africa," former National Museum Director Alec Campbell told me. "And most of what Botswana produces goes out the same way." Yet Botswana has made no bones of its repugnance for apartheid.

HOT, HARSH, AND UNYIELDING, the land lies in the darkest heart of southern Africa. A fifth of its territory, a narrow, marginally farmable strip beside the easternmost Limpopo River (map, page 83), holds four-fifths of the people. The rest is Okavango swamp, Chobe jungle, and the vast, enveloping Kalahari

World's richest diamond mine, Jwaneng is a dusty gray hole in the ground. Power shovels load trucks with kimberlite around the clock six days a week (bottom). A nearby treatment plant crushes the kimberlite and sifts out diamonds.

Never touching the riches before them, sorters cull gems from industrial stones (right). Earning more than 60 percent of export revenues, output from this and two other diamond mines puts almost a billion dollars a year into Botswana's treasury.



Desert—a thirstland of thorn trees and cattle grass, salt pans that ebb and flood with the seasons, bone white limestone ridges, and rocky hills that rise like some geologic afterthought from ocher plains. It is a land so dry that the national motto, the national greeting, and the word for money are the same: *pula*—rain.

Apart from a railroad the British had constructed across Botswana's eastern edge, the old rulers left few tracks in the shifting desert sand. Surrounded by hostile white minority regimes, Botswana was virtually penniless. It had almost no industry, no known natural resources, no paved roads except in a few small towns, and only one public secondary school. It produced no electricity of its own. It didn't even have a capital. (That, through the years when the territory was known as the Bechuanaland Protectorate, had

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been tucked away in Mafikeng, South Africa.)

"When we asked for independence," Botswana's current president, Quett K. J. Masire, likes to say, "people thought we were either very brave or very foolish."

They may have been both, but it is clear, a quarter century later, that despite the long odds, Botswana works. In fact the nation's early success often obscures its future problems. Botswana's 1.3-million population is growing at 3.4 percent a year—among the highest in the world. Left unchecked, it will double in 20 years. More than 100,000 are unemployed. An additional 20,000 enter the labor force each year. Yet skilled labor and managerial talent are in such short supply that large numbers of both must be imported. Even its five-member supreme court is composed entirely of foreigners. While per capita income has risen from almost nothing to $1,600 a year, income distribution figures tell a different story: The poorest half of the population receives little more than one-sixth of the nation's total earnings; the wealthiest 20 percent take

home two-thirds of the pie. Botswana's big, racially troubled southern neighbor, moreover, remains an ever present concern.

South Africa can field an army larger than Botswana's entire population. Though the Tswana tribes constitute an overwhelming 95 percent in Botswana, their actual numbers are even larger in South Africa, and for many in both places, ties remain close. "If South Africa exploded," Campbell told me, "Botswana would become a battleground."

And diamonds are not forever. There is no concern that the mines will fail, but the market can absorb only so many. There is no new engine of economic growth in sight. A tiny army created in 1977 to repel spillover raids from Zimbabwe's civil war has grown ever larger, draining more and more of the national budget—and posing, some fear, a political threat.

"People compare us with the rest of Africa and perceive a miracle," said Gobe Matenge, retired permanent secretary for home affairs and a kind of public officer emeritus. "They should compare us with other miracles—like Singapore, for example. And they should remember that what we've achieved can also be lost in the wink of an eye."

THE REAL MIRACLE is that Botswana ever became a nation at all.

Wandering Bushmen were the first known inhabitants. They arrived some 25,000 years ago, but no one can say whence they came or why they chose the Kalahari as home. By the beginning of the 13th century the pastoral ancestors of Tswana tribes had drifted south to settle, split, and settle again. In the 18th century still other Tswana tribes, driven north by warlike Zulu, claimed the more hospitable eastern portion of the land.

White Afrikaners in ox wagons, descendants of the Dutch who landed on the Cape of Good Hope, came next, squeezed from ancestral lands by colonizing Britons. Expansionists themselves, these Boers (Dutch for "farmers") clashed with the Tswana—who brought the wheel full circle by soliciting protection from Great Britain. And Britain, eager to secure a route north from its Cape Colony to its mines in central Africa, was only too willing to oblige. Thus, in 1885, the Bechuanaland Protectorate was born. And for the next 80 years the Union Jack fluttered over this flat and arid land.

Since independence, refugees fleeing racial strife have continued to spill into Botswana: colorfully garbed Herero from Namibia to the west, artful Hambukushu from Angola, industrious Kalanga, other blacks and whites alike from other troubled borderlands—Zimbabwe and Zambia to the north, the Republic of South Africa to the south.

For all the immigrants, as it was for those who came before, Botswana was less a land of choice than of last resort. Yet it has offered sanctuary, tolerance, and freedom. And in the process it became a refuge, a melting pot, a home. "We are a nation of refugees," Quill Hermans, the urbane governor of the Bank of Botswana, himself a white naturalized citizen from South Africa, told me. "We came here hoping to create something better than what we'd left behind."

MOCHUDI'S DIRT STREETS were puddled with rain the day they buried the grandson of a chief. Perhaps a thousand people had gathered in Sunday finery for the funeral, and the license plates of their cars showed that they had come from all over. Sandy Grant, a lean and blue-eyed Scot who immigrated to Botswana 26 years ago, became a citizen, and stayed on to found a local museum, had invited me to the services.

We stood at the hilltop cemetery as the casket went into the ground and the red earth was shoveled on top. As the preacher's eulogy ended, mourners from another funeral trooped over to pay their last respects. The crowd began to sing a soft and lovely hymn, which wafted on the wind across land and sky. Sandy clasped my hand in a gesture of communion. "I'm so damn *lucky*," he whispered, "to be part of this place!"

It was a sentiment I heard voiced again and again over nine weeks' travel through Botswana. Surely, I thrilled to the wildlife and land. I slept out in the Kalahari, under a sky that was itself strewn with diamonds, and I nodded asleep to the growling of distant lions. Once I was stopped on the main north-south highway—not by a patrolman but by three magnificent elephants that ambled out of the jungle. Two of them sat down in front of my car while the third approached the window. I offered it a cookie. It stuck its nose up.

But it was the graceful Batswana (the collective for all citizens) who carved the most

Prosperity means a modern education for pupils studying a spelling lesson on computers in the third grade at the John Mackenzie School in Francistown. At independence only 30 percent of children got any education. Now more than 70 percent finish all seven years of primary school.

Drawing from a well drilled by the government, a communal tap brings water to residents of Kanye. Since 1971 the government has provided more than 300 villages with clean, free water, a vital service where rainfall averages a mere 18 inches a year.

A doctor and two midwives tend a newborn at Nyangabgwe Hospital in Francistown, part of the government's health-care network. "About 85 percent of our people are within one hour's travel of a health facility of some kind," says Dr. Edward Maganu, permanent secretary at the Ministry of Health.

Free to make its platform public, the Botswana National Front campaigns in Gaborone. The governing Botswana Democratic Party and BNF, its main opposition, were among seven parties participating in the October 1989 elections.

The 40 members of the National Assembly, or parliament, attend the opening session.

indelible image in my memory. They spoke with uncommon affection about their country. Their immigrant past, their commitment to freedom, their diversity—that alone, astonishing in a nation of this size—evoked echoes of my American homeland.

There was, for example, Joe Ramotshabi, a tall, handsome, 28-year-old Texas Christian University graduate and three-time Olympic sprinter. Joe worked as an examiner at the Bank of Botswana. Leaning back against his pickup truck in the shade of a towering *morula* tree, he reflected on his days at TCU.

"I got so excited at graduation because I was going home," he said. "A friend from Kenya said, 'Don't be a fool! Stay here in America!' But I said, 'No. My people are in Botswana. That's where I must be.' "

Joe built a house for his mother with his own hands last year. He and his wife are building another for themselves in the village of Nko-ya Phiri ("nose of the hyena"), outside the capital, Gaborone. His outswept arm took in sacks of cement, a pile of gravel in the yard, a flock of goats ambling by. "When our kids are grown, this will be a whole new town. They won't believe we did this with our hands."

There was beautiful, articulate Athaliah Molokomme, 30, whom I met one morning at her mother's modest concrete house in Gaborone (pronounced hah-bah-ROW-nay). Athaliah, a jeans-and-T-shirt, antiestablishment firebrand, is a University of Botswana law graduate with a master's degree from Yale. She was working on a doctorate in the Netherlands. She loved her country, though she excoriated its leaders. "We could do better!" she declared. "The present government simply isn't innovative." She ran off a litany of sore spots ranging from women's rights and the disparity between rich and poor to a blistering attack on the nation's educational system.

"Yes, access has improved. Primary and secondary education are available and free," she acknowledged, spooning peanut butter out of a jar. Then she snapped: "But the content is geared to turning out bureaucrats. We can't all work in offices. We need people to build our houses. Install our plumbing. Fix our boilers and mend our electrical systems. People to make clothes and furniture." She sighed. "And no one knows how!"

In another Gaborone suburb on a searing sunny Sunday, the sound of gospel singing led me to a young man named Gosetsemang Makola. By week he is an inspector-auditor of cooperatives, on Sundays a worshiper in the Zion Christian Church—one of the largest religious bodies in southern Africa. His faded army uniform was soaked with sweat. His outsize white buck shoes were caked with dust. He snapped a whip and waved a stick and chanted sacred hymns. Around him similarly attired churchmen chanted sacred responses. "The spirits of the devil now surround you!" "Receive the Lord, and you'll be given gifts!" A hundred strong, they then began a thunderous stomp that shook the midday heat itself (pages 92-3). And one by one men seized with

faith dashed forward, threw themselves down, and thrashed about in something very much like break dancing.

"The stick and whip help cast out demons," Makola told me, as he slaked his thirst on the sidelines. "We don't have drums. We can't afford them. So we wear these *manyanyata*," he gestured to his shoes. "And stamp our feet to drive the devil underground."

"If he were alive today, my father would still be happy with the way things are going," says Lt. Gen. Ian Khama, with his mother, Ruth, beside a portrait of Botswana's visionary first president. Charismatic and politically astute, Oxford-educated Sir Seretse Khama steered the country toward success, setting a course of common sense and honesty in government.

Far to the northwest, in a nameless clump of rondavels along the Okavango's edge, I sat on a straw mat with Njemah Kamotja II, a traditional healer who would have been called a witch doctor in the old days. Njemah didn't know how old he was, but he was very old. His teeth—the few he still possessed—were blackened stumps; his skin, sagging, scaly, withered parchment. His voice came in high-pitched, cackling gasps.

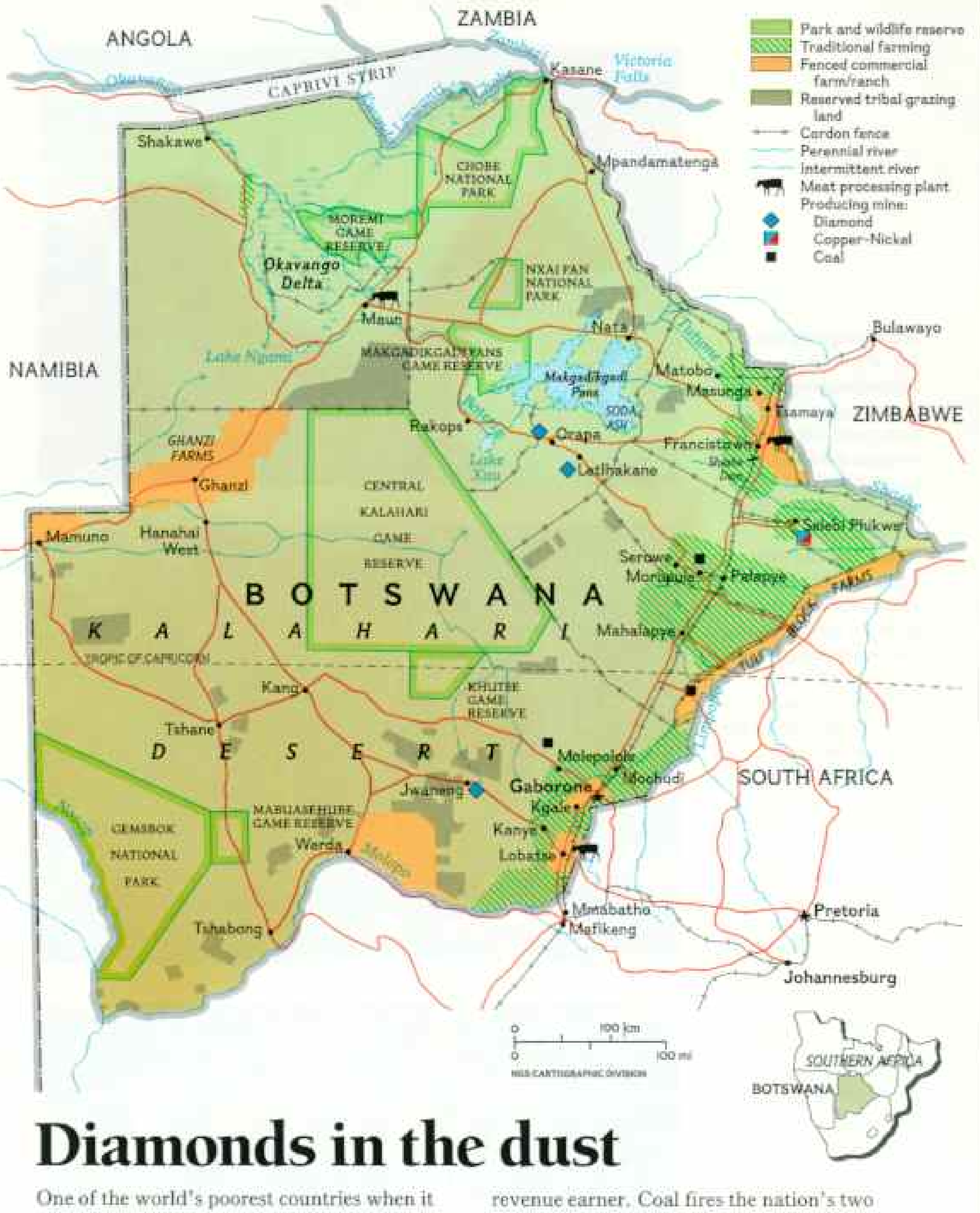
Njemah treated barren fields, childless couples, diseases of the body and the mind, and his power was reputed to be great. To exercise it, he told me, he first called up a diagnostic vision in a magic porcelain plate. Then, wearing a zebra skin, he danced all night around a fiery pot of appropriate roots and herbs. I asked him who cared for him when he was sick. He looked at me as if I was crazy. "I go to the government hospital," he replied.

SUCH DISPARATE PEOPLE. What bound them together? Part of the answer lay in what the British *didn't* leave behind. "The bad news was, the British left us with nothing," a University of Botswana scholar told me. "The good news was—they left us with nothing. No elitist class of bureaucrats among our own people. No racial hatred toward colonial invaders. No blood spilled on our sand in quest of freedom."

Good leadership has long been a Tswana tradition. In 1895, when Cecil Rhodes attempted to wrest Bechuanaland from Britain's Colonial Office and bring it under his British South Africa Company, three tribal chiefs went off to England to petition the crown. "We fear they will fill our country with liquor shops," they pleaded. The chiefs persuaded the London Missionary Society to take their case to the British press and public—and thereby roundly defeated Rhodes's land grab.

The two presidents Botswana has known have been able successors to those early leaders. Sir Seretse Khama, the grandson of one of them, was Botswana's first president. Born the chief of the Bangwato, largest of the Tswana tribes, Khama was also a thoroughly modern man—an Oxford-educated jazz buff who married an Englishwoman, Ruth Williams, renounced his tribal title, and founded the ruling Botswana Democratic Party. Khama's stature as a chief and as a man gave the party the broad political base it enjoys today and assured him free rein in exercising a far-sighted vision and uncommon common sense.

Not the least of Khama's attributes were an innate tolerance of others and a sometimes wicked wit. During final talks over independence, Khama sat on a negotiating panel with an unreconstructed British racist who insisted on referring to every issue as "a nigger in the woodpile." The dignified Khama pretended not to have heard. But after his elevation as



Diamonds in the dust

One of the world's poorest countries when it gained independence from Britain in 1966, Botswana—formerly the Bechuanaland Protectorate—appeared to have few prospects. The Kalahari Desert covers more than 80 percent of this landlocked republic; only 5 percent of its territory is arable. Minerals transformed the economy, now Africa's fastest growing. Diamonds were discovered at Orapa in 1967 and at Letlhakane and Jwaneng several years later. Copper-nickel matte is another important revenue earner. Coal fires the nation's two power plants; Botswana is virtually self-sufficient in electricity. Surveys indicate that the land may hold other exploitable minerals.

AREA: 600,372 sq km (231,805 sq mi). **POPULATION:** 1,300,000. **CAPITAL:** Gaborone. **LANGUAGE:** English, Setswana, other African languages. **LIFE EXPECTANCY:** 59 years. **ECONOMY:** Industry: mining, livestock processing, tourism. Export crop: beef. Food crops: sorghum, maize, millet.

Harvesting sorghum is hot, dry work in Mpandamatenga. To boost grain production and create jobs, the government subsidizes commercial farms in the area. Results have been disappointing.

At Gaborone's Corner Supermarket shoppers peruse merchandise catering to various incomes and international tastes. "We take a bit of a chance when we buy some things," says store manager Willem Henning, "but there's always somebody who is grateful we stocked a little bit of this or that." More than 90 percent of Botswana's supermarket items are imported from or through South Africa.

Scrupulously clean, workers at Lobatse's livestock processing plant cut beef from the bone. Most of this meat will be exported to Europe. A traditional measure of wealth, cattle outnumber people in Botswana by two to one.

interim prime minister, Khama held a tea in the just completed official residence. As the story goes, the Briton clapped Seretse on the shoulder and said, "I say, Mr. Prime Minister, we Brits have Buckingham Palace. The Yanks have the White House. What are you going to call your place?"

Seretse smiled serenely. "The Woodpile," he replied.

Quett Masire, who was vice president and minister of finance and development planning when he succeeded Khama upon his death in 1980, is walking testament to the nation's luck. Two years ago, on its maiden flight, Masire's presidential jet was hit by a missile at 35,000 feet over war-torn Angola. Somehow the pilot managed to land the plane. Masire walked away with only a shrapnel wound in his back.

He is a very different but no less capable leader than his predecessor—a successful farmer, a soft-spoken man who rules by consultation and consensus among his civil servants, cabinet, and parliament. "It can take forever to get a decision," mused a bank official. "It drives Americans crazy. But somehow we get it done!"

Together, Khama and Masire epitomize democracy Botswana style. For while traditional Tswana chiefs carried the divine, authoritarian sanction of kings, they could not rule without the consensus of a public forum called the *kgotla* (pronounced HOTE-la), the political heart of every Tswana village. An old Tswana saying remains very much true today: "*Kgosi ke kgosi ka morafe*—The chief is only the chief by the will of the tribe."

THE ELECTIONS of October 1989 were over. Linchwe II, chief of the Bakgatla tribe, grandson of a framer of the 1895 petition to the crown, former ambassador to the United States, and living bridge between tribal past and modern nation, zipped up to Mochudi's tree-shaded kgotla in a battered Datsun. He stepped to the podium wearing an ivory-colored safari suit and a thousand-watt smile. Before him, sitting on folding chairs and the ground, were some 500 of his Bakgatla tribespeople. Linchwe had come to hear their concerns and introduce their newly elected representative in parliament. One by one the Bakgatla rose and spoke their minds, their tart comments punctuated by the turkey-gobble ululations of the women.

Finally one grizzled octogenarian rose and addressed the new parliamentarian. "Don't go down to the big city and forget us, like your predecessor did," he growled. "Because if you do, when you come back here—we will cane you!"

Linchwe sighed. "Nobody said democracy was easy."

THE CAPITAL of this unpretentious nation serves as yet another example of sound leadership. Hardly a building in Gaborone stands above six stories. There are no gaudy monuments. The largest—the statue of Sir Seretse in front of the parliament building—is only one-and-a-half times life-size. Sir Seretse Khama International Airport, on the outskirts of the city, wasn't even built until 1984. It looks more like a facility serving Bakersfield, California, than the capital of a bustling young nation.

There are no mean streets in Gaborone. Even in Naledi, the city's poorest quarter, where empty beer and soda cans are ankle deep, I—a white man and a foreigner—met with smiles and friendly waves.

In sum, Gaborone is—well, an amiable city. Around dawn, with mist hanging in the air, its people are on the roads in droves, hitching rides to work from passing cars and trucks. Throughout the day in the Mall, a shop-lined esplanade in the city's center, the lilting voices of strollers mingle like an a cappella choir with those of hawkers peddling everything from mopani canes to rock-star posters. "*O tsoga jang, mma?*—How do you rise, ma'am?" "*Ke tsoga sentle, rra*—Healthily, sir!"

Twilight is the loveliest time. Then the waning sun washes the city in lambent yellow light, and—in the wet season—towering smoky clouds, skeined with silent lightning, sweep in from the east to bathe the city and the Kalahari plains with life-renewing rain.

Gaborone is changing. Built for a population of 20,000, the capital now feels the weight of 130,000 people pouring in from impoverished rural areas. The place is growing faster than anyone can count. Land prices have soared. Speculators abound. A newer, taller Gaborone is rising from the old. More Mercedes-Benzes are bending fenders on Nelson Mandela and Julius Nyerere Drives.

Some traditions endure, however. Every Friday afternoon Gaborone's population piles into pickup trucks—"bakkies," as they're

called—and rumbles off to cattle posts for a weekend of a fleeting tribal past.

TSWANA TRIBES have ever cultivated cattle—named them like children, praised them in poems, and valued them right along with pula. Ben Gasennelwe, 54, retired head of the National Development Bank, gave me a sense of that affection at his cattle post one blazing afternoon. It was a cluster of rondavels around a water borehole on 1,300 acres of scrub thorn and desert sand. With photographer Peter Essick, I had been invited for *braai*, a barbecue. Ben's wife, Kegalale, greeted us with cold beer and steaming plates of *seswaa*, the Tswana's traditional boiled, pounded beef.

Ben led us through the kraal. "Traditionally," he explained, "a man's wealth and stature have been measured by the heads of cattle he owns." An almost religious aura came over the man. "I love my cows," he said. "Now and then, in Gaborone, I long for them. A cow on the hoof means more to me than money in the bank—even to me, a banker."

In 1975 Botswana enlisted even this

tradition in the task of raising cash, soliciting and receiving an aid package from the European Community (EC) in the form of a preferred price for export beef. The national herd grew to nearly three million head, at least 100,000 of them on vast freehold grazings surrounding Ghanzi (pronounced HAHN-tsee), a scorching, bleak oasis atop a limestone ridge in the northern Kalahari. Two new abattoirs were opened to augment the original slaughterhouse at Lobatse. Today the EC takes in more than half of Botswana's beef exports and pays out as much as four times the world

Lightning signals the approach of pula, *or rain, as Georgina Mongwa prepares millet porridge outside her rondavel in the village of Tsamaya. Eighty percent of the population lives in rural areas, many subsisting on the crops they raise and income from cattle. Even when the dry season ends in October, rainfall is erratic. In this land "people all the time are supplicating for rain," says one woman.*

price—making cattle Botswana's biggest dollar earner after minerals.

But beef bonanza days may soon be numbered, at least for weekend ranchers.

"You can't make money in weekend cattle any more," said Seeiso Liphuko, deputy permanent minister for urban planning. "The beasts get sick. They fall to drought. Get stolen. They're too much trouble!"

A host of issues engulfs the cattle industry: communal versus private ownership of land, environmentally destructive overgrazing, quarantine fences that were erected to isolate cattle but that also impede the migrations of wildlife.

Dick Eaton, an old-time Ghanzi cattle baron and member of the board of the Botswana Meat Commission, a government-owned firm that holds a monopoly on beef exports, was explicit. "When we lose the EC price—that's *when*, not if—we've got to stand on our own two feet," he told me. "I've been warning farmers, tribal people, everyone I represent, that they should be saving for a rainy day." Some farmers have already begun diversifying, transforming their lands from cattle pasture to game farms.

Ghanzi's other endangered species is the Bushmen, Botswana aborigines who still inhabit the region. Thirty-five thousand strong, the Bushmen are not threatened as a race. But their nomadic way of life is at its end.

John Hardbattle, a 44-year-old Ghanzi cattleman who presides over a thousand head and 100,000 acres of rangeland, has personal reason to mourn the loss: He's one of them. Hardbattle's father was a British policeman who retired to the ranch, his mother a member of the Nharo Bushman tribe. "I grew up as a Bushman, living in a Bushman's hut—I couldn't even converse with my dad," Hardbattle told me. He spoke of Bushmen hunting leopards with nothing but a hook-thorn shield and a club, of all-night trance dancing to pulse-pounding drums, of the feared Makaukau tribe, who other Bushmen believed could transform themselves into lions.

At 15, Hardbattle—then known as Long Runner, for his ability to chase down stembok and duikers on foot—was uprooted from the veld and sent to school in England. Then came a three-year hitch in the British Army. When he got home in 1965, everything had changed. In Ghanzi a cash economy had replaced the old barter system. New cattle fences cut off the Bushmen's roaming life. Hardbattle had his father's ranch. But his brethren of the bush had nothing. And so they drifted into town and ranch as squatters in the doorways of civilization—and became the hapless victims of alcohol, tobacco, and disease.

In response the government erected resettlement villages, complete with schools, clinics, water holes, livestock, and arable land sites. But even those well-intentioned efforts have failed, so far. No one has taught the Bushmen how to make the change from nomadic hunting to pastoral, sedentary farming.

At Hanahai West, an 11-year-old resettlement village of 300 Bushmen families on an open veld 45 miles south of Ghanzi, I witnessed the government's efforts. The village

Glue sniffing has hold of a boy roaming Gaborone at night with friends. From disadvantaged families, such children typically wash cars and beg for food and money during the day. Some sleep on the streets.

Far from want, Mandipa and John Mosojane play cards during Dallas, *broadcast from South Africa. Their parents, professionals in Francistown, send them to private school.*

itself was a tidy cluster of metal-roofed houses, its most prominent feature a primary school of neat green-and-white buildings. Perhaps a hundred youngsters in uniforms romped at recess in the yard, as I talked with Philemon Balekile, a 26-year-old Tswana tribesman from Palapye, back east. He sounded glum.

"From the time of their arrival the people here have been taken from their culture," he said. "They dress, eat, even have their houses placed in the modern way—and none of it the Bushman's way."

Philemon pointed to two empty cisterns. "The water from the borehole causes diarrhea," he said. "So we have those tanks. A truck must come from Ghanzi to fill them. It last came two weeks ago." I asked about the health of the villagers. "Most of them have TB," he said. "A doctor comes every two or three months." Diet? "The government trucks in food once a month—maize meal, beans, cooking oil." So what can they grow here for themselves? His eyes swept the burning sand. "Absolutely nothing," he replied.

Still getting a feel for his hammer, apprentice carpenter Thatayaone Loeto shares company housing in the capital with workers from Zimbabwe, Malawi, Tanzania, and other countries. Like many companies, his employer trains local labor and imports experienced foreigners because Botswana lacks an adequate skilled work force. Africa's fastest growing city, Gaborone especially needs builders. Nearly 30,000 await subsidized housing there.

But can't the government do *something* to provide more meaningful assistance? He smiled wearily. "I haven't thought of what."

BOTSWANA HAS KNOWN AUTONOMY for less than a generation, so there are many who have witnessed the nation's entire history. D. R. Monwela, 68, is one of them. He sat in parliament all the years from independence until his retirement in 1988. I met him one morning in Maun, and he recalled his very first campaign.

"We loaded up the Chevy van with food, water, extra gasoline," he said. "One driver, three assistants, and I. We set out for six villages between here and Chobe, 185 miles away. No telephone, no radios to tell the people we were coming. We just showed up and spoke. And when night fell, we pitched our camp beside the road. We saw lots of lions. And, of course, we were used to the elephants. You don't honk your horn, you know. They'll charge your car. The biggest issues? Water, schools, a medical clinic—that's what the people wanted, and that is what we gave them."

Since the campaign of 1965 Monwela's country has come a long and perilous way. But the sometimes bumpy transition from plural tribes to singular nation continues.

Perhaps nowhere is the clash more evident, or vigorous, than in the rough-and-tumble skirmishing between the National Assembly, or parliament, and the advisory House of Chiefs, representing the country's eight major tribes. "When President Khama died in 1980," Chief Linchwe told me, "the politicians wanted him buried in Gaborone to show he was leader of the nation, not just of a tribe. Khama's people said, 'To hell with democracy! He'll lie with his ancestors in our village in Serowe!' " What about President Masire? I asked. "He's a commoner," the chief replied. "They'll probably bury him in Gaborone."

I climbed Serowe's rocky hill to view the Khama resting-place, a serene, stony plot overlooking the broad Serowe plain. Beside Sir Seretse's grave lay those of the other Bangwato chiefs dating back through time. A bronze *phuti*, a small African antelope, watched over them—the totem of the tribe.

But it was elfin Jimmy Kamane, 14, a bright, barefoot member of the Bakgatla tribe in baggy blue trousers and frayed white shirt, who seemed to articulate Botswana's future. I had picked Jimmy up near Mochudi as he was hitchhiking to school, arithmetic book tucked under his arm. I asked him if he was "smart."

With mighty stamping and rousing chants members of the Zion Christian Church—one of southern Africa's largest denominations—worship on the outskirts of Gaborone.

In a hushed classroom Christine Mosakala studies at St. Joseph's College, Botswana's oldest secondary school, started in Kgale in 1928 by Roman Catholic missionaries.

He didn't understand that English word.

I tapped my temple, snapped my fingers and gave him an eyebrow-woggling grin. "Oh, yes!" he exclaimed, with a perfect British accent, "I am veddy clevah!"

African history was Jimmy's favorite subject. "It's exciting!" he declared. I agreed and asked what he wanted to be when he grew up. "A soldier—to defend my country from its enemies!" he replied, casting an apprehensive southerly glance. He added: "But first I'm going to university. That's what Chief Linchwe tells us all to do."

I asked Jimmy which was more important: his Bakgatla tribe or his Botswana nation. "Botswana!" he replied instantly.

We'd reached his destination. He hopped out like a springbok with an ear-to-ear grin and popped to attention. "Botswana first!" he shouted, snapping me a salute as I drove off.

The vast majority of people in Botswana's heavily populated eastern quarter live in rural areas and depend on dirt farming for subsistence. Here too the government provides essential services, plus technological assistance and substantial subsidies for plowing and destumping. Family members working elsewhere pitch in with monthly cash remittances. But the soils are geologically ancient, barely fertile, and rural jobs are few and far between. The result? Fully half these people earn less than a hundred dollars a year.

Typical of these hardworking communities was Matobo village, in Kalanga country, some 60 miles northeast of Francistown on the bank of the dry Tutume River. Zungwa Mabgwe, 62, a tall, sinewy farmer with a warm smile framed in steel-wool whiskers, met me at his gate and shook my hand. We sat under the thatched roof of his house, and Mabgwe told me what life was like for him and his wife, Nkadzi.

Their day began at 6 a.m. with tea and sorghum porridge; then they bicycled to their 13-acre farm. Mabgwe drove the plow; Nkadzi kept their four-ox span in line. The daughters cut the brush ahead or gathered firewood for a lunch of tea and sorghum topped with a relish made on the spot from *delele* leaves. The yield was barely a ton of sorghum a year, plus a bit of maize, cowpeas, millet, and melon, which they sold to other villagers. "We don't know how to sell outside," Mabgwe said.

Their eldest son, a Gaborone housepainter, sent them $15 a month. Their second son, a student at the University of Botswana, sent half his $50-a-month government stipend. And government subsidies averaged about $10 a month. But with a third son, five daughters, and two grandchildren living with them, it was hard to make ends meet. Mabgwe earned extra income fixing bicycles, roofing huts, smithing axes and cowbells on a homemade forge. When I asked Mabgwe how he would measure his family's lot, he brushed the dirt floor with his large hands. "Very poor," he said. The government was helping, but it simply wasn't enough.

The family gathered around the fire after

dinner, and three-year-old Moti climbed into her grandpa's lap. A storm was coming up fast, and the wind blew suddenly beneath the eaves. Mabgwe thrust his arms out in a fatalistic gesture. *"Chazha, chazha!*—What must come, must come!" he said. "You can't hold back the wind."

Then what has been the biggest change these winds of change have carried? Mabgwe searched for words. "Before, we could survive," he said at last. "Now, we must have money. But we have few ways to earn it."

Would he perhaps prefer to return to tribal life? "In my head, I like the nation," he said. "But in my heart, I like the tribe."

TWO HUNDRED miles north, Botswana's arid salt pans and savanna give way to scrub jungle and a bit more rain. Here huge tracts have been cleared; the heavy "black cotton" soil has been planted with sorghum, maize, and sunflowers. Towering over the trees, three colossal concrete silos were visible from miles away.

Swept up in the cadence of the ndazula, a traditional dance, a Bushman with a fly whisk and a woman of the Kalanga tribe join wedding festivities at a cattle post. Afrikaans-speaking residents of Hounoed (below), near Werda, have a mixed native African and Boer heritage. Sue Williams, embracing Kalanga friend Imelda Molokomme (bottom), came from Florida to teach in Gaborone and found a successfully integrated society.

Each was stocked with enough sorghum to fill 74,000 sacks of 150 pounds apiece.

This was Mpandamatenga, a project consisting of some fifty 2,200-acre leasehold farms launched four years ago—the government's biggest effort to increase food production and amass reserves against future droughts. As Ben Mathe, a retired senior officer at the Bank of Botswana, and Mavis Tlale, the wife of a Gaborone executive, told me on the Tlale farm, the scheme has not gone well.

"We didn't know what we were getting into," Mavis said, gazing out over flatland stretching for miles in every direction. "We've been invaded by elephants, eland, and sables, by locusts and *podile* beetles, which suck the sorghum dry."

Rats and mice attack the fields at night. "They come by the millions and dig out newly planted seed," Ben said. "There is no drainage. Rain collects where it falls. You need big tractors to work this soil, at least four of them per farm. A lot of us bought the wrong equipment. It broke down. . . ." He gestured to a

distant junkyard of rusting machinery. "We got financing from the National Development Bank, but they won't loan us more until we pay back what we owe. To get the big machines, we had to mortgage another farm down south and our home in Gaborone. And every grain of this year's harvest will go to the NDB!" He sighed. "Four of us have sold out already."

I tried to offer solace: "It's carved on the soul of every farmer that next year will be better." Ben smiled. "That's what keeps us going."

With steady arms Francistown construction worker Ikgopoleng Mbengwa reassures his nephew, Lovemore Mambazo. Half of Botswana's population—among the world's fastest growing—are under the age of 15. Good luck and good government have built their country. They will need both as they face the future.

"THE ONLY ANSWER IS JOBS," said David Inger over lunch in his book-lined West Gaborone home. "The problem is creating them."

Inger is a naturalized Motswana (the term for an individual citizen) out of Nottingham, England. He is a director of the Rural Industries Innovation Centre, a kind of up-by-your-bootstraps employment training, rural help, and technology enterprise that sprawls across several leafy acres of red rock hills at Kanye, southwest of the capital. Begun in 1975—one of several programs sponsored in whole or in part by the Botswana government—RIIC offers courses in baking, carpentry, sewing, leather tanning, and smithing. It runs a profit-making furniture factory, sorghum mill, and solar water-heating firm. And its inventions are helping to create opportunity where none before existed: a low-cost sorghum dehulling machine, 60 of which are now at work in rural villages; a simple solar water-condensation "still"; a bread-baking oven made from two big truck wheels welded together. "Since we started up, we've created hundreds of informal jobs," Inger told me. "Our only option is self-employment."

It is not an option easily realized on the scale Botswana requires. But I encountered many throughout the land who were showing how gainful employment could be fashioned almost out of nothing—and demonstrating the kind of grit that helped build America.

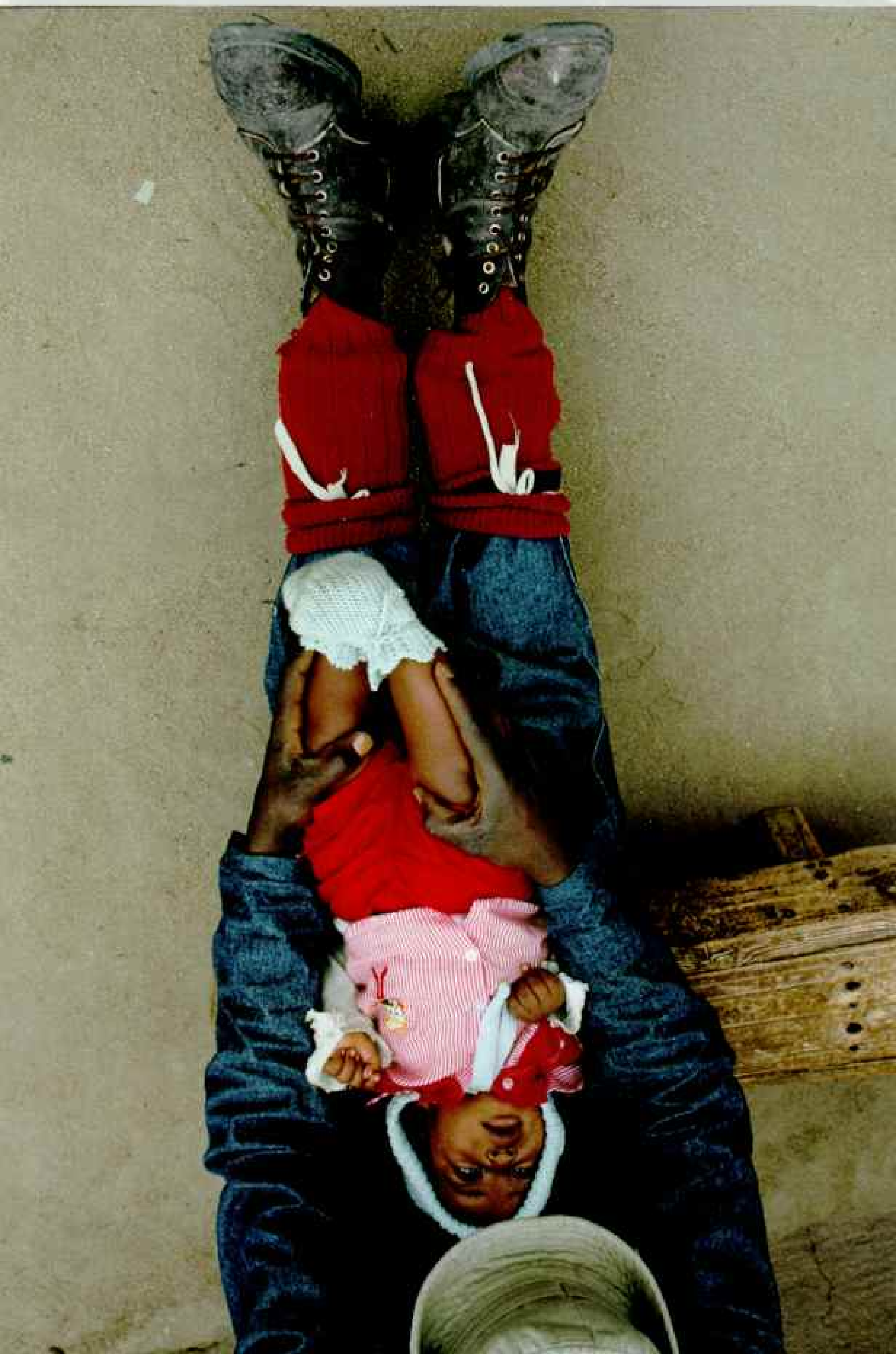
Take, for example, Chris Woolcott, a barrel-chested African-born Englishman, and his wife, Jeanette. They came down from Zambia five years ago to start what is now a 35-cow dairy farm outside Ghanzi. The Woolcotts battled *putsi* flies, mamba snakes, and unpredictable rains while Chris built their house. Nowadays they're up at 5:30 each morning, Chris to milk, Jeanette to pasteurize the batch on the kitchen stove—while simultaneously caring for Samantha, 5, Hayley, 3, four dogs, three cats, and a guinea pig named Squeakie. Together the couple hand-fill 400 cartons of milk and pack 60 pints of yogurt for sale in and around Ghanzi each day. "We're making it, barely," Chris told me, beneath a camel thorn out back. "It hasn't been exactly easy. But it's getting better and better!"

Or take Sebueng Keakopa, a large, lovely woman I met at her restaurant-bakery in Maun. "I'm a hard worker!" she allowed, and she was surely that. Back in 1973 Mrs. Keakopa made the mud bricks for her house, made the house, and then tied the thatch and roofed it too. "We had no money," she explained.

To get some, Mrs. Keakopa dug a hole in her backyard, baked five loaves of bread in it, and sold them to neighbors. Then she built a mud oven that could turn out 30 loaves a day. And then, with help from American friends, she got a brick-and-steel oven and began cranking out 120 loaves a day.

It's good bread. When I sampled it, Mrs. Keakopa had just installed two new commercial ovens. "Today," she said proudly, "I'm baking 700 loaves a day. I have six employees working two shifts. I bake brown bread, white bread, scones, buns, cakes—I'm the only woman in Maun who bakes wedding cakes!" Recently she also bought a car to aid the business. I asked about the bakery's name: Toti-toti. "It means 'bit by bit,'" she replied. "That's what I'm doing—just moving ahead, bit by bit."

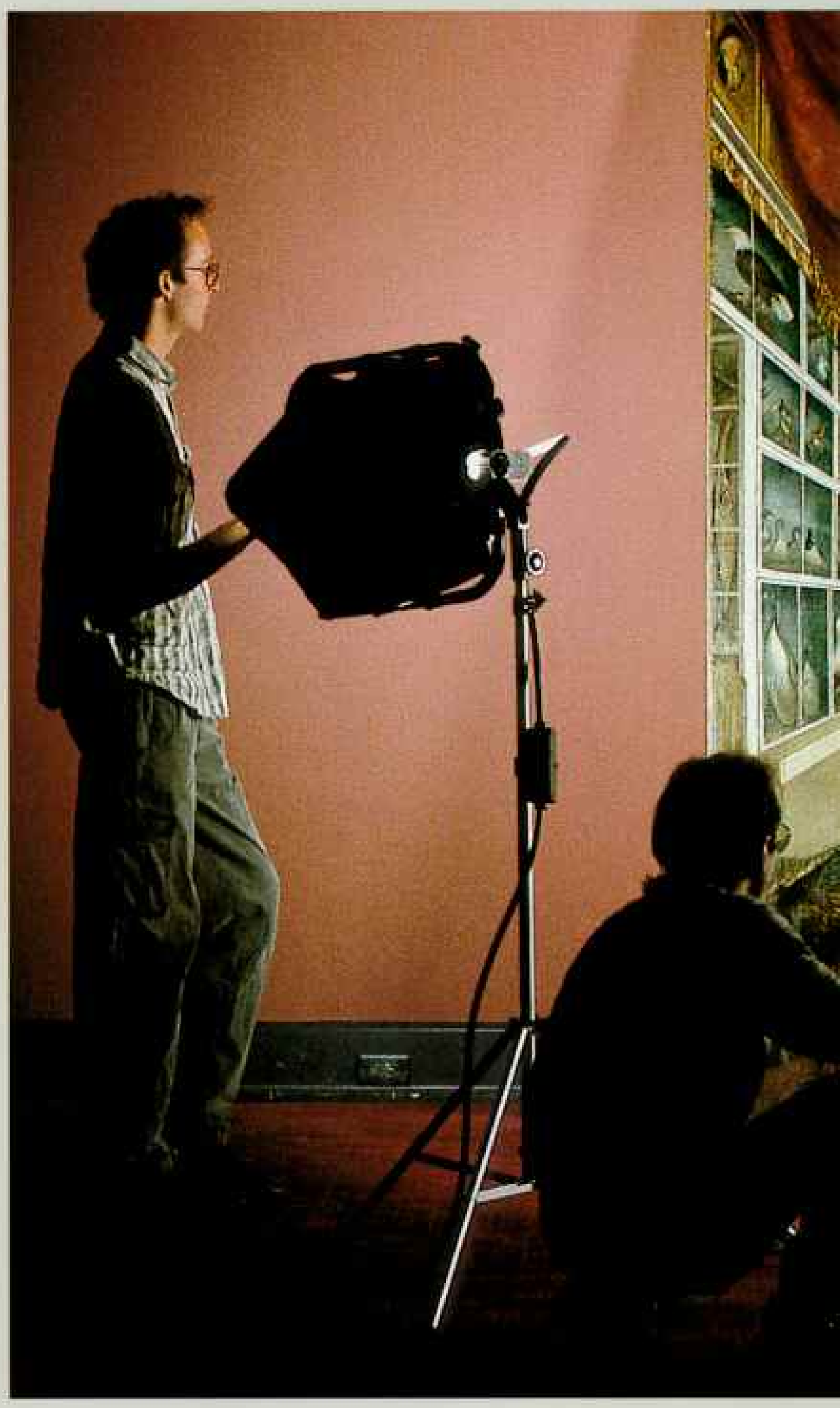
Toti-toti—that was the way this likable country was going to move now too, I mulled, steering my four-by-four through heavy rutted sand along the Okavango's edge. The boom time that diamonds brought is over. The nation's development will be slower now, more difficult, and surely there are growing pains ahead. But luck, leadership, and democracy have already proved a potent brew. And Botswana's leadership is still as sound as the pula. □



THE PEALES

America's First

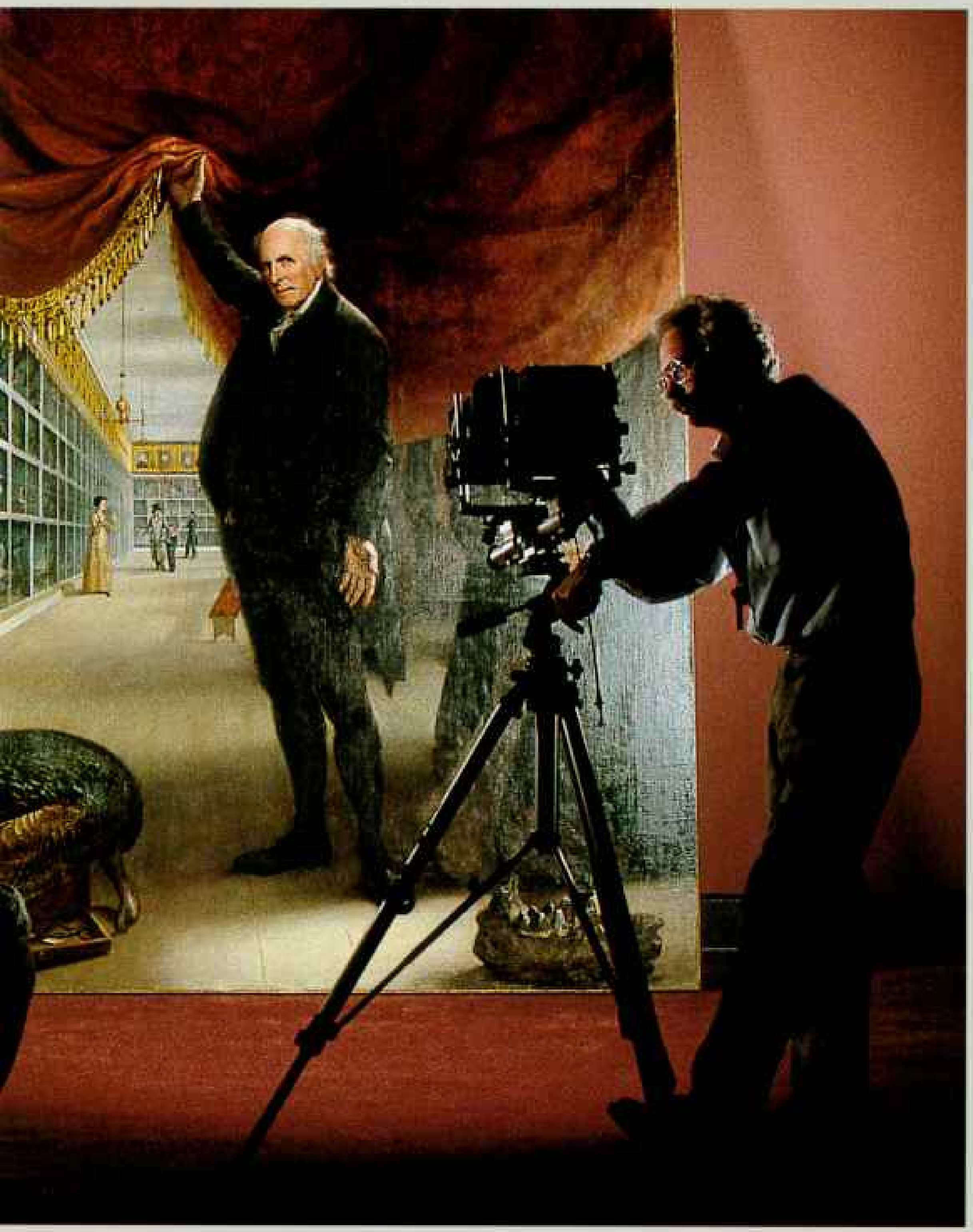
Lifting the curtain on a lifetime of achievement in art and natural history, Charles Willson Peale in his self-portrait "The Artist in His Museum" invites the viewer into its gallery—filled with portraits of statesmen he painted and specimens he preserved. The 1822 painting is being photographed by staff at the Pennsylvania Academy of the Fine Arts, which also holds works by his gifted progeny.



By
OTTO FRIEDRICH

Photographs by
KEVIN FLEMING

Family of Art



ON THE SOFTLY LIT museum wall, George Washington stands proud or, as Thomas Jefferson once said of him, "easy, erect, and noble." This is not the white-haired patriarch with ill-fitting dentures later celebrated by Gilbert Stuart but rather Charles Willson Peale's portrait of the ruddy and faintly smiling commander in full command, blue sash of office flowing across his ample belly, one hand resting nonchalantly on the muzzle of a cannon (page 119).

"Peale and Washington were rather good friends," says our guide through New York's Metropolitan Museum of Art, a slender young woman named Alice Iglehart. She has curly brown hair and wire-rimmed glasses and three silver bracelets on her wrist. "They liked to sit and talk and joke while these paintings were being done, and I think it's evident that Peale was trying to bring out the warmth and humanity of this person, rather than portraying him as someone unapproachable."

This is Peale's replica of a portrait he painted in 1779, at the request of the Supreme Executive Council of Pennsylvania, to commemorate the American victories at Trenton and Princeton. Peale was a natural choice since he had led a nervous company of Philadelphia militiamen through the mud and snow of both battles, while, as he later wrote in his diary, musket balls "whistled their thousand different notes around our heads."

Peale painted Washington from life seven different times. The last of these sittings occurred in 1795, at Peale's studio in Philadelphia. With him were his talented young sons, Raphaelle and Rembrandt, and his brother James. One of Peale's objects then was to help his relatives earn commissions, so they all set up their easels.

James Peale, who had been taught to paint by his more versatile older brother, remained in that brother's shadow, his health impaired by the war. As Alice Iglehart leads her flock to James Peale's rather stiff portrait of Washington, she speaks of it equivocally. "What James was trying to do was brighten the palette," she says. "This is much more vibrant, more energetic—and yet to me not nearly as realistic and captivating as his still lifes."

She thinks better of an equally stiff portrait by Rembrandt Peale, one of some 70 copies he made from a portrait of Washington he painted in 1823, but she has some mild criticisms of that too. "Rembrandt thought of Washington as a godlike figure," she says. "Washington seems to be floating above us, looking away. His face glows in the strong light and heavenly background of pastel clouds."

The reason I'm interested in seeing these portraits of Washington through Alice Iglehart's wire-framed eyes is that she too is part of the Peale clan.

Charles Willson Peale named 10 of his 17 children (11 of them survived to maturity) for famous painters, and so the first of his daughters to grow up alongside Raphaelle, Rembrandt, Titian, and Rubens Peale was one Angelica Kauffmann Peale, named for a gifted Swiss artist who became a protégée of Sir Joshua Reynolds and a founding member of the British Royal Academy.

When Alice Iglehart, a descendent of Angelica Peale, looks at the portrait of Washington on the battlefield, she is admiring the work of her great-great-great-great-grandfather. Having studied art history and applied for work at the Metropolitan Museum, she was so entranced by Peale's works there that she now gives lecture tours on her ancestor.

"I think there's something really magical about his work," she says. "And I'm fascinated by his love of life, and how much he wanted to accomplish. And I wish to God I could have met the man."

IT IS A VERY UNDERSTANDABLE DESIRE, for there is nobody in the remarkable Peale tribe more remarkable than its founding father. Charles Willson Peale was very much a man of his remarkable time and place, of that generation that created the United States of America. He shared with his contemporaries a love of exploration and invention and a sense of unlimited possibilities. He always retained a quality of innocence, of guileless enthusiasm. He painted many of the great men of his day, many of them as friends, and so our sense of how that whole generation looks comes largely through his work—more than a thousand portraits in all.

He not only painted Washington more often than anyone else did, but he also painted his

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PRIVATE COLLECTION (TOP L; (FROM LEFT) PHILADELPHIA MUSEUM OF ART; PRIVATE COLLECTION; NATIONAL GALLERY OF ART, PATRONS' PERMANENT FUND; PRIVATE COLLECTION

Not only did Charles Willson Peale, at top, teach his children to paint (11 of 17 survived to maturity), he also named ten of them for artists, including, left to right, Raphaelle, Rembrandt, Rubens, and Titian II. The miniature portraits are photographed details from full-size paintings.

successor in the Presidency, John Adams, who once described Peale as "a tender, soft, affectionate Creature." Peale painted Adams's successor, Jefferson, with whom he later conducted an amiable correspondence on the best methods of plowing and of planting, and also Jefferson's successors, James Madison and James Monroe. He painted the Marquis de Lafayette, with whom he had spent that hard winter at Valley Forge, and Benjamin Franklin, who sent him the carcass of a French Angora cat as one of the first contributions to Peale's museum of natural history in Philadelphia, the first of its kind in America. He painted John Paul Jones and Alexander Hamilton and Thomas Paine. "Ever fond of perpetuating the Remembrance of the Worthies of my time," Peale wrote in 1780, "I conceive it will be a means of exciting an Emulation in our Posterity to deserve the like Attention, and mankind will receive an advantage thereby."

Because he was an ardent liberal—he even became chairman of the radical political group known as the Furious Whigs—Peale had some trouble winning portrait commissions from conservative merchants. So he built, in 1782, America's first skylighted art gallery, adjoining his home at the corner of Philadelphia's Third and Lombard Streets, on the unorthodox theory that art could be appreciated by the common people.

He was sketching some enormous bones of an unknown animal when his brother-in-law Col. Nathaniel Ramsay told him, "Doubtless, there are many men like myself who would prefer seeing such articles of curiosity than any paintings whatever." This remark was the seed from which Peale's famous museum sprang forth. From that moment, Peale decided to collect and show to the public not only fossilized bones but also specimens of all the animals, birds, fish, and insects (not to mention Indian artifacts) that could be found on this largely unexplored continent.

Peale invented everything as he went along. Taxidermy, for example, was a craft that he had to figure out for himself. He failed to preserve Franklin's Angora cat, but when he heard that Lafayette had sent Washington some Chinese pheasants, he asked if he might

have them when they died, and these he succeeded in stuffing. (They are still preserved at Harvard.)

He also invented the idea of displaying his creatures in their natural habitats. A visiting clergyman named Manasseh Cutler wrote in 1787 of seeing a pond in the museum containing "a collection of fish with their skins stuffed, Water-fowls—such as the different speecies of Geese, ducks, Cranes, Herons, etc.; all having the appearance of life, for their skins were admirably preserved."

For Peale's 250th birthday in the spring of 1991, the Peale Museum that his son Rembrandt founded in Baltimore in 1814 plans an exhibition artfully entitled "Mermaids, Mummies, and Mastodons." "We will have on loan many of the surviving artifacts known to have been in the various Peale museums," says curator Richard W. Flint. New Peale family exhibitions keep opening, in Washington, D. C., New York City, and elsewhere.

FOUNDING FATHERS like Peale do not appear out of nowhere, of course. The first Peale on record as having received a university education in England was Thomas Peale, son of a carpenter, who graduated from Cambridge in 1680, then became a clergyman in Rutlandshire and married the sister of a local landowner named Charles Wilson. Their son Charles followed in the same path, and so did that Charles's son Charles. The youngest Charles did not graduate, but migrated to London to work as a clerk in His Majesty's General Post Office, augmenting his modest salary by embezzlement.

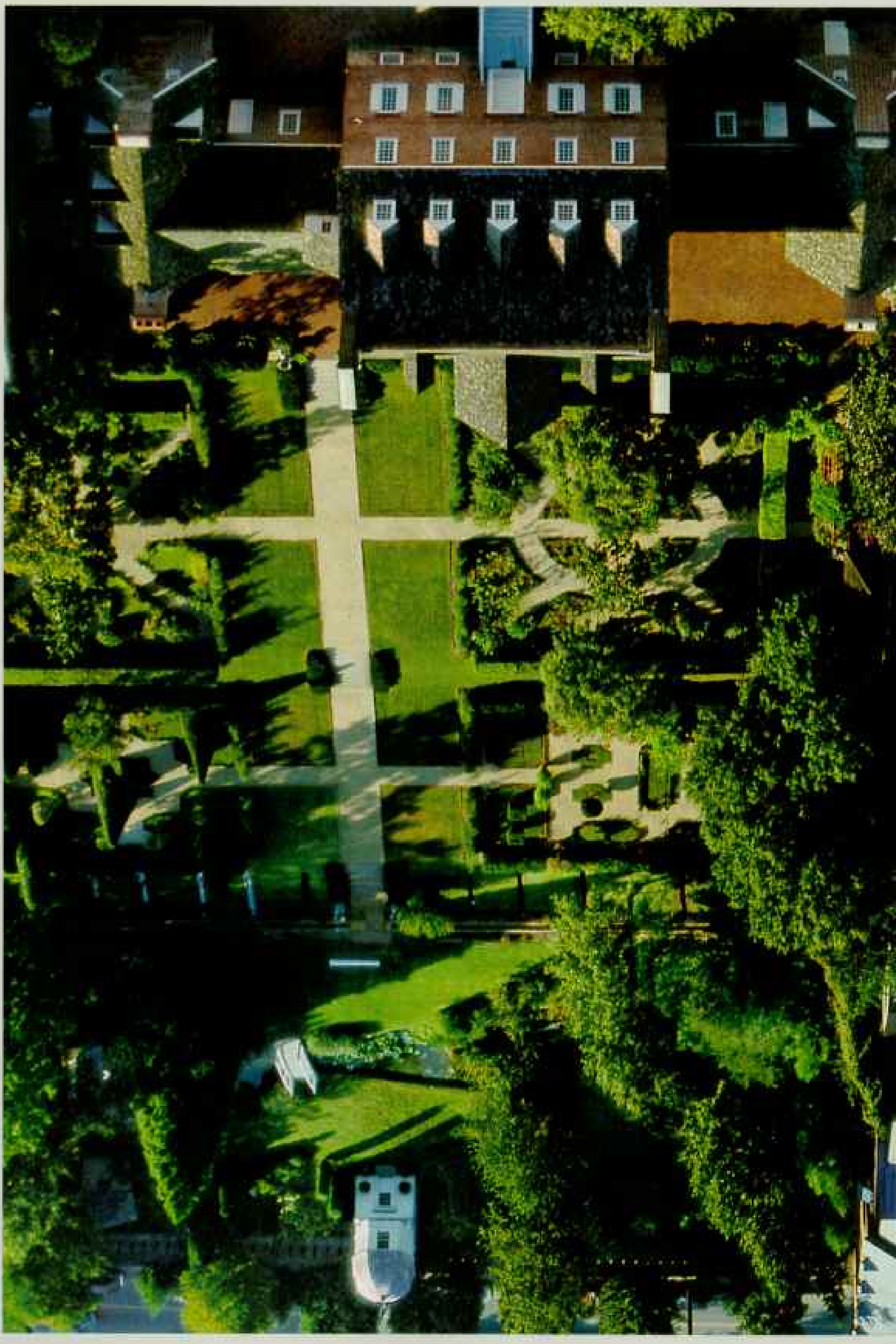
When arrested in 1735, he was found to have stolen 700 pounds. Since this was a capital offense, young Peale was duly sentenced to be hanged, but his sentence was commuted to banishment for life to the American Colonies. Penniless and friendless, Peale sailed to Virginia, found employment as a schoolteacher in Annapolis, Maryland, and encountered there an amiable widow named Margaret Triggs. Scarcely five months after their marriage, she gave birth, on April 15, 1741, to their first son, Charles Willson Peale.

I happened upon the spot recently, returning to my home in New York from a funeral service in Washington, D. C. After crossing the bridge that now connects Annapolis to the Eastern Shore of Maryland, I got off the main highway on Route 18 to cruise through the lush farmlands. A few miles south of a town called Centreville was a plaque in a field. "Birthplace of Charles Willson Peale," it proclaimed. "First Free School of Queen Anne's County erected near here 1724. Its sixth master was Charles Peale, father of the distinguished portrait painter and museum founder." Except for a low white storage barn on the horizon, there is nothing there now but fields of grass growing in the sunshine.

Charles Peale seems to have been an indulgent father. When his son was six, the father wrote to a sister in England: "Charly, who is a . . . manly straight Boy . . . gives me hopes of being a good Genius, being very docile." The exiled Peale died three years later, leaving to his widow and five orphans very little more than a belief that although they had come

PEABODY INSTITUTE OF THE CITY OF BALTIMORE (ABOVE)

"His manners were of the first polish," wrote Peale of his early patron and Declaration of Independence signer William Paca. Peale's 1772 portrait of the three-time Maryland governor was used to help reconstruct a pavilion in the garden of Paca's house in Annapolis.



down in the world, they still had a claim to landed estates in Rutlandshire.

Young Charly had to be apprenticed to a saddlemaker. It can be argued that learning to make saddles was more valuable in 18th-century America than reading Latin at Cambridge. Peale learned how to use his eyes and hands and to invent whatever he needed. When his watch failed him, for example, he taught himself to repair watches.

His relations with people were equally unschooled and straightforward. He was 17 when he met a girl named Rachel Brewer; she was 14. After a respectable number of visits to her home, he bluntly proposed marriage, saying he would give her an hour to make a decision, then ostentatiously pulling out his smoothly functioning watch. She seems to have been struck dumb. "The time expired," Peale later wrote in the grand third-person style of his autobiography. "He must now take his leave of the Family for ever."

Forever, at that age, sometimes lasts only a few months. "On a Summers Evening, walking out for recreation," his account continues, "by chance he spied Miss Brewer." Rachel told him if he had chosen to misinterpret her silence "as a denial, she was not blameable."

They were married in 1762, when he was 20 and she 17. Then babies began arriving, and all too often dying. The first, Margaret Jane, lived 12 days; James Willson, two years; Eleanor also died in infancy; Margaret lived less than a year. Then their fortunes changed. Raphaelle, future master of still-life painting, arrived in 1774, Angelica Kauffmann in 1775.

It is commonplace to say that 18th-century parents accepted such losses with equanimity, but one of Peale's most affecting paintings, "Rachel Weeping," shows his wife, newly recovered from smallpox, grieving over the body of Margaret (page 113). "This picture,"

PRIVATE COLLECTION

An artful deception, Peale's "The Staircase Group" depicts sons Titian I (right, at top) and Raphaelle. The real wooden stair at the bottom takes the illusion one step farther. When visiting Peale's museum, George Washington was taken in and "bowed politely" to the painted figures, according to an account by Rembrandt.

Titian I died at 18, and Raphaelle became something of a profligate. When not drinking or clowning, he painted still lifes, like "Covered Peaches" (above). "My dear Raphaelle," admonished his exasperated father. "Why will you neglect yourself? Why not govern every unruly passion? Why not act the man?"

wrote John Adams after Peale had shown it to him, "struck me prodigiously."

More characteristic of Peale's domestic menagerie is a charming painting called "The Peale Family Group," which shows Peale bending teacher-like over his younger brother St. George, who is drawing a picture of their mother. Gathered around the table are James, his sisters Elizabeth and Margaret Jane, Rachel, and a couple of unidentified children, presumably Eleanor and Margaret, the nurse, Peggy Durgan, and the family dog, Argus.

Peale, it seems, was a benign but watchful father. "My opinion," he once wrote to a friend, "is that all youth should be enticed, persuaided, commended to do good. . . . I think those who use Stripes or any other kind of severities are *lazy*, *base*, and unworthy."

ON A SHOPPING TRIP to Norfolk, Virginia, in 1762, Peale happened to see some paintings — several landscapes and a portrait. "They were miserably done," he later wrote. "Had they been better, perhaps they would not have lead Peale to the Idea of attempting any thing in that way." In that time and place such paintings were not considered anything so forbidding as art, more like a handicraft, a kind of furniture.

Peale tried painting a landscape, then a picture of himself taking apart a clock. Somebody asked him to do a pair of portraits and paid him

PHILADELPHIA MUSEUM OF ART, GEORGE W. ELKINS COLLECTION

Captivated by the "bewitching study of Nature," as he called it, Peale opened his Philadelphia museum in 1786 "to diffuse a knowledge of the wonderful works of creation."

Originally housed in a gallery adjoining his house, it supported his family for years. In 1802 Peale moved his museum to the second floor of the newly vacated State House, now Independence Hall (facing page).

PHOTOGRAPHED AT THE MASSACHUSETTS HISTORICAL SOCIETY (BELOW)

An admission ticket is held over a broadside written by Peale to solicit public support (above). The museum featured more than a thousand birds preserved by Peale. Some survive at Harvard University's Museum of Comparative Zoology (top), including Chinese pheasants presented by Lafayette to George Washington, a bald eagle, turkey, and owl.

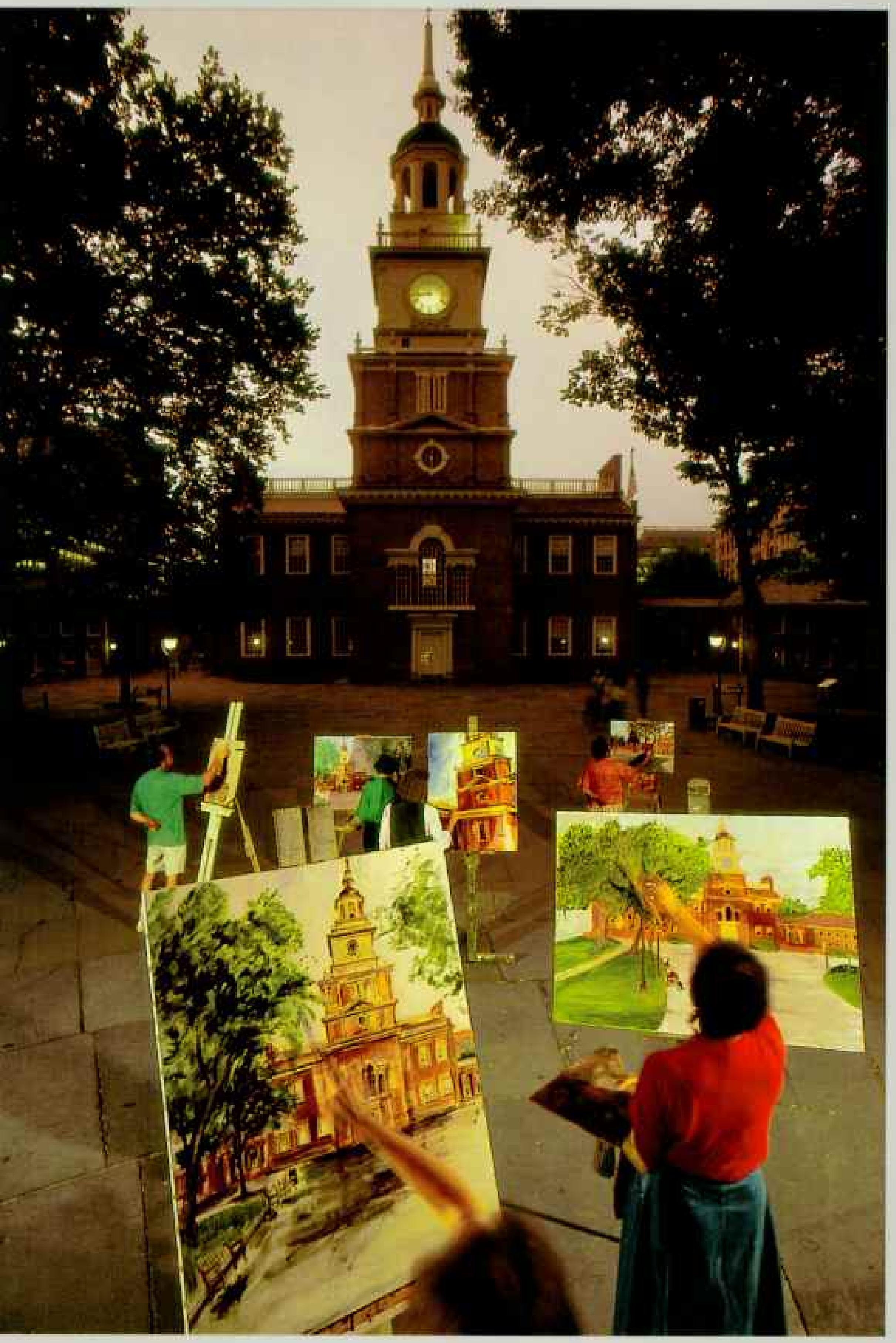
ten pounds. Peale began to think this new line of work might be more profitable than the saddlery business. He found a professional portraitist named John Hesselius, living near Annapolis, and promised him a saddle in exchange for lessons. Hesselius painted half a face, then showed Peale how to finish it.

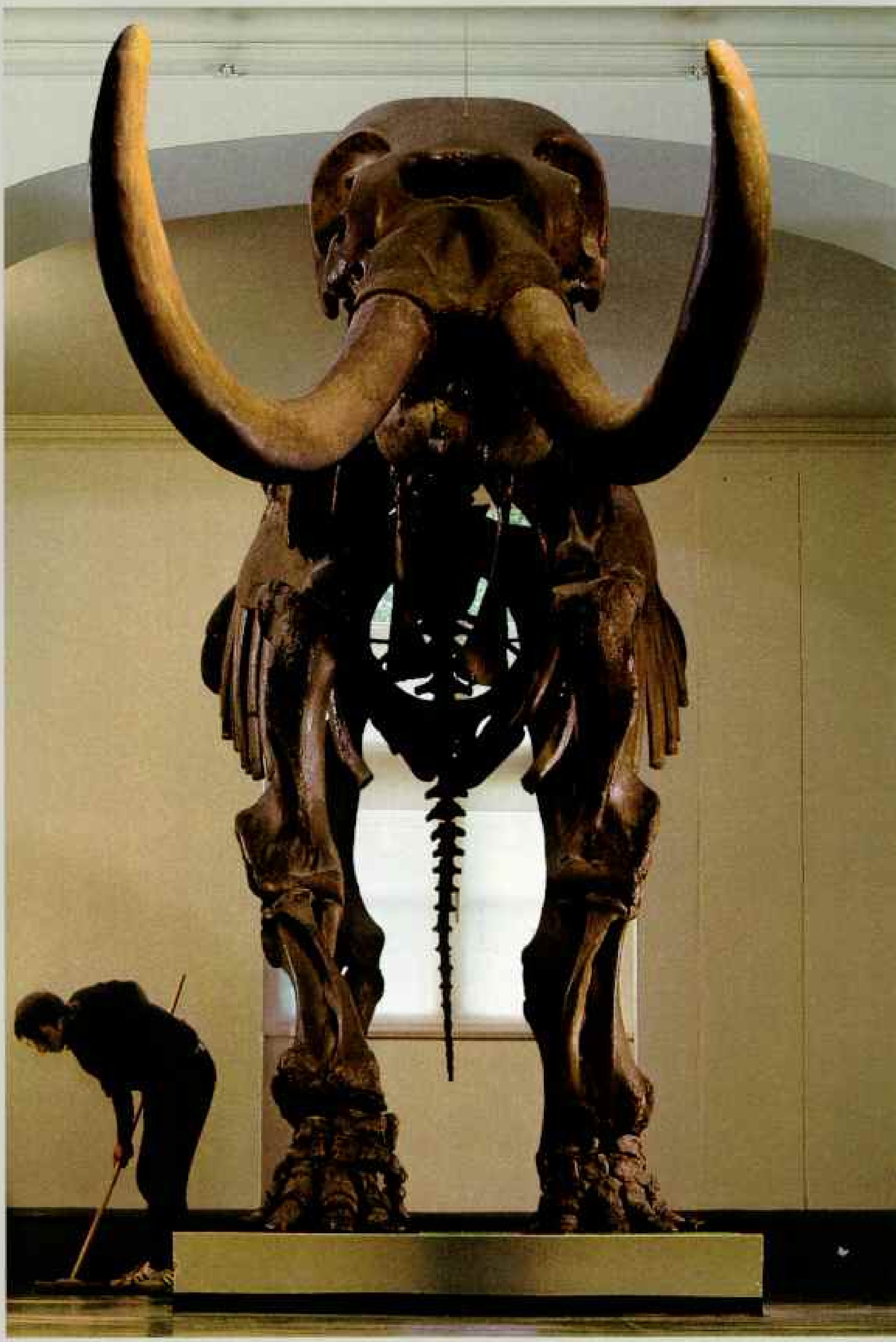
Then, at this threshold of a promising new career, everything went wrong. An associate in the saddlery business embezzled all the available money and fled. Peale found himself bankrupt. Threatened with prison for debts of some 600 pounds, he was forced to abandon his pregnant Rachel in 1765 and flee by boat to Boston. There he was encouraged by the portraitist John Singleton Copley, but it was only the intervention of friends and relatives that won a stay from his creditors and let him return home.

These friends went further. They raised a sum of more than 80 pounds to send Peale to London to study with the famous American painter Benjamin West. West not only treated his younger compatriot kindly but painted a handsome portrait of him as well. And Peale finally learned that his family no longer had any valid claim to ancestral estates. When he finally returned to long-suffering Rachel more than two years later, he was fully ready and able to paint his way out of debt.

To make his career, Peale moved in 1776 to Philadelphia, then the biggest city in the Colonies, but he soon found it embroiled in plans for war. The painter acquired a rifle and, in collaboration with astronomer David Rittenhouse, experimented with various mixtures of gunpowder. He also fashioned a telescopic sight that, on first use, blackened his eye.

At 35, he was anything but soldierly. "Peale





was a thin, spare, pale-faced man, in appearance totally unfit to endure the fatigues of long marches," he wrote of himself. Yet two months after he joined the Philadelphia militia as a common soldier in August 1776, his fellow soldiers elected him a lieutenant. Peale not only led his company off to war but also cooked for the soldiers and even made them shoes.

When the British evacuated Philadelphia in the spring of 1778, the city was torn between reactionaries and radicals—supporters of the establishment and what the establishment decried as "mobocracy." As a longtime Son of Liberty, Peale kept being pushed into the bitterest controversies. He served as an agent for a commission that confiscated property of wealthy Tories judged to have sided with Britain and on another that investigated the profiteering of Washington's close friend Robert Morris (whose portrait Peale nonetheless painted more than once). At one point Peale was even attacked in the street by an unidentified assailant. It all became too much for him. In 1780 he lapsed into what he called "a kind of lethargy," a condition that we might now regard as a nervous breakdown.

"In some of my intervals of reflection I have been a good deal alarmed at my situation," he wrote to a relative in 1783. In one instance he was sitting by the fireside among his family and suddenly tried to think how many children he had, and could not do so; in another he tried to remember whether his mother-in-law was dead or alive, and could not do so.

The great healing event was the end of the war. "It was to me like waking from a dreadful dream," he wrote years later. "My joy was great to know that I could lay me down to rest, without fear of alarm before morning."

Peale celebrated by building a tremendous triumphal arch, all timber, painted cloth, and fireworks. It was to extend nearly 60 feet across Market Street and 40 feet high. It included a laurel-wreathed Washington returning like Cincinnatus to his plow, plus the figures of Justice, Prudence, Temperance, and Fortitude, and Indians building churches. The sad outcome was that Peale's fireworks set the whole construction ablaze. They also set Peale ablaze as he put finishing touches on the arch. He jumped for his life, breaking a rib or two, but managed to put out the fires in his clothes and make his way home.

Such a disaster might discourage a less enthusiastic creator from ever attempting a sequel, but Peale was irrepressible. When Washington later made his stately procession northward to assume the Presidency in New York City in 1789, Peale was waiting in ambush. On the conquering hero's arrival in Philadelphia, he had to pass under yet another triumphal arch, where, when the 15-year-old Angelica Peale pulled a secret cord, a crown of laurel leaves would fall onto the head of the startled President. Contemporary chronicles claim that the surprise worked perfectly; family tradition adds that Washington paused to kiss the cheek of the white-robed Angelica.

That element of showmanship was central to Peale's museum. It must be scientific and serious; it must educate the people in the ways

Reading news in 1801 that fossil bones of an enormous animal had been found on a New York farm, Peale rushed off, bought them, and secured rights for the rest. He embellished the excavation in "The Exhumation of the Mastodon," which depicts 75 persons, among them friends and kin who were never near the spot. The completed skeleton (facing page) was later sold to a museum in Darmstadt, Germany.

HESSISCHES LANDESMUSEUM DARMSTADT (FACING PAGE); PEALE MUSEUM, BALTIMORE

Art and nature, two of Peale's passions, meet in a drawing class at the Pennsylvania Academy of the Fine Arts. Peale and his son Rembrandt were among the 71 founders of the academy in 1805. Peale felt that such institutions could provide the "virtuous education" needed to preserve the values of democracy.

of God and man, but it must also sell tickets.

His collection kept growing. Soon after he moved his museum into the American Philosophical Society's Philosophical Hall in Independence Square in 1794 (and publicly "bid adieu" to painting, recommending that anyone who wanted a portrait should apply to Raphaelle or Rembrandt), he amassed more than 200 stuffed animals, 1,600 birds, 4,000 insects, and 11 cases of minerals. Peale's living menagerie included an elk that wandered loose in Independence Square, a bald eagle so tame that Peale could hold it in his hands, and a cow that had two tails, five legs, and six hooves. Also several pet grizzly bears.

Also children. Peale took in not only a niece and nephew orphaned during the Revolution but also a young student, the deaf-mute son of Gen. Hugh Mercer, killed at the battle of Princeton.

PEALE WAS ALREADY 60 when, in June 1801, he saw a newspaper story reporting that a farmer in the Hudson Valley had discovered some more huge bones of the kind that had originally inspired Peale's museum. Taking along Rembrandt, by this time 23, Peale boarded a stagecoach for New York to see what he could learn about the mystery of the "great American incognitum." He made his way to the farm of John Masten, west of Newburgh. "The greater part of the skelleton was here brought together," Peale noted in his diary, "yet many was still wanting."

Peale artfully asked just for permission to sketch the relics lying in Masten's barn. Masten invited the artist to join the family for dinner, during which one of Masten's sons finally blurted out the question of whether Peale would like to buy the mysterious bones instead of just sketching them.

Peale offered two hundred dollars for the bones plus one hundred dollars more for the right to dig up any more that he could unearth. It was only the next day that Peale found his offer accepted. "My heart jumpt with joy," he wrote to his wife. And to President Jefferson: "The grandeur of this Skeleton when completed, will I hope excite your curiosity so far as to produce me the favour of a visit to the Museum, and that you may enjoy pleasure while contemplating the magnitude of the animal." Jefferson promptly wrote back to offer the use of Navy equipment to pump out the swamps that Peale wanted to explore and a supply of Army tents for shelter.

But Peale had already devised the pump he needed, a tottery triangular structure that lifted a series of buckets out of the 12-foot-deep

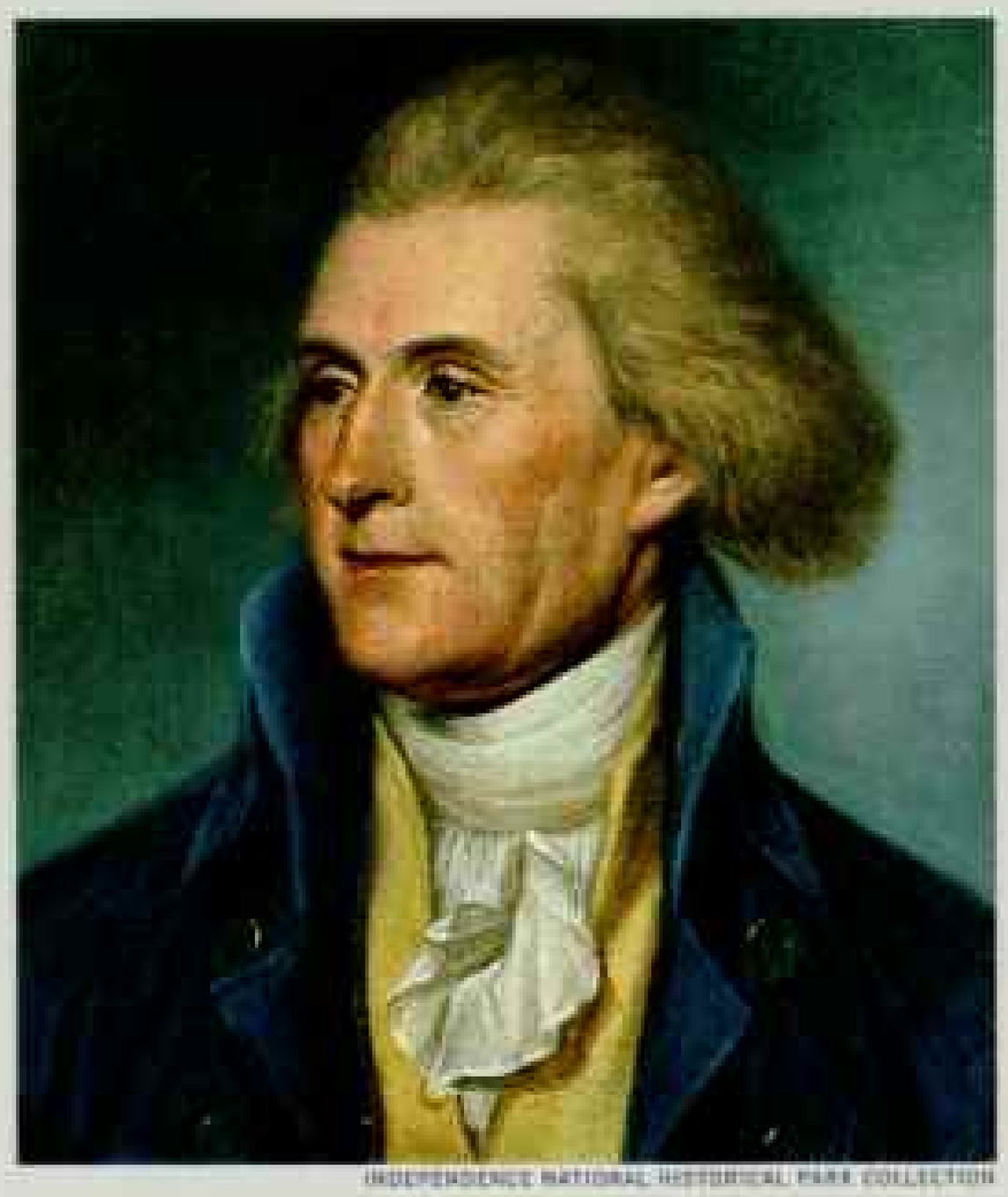
pond where the bones had been found. This was powered by farmboys and spectators tramping along inside a huge treadmill. On several occasions, heavy rain nearly caused the structure to collapse, but Peale labored on. After more than a month's work he sailed back to Philadelphia with his crates of treasure. It would take him and Rembrandt three more months to fit the bones together. All told, he would spend $2,000, some of it borrowed, to complete the project. When they were finished, however, they had a marvel. It stood 11 feet high at the shoulder and 17 feet 6 inches in length. Its curving tusks reached out 11 feet.

The great American incognitum was the first mastodon skeleton anyone had ever dug up and put together. Peale did not know that; he thought his discovery was akin to the mammoth bones that had been found in Siberia, so he and all Philadelphia called it a mammoth. It was left to Baron Georges Cuvier, the founder of modern paleontology, to describe and name the mastodon.

Peale advertised his "mammoth" as "the Largest of Terrestrial Beings!" People flocked to see it, paying a stiff 50-cent admission. It

An inventive mind and an itch to experiment led Peale to acquire the American patent to the polygraph, which could make duplicate copies of a document. He improved it and sent one to Thomas Jefferson at Monticello (bottom).

Peale's deep admiration for the man shines in this 1791 portrait painted when Jefferson was secretary of state. The two men were friends, even though Jefferson rejected Peale's proposal that the federal government take his museum under its wing.



INDEPENDENCE NATIONAL HISTORICAL PARK COLLECTION

became a kind of fad and added a new word to everyday speech. A Philadelphia baker began selling mammoth bread; women in Cheshire, Massachusetts, sent President Jefferson a mammoth cheese weighing 1,230 pounds.

PEALE'S WIFE, RACHEL, died in 1790, apparently of tuberculosis, just short of her 46th birthday. For three days Peale refused to let anyone move the body. He sat by her bedside, waiting in vain for some sign of life. Given the social conventions of the day, the 49-year-old widower with six children soon sought out a new wife. He was much taken with a young woman named Elizabeth DePeyster when he heard her sing a new song named "Hush Every Breeze." They were married in the spring of 1791, and more babies began arriving.

The first new son was named Vandyke Peale, but he died in infancy, and from then on, Peale wanted to honor not art but science. The next son, born in 1794, was Charles Linnaeus Peale. When another son arrived in 1795, the first child actually born in Philosophical Hall, Peale wanted to call him Aldrovand, for the 16th-century Italian naturalist Ulisse Aldrovandi. Perhaps persuaded by some kindhearted soul that this would be a heavy burden, Peale carried the baby in his arms into a meeting of the Philosophical Society and asked the assembled savants to decide on a name. They chose to name him for Benjamin

Franklin. Pregnant again at 38, with what would have been Peale's 18th child, Elizabeth felt premonitions. "Ah, Charles," she said to Peale, "if I live I shall be a better wife to you than I have ever been."

Elizabeth died in childbirth. A year afterward, Peale married Hannah Moore, a 50-year-old Quaker whom he described as "a cheerful, discreet and good-tempered woman—not giddy or frisky in her movements." Her only fault, he felt, was her habit of taking snuff—"a nauseous stinking weed."

Peale had strong views about healthy living, which, he was convinced, should enable any prudent citizen to last 200 years. He even published, in 1803, "An Epistle to a Friend, on the Means of Preserving Health," advocating such modern concepts as regular exercise and a spare diet, vegetables cooked in steam, no liquor or tobacco, and, above all, "serenity of mind . . . that sweet benevolence of disposition; that love of order . . . [which] are springs of health that flow in all directions." Hannah admired her sprightly husband but would not give up snuff.

Peale had always tried to run his museum as a profit-making operation—indeed, he raised his family on the proceeds—and yet he dreamed of turning it over to the national government, perhaps to be associated with a national university. He thought that President Jefferson might favor the idea, but Jefferson declined. "One of the great questions," he wrote to Peale, "is whether Congress is authorized by the Constitution to apply the public money to any but the purposes specially enumerated in the Constitution." He thought that a majority in Congress would be opposed.

Rebuffed, Peale turned to the Pennsylvania authorities. After threatening to move his museum from Philadelphia to New York or Washington, he petitioned the state government for public support, and the state responded in the summer of 1802 by letting him move his collection into the recently abandoned State House on Independence Square. So Peale's bats and tigers and insects moved into the very building where Washington and his associates had created the Constitution.

At 69 Peale was thus able to "retire," just as his friend Jefferson had recently done. The Peale museum devolved upon Rubens Peale, an amiable boy whose eyes had been too weak for him to study painting. He promised his father the same income that the museum had

AMERICAN PHILOSOPHICAL SOCIETY, PHILADELPHIA

PHILADELPHIA MUSEUM OF ART, GIVEN BY THE BARRA FOUNDATION

An officer in the American Revolution, Peale at age 36 painted a self-portrait (top), shown here in a print alongside his sketch of a cannon, war diary, and map of troop positions in 1776.

Peale had already known personal grief. A 1772 smallpox epidemic took his infant daughter, memorialized in a portrait with his weeping wife, Rachel. Because she could not bear to see the painting, Peale kept it curtained.

recently been earning, namely $4,000 a year. Imitating Monticello, Peale bought a farm near Germantown, Pennsylvania, consisting of about a hundred acres of land with mill streams and orchards. Two years of hard work transformed the place, and Peale named it Belfield.

"THOUGH AN OLD MAN I am still but a young gardener," Jefferson wrote from Monticello to Belfield. Peale could match him in inventiveness. He not only used the moldboard plow that he built from plans Jefferson sent him and adopted Jefferson's system of contour plowing (which enabled him to grow corn 13 feet high), but he also made a corn-planting machine and a horse rake and an apple-paring machine and a milk cart that would not spill milk. At 78 he built one of America's first velocipedes, which one of his younger sons said "goes down hill like the very devil."

Rubens, a botanist who played a part in introducing the geranium from France to America, came on visits to supervise the planting of boxwoods, exotic herbs, and berries.

And Belfield still survives, amid offices, winding roads, and the manifestations of La Salle University. The farmhouse is an amiable, stuccoed, three-story structure, approached by a curving stone walk and an unassuming front porch. Today it is the headquarters of Brother Patrick Ellis, the president of La Salle.

Shortly before his father's retirement to the farm, Rembrandt, who had announced that he wanted to be known henceforth only as Rembrandt, without the Peale, went to study in France and added to his considerable success as a portrait painter. Raphaelle, advertising himself as still a Peale, offered discounts: "A NAME! RAPHAELLE PEALE, To make himself eminent, will paint MINIATURES, for a short time, at Ten Dollars each. . . ." Raphaelle's real passion, though, was still lifes, a category for which there was virtually no market. Rembrandt got as much as one hundred dollars for his portraits; Raphaelle often sold his glowing fruit for less than $40.

If there was a blight on Peale's busy decade of retirement at Belfield, it was his difficult relationship with Raphaelle, this strange and enigmatic character who may have suffered from the constant competition of his gifted younger brother Rembrandt and from his father's frequent praise of his brother.

Raphaelle could not compete; instead, he joked. He liked to paint optical illusions. On one occasion, shortly after acquiring an untrained puppy, he painted and placed on the living-room rug what looked like a newly deposited dropping. His wife angrily insisted that he clean it up, and so with a triumphant flourish he retrieved it. He was not only a skilled mimic but a skilled ventriloquist as well. One of his specialties was to carve a chicken at dinner while making the chicken appear to beg for its life and shriek when the actual carving began.

He also played the clarinet, flute, mandolin, and guitar. He painted gorgeous still lifes that few people wanted. And he drank. In a parody of his father, he invented things that went largely unused. He built a machine to purify salt water. He published plans for carriage wheels and lightning rods. He even concocted a new theory of the solar system, in which the sun was "an electric body" that cyclically attracted and repelled the earth.

Raphaelle married a pretty Irish girl called Patty McGlathery. Peale, who was not above snobbery when his own children were involved, disapproved. The objects of his disapproval proceeded to have seven children, but it was Peale who had to support them while Raphaelle wandered and clowned and drank. Peale repeatedly scolded his prodigal. "If you applied as you ought to do, you would be the first painter in America," he wrote.

IF RAPHAELLE was a trial to Peale, his younger sons were almost as much so. Charles Linnaeus played the flute and clarinet but apparently disliked working at that or anything else. Peale apprenticed him to a printer, and Lin quickly responded by running away to sea. He brought back a horned lizard from Brazil for the museum, then went to sea again to join in the naval skirmishes of the War of 1812.

Flora and fauna from around the world collected and sketched by Titian II, named for his late brother, flank a portrait of the preeminent naturalist Thomas Say, painted by Rembrandt. The family scientist, Titian journeyed to South America and the South Pacific and, with Say, a close family friend, explored Florida and the Rocky Mountains.

PHOTOGRAPHED AT THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

The youngest son, Titian Ramsay II (named for an earlier Titian who died at 18), was a gifted naturalist, but he quarreled about Peale's domineering sister-in-law and housekeeper, Rachel Morris; Peale criticized him for being disrespectful and "a silly boy." He and a group set off in 1817 through the swamps of Florida, sketching and catching whatever they could find. Two years later he joined Maj. Stephen H. Long's pioneering expedition, which was officially assigned "to explore the country between the Mississippi and the Rocky Mountains." Starting in Pittsburgh, the explorers chuffed down the Ohio River, then up the Missouri and the Platte. They got as far as Longs Peak, just north of Pikes Peak.

Peale may simply have been getting too old for the stresses of raising children. Even those sons who had modeled themselves on him now looked on their father's ever changing enthusiasms with a certain condescension. Peale was aware of his wanderings. "I am not unconscious that I have misspent much of my time," he wrote to Jefferson in 1815. He turned to Rembrandt for further lessons, and then he began painting landscapes of the countryside around Belfield.

He painted new portraits of his family. He painted Hannah, head-on, in her rather forbidding Quaker bonnet. He also painted Raphaelle, all angry self-control, with a paintbrush in his hand and a still life of apples behind his head. He painted a wonderfully warm portrait of his brother James by lamplight. In 1818, when he was nearly 80, he went to Washington and painted a new generation of political leaders—President Monroe, Secretary of State John Quincy Adams, House Speaker Henry Clay, Gen. Andrew Jackson.

He painted himself. The most famous of these late self-portraits is "The Artist in His Museum" (1822), in which Peale, with an almost demonic gleam of triumph in his eye, holds high a tasseled curtain to reveal the tiers and tiers of stuffed birds in the State House. "The light I have chosen for my portrait is novel," he wrote to Jefferson. "My back is towards the light, so that here is no direct light except upon my bald pate, the whole face being in a reflected light." It is a haunting picture, with that farseeing look of the very old.

Peale was 80 in the fall of 1821 when, after a brisk spin on his velocipede, he came down with yellow fever. Hannah, who was 66, soon fell ill as well. Peale mistrusted doctors and all their medicines, particularly the popular purgative known as calomel (mercurous chloride). Hannah entrusted herself to the doctor; Peale did not. Peale woke up in the night and sensed a strange silence. "I hoped from the stillness that they had given her an anodyne while the blisters was drawing," he wrote. "No, the stillness was death."

He survived. Tired of farming and of the country, Peale returned to Philadelphia and resumed management of the museum, with Franklin and Titian II as assistants. Rubens later left to start a museum in New York City.

PHILADELPHIA was preparing to fully celebrate the triumphant return of Lafayette, by now nearly 70. Chief Justice William Tilghman, a man with whom Peale had had difficulties, saw to it that Peale's museum was excluded from the itinerary. But Lafayette strayed from that itinerary, strolled into the museum, and encountered "my dear Peale," his comrade at Valley Forge. They fell into each other's arms, and Lafayette insisted that his old friend join the welcoming party and ride in the same coach with him and the frowning Justice Tilghman.

"I am young, and I am old," Peale wrote to a friend at 85. "I am contented, and not contented. I am alone amidst company. . . . I hope to make 100 ladies happy, yet one would be enough. . . . An accomplished, sensible companion, good nature in abundance to forgive all follies . . . are there such to be had?"

A friend told him about a pleasant lady named Mary Stansbury, in her early 50s, a teacher in a New York school for deaf-mutes. He went to call on her, bringing copies of his "Epistle on Health" and his "Essay to Promote Domestic Happiness." Peale proposed to her that she teach him her method for instructing deaf-mutes, and he would give her lessons in painting or, better yet, teach her his newest enthusiasm, the making of false teeth. She protested, saying that she "had no genius," but Peale pressed on. "I told her that I would be her physician, her nurse and her protector," he wrote in his diary, "that it should be my constant care to please her in every way that was in my power."

She consented only to show him her false teeth and to make a mold of her mouth with beeswax so he could provide her with a new set made of porcelain. Peale had been tinkering

When this Egyptian mummy toured in 1823 to raise funds for Massachusetts General Hospital, Rubens, exhibiting the family flair for promotion, booked it into his Baltimore museum. Returned to Boston, it remains on display in the hospital amphitheater. The elder Peale himself was not above displaying attendance boosters like the trigger finger of an executed murderer.

with false teeth for decades and had made a complete set for himself back in 1809. He experimented with ox teeth and shells, and though the dental possibilities of porcelain were well-known in France, he was one of the first to use it in America. Peale decided that this help to the aged and others was more valuable than "any other work I can do."

There was no great demand for his porcelain teeth, since he charged an impressive $150 for a set. And the man who had once planned to live to 200 now began discovering that this would not be easy.

On his return from his visit to Mary Stansbury, the steamboat to New Brunswick ran aground a mile from its destination, and the octogenarian Peale had to totter through the darkness with a heavy trunk on his back. Feeling poorly on his return to Philadelphia, he suspected that his chest pains meant pleurisy, then that he had strained his heart. But he kept working. A month later, in February 1827, he fell unconscious aboard the steamer *Trenton*, bound for New York. In his suitcase was a new set of porcelain teeth for Miss Stansbury.

He was brought back to Philadelphia, but now his energy was ebbing. On February 22 he went to visit his second daughter, Sophonisba, and asked her to wash his hair. While she did so, he fell asleep. Sophy found it hard to awaken him so that he could get home. A doctor came to examine him, and his third daughter, Sybilla, agreed to sit with him through the night. They were alone, late, when Peale suddenly said, "Sybilla, feel my pulse."

"I can't find it, Pa," she said.

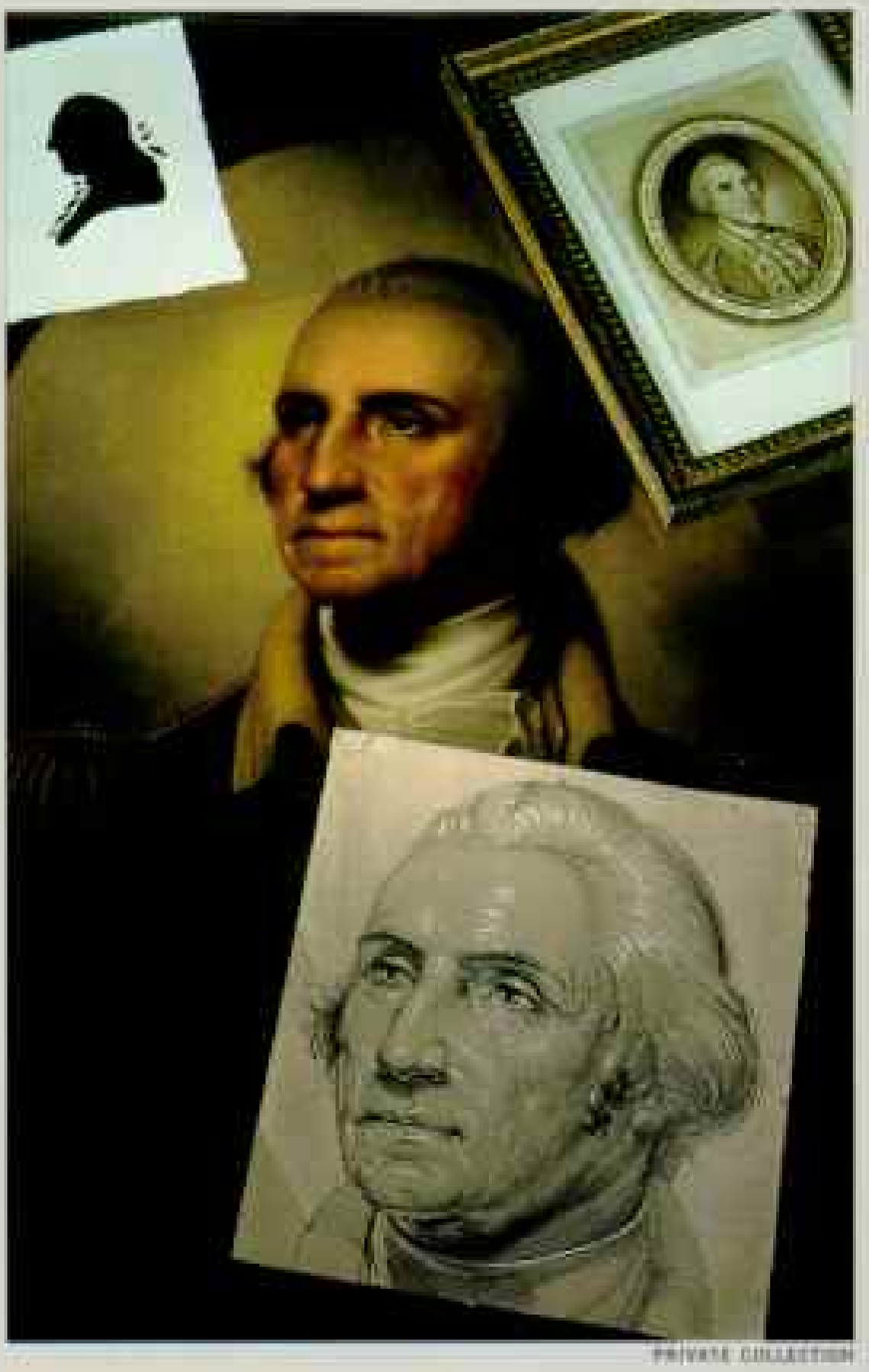
He lies now in a long, low grave outside the beautiful old church of St. Peter's, just a few blocks south of Independence Square. "He participated in the Revolutionary struggle for our Independence," the epitaph says. "As an artist, contributed to the history of the country. Was an energetic citizen and in private life Beloved by all who knew him."

The only one of Peale's seven sons buried nearby is Raphaelle, that gifted and afflicted prodigal, who was reduced, in his last days, to writing bits of doggerel for a baker to insert

Posing was tedious business at first, wrote George Washington, who sat seven times for Charles Willson Peale. "Now no dray moves more readily to the thill, than I to the painter's chair." One of Peale's portraits of Washington is explained to a group at the Metropolitan Museum of Art in New York City by Peale descendant Alice Iglehart (facing page). At the last sitting, in 1795, Peale was joined by his young sons Raphaelle and Rembrandt and brother James, prompting rival Gilbert Stuart to caution Mrs. Washington, lest her husband be "Pealed all round."

Peale's paternalism paid off. Rembrandt later sold at least 70 copies of an idealized composite portrait (right, at center). It is ringed by other likenesses of Washington (clockwise from above left): a silhouette from Peale's museum, a mezzotint by father Charles, and an ink sketch by Rembrandt.

The Washington portrait held by Clement E. Conger (above), curator of the State Department's Diplomatic Reception Rooms, is a replica made by Charles of the portrait he painted at the last sitting.



PRIVATE COLLECTION

into his cakes. Crippled by gout as well as by alcohol and arsenic (some say from his taxidermy at the museum), he died in 1825, two years before his disappointed father.

Families develop in unpredictable ways, merging with other families to create all kinds of hybrids. By now the descendants of Peale and his three wives and 17 children are beyond all reckoning. When an enormous microfiche edition of Peale's collected letters, journals, and memoranda was edited and published in 1980 by Lillian B. Miller of the National Portrait Gallery, the gallery invited all the known descendants to a celebratory reception.

About 40 came. "And we have a wonderful photograph of them," Dr. Miller says. "Many of them had never known one another because they came from different branches of the family and really didn't know about the members of the other branches."

In meeting these descendants of Peale, Dr. Miller made a discovery that surprised her, though perhaps it shouldn't have. "In every branch of the family, in every generation, there's been an artist," she says. "And frequently the artist did not realize that he or she

Returning as a newly restored Peale portrait, the 1775 visage of Fielding Lewis, Jr., charms benefactors of Kenmore museum—housed in the Fredericksburg, Virginia, home of Lewis, nephew of George Washington.

With his family and his more than one thousand portraits of Founding Fathers, Peale left a long legacy in kinfolk, canvas, and curiosity.

was descended from an artist. There must be something hereditary about the relationship, say, between the eye and the hand."

Peter Sellers, one of many descendants through Peale's daughter Sophy, is skeptical about such theories. He is a mathematician at Rockefeller University in New York. "Looking from a scientist's viewpoint," he observes, "I'd say the influences are environmental."

His niece in Maine, Molly Parrish Whittaker, has illustrated a book on the lakes and ponds of Mount Desert Island but does not consider herself a professional artist. "You just do it, what's inside of you," she says. She has been aware of Peale since childhood, but she has never been interested in portraits. What interests her now is Raphaelle's still lifes. "I'm doing the same kind of things he did," she says.

MORE CURIOUS STILL is the career of Peter Sellers's cousin Susan Sellers, who studied at the Rhode Island School of Design and later went to Australia. I telephoned her at her home on the outskirts of Sydney to ask if she had been inspired by her great-great-great-grandfather.

"Well, I think there might very well be a connection," she said. "I sort of grew up with Peale. I've been an artist and illustrator for quite some time, but lately I've been getting more interested in native animals, which was also one of Peale's interests."

As with Peale, this is more than just an interest. Susan Sellers belongs to the New South Wales Wildlife Information and Rescue Service, which devotes itself to helping animals in distress, particularly native ones. "I have a little flying fox here at this moment, an orphan," she says. "His mother was electrocuted on the power lines. He's delightful. His name is Harold. I've had various things coming through my house. I once had a baby kangaroo. And there were three lovely little fairy penguins in my bathtub. I learned how to feed them, and then they were rehabilitated and taken to a penguin sanctuary. I named them Sunday, Monday, and Tuesday, because that's the way they came."

Wouldn't Charles Willson Peale, the keeper of pet grizzly bears, the discoverer of the great American incognitum, have been pleased? And if Alice Iglehart wishes to God that she could have met the man, wouldn't Peale have equally enjoyed meeting the descendants who so variously pursue the visions that once inspired him? □

A work-weary harvester in the Bajío relaxes on blossoms of marigolds, used in chicken feed.

Mexico's Bajío —

By CHARLES E. COBB, Jr. NATIONAL GEOGRAPHIC SENIOR STAFF

On these verdant plains the seeds of Mexican independence were planted, grew, and flourished.

The Heartland

Photographs by DANNY LEHMAN

IN A COOL ADOBE-WALLED ROOM more than 200 years old, Luis Obregon twisted a spigot to release mescal from an oaken barrel on which the brands of neighboring ranches had been burned. He handed me a drink: "Welcome to Santacilia."

Don Luis's ranch lies between the towns of Dolores Hidalgo and San Luis de la Paz on the edge of the Bajío, or "lowland," the historic heart of Mexico (map, page 128). Unlike many old haciendas in the region, Santacilia is not in ruins. It is a working ranch famous for breeding fighting bulls. Don Luis and I settled into chairs to talk while sipping our drinks. Every object seemed to echo the richly textured historical fabric of the Bajío. A painting of Benito Juárez, the Indian shepherd boy who in 1861 became Mexico's great reform president and from

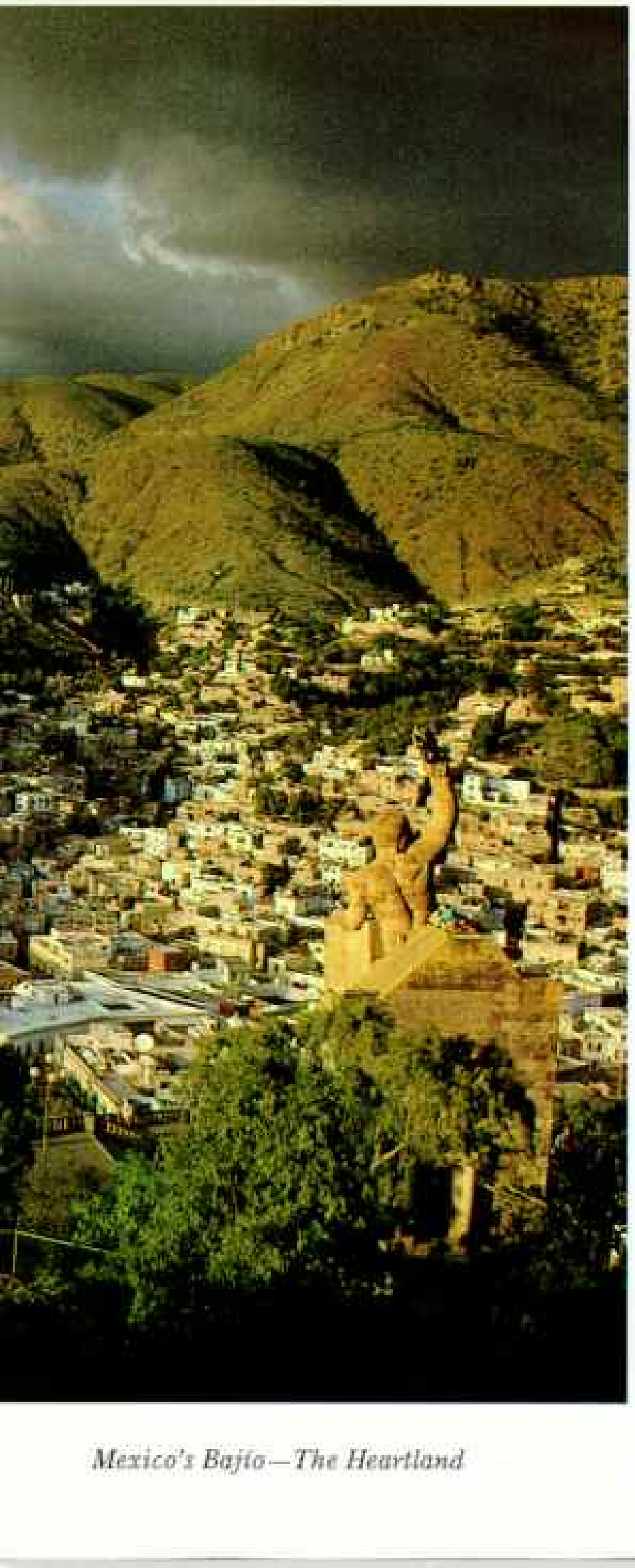
whom Don Luis claims descent, looked down upon us. The main house was built sometime in the 1700s, but Don Luis was not sure of the exact date. "The roof was fixed in 1851, of that I am sure," he chuckled.

Outside, next to an old high-arched granary, stands a modern building that houses a lab for freezing and preserving sperm. "One old bull's been dead for ten years," said Don Luis's son Antonio with a laugh, "but with this system he's still making babies."

Santacilia's mixture of old and new reflects the larger Bajío. At the geographic center of Mexico, it was in Spanish colonial times the generator of great silver wealth. It served as the cradle of independence, then as the stage on which later political and military struggles shaped the modern nation.

Today brings new challenges: rapid industrialization, booming export agriculture, and a population—now more than three million—growing almost twice as fast as the rest of Mexico. All threaten the special charm and traditions, the picturesque towns, and the conservative spirit that mark the region.

Will the Bajío survive "progress"? I spent six weeks crisscrossing its 10,000 or so square miles, seeking answers. I often felt not so much that I was traveling through an area as wearing it—like a subtly colored serape—and fingering its many textures.



I HAD COME to the Bajío from Mexico City, rolling north on the new express train, *El Constitucionalista*. Within an hour the smog, the traffic, the human swarms of the federal capital had vanished; as the train climbed, I saw ahead to left and right the burned-brown ridges of the mountains and between them green fields, grazing sheep, the belfries of churches.

Although Bajío means lowland, the plains here are between 5,500 and 7,000 feet in altitude, low only in relation to the surrounding mountains. Volcanic eruptions and the Río Lerma and other rivers gave these plains fertility. One Franciscan friar reported to the King of Spain: "The countryside seems to be enameled with flowers and herbs and its mountains covered with leafy trees."

But the mountains held more than trees. In 1548, as some accounts have it, muleteers heading north from Mexico City stopped one night and built a fire, banking it with stones. In the fire's heat the rocks exuded silver.

Soon the rush was on to find and exploit the fabulously rich veins of ore. The silver

The fury of revolution burst along the cobblestone streets of Guanajuato in 1810 to rally those denied equality or a share of the Bajío's wealth of silver. Indians, mestizos, and criollos were embarking on a bloody war against Spanish rule that ended 11 years later in independence.

would become like blood running through the veins of Mexico. Great galleons would wait at Vera Cruz to carry it across the Atlantic to enrich the Spanish crown and shake the economies of Europe, while other galleons would wait at Acapulco to transport it across the Pacific to Manila to be exchanged for the silks and spices of Asia.

ATOP AND AMIDST the greatest maze of mines rose Guanajuato, queen city of the Bajío, my first destination. I disembarked *El Constitucionalista* at its last stop, San Miguel de Allende, and drove to Guanajuato. A tunnel following an old river course leads into the city.

My first impression was that I had slipped out of the 20th century. It was dusk. The city, which overflows the floor of a narrow canyon, seemed a softly colored palette of stucco and adobe. University students in Renaissance costumes strolled with guitars and mandolins as they sang serenades, one of the rituals of Guanajuato's annual Cervantes festival. Lanterns illuminated many of the steep twisting streets with hidden plazas and ornate old churrigueresque churches. Even a hundred years ago horse-drawn carriages couldn't manage these streets. The faces of passersby reflected the long-ago merging of cultures and peoples drawn to the mines: Spanish conquerors, Indians, Africans—slaves and freemen.

I wanted first to see one of the great old mines. So one morning, from the open elevator we shared, foreman Emiliano Torres Rivera signaled by whistling to an invisible operator, and down we dropped . . . 1,100 feet into the heart of the Rayas Mine.

Mining tunnels branch in every direction beneath the city, some five miles of them, Emiliano estimated. "I began as a peon," he said, "filling up cars with a shovel and a bucket. Then we had to pull and push the cars a long way." He grimaced, remembering, then flashed the smile that seems to come so easily to faces here.

In the 1970s Rayas and other mines modernized, bringing in pneumatic shovels

Scars from past corridas lie hidden beneath matador Rodolfo Rodríguez's "suit of lights." Gored 12 times in 22 years, he emerged unharmed on this Sunday in San Miguel de Allende. The bulls did not.

and electrically driven cars. But workmen still pulverize chunks of ore with 12-pound sledgehammers.

Deep in the mine, a portion still supported by 16th-century arches, I recalled descriptions from older days.

The German naturalist Alexander von Humboldt visited Guanajuato in 1803. He found 5,000 men working in the mines and plants, and 14,600 mules turning the mills. He was startled to discover that "all the metal which is taken from the vein should be carried on the backs of men. The Indian *tenateros* . . . remain loaded with a weight of from 225 to 350 pounds for a space of six hours. . . . they ascend and descend several thousands of steps in pits of an inclination of 45°. These tenateros carry the minerals in bags. . . . To protect their shoulders (for the miners are generally naked to the middle) they place a woolen covering under this bag. We meet in the mines with files of fifty or sixty of these porters, among whom there are men above sixty, and boys of ten or twelve years of age. In ascending the stairs they throw the body forwards, and rest on a staff which is generally not more than three decimeters [about a foot] in length."

Brutal labor, but the mines built the Bajío. Mules and men required food, so commercial

Plains rich with promise

***Bajío** means "lowland," but these intermontane plains north of the nation's active volcanic belt lie more than a mile high. Comprising much of Guanajuato and parts of adjacent states, the region is enriched by volcanic ash that fertilizes fields of grains and vegetables. On entering the area in the mid-16th century, Spanish colonists began pacifying the nomadic Chichimecs, and, seeing the farming potential, started irrigating the land.*

agriculture developed. The need for harnesses, tools, and clothing started such industries, and towns grew.

"The combination of mining, agriculture, industry, and trade was unique in New Spain," writes historian Eric R. Wolf. The Bajío also controlled the flow of goods between Mexico City and the north. Wealth could grow without being siphoned off immediately by the greedy central government in Mexico City.

AND SO GREW a rich and complex society; near the top were the criollos, people of European ancestry born in Mexico. Theirs was a splendid life. "The pompe and liberalitie of the owners of the mines is marvellous to beholde," one observer wrote in 1572. "I have seene a miners wife goe to the church with an hundred men, and twenty gentlewomen and maids. They keepe open house: who will, may come to eat. . . . They are princes in keeping of their houses, and bountifull in all manner of things."

There were many diversions, feast days and public celebrations, none more popular than the *mascarada*, or masquerade.

These processions included "Indians . . . their bodies [daubed] with clay paints of many hues . . . a company of infantrymen formed by one hundred and eight youths marching six abreast . . . with bright-colored plumes fluttering from the crest of helmets." There were figures representing the Aztec kings and, in a grand carriage, Holy Roman Emperor Charles V.

"Then came the triumphal float, lovelier than the starry firmament and its twinkling constellations"—a ship, covered with flowers and streamers, bearing an image of the Virgin of Guadalupe. Around the float were "venerable old men who, in chants of marked devotion, intoned praises of the Most Holy Virgin."

In time Spain seemed remote and Spanish rule was resented. The criollos were allowed more wealth than power; that was held by the *peninsulares*, Spaniards born in Spain. Mestizos (persons of mixed Spanish and Indian blood) and Indians resented their own poverty and powerlessness. Although divided by class, criollo, mestizo, and Indian were linked by a growing consciousness of being American . . . *Mejicano*.

By the early 1800s change was in the air. The American and French Revolutions had set a precedent for armed struggle for freedom; books by thinkers of Europe's Enlightenment spread notions of better and more just societies. Then Spain was thrown into chaos by the invasion of Napoleon Bonaparte. Throughout the Bajío "literary clubs" met to discuss these ideas and developments—and to plot revolution. Among the plotters was an aging criollo parish priest with a deep concern for the poor, Miguel Hidalgo y Costilla.

When the Spanish discovered the conspiracy, he decided to act quickly. On the morning of September 16, 1810, in the town of Dolores, Father Hidalgo issued his incendiary *Grito de Dolores* ("cry of Dolores"), calling for revolution. It is a cry ritually remembered on the evening of September 15 by Mexico's President, governors, and local officials from their public balconies. *"¡Viva la Independencia! ¡Viva Hidalgo! ¡Viva México!"*

The mestizos and Indians listening to Father Hidalgo grabbed whatever they could use as weapons and marched off to what would be a bloody 11-year war. The criollos, jealous of the power of the peninsulares, joined in the crusade against them. Guanajuato was one of the first cities attacked, and many of its peninsulares were massacred.

Within a year Father Hidalgo was captured, charged with treason and heresy, and executed. His head and those of three co-plotters were placed in cages, one hung on a hook at each corner of the Alhóndiga de Granaditas, a huge granary in Guanajuato. The building serves today as an art and historical museum, and there, should you wish, you can still see the hooks where the heroes' heads were hung.

FOR 50 YEARS after their settlement of the Bajío the Spanish were at war with the Chichimec Indians. Cities were fortified and kept *muy comunicadas*—in close contact. They remain muy comunicadas but also display a little civic rivalry: Querétaro, for instance, some hundred miles southeast of Guanajuato, claims to be the region's most historic city.

Its center is remarkably preserved. Wandering through tree-lined plazas, past madcap angel-laden baroque churches, and up streets lined with 18th- and 19th-century homes where criollo intriguers plotted

Fueling up for a day's work, a family eats breakfast before harvesting a cornfield (left). Farmers use simple means, such as oxen, to work the fields (far left) in what is one of Mexico's most highly productive agricultural areas. In Magdalena de Araceo (above), corn shocks are formed with a stalk-and-leaf matting called rastrojo to protect the corn inside from rain and pests. When dried, the corn is ground for tortillas. The rastrojo is fed to hogs and cattle.

independence, I felt the years peel away.

Here in 1848 Mexico gave up its claim to Texas and ceded more than half its territory to the United States. Here in 1916-17 Mexico's constitution was written and adopted. Here in 1929 was organized the party that has governed Mexico for the past six decades, known today as the Partido Revolucionario Institucional. And here in 1867 ended the last European dream of controlling Mexico.

French Emperor Napoleon III invaded Mexico and placed on its throne in 1864 Austrian Archduke Maximilian. Napoleon thought the Austrian would be a puppet; Maximilian, with his beautiful Empress Carlota, tried to rule independently and well. But when the United States, its Civil War ended, re-asserted the Monroe Doctrine, Napoleon withdrew his troops, and Maximilian lost ground to the army of Benito Juárez.

Empress Carlota sailed for Europe to plead for military aid; Maximilian joined his forces at Querétaro, where he was welcomed by the city's elite and showered with flowers thrown from balconies. But within months he was forced to surrender to Juárez's army and was condemned to death.

Maximilian was gallant if ineffectual. At his execution, it is said, he offered smelling salts to the presiding priest, who seemed faint, and handed each member of the firing squad a gold piece, urging them to shoot straight and spare his face for his family's sake. The rifle shots rang out; Maximilian fell, his face covered with blood. "¡Viva México!" he cried. The soldiers fired again. The emperor's sad story was finished.

As for Carlota, she had gone to Europe for help but found only madness. She spent her last 60 years in seclusion, never hearing the tragic news from Querétaro.

BEYOND ITS HISTORICAL richness, Querétaro is also a laboratory for the future. With 700,000 inhabitants, it is the Bajío's second largest city and, like most cities in the region, is growing at over 4 percent a year. That rate is likely to accelerate.

Mexico's national government is discouraging further growth in Mexico City and other metropolises and diverting it elsewhere. Querétaro is first stop on a new development corridor running 240 miles northwest across the Bajío to León. In the 1950s, there were only a handful of companies in Querétaro; now there are 1,500, producing automobile parts, heavy and light machinery, and food products.

"People have come from everywhere," said businessman Victor M. Amieva. "I am a Queretano, but now when I ask in any group how many are from Querétaro, maybe there will be one or two."

Growth is concentrated in a great ring around the city's colonial core. This ring is bursting with factories, small workshops, stores, cafés, and homes—"As if," one resident told me, "we were an attic to which you can come with anything."

Sporting the colors of the Mexican flag, thousands of Guanajuatans (above) don red-white-and-green caps to show support for state governor Rafael Corrales Ayala at his annual address. The ruling Partido Revolucionario Institucional provides transportation and snacks to encourage attendance.

Followers rally around President Carlos Salinas de Gortari (left) when he visits the town of Irapuato.

Flaming charge of a mock bull draws cheers from the crowd at a fiesta in the village of Atotonilco. Lively pageants celebrating

the history, religion, and ethnic spirit of Indians, mestizos, and Spaniards are held somewhere in the Bajío almost daily.

Freshly dyed and almost dry, handmade shoes (below) await inspection on the roof of a family shop in León, the Bajío's largest city. They will be sold to distributors for about $12 a pair in a market where competition forces price wars.

Cost-efficiency motivates foreign investments such as the American-owned Birds Eye plant near Celaya (top right), where women sort broccoli destined exclusively for U. S. tables. Companies like Birds Eye and A P

de México (middle right), a U. S.-controlled muffler manufacturer in Querétaro, offer Mexicans steady employment.

Silver mines such as Las Torres in Guanajuato, where a miner uses a pneumatic drill to clear a tunnel (bottom right), yield approximately 20,000 pounds of ore a month.

The phenomenon is not new, architect Carlos Arvizu explained, pulling out 17th- and 18th-century maps that show the steady expansion of the city in those centuries. "The colonial city had a large elegant center with quarters and subsystems surrounding it." The model, he believes, is still applicable. "We can control growth, if there is the willpower and the interest. But without those, we risk becoming a new Mexico City."

One way to control growth is to slow the rural flow into the city. More services are being developed in the countryside, more jobs created there. Just outside Querétaro, in Sanfandila, such a modern urban subsystem is being developed. Already two research institutes are in place; public housing, schools, and small industries will follow.

ADAPTING: The people of the Bajío have a special talent for it. Consider the town of San Miguel de Allende, among the prettiest in Mexico. It was founded in the mid-1500s as a Franciscan mission and in time became a market town serving the surrounding haciendas. It was noted for its serapes, tinware, and horse tack. It produced one of the heroes of the war for independence, Ignacio Allende, a cavalry captain and co-conspirator with Father Hidalgo. Allende's head also once adorned the old granary in Guanajuato. To honor him, San Miguel appended his name to its own.

Today the town serves as a national monument, tourist target, and refuge for North Americans. Pastel-hued houses nestle against the surrounding hills; homes and lovely gardens in the Spanish style are concealed by surrounding walls.

The city's crown jewel is its parish church, La Parroquia. Its facade was rebuilt, according to legend, by an Indian stonemason inspired by postcards portraying great European Gothic cathedrals. The cards gave only front views, so the rear of the church was left plain. The stonemason got the spires tall enough, though; they poke the sky, a beacon to the city's flower-decked central plaza. There, in the evening, young couples promenade, older folks sit and talk, and kisses are stolen beneath neatly trimmed trees. And if you are awakened at 2 a.m. in your hotel by the sound of a mariachi band (pages 138-9), it may well be a newly married couple returning to their honeymoon suite.

But there is also a touch of Santa Fe, Key West, or Carmel here. Since the late 1940s San Miguel has been a favorite of U. S. citizens, especially writers, artists, and retirees. "This was just a dinky little town when I arrived 50 years ago," said Stirling Dickinson, who came to write, helped found an art institute, and now raises orchids. Today about a thousand North Americans live in the city year-round; its total population has grown to 110,000. Says writer Bob Somerlott: "We're just a ripple, although a ripple that the other towns don't have."

The foreign presence, as well as skyrocketing inflation, has helped push up prices. When I stayed with Gustavo Torres and his family, it was easy to see that keeping ahead of costs required the efforts of all.

Gustavo's wife, Tere, rises early every morning to make the dough for the pastries and cakes she sells. They share their house with the families of two of their children and rent rooms to U. S. students who come to study Spanish or art at San Miguel's institutes. Did Tere resent the foreign presence that contributes to the higher cost of living? She paused as she kneaded dough and replied, "No. We need the tourism. It is still better here."

AS THE MOUNTAINS once yielded their treasure of silver, the Bajío's plains now yield a new mother lode. And if you eat frozen broccoli, you probably share in the action. The Bajío was long the great granary of Mexico. "All around, everywhere, were just fields of wheat and corn," remembers Martha Portales. "Now it's mostly fruits and vegetables."

Frozen and shipped north to the great and hungry U. S. market, vegetables are a precious commodity. Guanajuato state's broccoli and cauliflower production annually grosses more than 50 million dollars. Last year that state shipped out 189 million pounds of it, mostly to the United States.

Near Celaya, where the Mexican revolutionary Pancho Villa was defeated in bloody battle by government forces in 1915, I visited Mexico's first frozen broccoli processing plant, established 23 years ago. The label, Birds Eye; the owner, a giant U. S. firm.

"When we're going full blast," said Von Peacock, Birds Eye agricultural manager, "we employ 1,500 to 1,800 people." The largest of four greenhouses is bigger than a football field. All are filled with seedlings. Thirteen million a month are generated, Von told me.

Birds Eye provides these seedlings, along with fertilizer and insecticides, to farmers throughout the Bajío. In 11 weeks, when the plants are harvested, they are

trucked back to the plant for processing.

At a "trim area" inside the main plant, women were rapidly cutting and sorting by hand. Conveyor belts spill the broccoli into giant vats for blanching to lock in color, then the vegetables are frozen. "Doesn't the smell remind you of your mother insisting that you *will* eat your vegetables?" I asked production manager Gary Tritt.

"It does smell like broccoli on the stove," he agreed. "But that's OK. If I worked in a chocolate factory, I'd probably suffer from eating it all."

Foreign firms produce 40 percent of Guanajuato state's agricultural exports. More and more, however, the Bajío attracts Mexican entrepreneurs. César Coello heads the Dipasa Food Processing Company near Celaya. Dipasa processes about 50,000 tons of sesame seeds a year, and much goes to the U. S.

At 40, César is typical of young entrepreneurs here. He started in Mexico City but didn't like it there: the pollution, the hugeness. As for northern Mexico, temperatures were extreme, costing more in heating and cooling, and the unions up there were tough. In the Bajío he is *muy contento*.

Agricultural exports bring in big money but also pose a problem. Warns economist Leonel Corona of the National University of

Mexico, "Our commercial agricultural production has increased, but we export so much that we must import our own food."

He urges the Bajío to meet its own food needs. "We have that potential," he told me. Then he sighed. "But our compass is always pointed north."

ALTHOUGH THE BAJÍO is the mother of modern Mexico, its children differ over what the past has promised. "Look! Isn't this a pretty thing they have done to me!" moaned Angela Rivera Estrada, standing before what remained of her humble house in the village of Ribera de Guadalupe. The government had ordered it bulldozed; it was now a rubble of tile and adobe. "Is this any way to treat a person?"

"But she was squatting on *my* land," insisted farmer Pedro Rivera. After sharecropping on a nearby ranch, he had bought the 45 acres in 1982. Pedro is not rich; his farm has no electricity, running water, or irrigation. Still, acquiring it had filled him with pride and hope. Then one morning he woke up and—"These people were building on my land. They said it was *ejido* land."

About half the agricultural land in the Bajío is privately owned; the rest is ejido, or communal land, apportioned by the state. The division reaches back three-quarters of a century to the Mexican revolution's promise of land to the landless.

Mexico's constitution guarantees that all who want farmland will receive some for their use. But now, officials say, there is little land left—none in Guanajuato state. So the landless gaze enviously, sometimes desperately, at private land. And sometimes they simply move onto it. It had taken Pedro three years to get the squatters removed; now he feared they would return.

As for the *ejidatarios*, those who have been given communal land to farm, the story is mixed. Some call the program a failure, and it is easy to see why. Wherever I saw the rockiest soil, or weeds, or scraggly crops, it was ejido land. Of the 300 farms producing for agro-industry in Guanajuato state, only four are ejidos.

Lack of capital is part of the problem. Ejido land can't be seized for debt, so banks are reluctant to lend money for seed and fertilizer. And even when these are acquired, the ejidatario often has a plot too tiny for commercial possibilities.

Yet I often came across what seemed a contradiction: the appearance of prosperity on ejidos. In truth ejidatarios are not ground down by desperate poverty. In many homes I saw TVs and modern appliances. These were bought with the money of men who went

Mobile mariachis serenade newlyweds Guadalupe and Antonio Sánchez on the way to their wedding reception in San Miguel de Allende. Such nuptial bands apparently originated during the French occupation in the 1860s and derived their name from the French word "mariage."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36
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FRANCISCO LUGO LOPEZ
R.I.P
PAPA HITO

At risk of joining the honored dead, a young boy (left) grabs a tenuous handhold on a wall of stacked burial niches. He hires out his services for about a quarter to place flowers in Guanajuato's municipal cemetery on the Day of the Dead, November 2. Family and friends adorn graves and show respect with special offerings of food for the deceased, who tradition says return as spirits on this day.

Unwavering devotion is offered to the Virgin of Guadalupe, Mexico's patroness, in the village of Apaseo el Alto (above). Numbering about 300, worshipers pray in three one-hour shifts each day from October 28 to her feast day, December 12. The 46 rosaries they complete each day represent the years she is thought to have spent on earth.

north to the U. S. to work. Per capita, probably more Mexican workers go to the United States from the Bajío than from any other region of the country.

In tiny Huapango the new church had a shiny tile front and asbestos roof, lending an air of prosperity. But there were no men. The wheat had already been harvested, explained schoolteacher Pablo Durán. "The men are up north in the U. S. again. They come back only to plant and to harvest."

IN CONFRONTING the future, only one problem may be beyond human reach: water. In colonial and later times it was abundant; the Bajío still, by Mexican standards, has a generous supply. But as population has swollen and farming and industry have grown, demand overruns supply. The Bajío now sees its water table drop four feet annually.

"There are no more wells for irrigation," says Octavio Mijangos Borja, formerly of Guanajuato state's development office. "In 10 to 12 years, if the trend continues, we will have just half the wells we now have."

Dwindling wells have sent many from rural areas to the cities. León, the northernmost and, with nearly a million people, the most populous of the Bajío's cities, faces a crisis. In olden times it was here that wagoners stopped to exchange teams of horses and refit with new bridles, harnesses, saddles. Leatherware, especially shoes, still provides nearly half the city's income. Its streets are hurried, honking, crowded, and growing more so every day. In 1989 León held 138,153 houses; by the year 2001 it expects more than 288,000, each with an average of six inhabitants.

"We won't have a future after 2005," said Mario Plasencia, chairman of the municipal water company, "unless we recycle and reduce consumption." Neither is easy.

As quantity has dropped, so has quality. The density of industry along the Río Lerma has led to increasing pollution. One polluter is the government's giant Pemex petroleum refining facility at Salamanca, which provides industrial and auto lubricants for all Mexico. At Arroyo Feo, a slender dirty brown stream emptying into the Río Lerma near the Pemex facility, Margarito Rodríguez Cornejo sighed wearily and told me, "When I planted alfalfa last year and watered it with that water, it wilted, then died."

"In the past nobody addressed the problem," said Mijangos Borja. Now they do. Thirty-six treatment plants will be in operation in the Bajío within the coming year. And Pemex is working on a project to recycle the water used at the Salamanca refinery.

Cherished moments with his son Pedro are in short supply for Demetrio Arellano, who will soon leave San Cristóbal for the U. S., where he picks crops and works in construction. He says the money is good—so good that some men do not return. But missing his family has always brought him back to the Bajío.

ON ONE OF MY LAST EVENINGS in the Bajío, I found myself back in lovely San Miguel de Allende. It was September 15, the eve of Mexico's Independence Day. The midnight sky exploded as fireworks turned the darkness into cascading colors. Cathedral bells chimed; the cry "¡Viva México!" rose from the hearts as well as the throats of thousands gathered in the plaza. Neither the Bajío's nor Mexico's problems seemed insurmountable in that moment when proud past joined belief in the future.

My mind raced back over memories of my travels in the Bajío: the sweat-streaked faces of the workers in the silver mines, the market days in small towns with melons and lentils and peppers spread on blankets on the ground, that iron hook from which the cage containing Father Hidalgo's head had hung, the squatters and the North American retirees, the broccoli packers and the politicians.

My mind's eye came to rest on the words on a plaque in a shiny new airport in Celaya, the words of the great modern poet Amado Nervo; words looking toward a future that "will fine-tune this poor human clay that so easily remembers the swamp and forgets it has wings." □

BETH MIAKININ *tells how good conversation and careful listening led to a new kind of car, being built in Spring Hill, Tennessee. Beth's father worked in the auto industry for 37 years. All through engineering school, she promised herself she was going to do something different. Which she did. In 1986 she came to Saturn, as a product development engineer.*

"...A lot of companies only ask customers for feedback after their products are out on the market. Not before they're built.

Well, we asked our questions up front. When the answers could still have an impact on the cars we were building. We asked things like 'How does this switch feel when you operate it?

What about the comfort of the seats?'

People really love talking about their cars. We'd be interviewing them and they'd go

on forever about just one question if we didn't stop and ask them another one.

After a while, you become very sensitive to the comments you get back.

A one-on-one conversation with a real live human being is more useful to me than a stack of mathematical data five feet high.

Data may tell you whether a certain feature was rated a 4 or a 5. But it won't tell you how to go back and turn it into a 10.

People are always amazed that a car company would actually care what they think. Or ask them what they'd like to see in the future.

Speaking with our potential customers is the best thing this company can do to keep our perspective. When you do, you always come back feeling a little clearer on what's important.

And who you're working for....»

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THE PRESIDENT'S REPORT ON THE

Education Foundation

THE NATIONAL GEOGRAPHIC SOCIETY

Dear Members:
Earlier this year I had the privilege of awarding the Society's first Distinguished Geography Educator Awards to four exemplary individuals: Christopher Salter of the University of Missouri–Columbia, Richard Boehm of Southwest Texas State University in San Marcos, David Hill of the University of Colorado at Boulder, Sidney Jumper of the University of Tennessee at Knoxville.

As pioneers of geography education, they have struggled through bureaucratic jungles, scaled heights of indifference, and crossed great seas of ignorance with the same determination and vision shown by the world's great explorers.

I want to thank these educators and their universities for exceptional work.

GILBERT M. GROSVENOR
President and Chairman

Teachers Take to the Field, the Factory, and the Arctic

IT WAS THE TEACHERS' TURN to board the buses this summer as more than a thousand of them from 27 states took part in 39 regional institutes sponsored by the Society and its Education Foundation.

During the Southwest Texas State Institute, teachers visited Del Rio, Texas, and Ciudad Acuña, Mexico, to study the *maquiladoras* program. Parts for American products like electronic appliances and even diapers are assembled in some 1,800 Mexican factories, where labor costs are low and paychecks welcome for 450,000 workers.

"What we usually see in news about border towns is negative," says Lynn Bright, a junior high school teacher from San Angelo. "What I saw were clean factories, better wages, and people helping one another."

In the far north, teachers attending the Alaska Summer Geography Institute went to Prudhoe Bay, courtesy of BP Exploration, to study the environment, the geography of petroleum, and the economic and cultural factors that influence the landscape.

"The field trip made me think a lot about whether or not we ought to open up the Arctic National Wildlife Refuge for oil exploration, even considering the Middle East situation," says Jody Marcello, a middle school teacher from Sitka. In Washington, D. C., a hundred teachers at the Society's two institutes attended sessions on lesson content, leadership development, and educational technologies.

More than 3,100 teachers have taken part in Society-sponsored institutes since 1986. With the workshops these teachers then hold for colleagues, the institutes' message reaches at least 100,000 teachers each year.

President Bush Pushes Education Effort

TAKING A TOUGH LOOK at the entire educational system in this country, President George Bush and the nation's governors earlier this year adopted a set of six goals for the end of the decade. Among them is a call for all fourth-grade, eighth-grade, and twelfth-grade students to demonstrate their competence in key academic areas, including geography.

The President later reaffirmed his support when the governors met with him at the White House. "I want to see these goals posted on the wall in every school," he said, "so that all who walk in—the parents, students, teachers—know what we're aiming for."

To help make that happen, the Society designed and produced a poster illustrating the goals (below left), which was presented to the President at a White House ceremony in September. It was distributed to more than 100,000 schools in the country, accompanied by a letter from President Bush.

Florida Kiwanis Clubs Lend Material Support

"TO TEACH GEOGRAPHY without the most basic tools—current maps, globes, atlases—just didn't make sense," says Edward Fernald, geography professor at Florida State University in Tallahassee and head of the Florida Geographic Alliance. "I had to do something."

Fernald had been getting a clear message from teachers attending training workshops held by the Florida Alliance: They needed up-to-date teaching materials. So in mid-1989 he got in touch with the Florida Kiwanis Club, which took up the challenge. In just a year 42 Florida Kiwanis Clubs have committed more than $100,000 to local schools for new maps, globes, atlases, and other geography education materials—and an additional $250,000 has been promised during the next five years.

"We ask each club that wants to participate to donate $500 to $1,000 annually to a school for a minimum of five years," says Ralph Mead of the East Orlando Kiwanis Club, who chairs the Florida project. "The clubs hold events like barbecues, golf tournaments, and auctions to raise the funds."

Encouraged by this effort, Kiwanis in Alaska, Connecticut, Indiana, Michigan, Oklahoma, and Virginia have adopted similar programs. Three national publishers—Rand McNally, Nystrom, and Cram—have offered schools in the Florida Kiwanis project incentives when purchasing maps, globes, and atlases.

NATIONAL GEOGRAPHIC PHOTOGRAPHER JODI COBB

Declaring the value of education, President Bush unveils the Society-designed poster of the nation's goals, with some help from elementary school students Marcus LaRuex of Fort Wayne, Indiana, and Jennifer Abreo of Mobile, Alabama.

A mere 250 tons.

Only the rarest diamond survives the hazardous journey from the depths of the earth to the earth's surface.

About 250 tons of ore must be mined to produce a one-carat polished diamond of gem quality.

Anything this rare is also deemed of incomparable worth.

Which is one reason a diamond remains among the most costly of precious gems.

Yet isn't it worth it for the woman you love?

A diamond is forever.

FORUM

Yugoslavia

I was delighted to find an article dealing with Yugoslavia (August), an area I have studied for many years as an anthropologist. However, the comments about the conflict between the Serbs and Albanians represent a distorted view. The establishment of Serbian control over the Kosovo Autonomous Province has been the result of decades of Albanian oppression of the Serbian, Montenegrin, Turkish, and other minorities there. Moreover, the author fails to mention that during World War II almost a million Serbs were killed by the pro-Nazi Independent State of Croatia. In two World Wars the Serbs were the staunch allies of the West, while large numbers of Albanians and Croats supported the other side.

ANDREI SIMIĆ
University of Southern California
Los Angeles, California

We are saddened by your biased article about Yugoslavia. Throughout it your writer describes everything Croatian or Slovenian in appealing terms and everything Serbian in negatives. Even when describing the beautiful Adriatic coast, he devotes not a single line to the Montenegrin Riviera, considered the most gorgeous; for example, the medieval city of Budva and the island village of Sveti Stefan. He doesn't hint at the cultural wealth preserved in Serbian medieval monasteries, never mentions the famous Serbian spas or the exquisite Serbian handicrafts. He doesn't even mention the victimization of the Serbian people for 40 years by the Croatian Tito or the blatant discrimination practiced against them today.

JASMINA WELLINGHOFF
Serbian Unity Congress in the United States, San Antonio, Texas

The author interviews no one in the federal capital and offers few opportunities for Serbian dissidents, intellectuals, and opposition party leaders to provide a balance to the litany of Croatian, Albanian, and Slovenian complaints.

BRANKO TERZIC
Milwaukee, Wisconsin

Being born in Croatia and knowing the situation, I congratulate Kenneth C. Danforth on a realistic presentation. The cultures, religions, customs, attitudes of individual nations are so different that a peaceful and orderly union is almost impossible.

REVEREND STANISLAUS GOLIK
Omaha, Nebraska

Your article on my native Yugoslavia is very realistic. The conflict between the Serbs and Croats goes back to 1928, when leaders of the Croatian Peasant Party were assassinated in the parliament in Belgrade by a Montenegrin deputy. During World War II about one and a half million people, mostly civilians, were killed by the three warring factions: the Serbian royalist Chetniks, Tito's communist Partisans, and the pro-Nazi Croatian Ustaše movement, which was especially cruel. This only contributed to the existing animosities between various groups and might result in the breakup of the federation into small states, a phenomenon correctly described as "balkanization."

BRUNO CARMON
Beersheba, Israel

Americans fought a civil war over the issue of confederacy. How tolerant would the U. S. government be if your Hispanics wanted to have a separate state in Florida or in California with the purpose of seceding and joining Mexico or Cuba?

DAN MRKICH
Ottawa, Canada

Thirty-two pages and 24 photos and only one small photograph to represent Serbia's and Yugoslavia's vibrant capital. Belgrade (Beograd), which means "white city," deserves better. The splendid St. Sava church nearing completion on Vracar Hill, which will be the world's largest Serbian Orthodox church, was conspicuously absent.

JOHN SHATLAN
Pittsburgh, Pennsylvania

Philadelphia's African Americans

As an African American from Philadelphia, I was extremely proud to see pictures of my hometown (August). While your magazine has shown many cities, you've never before really shown a black perspective of a city.

CHERYL BUTLER-FOSTER
Philadelphia, Pennsylvania

Our first city story with a black perspective was "To Live in Harlem," in the February 1977 issue.

As a humanities scholar I appreciate what Roland Freeman has done: it is cultural anthropology and cultural history at its finest. I am recommending this article to my humanities faculty to use with their classes. This is important work. It is alive. It is life. Please give us more of Roland Freeman. Also my compliments to the layout person involved.

JA A. JAHANNES
Savannah State College, Georgia

Freeman's self-proclaimed "obligation to present the fullness of the experience" of African Americans was noble but far from fulfilled. These photos are no more representative of African Americans than an essay on Appalachian backwoods folk

music and religion would be of European Americans. The photos perpetuate three old stereotypes: That music, religion, and manual labor naturally play more dominant roles in shaping African American lives. For instance, recent surveys have found that religion is a driving force in the lives of equal proportions (about 30 percent) of both black and white Americans.

RUSSELL KING
Madison, Wisconsin

The religious diversity of African Americans is well-known. However, your picture showing African American Schwenkfelders boggles the mind. The Schwenkfelders are followers of the teachings of my ancestor, one Caspar Schwenckfeld, a 16th-century nobleman from Silesia, who was influenced by Jan Hus and Martin Luther. There were several migrations of these people to America in the 1730s to escape religious persecution. They settled in eastern Pennsylvania, where Schwenkfelder churches still exist. That African Americans would embrace a religion so foreign to their roots is truly amazing. Only in America.

JOSEPH B. HARTRANFT
Roanoke, Virginia

Missouri Botanical Garden

I grew up within walking distance of Shaw's Garden (August) in the late 1930s and '40s. It was my

childhood's mysterious and exciting jungle, my shadow-drenched adolescent retreat, my pathway to exotic worlds that have lured me ever since. Whether I've been at Chatsworth or Kew Gardens or in Tunisia or China, a part of Shaw's Garden has always been with me—an urge to see more.

CHARLES WETZEL
Madison, New Jersey

The article says that along with the rain forests "will vanish a quarter of all life-forms—including, perhaps, a plant that could provide a cure for cancer or help end world hunger." This statement appeals to the same misguided assumption that is causing rain forest destruction: the idea that human beings are more important than other life-forms and that the rest of life is here for no other reason than to serve our needs.

JANIE MATRISCIANO
Readfield, Maine

Voyager

Your article on Voyager's visit to Neptune (August) is one of the best I've read since becoming a member in 1957. Having recently spent several days at the Jet Propulsion Laboratory, I can attest to the wonders wrought by the sages in Pasadena.

PAUL W. KOCH
Daniel Webster College
Nashua, New Hampshire

Solar System Map

The map supplement with your two superb Voyager articles (August) is without a doubt the finest and most informative graphic portrayal of our solar system that I've encountered in my long experience as an astronomy writer, columnist, lecturer, and celestial cartographer. I hope it is available as a separate item for its great educational value.

GEORGE LOVI
Lakewood, New Jersey

Plastic-coated copies of the map are available from the Society at $4 each.

Northwest Passage

Thanks to photographer Richard Olsenius and writer John Bockstoce for bringing a distant land and people into my soul (August). Whether from Washington or Paris, we all share a responsibility to ensure that the traditions of Eskimos pulling together for a whale harvest will continue.

PATRICK MARX
Paris, France

With disgust I viewed the layout glorifying the Eskimo slaughter of the last remnants of the bowhead whale population. Someone without a background on the plight of the marine mammal population would get the idea that the slaughter was like our putting up a Christmas tree or lighting a menorah. The Eskimos have managed to get permission to harvest mammals they don't need with the excuse that their dying culture needs it.

ERIC EMREY
Gaithersburg, Maryland

Geographica

The note in your August issue on Jane Goodall mentions the "often inhumane treatment [of chimpanzees] in zoos and research laboratories." Thousands of humane research scientists and zoo directors in this country would appreciate documentation. We would be the first to condemn such treatment and to see that the guilty are punished. Otherwise, you are libeling people who help make more likely your continued existence as well as that of endangered species preserved in zoos. Animal research has played an indispensable part in the progress of modern medicine.

WALTER H. INGE
Atlanta, Georgia

In her new book, Through a Window *(Houghton Mifflin Company, 1990), Dr. Goodall cites her visits to both compassionate and "shockingly cruel" research facilities in the U. S. and abroad.*

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

Eruption of Kilauea volcano on Hawaii

"When you're working on a volcano, your equipment and wits can't fail you."

—Dr. Michael Garcia

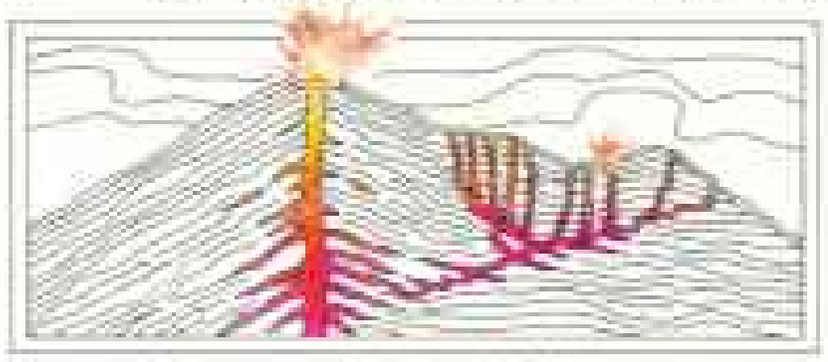
Earthquakes rock the black, rippled terrain. Fire fountains explode from the mountain's side. Iridescent orange lava, as hot as 2100° F, sweeps down the volcano's flanks in thin sheets and swift rivers. The air is filled with the roar of molten rock slamming against a crater wall. It rains pumice.

Dr. Michael Garcia

This is Kilauea, which ascends majestically from the floor of the Pacific and disgorges a continuous stream of lava that can fill a large stadium in less than a day. Professor Michael Garcia has devoted his career to exploring the mysteries of volcanoes, particularly Kilauea, one of the most active in the world.

"It's the premier place to study how volcanoes work," he said.

Dr. Garcia has been gathering data on Kilauea since 1978. When he is not in the lab conducting chemical analyses of lava, Garcia is in the field, measuring intervals between fire-fountain pulses and plucking samples from lava rivers. He believes that a keener understanding of the volcano and its internal structure can help scientists better anticipate eruptions.



Magma conduits inside Kilauea

Working in such a hostile environment, Garcia must rely on his experience, instinct and equipment. "You have to respect Kilauea's might—especially when you feel it rumbling beneath your feet," he said. Demanding the highest standards from his instruments, Dr. Garcia insists that they be rugged and reliable.

It's little wonder that he has chosen a Rolex Oyster Perpetual as his timepiece.

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"I'd like to THANK my MOTHER my FATHER and especially my FAIRY GODMOTHER."

KARLA THOMAS
Miss Bethune-Cookman College 1989/90

JUST WHEN KARLA THOMAS THOUGHT she'd miss out on a college education, along came the United Negro College Fund waving its magic checkbook.

"It was a godsend," says Karla. "And being voted college queen last year was another huge thrill."

Thanks to a much-needed $7,500 annual scholarship, a lot of hard work and late nights, she'll graduate this year with a degree in business administration.

"Grad school's next on my list. So many more doors are open to me now!" she says.

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For Karla, Toyota's involvement has meant more than just financial support.

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GEOGRAPHICA

NATIONAL GEOGRAPHIC MAGAZINE

Lake Baykal's Deep Vent: A Freshwater First

A joint Soviet-American scientific expedition cosponsored by the National Geographic Society has discovered a hot vent in Lake Baykal in the Soviet Union—the first time a freshwater spring has ever been found that supports such a diversity of deep-water life, including fish, sponges (right), worms, and snails.

The vent is about 1,390 feet down in Frolikha Bay in the northeastern corner of the world's deepest—5,370 feet—and perhaps oldest lake. Scientists estimate that the lake basin was formed about 25 million years ago. Kathleen Crane of Hunter College, the group's chief scientist, said the presence of hot springs can be a sign that the area beneath the lake is slowly spreading apart, creating a rift valley. Fewer than 20 hydrothermal vent fields have been found in the world's oceans since the first ones were discovered in the Pacific's Galápagos Rift (NATIONAL GEOGRAPHIC, October 1977).

Crane's team found the vent site by studying geothermal maps, which showed several areas of high heat flow in the lake floor. The maps of Lake Baykal were prepared by Vladimir Golubev, a Soviet geophysicist who was with the group aboard the research vessel *Vereshchagin*, operated by the team's cosponsor, the Limnological Institute at Baykal. The scientists lowered a sled containing a camera and a temperature and salinity sensor and located the spring after several passes.

As part of the expedition the team used towed sleds, manned submersibles, and remotely operated vehicles (top left) to explore and photograph animal life, such as this sculpin seen against the steep wall of the lake (top right) and crustaceans atop sponges (left). Baykal holds some 2,600 forms of life, more than half of them found nowhere else on earth.

ALL BY EMORY KRISTOF, NGS

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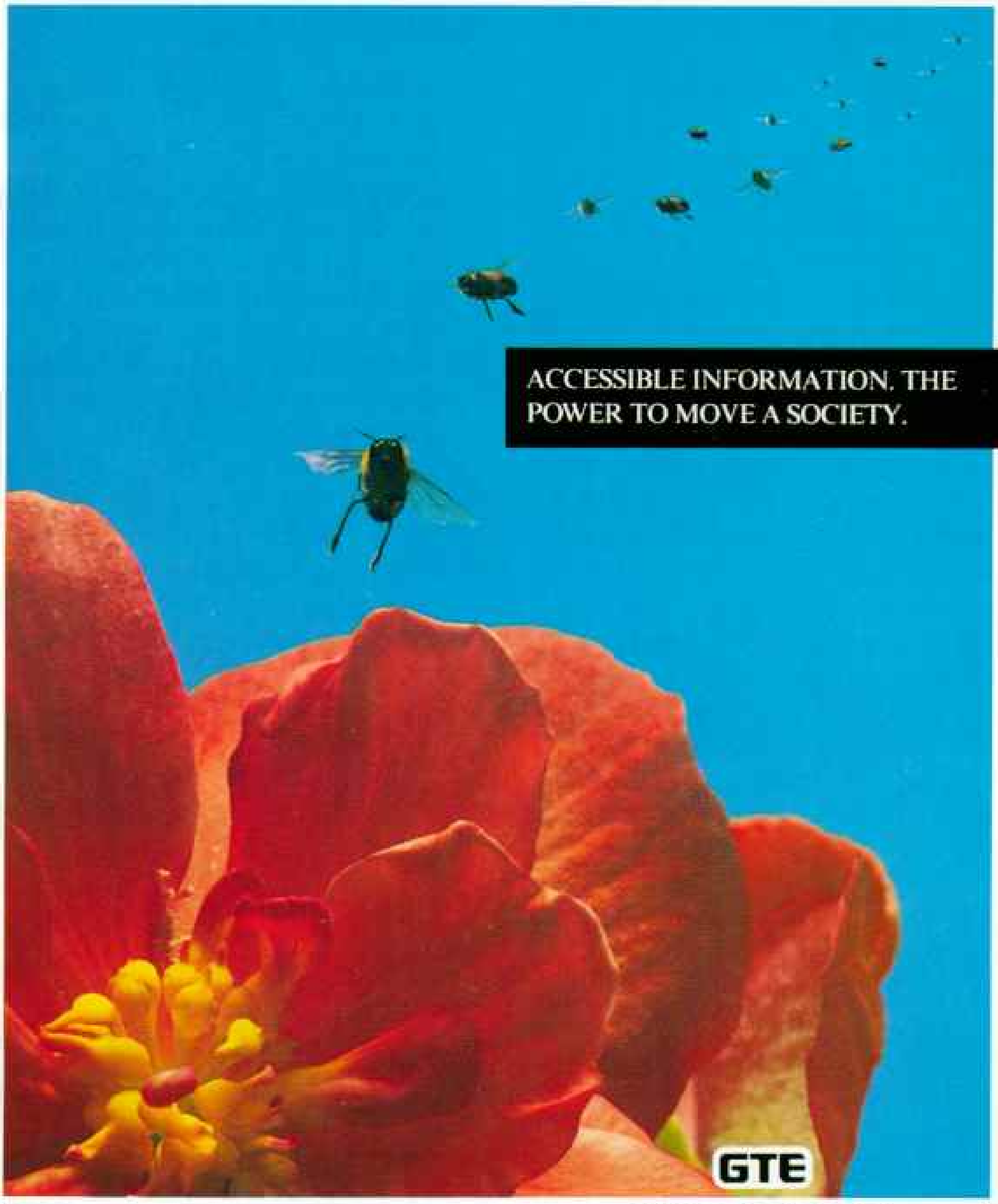

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The Accord

A Miniature City Down in the Basement

George E. Slye used to be into construction in a big way. He's still in construction but on a smaller scale—a much smaller scale.

Slye, a developer, sold his New England firm in 1983 and began creating models of U. S. and Canadian skyscrapers in his basement. He made only intermittent progress until he saw the February 1989 GEOGRAPHIC article on skyscrapers. "That was very inspirational," he says. Slye soon had more than a hundred miniatures of the best known buildings from 33 cities in North America. He now has six modelers around the U. S. working in balsa, basswood, and plastic at a scale of one inch to 200 feet. They turn out wonders like a nine-inch Sears Tower and a five-and-a-quarter-inch Chrysler Building—and a Golden Gate Bridge done in brass sheeting with the aid of a computer-directed laser.

When Slye learns of a new skyscraper about to be built, he writes to the owner, asking for architects' drawings, roof plans, anything that will help him duplicate it. The response is almost always positive: "They all want their building in my basement in Tuftonboro, New Hampshire," he says with amazement. Now he is working out a way to take his eight-foot-by-eight-foot show on the road.

In many cases the models are finished before the real buildings. "I have no EPA requirements, and I haven't had any labor problems yet," says the 59-year-old Slye.

DAWN E. HENRY, SABA

A Rabbit, a Star, an Ancient Supernova

"Prostrating myself before your majesty, I hereby report that a guest star has appeared," wrote Chinese royal astrologer Yang Wei-Te in A.D. 1054 of an exploding star that created the Crab Nebula. University of Texas researchers now have found evidence that the Mimbres people of southwestern New Mexico also saw the supernova.

The Crab Nebula, 6,500 light-years from earth in the constellation Taurus, is a glowing cluster of gaseous filaments and dust surrounding a pulsar, which is composed of superhot compressed star matter radiating enormous energy.

R. Robert Robbins, an astronomy professor, and Russell Westmoreland, a student, were searching through a catalogue of Mimbres pottery from the University of Minnesota when they found a shallow bowl (bottom left) depicting a rabbit that seemed to be shaking a starlike object off its foot. To the Mimbres people, the rabbit is the man in the moon. The star emits 23 rays—the number of days the Chinese said the supernova was visible during daylight hours. The rabbit and star are in about the same relative position as the moon and supernova at the time the explosion was first seen. Archaeologists have dated the bowl to the 11th century.

Many Indian groups in the Americas regularly watched the sky (GEOGRAPHIC, March 1990). "The Mimbres people were better astronomers than we thought," says Robbins. "Maybe all the Indians were better astronomers than we thought."

UNIVERSITY OF MINNESOTA MUSEUM

Fighting to Help Cranes in the Mekong Delta

Americans have returned to Vietnam's Mekong Delta to study a flock of eastern sarus cranes, one of only a few flocks known to exist in the wild.

Once widespread in Asia, the cranes have nearly disappeared because their wetlands habitat has largely been wiped out. In January 1986, during the dry season, a Vietnamese researcher spotted a flock of the birds feeding in an artificial water impoundment. The impoundment was created to aid production of a tree called melaleuca, which grows in water.

For three years a group of Americans and Vietnamese—sponsored by the International Crane Foundation, the National Wildlife Federation, the University of Wisconsin, and Earthwatch—has been studying the flock, which numbers as many as a thousand birds and is reproducing well. The group soon will present local authorities with a plan to help manage the area, part of which is already a local nature reserve.

TOM GRANT

The problem, says George Archibald, director of the Crane Foundation, is that some residents of the desperately poor region want to drain the impoundment and turn it into rice fields. "For those on the edge of survival, the environment is not an immediate concern," says Archibald. But, he adds, this is the only area where these cranes are known to feed: "If it's lost, they could be lost too."

ANNOUNCING THE WINNERS OF THE MAZDA PHOTO CONTEST '91.

After you meet up with a Mazda, it's amazing what can develop.

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(Wiesbaus, Austria)

Hajime Inoue
(Fukuoka, Japan)

Dan Crawford
(Alabama, USA)

Bruno Gelbweiler
(Bergenfeld, West Germany)

Heinrich G. Weltzien
(Bonn, West Germany)

Peter Wünsch
(Innsbruck, Austria)

Frankie Tun Tin
(Mandalay, Myanmar)

Bruce Lorner
(Colorado, USA)

Charles E. Richwood
(Bulawayo, Zimbabwe)

Second Prize Winners

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Rhonda Hall *(Victoria, Australia)*
James Douglas McKittrick *(Queensland, Australia)*
Michael Appelt *(Gramatneusiedl, Austria)*
Gertrude Dolezelhal *(Wien, Austria)*
Frank Johann *(Karlsruhe, Austria)*
Elfriede Rath *(Hengstberg, Austria)*
Helmut Resch *(Tulln, Austria)*
Juan Balao B. *(La Paz, Bolivia)*
Rain Ackerman *(Manitoba, Canada)*
Czeslaw Krys *(Vancouver, Canada)*
Yolanda Tampier B. *(Santiago, Chile)*
Annette Voigt Bastrup *(Frederiksberg, Denmark)*
Gurli Christoffersen *(Vesterod, Denmark)*
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In their haste to find solutions, some policymakers propose to ban plastics. The fact is, according to a recent study, plastics make up about 18% of the volume of solid waste in our landfills: paper and paperboard, about 38%; metals, 14%; glass, 2%; and other wastes, 28%.

If plastic packaging is banned, the need for packaging won't go away. The idea is to replace plastic with biodegradable materials. Studies show, however, that degradation is so slow in today's landfills so as to almost not exist.

that plastics can't be recycled.

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After Nazi Prison a "Full, Unselfish Life"

"Proudly she wears her prison badge, an honor won when the Nazis jailed her," said the legend under a photograph in a November 1945 GEOGRAPHIC article about the end of World War II in Norway.

The unnamed woman in the photograph was 22-year-old Eli Engen, a courier for the resistance in Nazi-occupied Norway, who had spent the last four months of the war in prison at

ANDY ELKIN

Grini. She later won a scholarship to an American college, married a Lutheran missionary, and set off on a new set of adventures before settling down in Shaker Heights, Ohio. Last year Eli Voss—shown with her granddaughter Jesse Griffiths (above) examining part of a diary she wrote in prison—retired after 23 years as a teacher.

Eli calls her release from the Nazi prison "a moment you don't forget in a million years," but she has had many dramatic moments. After her marriage she and her husband worked in China until 1948, just before the communists took over. "Highly pregnant," she stopped in Hong Kong to give birth to the first of three daughters. The Voss family lived in the U. S. for a while, then went to South Korea and "lived through a couple of revolutions." They returned to the U. S. for good in 1962. "Except for having teenage daughters, there was no major crisis after that."

Eli, whose husband died in 1983, has just made her fourth visit home to Norway and now teaches English to foreign students. A friend says she has had a "full, unselfish life."

Whale Migrations: Mother (Nature) Calls

Each winter, humpback whales gather in the waters off Hawaii to breed and calve. But when they leave for feeding grounds in cooler waters several thousand miles away, the humpbacks separate: Many go to Alaska (GEOGRAPHIC, January 1984), while others make for the central California coast.

Individual whales have been known to return to the same feeding grounds year after year. Why they do so has long been a puzzle. An important piece was added recently by C. Scott Baker, who has been studying population genetics of the "singing whales" with support from the National Geographic Society.

Baker and his colleagues used a small biopsy dart to collect DNA from 40 whales at two feeding grounds. They found that the whales in southeastern Alaska shared nearly identical mitochondrial DNA—the form passed on by the mother—and that it was different from the DNA of the whales off California.

This suggests that the whales always return to the feeding grounds of their mothers, in a pattern extending back many generations, Baker says. One advantage of this migratory strategy: A whale may be able to count on relatives to help capture prey. "Simply put," he says, "you would be more likely to help your kin than to help a total stranger."

MARK WEINRICH, CETACEAN RESEARCH UNIT

YALE BABYLONIAN COLLECTION

Some Tasty Recipes for a Babylonian Feast

A stew of kid spiced with garlic and onion and prepared using fat, soured milk, and blood probably won't be part of your Christmas dinner. But 3,750 years ago it may have been haute cuisine to inhabitants of Babylonia.

Recipes for this and more than two dozen other dishes—such as stews of pigeon, mutton, and spleen—are recorded on three clay tablets in the Yale Babylonian Collection in New Haven, Connecticut. Dating from about the time of Hammurapi and fully deciphered only in the past decade, the tablets are believed to be the world's oldest cookbooks. They originated in what is now Iraq. The largest of the tablets measures 6.5 by 9 inches. All are somewhat damaged.

They contain a "very elegant handwriting without visible errors, in all respects answering to the highest standards of cuneiform writing," says William W. Hallo, curator of the Yale collection. Although the collection's catalog has listed the tablets since 1933, there is no record of where or when they were discovered.

Neither Professor Hallo nor Jean Bottéro, a French scholar who is publishing a full translation of the wedge-shaped script, knows exactly why the tablets were inscribed or for whom. Most ancient Babylonians ate subsistence foods, but these assorted recipes, which call for a variety of rich ingredients, almost certainly were prepared for the elite, perhaps royalty.

Suggestions for GEOGRAPHICA may be submitted to Boris Weintraub, National Geographic Magazine, Box 37357, Washington, D. C. 20036, and should include the sender's address and telephone number.

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NATIONAL GEOGRAPHIC MAGAZINE

FROM THE EDITOR

Okavango: Africa's Wild Treasure

LIKE MOST of Africa's larger wild animals, the hippopotamus on the cover faces a future ranging from uncertain to nonexistent. The hippo lives in seasonal wetlands of the Okavango Delta, a vast expanse roughly the size of Massachusetts in the southern African nation of Botswana. The Okavango represents one of the last great wilderness sanctuaries for African wildlife, including what may be the largest remaining herd of free-ranging elephants—perhaps 67,000 animals.

Botswana faces the classic African dilemma: how to preserve its priceless natural heritage in direct competition with a rapidly growing and demanding population. Botswana is fortunate in the incredibly rich diamond deposits that give the country a higher per capita income than that of most African nations. The income allows Botswana a wider range of options in the management of wildlife versus human pressures, which continue to grow.

Photographer Frans Lanting and staff writer Doug Lee offer a unique view of the majesty and fragility of this vast wilderness in a striking photo essay that leads the issue, "A Gathering of Waters and Wildlife," and the article "Okavango Delta: Old Africa's Last Refuge," beginning on page 38. Writer Arthur Zich and photographer Peter Essick follow with a detailed portrait of the nation and people in "Botswana, the Adopted Land."

Like many Africans the Batswana, as inhabitants of Botswana are known, resent outsiders telling them how to preserve their wildlife. Yet the Batswana depend on those same outsiders for income from tourism based on the animals. Obviously there is need for understanding on both sides.

The great American naturalist William Beebe once compared wild animals to masterpieces of art and musical composition. The latter, Beebe wrote, could always be re-created if lost, "but when the last individual of a race of living things breathes no more, another heaven and another earth must pass before such a one can be again."

One can only hope the wild heaven that is the Okavango will not pass from our world.

William Graves

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KEY TO 1990

NATIONAL GEOGRAPHIC MAGAZINE

JANUARY

FEBRUARY

MARCH

APRIL

MAY

JUNE

Monitoring changes around the world, the GEOGRAPHIC looked into Alaska's big oil spill, watched the Berlin Wall topple, and reported on America's diminishing old-growth forests. Use this listing to find other stories of interest.

Detailed indexes of the year's articles are available free upon request. The January-June index (Vol. 177) is available now; July-December (Vol. 178) will be ready in January. The *National Geographic Index 1888-1988* is available for $24.95; a deluxe edition, with slipcase and separate map index, for $34.95. A full 1989-90 supplement will be available in January: $1.00, free with *Index*.

JULY

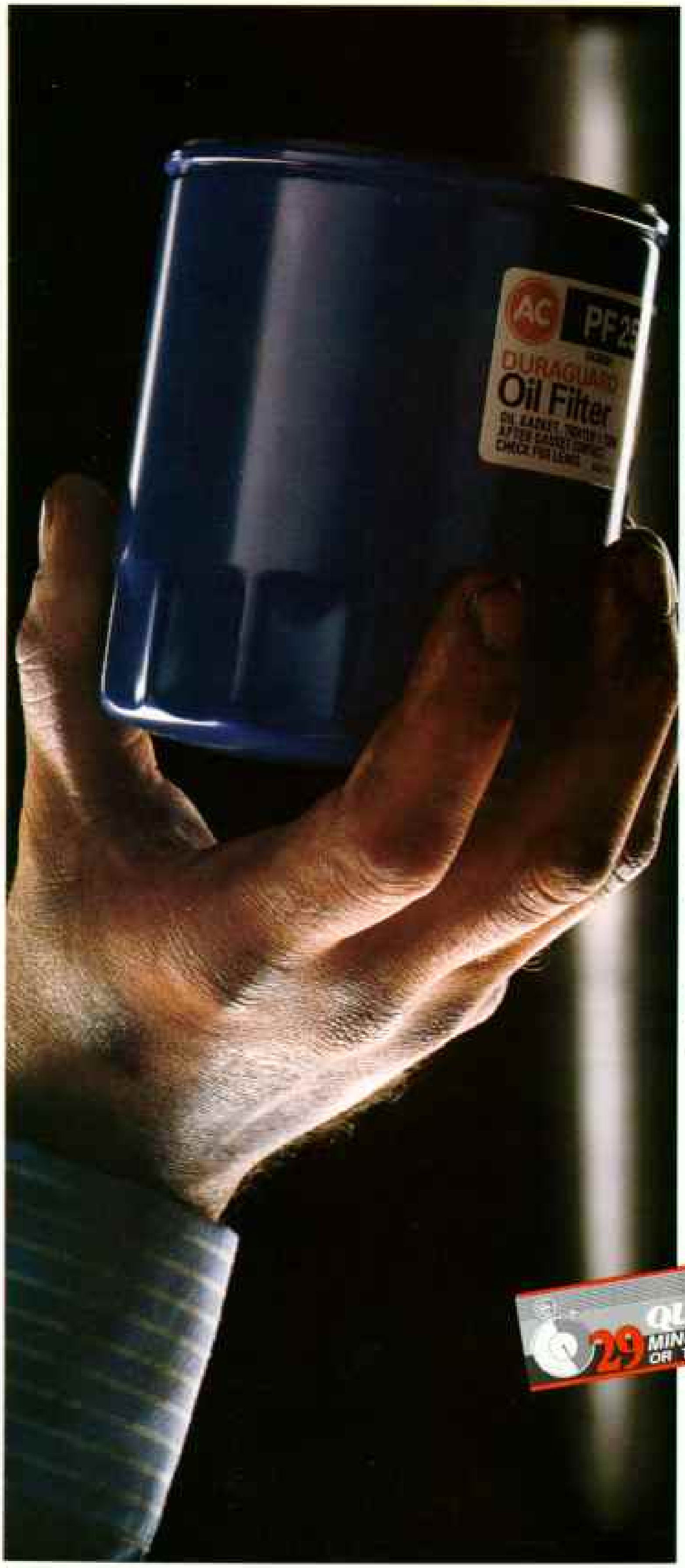
AUGUST

SEPTEMBER

OCTOBER

NOVEMBER

DECEMBER



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Earth Almanac

NATIONAL GEOGRAPHIC MAGAZINE DECEMBER 1990

BOB AND VALERIE TAYLOR

Sharks: Predators That Need Our Protection

They cause more nightmares than any other denizen of the sea, although they benefit humans in many ways. But at the rate we destroy sharks, says the National Marine Fisheries Service, several species may soon be little more than gliding memories in eastern U. S. waters.

East Coast commercial and sport fishermen, who kill sharks to the tune of more than 22,000 metric tons a year, are threatening the viability of species like mako, sandbar, and blacktip. Fin fishermen slice off only the fins, for sale as an Oriental delicacy. When nets set for other fish sweep up sharks, like this blue, fishermen sometimes bludgeon the creatures and toss them away.

What a loss, says NMFS fishery administrator Paul Leach. "The meat of most is good, the hide makes great leather, the liver provides vitamin A, and the cartilage contains oil used in pharmaceuticals. Sharks almost never get cancer, which makes them valuable for research."

New rules limiting the annual East Coast catch and requiring fishermen to utilize more of their take "should allow these shark populations to rebuild in a few years," says Leach.

Earth Army Echoes the Fabled CCC

A new earth army, modeled after the Civilian Conservation Corps of the 1930s, will enlist recruits early next year to replant damaged forests and rebuild city blocks. The CCC was a federal program that helped tackle unemployment during the Great Depression by offering "simple work" in forestry, flood control, and construction. It employed an average of 300,000 young people a year.

In contrast, the new Earth Conservation Corps will operate as a nonprofit corporation, funded by grants from foundations, industry, and individuals. Founders hope eventually to recruit 4,000 young people each year, for up to two years of national service, drawing largely on the ranks of inner-city unemployed.

Following a period of training, recruits will step out salaried, uniformed, and with a sense of purpose. The work will be hard: fighting forest fires, framing houses, protecting wetlands, clearing land for neighborhood gardens, or cleaning up oil spills. The first class of recruits will head for South Carolina to help replant some 1.3 million acres of forests destroyed by Hurricane Hugo.

"Our goal," says corps president Bonnie Guiton, "is to preserve two of our greatest resources—the environment and our youth. Both are at risk."

The Blast Not Heard Around the World

In one of North America's biggest pyrotechnic shows, a mushroom cloud of ash some 30,000 feet high erupted from Alaska's Redoubt volcano on April 21. For months the 10,197-foot cone had belched ash, steam, and other gases. The activity was visible from Kenai, 50 miles to the east, and occasionally from Anchorage, 115 miles to the northeast. Yet the rest of the world largely ignored the spectacle, possibly because of its remote location and because it caused no casualties.

However, one plume nearly brought down a KLM Royal Dutch Airlines jet with 248 people on board. Ash stalled all four engines, and the plane fell 13,000 feet before the crew restored power and landed at Anchorage.

Heat from another eruption melted snow, flooding an oil terminal nearby on Cook Inlet; repairs cost 18 million dollars. Oil wells had to cease pumping for months to prevent spills.

PETER D. FLANAGAN

Wildlife seemed little affected. In the aftermath, new snow showed tracks of a bear that had climbed to the rim of the cone for a look.

The numbers outside.

TED SPIEGEL, BLACK STAR

Children Pay for Corrupted Environment

Children suffer more from degraded environments than adults. The toll is especially high in the developing countries, according to a report issued jointly by the United Nations Environment Programme and the United Nations Children's Fund.

An estimated 14 million children under five die each year as a result of poor sanitation, tainted drinking-water supplies, malnutrition, common diseases, and environmental pollution. An additional three million children are seriously disabled.

Diarrhea and acute respiratory infection, some of which is attributable to air pollution, each account for about four million deaths. Children inhale more air per unit of body weight than adults, maximizing the effect of pollutants. In 1985 highly industrialized Cubatão, Brazil, saw infant mortality run a suspicious ten percent above the rest of São Paulo state.

Deaths from common diseases may begin with inadequate diet brought about by degraded land. Children, whose nutritional needs exceed those of adults, weaken more from the decreased food production. In addition, radiation, mercury, and pesticides may cause birth defects.

"Admittedly, the figures are imprecise because many developing countries don't keep good data," said Gareth Jones, a UNICEF statistician. "Activities to reduce child mortality and other efforts to improve the well-being of children will ultimately have a positive effect. What's good for children is good for the environment."

Prairie Transplant: A Miraculous Move

When gravel mining threatened to gobble a patch of rare virgin prairie near Barrington Hills, Illinois, a friendly scalping shifted it to a bald spot six miles away. The weather cooperated, said Steve Packard of the Nature Conservancy, who organized the first ever prairie ecosystem transplant. "It stayed cool, and rain fell. The patient seems to be doing quite well, getting back some of its color."

In recovery are 2.4 acres of "dry gravel prairie," formed over some 10,000 years. At the end of the last Ice Age, rocky debris washed from melting glaciers and created rounded hills called kames. A unique combination of plants and animals found a home.

Last summer the gravel company that planned to mine the property permitted the Conservancy to skim off the prairie sod. First truck-mounted tree spades bit out eight earth plugs five feet deep. Other machines shaved off 16 inches of topsoil. Some 400 volunteers then rerooted plants like grooved flax, short green milkweed, and cylindric blazing star. Rodents, reptiles, and insects, even butterflies, were transported to the new site. "In five years or so," says Packard, "we'll know what survived."

KEVIN D. MOONEY

S. WAYLON ROBERTS

Still Champ After Half a Century

How big is the single biggest living thing on earth? If an average-size man stood next to the General Sherman sequoia tree in California, the trunk area below his belt would outweigh a Boeing 737. The tree's total weight: an estimated 6,167 tons.

In an era when records are broken daily, this heavyweight champ has held its title since 1940. That's when the American Forestry Association, a nonprofit booster of trees and forests, began its National Register of Big Trees. Some 750 arboreal champions, each one the largest of its species, are now listed.

Tiniest of the titans is a shrub-size Virginia Stewartia found in the town of Chesapeake. A giant of its kind, it stands but 15 feet tall, with a trunk 10 inches around.

The computer inside.

Since buying a computer today is such a numbers game, here's a simple rule of thumb. Look for 386™SX, 386™ or 486™ on the outside to be certain that you have Intel technology on the inside. From the company that invented the microprocessor. The company that has shipped over 10 million 32-bit processors. The same company that's investing over $1 billion this year to make sure the computer inside your computer has the technology, power and compatibility to take you into the future.

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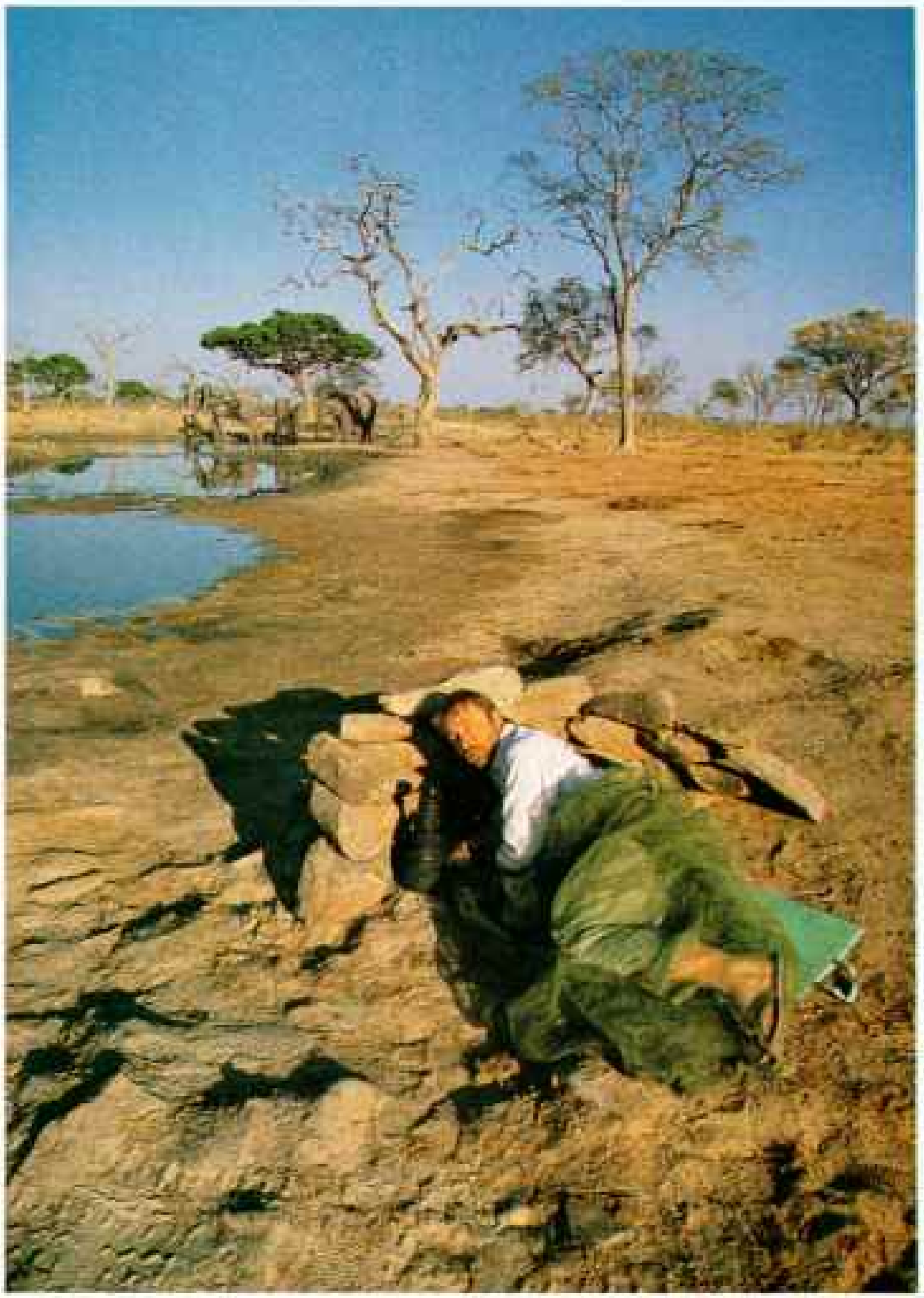
On Assignment

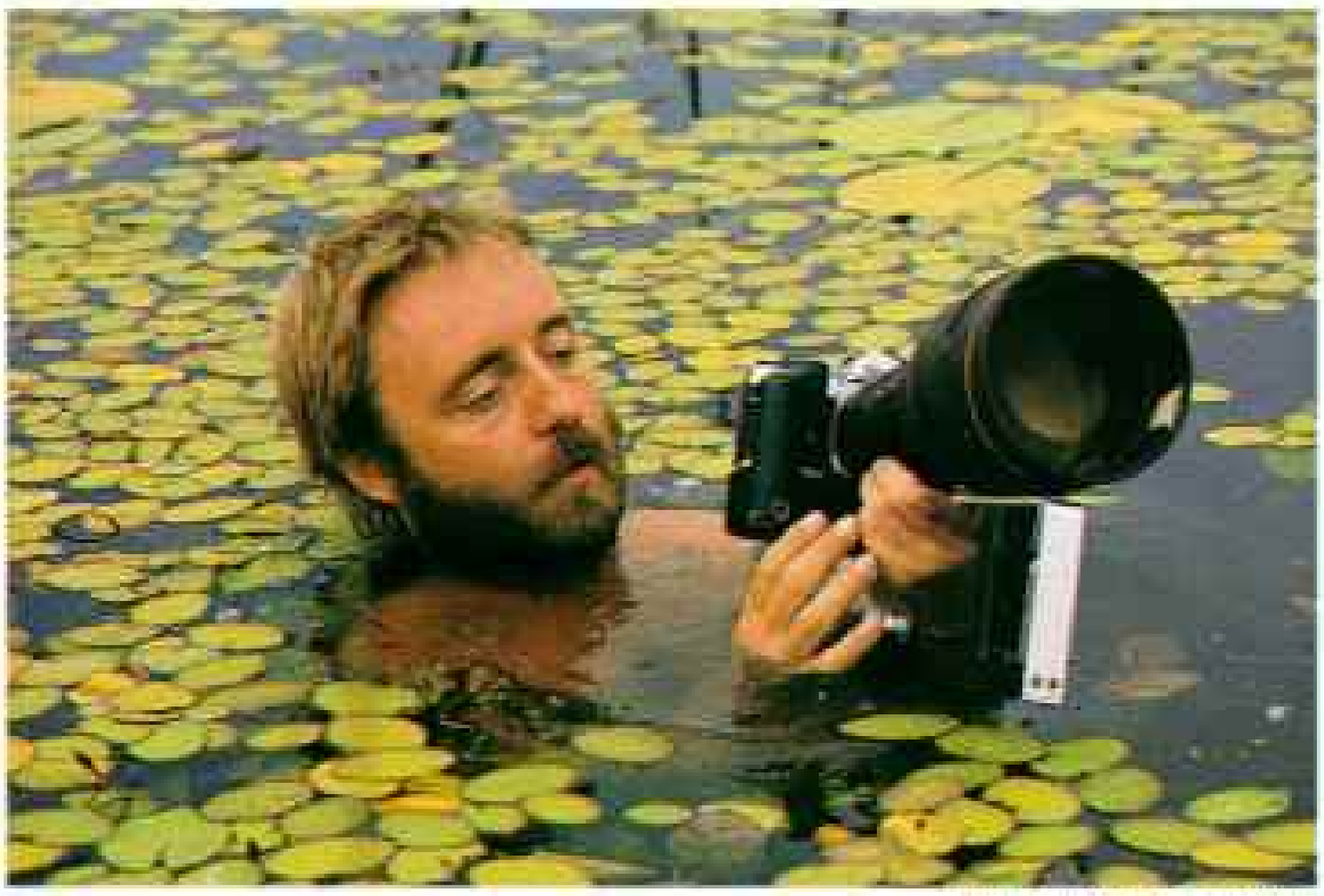
A TELEPHOTO LENS doesn't bring subjects close enough to suit free-lance wildlife photographer FRANS LANTING. "Making myself vulnerable lets things happen visually," explains Frans who—submerged or stretched out in the dirt—captured strikingly intimate images in Botswana for this issue. "I can judge risks based on my knowledge of animal behavior, but there is always an element of unpredictability. I've made lots of mistakes, but so far I've survived them all."

Neck-deep among the lily pads in an Okavango swamp (below), Frans was watching for fish eagles (pages 14-15). "I'd gone to the same spot two days in a row," he recalls. "When I returned on the third day, right next to where I had worked for hours was a ten-foot crocodile lying on the bank. I realized that this was his territory, and I had been damned lucky."

Leaving his Land Rover for a makeshift blind of rocks and camouflage netting, Frans waited for big game at a water hole (right). When elephants began to drink only ten feet away, their stomach rumblings made the ground vibrate beneath him. From that perspective the pachyderms took on truly gigantic proportions.

"Elephants are strong enough to trample you, but at least they give notice. Once they start swaying on that front foot and spitting water or dust at you, it's time to make a quick retreat."





BOTH COURTESY FRANS LANTING

After a decade with wildlife around the world, the California-based native of the Netherlands has learned it's often the smallest creatures that give the most trouble. Ten days after finishing an assignment on lemurs in tropical Madagascar for the August 1988 GEOGRAPHIC, Frans was shivering on a sailboat off the island of South Georgia (March 1989).

"On the first camping trip ashore I became very ill—with malaria," he says. "Who thinks of taking malaria pills to Antarctica? I just had to keep going."

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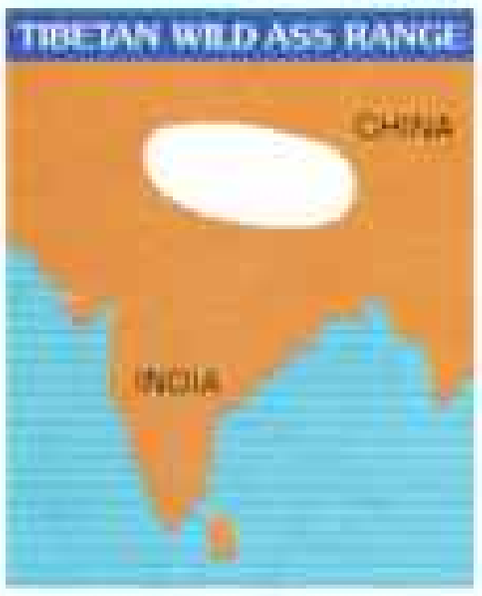
WILDLIFE AS CANON SEES IT



Tibetan Wild Ass
Genus: *Equus*
Species: *hemionus*
Subspecies: *kiang*
Adult size: Shoulder height, 1.4m
Adult weight: Approximately 300kg
Habitat: High altitude desert on the Tibetan plateau and Ladakh, India
Surviving number: Unknown
Photographed by Rajesh Bedi

The Tibetan wild ass, also called kiang, inhabits an arid and desolate environment. Although vegetation is sparse and the weather is extreme, the kiang survives in these barren upland plains. Vast herds of wild asses, yaks and antelope once existed on the Tibetan Plateau. But even in this remote region, their numbers have diminished from human disturbance in recent decades. To save endangered species, it is essential to protect their habitats and understand the vital role of each species within the earth's ecosystems. Photography, both as a scientific research tool and as a means of communication, can help promote a greater awareness and understanding of the Tibetan wild ass and our entire wildlife heritage.