DOUBLE MAP SUPPLEMENT: THE MANY FACES OF AFRICA (page 737)

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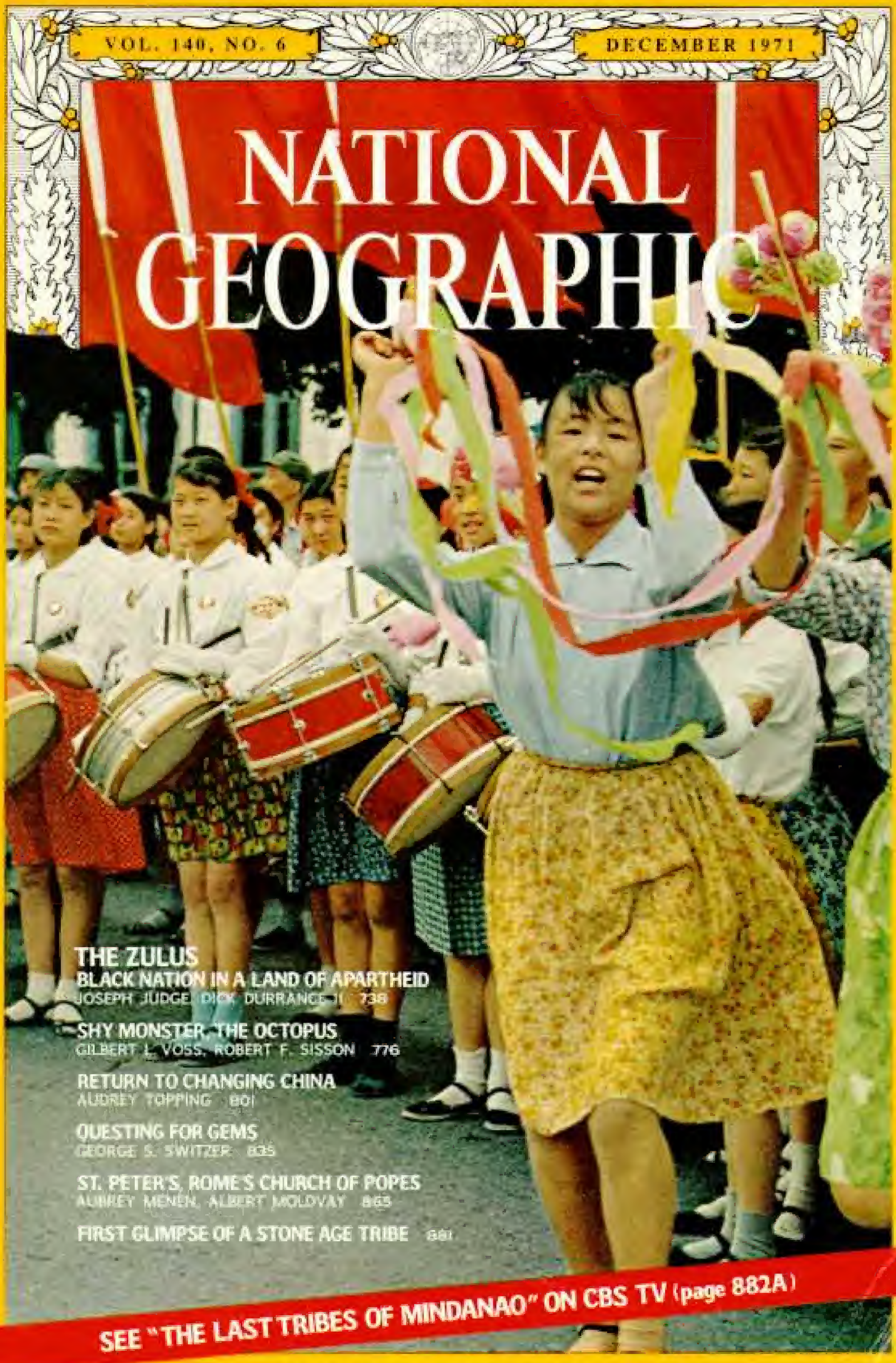
NATIONAL GEOGRAPHIC



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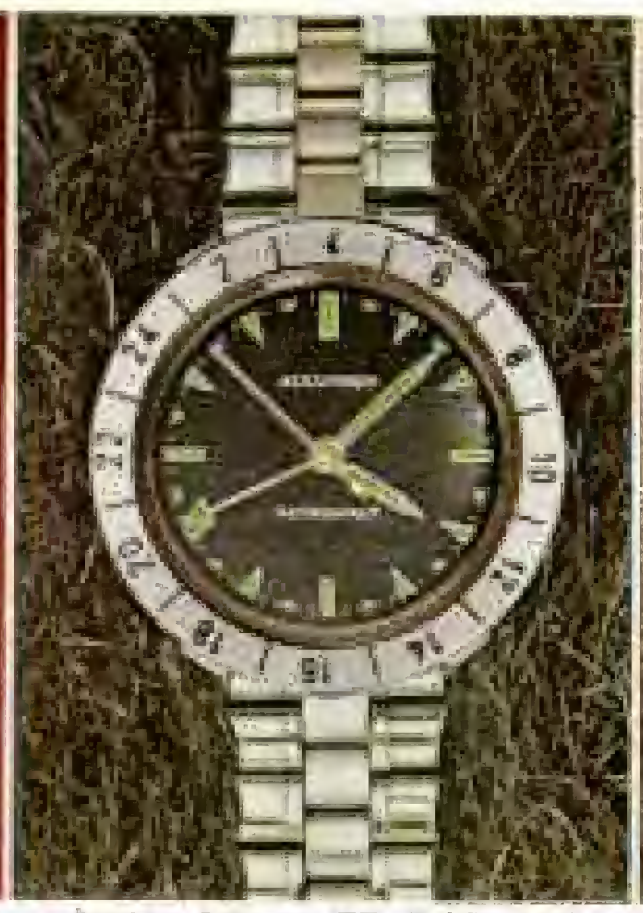

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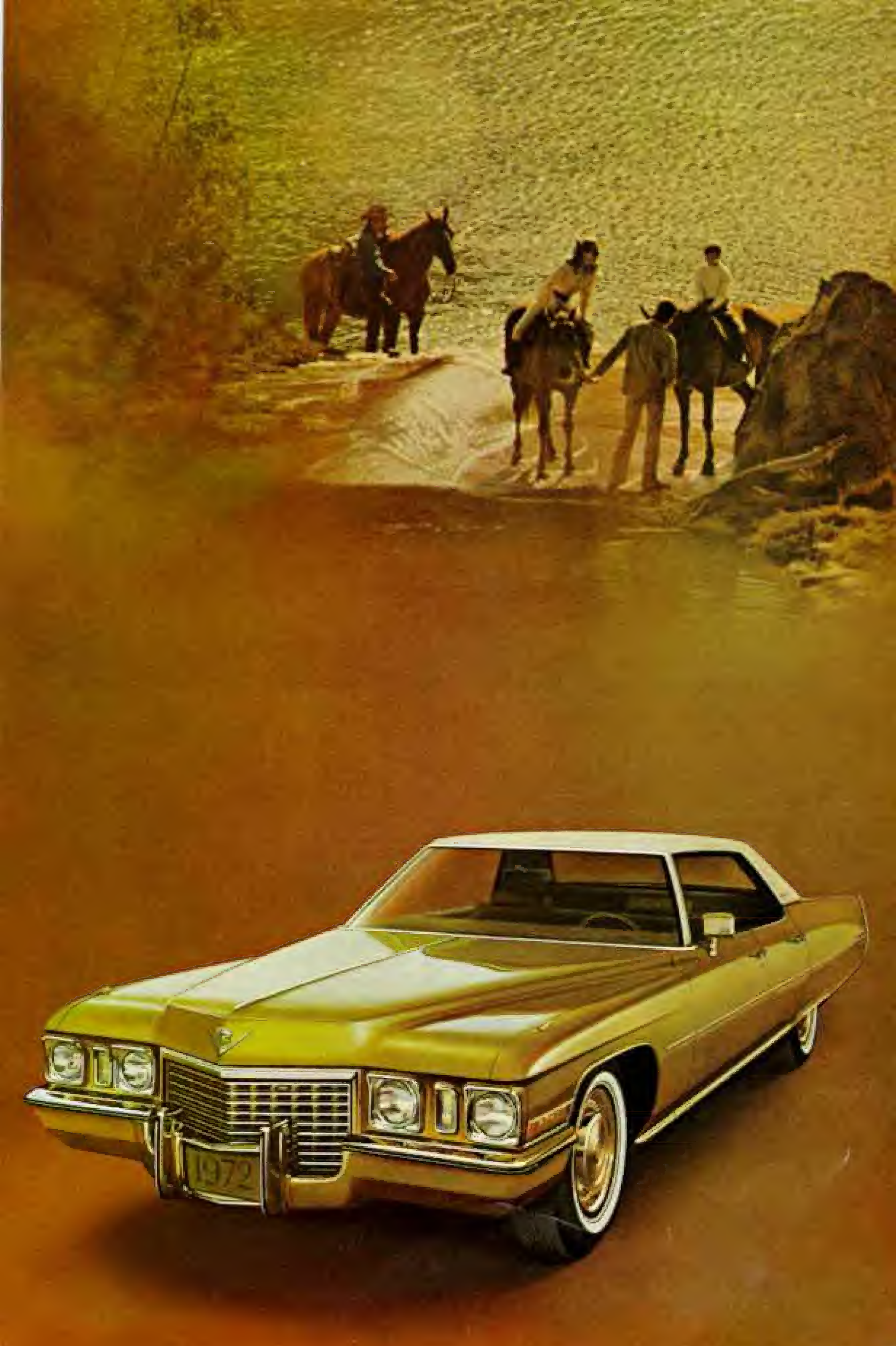
Shown is the 1972 Sedan deVille.


1972

The Clunker

Fully-equipped with polluting exhaust, gripless brakes, treadless tires, faulty lights. Price? Maybe your life.

The clunker comes in all makes and all colors. Some are oil-burners, engine-knockers, or wrecks, like the one above. These are easiest to spot. And avoid.

But they are not the most dangerous clunkers. The most dangerous ones look quite normal. When you find out about the faulty brakes, or lights or tires... it's usually too late.

If you're lucky, you live to tell about it.

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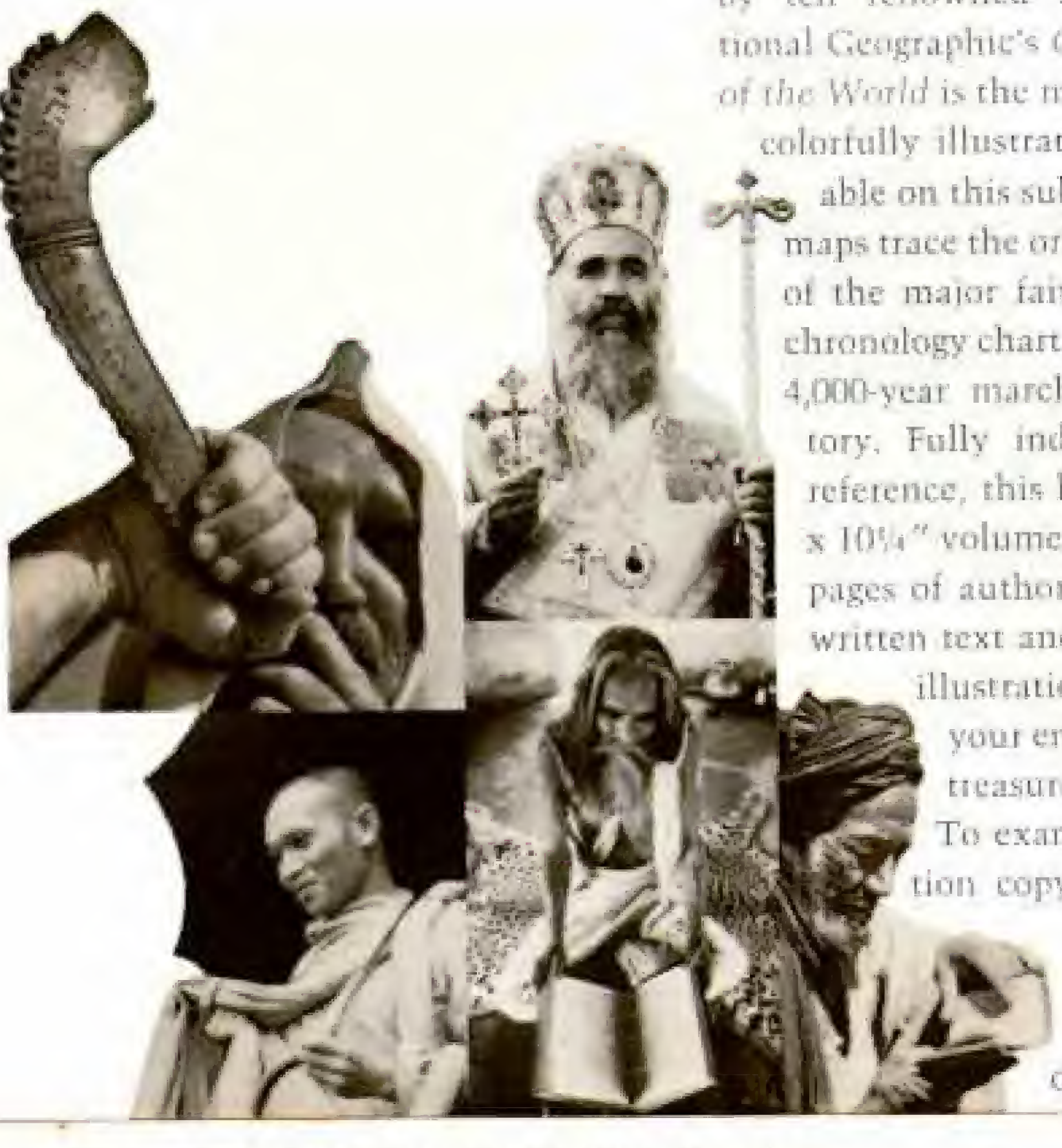

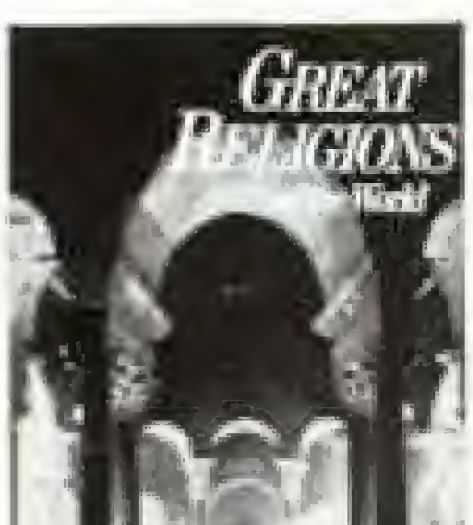

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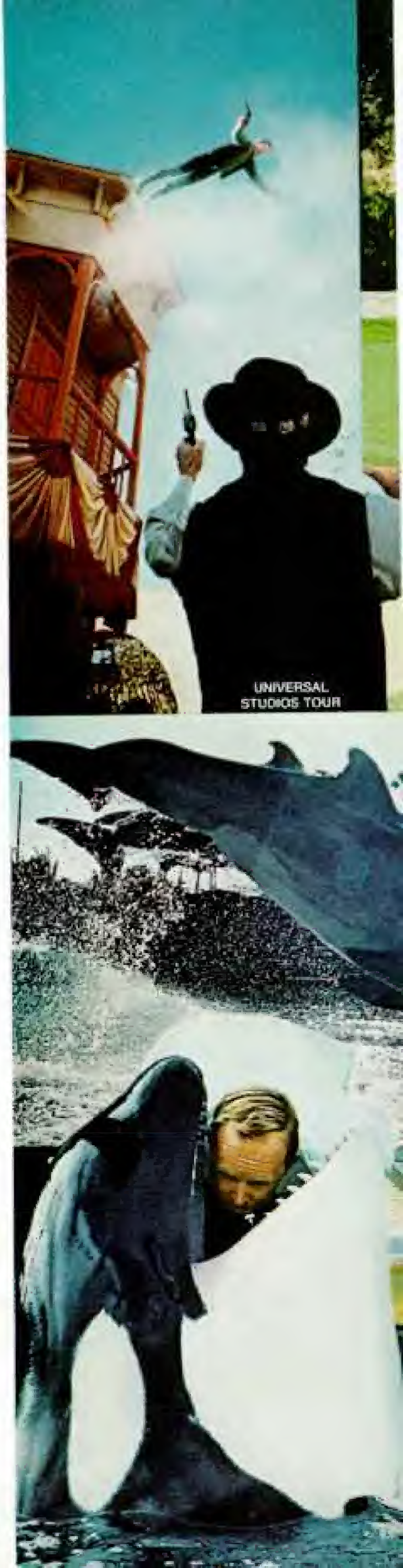

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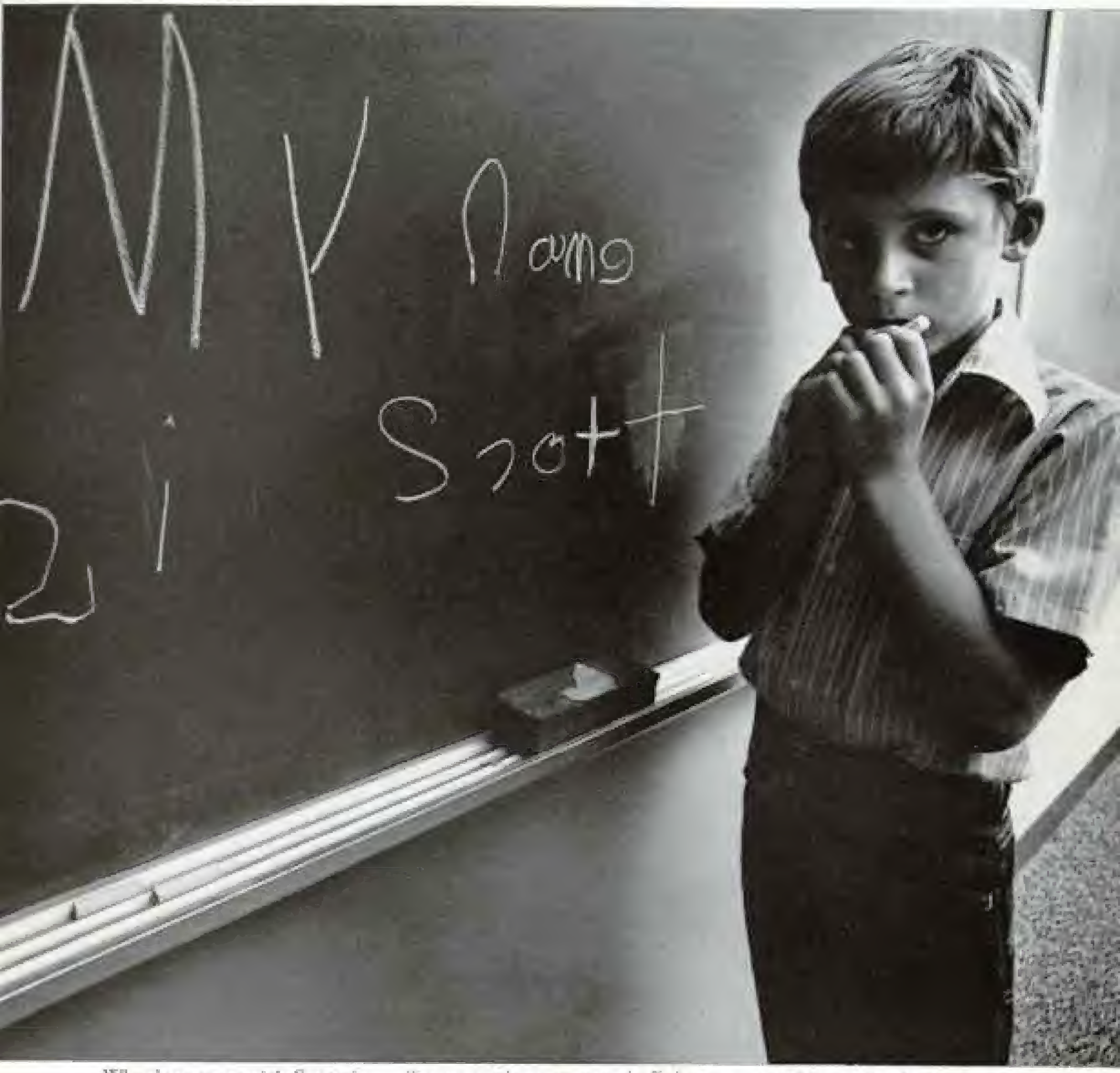
Scott isn't stupid. But it took a smart teacher to recognize it.



What's wrong with Scott is what's wrong with at least one kid in almost every classroom.

Scott has a learning disability. A perceptual problem.

When he writes, the letters are mostly illegible shapes. When he does his arithmetic, the answers are usually incorrect.

If you wanted to guess how many kids have ever had a problem similar to Scott's, you could start by counting many of the kids who've dropped out of school.

The sad part is:

You can correct the problem if you spot it soon enough. Before a child has failed and been frustrated and lost his self-confidence.

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We produced a film called "Looking at Children," and a companion booklet.

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NATIONAL GEOGRAPHIC

December 1971

Portrait of a continent, its people and its past

AFRICA has always had a special hold upon the passions and imagination of man. The mystique surrounding its people and their customs, the magnificent spectacle of its wildlife, the depths of its poverty, the beauty of its landscapes, and now the fragile politics of its newborn nations—almost everything to be seen from Cairo to Cape Town is deeply felt.

Perhaps that is one reason why so many of us have viewed the continent through a haze of romanticism. The land itself long seemed aloof and forbidding, the ultimate challenge to explorers. When they did break in, to conquer the rapids, survive the fevers, find the trails, they often met bitter resentment.

The white man's presence for too long meant subjugation and the shackle of the slave trader. Uncounted numbers of Africans were carried away in chains; some ten million reached the New World. A handful of European powers divided the huge continent among themselves.

Only four African countries were independent in 1950. Today 42 chart their own courses. Scientists and scholars have come to a new appreciation of the achievements of black societies. African sculpture, "discovered" by European artists half a century ago, has had a profound impact upon Western art.

Inspired by the response to the Society's ethnic map *The Peoples of Mainland Southeast Asia* (March 1971), Geographic cartographers have portrayed the "dark continent" in another double supplement—one side illustrating the present-day inhabitants, the other Africa's fascinating history. Scholars tell us that many Afro-Americans are descended from the Ibo, Malinke, Yoruba, and Hausa of West Africa. Where do they live today? The map locates the homelands of more than 500 ethnic groups. Artist Sherry Wolf has painted representative individuals.

The map shows how colonial and national boundaries sundered many groups. The Malinke are divided among Senegal, Guinea, and Mali. The pastoral Masai live in both Tanzania and Kenya.

And what of the ancestors of today's Africans—and of man himself? National Geographic's staff archeologist, George E. Stuart, spent months researching the map's historical side. Notes trace modern man's story on the continent from his probable origin there, perhaps as long ago as 100,000 years.

There has been a growing, and until now unmet, need for a map of this kind. It illustrates the rich heritage of 23 million Americans—a heritage that belongs, finally, to all mankind.—THE EDITOR

The Zulus: Black Nation

By JOSEPH JUDGE

"THOU WHO ART GREAT as the mountains! Cleaver of the heads of enemies! Thou whose wounds emit gunsmoke! Thou of the elephant! Thou who art black! *Bayete!*—All hail!"

I waited at the entrance to the royal kraal while my Zulu friend and interpreter, Tayson, bowing low with folded hands, yelled out an *isibongo*, a song in praise of the Zulu kings—the acceptable way of ringing the royal doorbell.

The kraal, a compound of huts attending a blue cinder-block house, commands an open height in the mountains near Nongoma, in northern Zululand, a part of the Republic of South Africa (map, page 751). Behind us, the dirt road we had climbed plunged toward a valley in which grazing cattle seemed no larger than pebbles. It was one of many such roads I followed as I crisscrossed the 10,000 square miles of Zululand's corrugated surface.

An elderly *induna*, or chief's adviser, emerged from a hut, rendered the palms-together salute of respect, and inquired as to our business. After a moment he led us into the simple but spotless living room of the house of Prince Israel Mcwayizeni, son of Solomon, son of Dinuzulu, acting paramount chief of the Zulu nation.

Tayson respectfully entered on hands and knees as the prince, a rather shy, rather plump man in a brown suit, welcomed me.

While courtesy and respect are customary virtues of the Zulus, they reserve a special exalted manner of speech—we would think of it as flowery—for occasions such as a conversation

Brilliant field commander, King Shaka forged an empire from tribes and clans his Zulu regiments engulfed in their early-19th-century sweep across southeast Africa. In the grip of apartheid, today's 5,900,000 Zulus cling to the pride that powered Shaka's legions.

in a Land of Apartheid

Photographs by DICK DURRANCE II

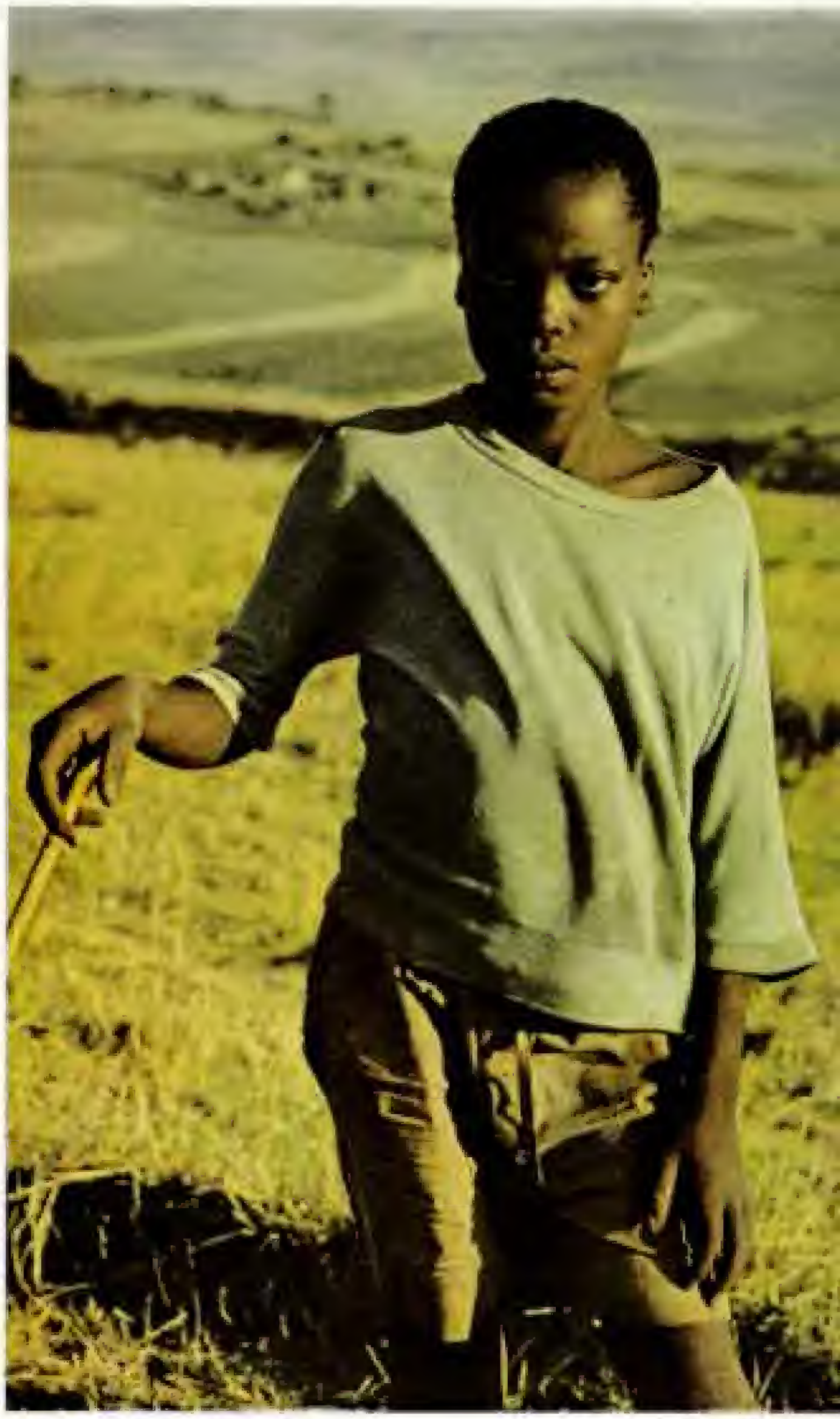
BOTH NATIONAL GEOGRAPHIC STAFF

with the paramount chief. When it came my turn to speak, I tried my best to uphold the tradition.

"I have come to Zululand," I said, "as a man who would discover a new valley, so that others who are far away might also know of it. In these new times, when my countrymen are curious to know of African peoples, I hope to relate to them the rich history and the proud heritage of the famous Zulus. I will tell them of Shaka, Dingane, Mpande, Cetshwayo, and Dinuzulu—the warrior kings of Africa, whose spears and regiments changed the face of this continent and shook the power of Britain when Britain shook all the world. I hope to tell them also about the Zulu of today, a man living in two worlds, one of his making and one not. I ask you to open the kraals of your people."

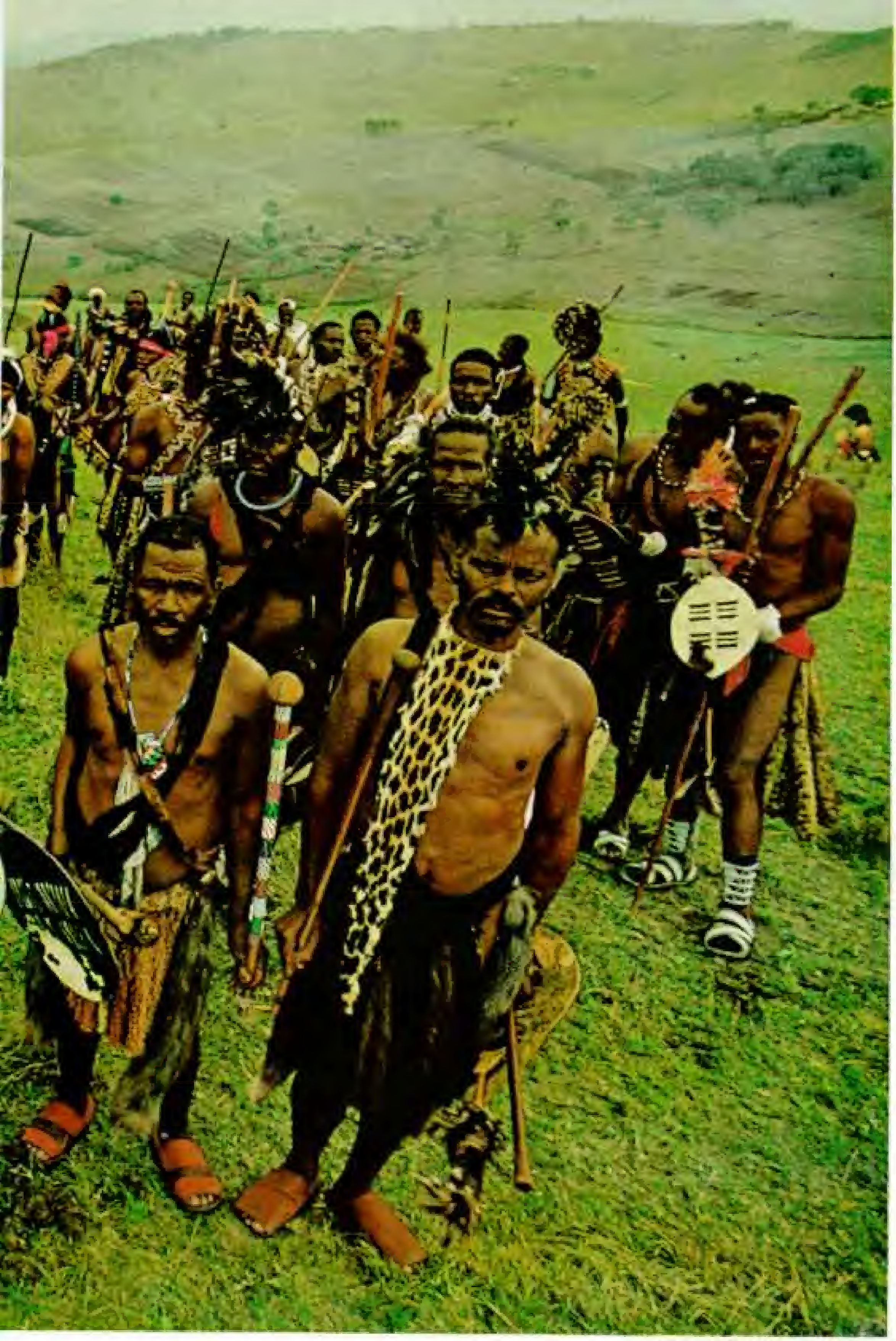
"You have the welcome of the people," Prince Israel replied. "We Zulus indeed remember our past, but now the spears are broken, the regiments live only in the memory of the old, while the young leave the kraals to find work in the cities of white men. There the old ways die. Still, the Zulu nation endures, bound to its chiefs, bound by its pride. We hope you will find the right road, backward and forward. The truth is a difficult thing."

IT IS A PLEASANT WALK into the countryside that falls and swells toward the valley of the Black Umfolozi River. Herd boys sit like small



Labeled by his color: Segregation clouds this Zulu youth's future as he approaches manhood in South Africa. Traditional customs survive among the half million Zulus in Zululand, but others adopt new ways as they move to fill jobs in the labor-hungry nation.

Knobkerries and shields knife memories of glory for the Buthelezi clan. Here members assemble in traditional garb—except for women's sneakers—behind their modishly dressed clan head, Mangosuthu Gatsha



Buthelezi. As chief executive of the Zulu Territorial Authority, he leads the way toward a day when the Zulus—one in four among South Africa's blacks—can have a separate state and regulate their own internal affairs.

tree stumps in the thin shade of thorn trees, watching panting cattle wander in fenceless stony pastures. There, away from the road, you sense what Zululand must have been before the generals and the politicians of an earlier time divided it into white farms and native reserves.

A thousand years ago ancestors of the Zulus wandered into the coastal strip between the Drakensberg range and the Indian Ocean. Those immigrants had come a long way from Central Africa, drifting at the pace of their cattle, as sons and grandsons pushed on to new pastures.*

When they spread across the inland plateau of what is now the Transvaal and stood on the high escarpment of the Drakensberg, they looked down upon a place that might have served as an illustration for Eden. Wide valleys, framed by blue buttes, stretched toward the distant sea. In every direction the earth was crumpled into green hills; they were soon covered with kraals, like patches of colossal mushrooms. Here the Zulu nation arose.

Today that nation is dispersed throughout South Africa; of the 3,900,000 Zulus, only 500,000 are left in their homeland, great portions of which are occupied by the sprawling farms of 13,000 white men.

MAZIBE'S SUBSTANTIAL KRAAL has stood on a shoulder above the Black Umfolozi River since his great-great-grandfather, Mvulane, built it there about 1840, in the time of King Dingane. More than a dozen thatched houses encompass the upper part of a cattle pen built of orange boulders, like the wall of an ancient city. Now, at noon, the cattle were away in the valley, nuzzling the sand of the stream bed for the smell of water.

Mazibe himself, wearing a skirt of animal tails, a leather apron, and a fading army shirt, basked like an old lion on a rock in front of his *indlunkulu*, or Great House, where he lived with his Great Wife.

A traditional Zulu kraal reflects the polygamous society within it. A second wife, known as Left-Hand Wife, whose children cannot inherit the kraal leadership, lives in a hut to the left of the Great House. A Right-Hand Wife is taken on as an understudy for the Great Wife, should she have no sons. A wealthier man may have even more wives.

We retreated from the hot sun, stooping to enter the *ilanga*, a private hut of the headman in which he greets visitors. Clean mats had been spread on a floor of cow dung smoothed to a hard polish with a stone.

THE OLD MAN did not know exactly how many people lived with him in his kraal. It was not Mazibe's concern. But he could describe to a hair each of his 112 cows. We asked a young girl who had been to mission school to make a census, and she returned in an hour to report a population of 43—including Mazibe's three wives, two of his brother's wives, and two of his son's. Mazibe was not surprised. He knew there were many, as there ought to be.

But misfortune weighed in his heart. A son had recently been killed in an accident in Thekwini, the Zulu name for Durban. And in the evening, when the precious cattle plodded home, there would be fewer; more would have fallen to their knees in the thornbush and died of thirst.

Mazibe saw these tragedies in his own way. "Thekwini," he said, "is a bad place for young men. They lose their sense of obedience and drink whiskey and adopt the ways of the white man. The young men go astray because the white man does not let us kill evildoers. Before, every Zulu was obedient to the laws of the tribe. Those who were not, we killed. The others saw and obeyed."

And the drought? Was that also the fault of the white man? He nodded gravely.

"Before," he said again, "we would make rain. The missionaries have stopped that. They say it is heathen. They say you must go on a mountain and pray for rain, and then Nkulunkulu will send rain. But those missionaries are too lazy to do it! Go down to the church and see what they are doing. Drinking tea, instead of going into the mountains to

*For a view of the whole continent's varied inhabitants, see "The Peoples of Africa," one side of the double map supplement distributed with this issue.

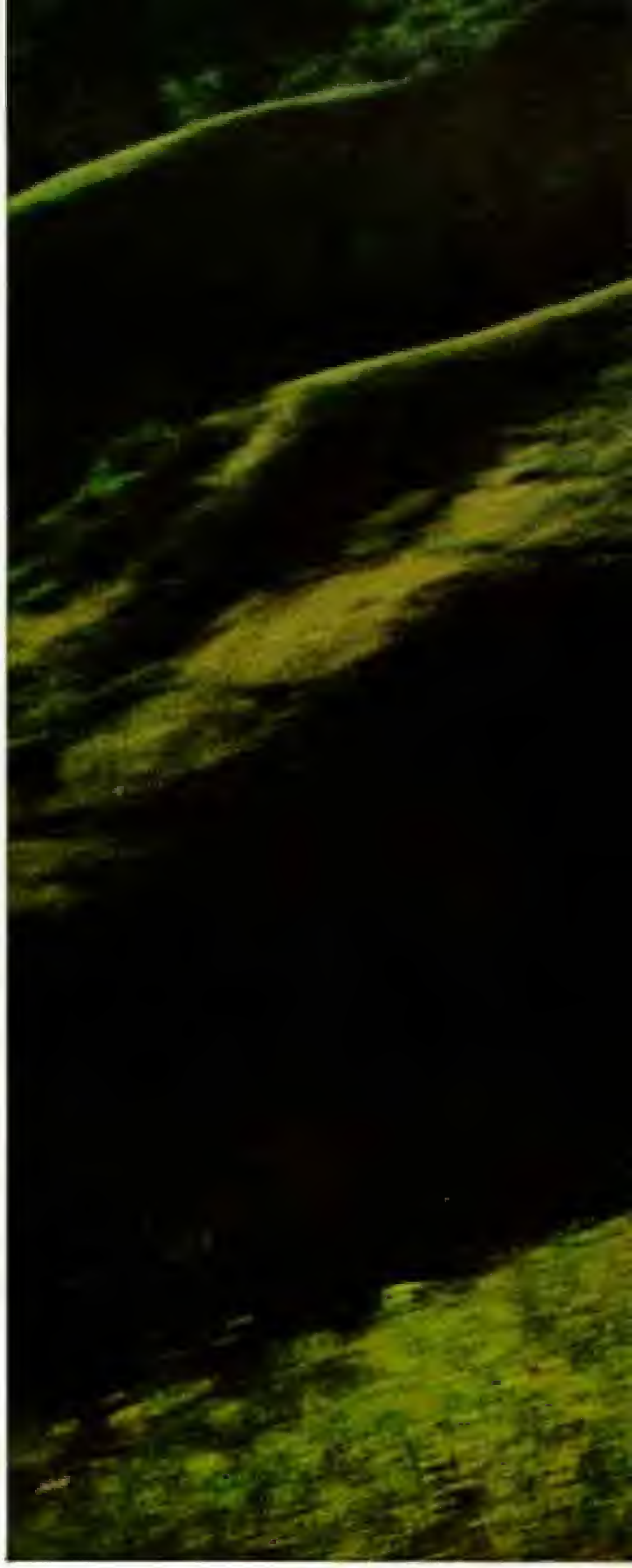
Tending the soil, hoe-wielding Zulu mothers and daughters prepare to plant grain near their kraal, the circle of huts in the distance. Men assume a less arduous role: caring for precious cattle, the traditional measure of wealth among Zulus. Farm-area children usually attend school only briefly, then work shoulder to shoulder with their parents.

Giving voice to history, Princess Magogo, mother of Chief Buthelezi (page 740), trills the old songs of her people while accompanying herself on an *ugubu* (**below**). She taps the instrument's one string with a slender reed, a gourd amplifies the sound. The princess' status as a descendant of kings entitles her to wear leopard skins, badge of Zulu royalty. But traditional Zulu society considers a woman—even a royal one—to be subservient to her husband, with limited rights and authority. If widowed, she becomes the responsibility of her husband's brother or her eldest son.

ENTERTAINING [ABOVE] BY DAN DUBOWITZ • REMEMBERING BY MICHAEL MCINTYRE ©

Visitor from the city makes himself at home, strumming an ugubu while his host's wives prepare the evening meal [above]. The kraal of a well-to-do Zulu usually includes a Great House, which he may share with one of his wives. Otherwise, each wife has her own hut, where she lives with her offspring. The family also uses the Great House for communal dining.

In days long gone, a royal kraal could be the size of a small city. King Dingane, who seized power in 1828, built one [left] that accommodated more than 20,000 persons. Here, in 1838, the Zulus first spilled the blood of Dutch immigrants. Piet Retief, a leader of the Great Trek from Cape Colony, took a party of 71 Boers to negotiate with Dingane for land. The king agreed, on condition that the Boers bring back Zulu cattle stolen by the Tlokwas, a neighboring tribe. Retief tricked the Tlokwas into surrendering the cattle, thus convincing the Zulus that the Dutch had magic powers. This prompted Dingane's next decision. Though he had signed a charter granting farmland to the Boers, he gathered his visitors together and had them all killed. Soon, however, new waves of armed Europeans pushed the Zulus aside and established farmsteads throughout Natal.



pray. What can you expect but a drought!"

Mazibe's brother and uncle, who also live in his kraal, joined us. Soon one of Mazibe's wives, plump and humble as traditionally a Zulu wife should be, entered on her hands and knees. Permitted to kneel but not to stand, she adroitly balanced a baby strapped to her back in a cloth sling, while serving us roast chicken and *uphuthu*, a kind of hominy that has been a staple Zulu dish for centuries.

After the meal, the old men sat back against the wall, their faces graven with shadows and alight with character and dignity. One of them spoke to me of the past.

"My father was of the uFalaza—'Clouds of the Heavens' regiment—in the time of Cetshwayu, the last of our great kings. His father, brother to the king's prime minister, Mnyamana, was of the Amaphela regiment. In those days of my father and his father there were steady rains and much grass for the cattle, but in these days we have drought, followed by thunderstorms and floods.

"So it is with the Zulu nation, after King

Inventive young Zulu hurtles down a hill (**above**) on the wooden-wheeled vehicle he fashioned from a forked branch (**left**). In time the lure of city jobs and wages will probably take him away from the simple life of Zululand, a checkerboard of 29 native reserves interspersed with blocks and corridors of white-owned farms. Inevitably, traditional ways disappear as education and urban migration affect more and more Zulus.

Cetshwayo. It was he who said, 'First come the traders, then the missionaries, then the red soldiers.' And always, they wanted land. Always, the white man has taken our land. First the Boers, who took Utrecht from King Mpande. Then the red-coated English, who opened Zululand for settlement. Now the young men go off to Thekwini on the big bus, and respect has broken down, because men begat, and the cattle begat, but the land could not beget."

It was not always so. Once the land was

plentiful and virgin, and the children of Adam were unknown. Modern scholarship is awkwardly silent about the first inhabitants. They simply appear, about 10,000 years ago, already in place: the Bushmen—small hunters with peppercorn hair who move with the game, sniff a track as adroitly as a dog, and bring their quarry down with tiny arrows dipped in poison—and the Hottentots—indigenous, presumably related to the Bushmen, but much advanced, with a pastoral way of life. These Hottentots appear only briefly in formal history. The tale goes that a party of white explorers led by Bartholomeu Dias, the redoubtable Portuguese commander, encountered some Hottentots in 1488. The natives threw stones. Dias leveled his crossbow at the nearest Hottentot, pulled the trigger, and announced the presence of the European in southern Africa.

Many more, of course, followed Dias—first the Dutch (the ancestors of today's Afrikaner); then the English. Few of them were aware of a third people on southern Africa's turbulent stage. Organized in powerful clans, they were the Nguni, who spoke a Bantu language. Among them were the forefathers of the Zulus.

In the waning years of the 18th century, the vanguard of the Dutch farmers, or Boers, spreading from the Cape of Good Hope, reached the Nguni frontier on the Great Fish River. There was surprise and shock on both sides. Whose land was this to be? Too many people pressed against too little land. The Xhosa clan and the Boers clashed first, but to the north a greater storm brewed in the figure of an Nguni chieftain, a black Napoleon named Shaka.

"I'VE LIVED HERE since 1917," said Arie Harris, whose comfortable farmhouse stands near the White Umfolozi River, "and this is as long as I've ever seen it dry."

He lifted the broad brim of his hat and wiped his freckled brow as we toiled up through a billow of brown hills.

"Up ahead there now, that hill, that's where it all started for Shaka. It's called Gqokli."

The clicking sound of the word caught my ear.

"I've a Zulu tongue," he smiled. "It's the most beautiful, expressive language."

Arie paused and peered around on the ground.

"There," he said finally. He pointed to two clay nozzles protruding from the ground like the nostrils of a crocodile.

"That's what's left of one of Shaka's forges. They used the skin of a goat for the bellows. This is where they made his infernal invention, the stabbing *assegai*. Before his time, the tribes used long throwing spears. Each man carried several, and the warriors would toss them at one another until they were all used up. Then one army would chase the other one home without too much harm done.

"Shaka changed all that. He shortened the spears, put stout hafts on them, and taught his warriors a revolutionary battle tactic—to close with the enemy and sink the blade into the chest. Right there, on Gqokli Hill, he put his new army to the test, and before he was done he had disrupted a large piece of this continent."

Shaka, who was born about 1787, was perhaps the most

Wide eyes on the future, this youth (**right**) learns arithmetic with such terms as *inkulungwane namakhulu ayisikhombisa namashumi ayisishiyagalolunye nantathu*—Zulu for 1,793.

Descendant of warriors serves in an army founded on compassion (**far right**). Like nearly all nonwhites who labor daily in the cities, she must by law return each evening to a black-only area.

Kraal life forsaken, a chic Zulu (**right**) has adapted to city ways. Zulu women increasingly seek careers as nurses and teachers, but their job opportunities are limited to black-only areas.

Mustachioed Zulu peers from behind safety goggles at a sawmill. South Africa's perennial labor shortage may offer the Zulus their best chance of advancement to better-paying jobs.

Gallbladders from cattle crown a *sangoma*, or diviner (**right**), who diagnoses illnesses and sniffs out the spirits believed to cause them. Vials of herbs dangle from her necklace.

Quest for knowledge demands concentration (**far right**). This student attends classes at University College of Zululand near Empangeni, one of three South African colleges for blacks.

"We were pinned like rats in a hole," wrote a British soldier of the defense of Rorke's Drift in 1879, when he and a hundred others (**left**) withstood the might of 4,000 Zulu warriors until the attackers gave up after 12 awful hours.

The battle followed the humiliating defeat earlier that day of a mixed contingent of 1,700 Britons and Africans who were encamped near the sphinxlike hillock called Isandhlwana (**below**). There the Zulu regiments suddenly appeared—20,000 strong—and swooped in to "wash their spears" in the blood of the invaders, slaughtering some 1,300 of them. Scattered across the battlefield, piles of whitewashed stones now mark the spots where British soldiers fell. Less than a year later the British broke the back of the Zulu army.

devastating individual in African history (page 738). By Nguni standards, he was illegitimate. His mother, Nandi, and his father, Senzangakona, chief of a small clan called Zulu, were related: their people drove Nandi away. She and her child found refuge with the neighboring Mtetwa clan. Soon after the clan's chief, Dingiswayo, began to organize his young men into military regiments, or *impis*, Shaka became his champion warrior. When his father died, Shaka seized control of the Zulu clan and then of the Mtetwa.

The momentum of conquest built to an incredible tempo. For miles in every direction, warriors who now called themselves Zulus traversed an ever-widening wasteland to find cattle and women. An area the size of Indiana was cleanly depopulated by men on foot in less than three years. As clans spilled out of the way or pushed for their lives against surprised neighbors, a chain reaction of death and terror swept southeast Africa.

As Shaka's power grew, so did his disregard for human life. One of the first white men to visit him, the English trader Henry Francis Fynn, remarked with horror on Shaka's habit of casually condemning members of his court to instant execution because of the smallest social infraction, such as sneezing or making him laugh when he did not want to laugh.

When his mother Nandi died in 1827, Shaka unleashed a wild riot of grief. Fynn

(Continued on page 756)

CRINKLED HILLS *freckled with kraals plunge to the Nsuze River. In this region lies the legendary birthplace of a man called Zulu—which means "heaven." In the early 1600's he founded a clan that bears his name, and thus became progenitor of the Zulus, the "People of Heaven."*

Resplendent in wedding finery, a groom (**above**) awaits the arrival of the bride-to-be near his kraal, 25 miles from Nongoma. The customs and costumes of such ceremonies have changed little since the days of Zulu glory.

This bridegroom has presented *lobolo*—bridewealth—to the girl's father. The payment, usually 11 head of cattle, legalizes the marriage and legitimizes children born to the couple. If the woman deserts her spouse or fails to have children in a reasonable time, however, the husband may recover the lobolo

PHOTOGRAPHS AND ACCOMPANYING ESSAY BY STEPHEN ALVAREZ © N.G.S.

Foot-stomping clamor, rehearsed in advance, signals the approach of the bride's family (above). Face veiled by green yarn, the shield-bearing bride brandishes a knife to signify her chastity. Along with ritual beer and livestock, the bride's party brings gifts that satisfy modern needs—luggage, furniture, pans, and fabrics—which they heap in the center of the dancing circle (**left**). After the wedding the young wife bids goodbye to her own clan and transfers her allegiance to that of her husband.

reported that 7,000 people died by frenzied spear thrusts. Shaka even banned the planting of crops. When he then dispatched his army on another campaign, his exhausted, frightened people turned against him. Shaka's half-brothers, Dingane and Mhlangana, and his closest servant, Mbopha, assassinated him and stuffed his body into a grain pit. His bones remain there, say the Zulus, somewhere under a street in the village of Stanger, 45 miles north of Durban.

THE LIGHT WAS FAILING, far west where the hills of Zululand merged into a mist, as Tayson and I walked down a long slope. Below us, a wedding party of about 200 people seemed like bolts of bright cloth thrown loosely on the brown pastures—the girls of the *umthimba*, the family of the bride, in a dancing line, and the *ikhetho*, the family of the groom, seated opposite them.

The dancers wore beaded shawls and necklace-ropes of beads over their nude torsos. The bride, a girl from the Buthelezi clan, was a surprise, however. She carried the traditional knife, to symbolize her virginity, and the small dancing shield, but the rest of her costume was Western: a two-piece white satin suit with a maxi-skirt that descended to just above her ankles.

"The loss of a woman," Tayson said as we sat on the ikhetho side, "is a serious thing to a family, for the women grow the crops and raise the children. To make good such a loss, the groom has to pay *lobolo*. It has always been paid in cattle, usually 11 head, but it may be more, depending upon the woman."

By Zulu custom a man must seek a wife outside his own clan—a risky business, considering the feuds that may exist. To reduce tensions, the Zulus have invented a thoroughly rational custom called *qhabuzela*.

On the night before the wedding day, the umtheko and the ikhetho line up on either side of the groom's kraal. While the groups sing, shout, beat drums, wail, and pound kettles, they unleash a torrent of insulting—if good-natured—maledictions toward each other. They keep at it all night, and afterward there is really nothing left to say.

One of the ikhetho suddenly started from the seated pack and made for the dancing girls as though he would brain one with his knobkerrie. Instantly a man leaped from behind the dancers and faced the attacker. They performed a mock duel, with much banging of shields and shaking of sticks.

This display kindled the spirits of the old men. One jumped up and began a *giya*, an individual stamping dance of a warrior. The others encouraged him with a powerful and ominous war cry: "*Usuthu! Usuthu!*"

The line of dancing girls now came to within a few feet of the ikhetho, and an official witness stepped forward, described the lobolo, and certified that it had been paid. The bride and groom then touched hands for the first time—but she remained in a stooped posture with her head lowered and eyes downcast.

In the last light of day there appeared on the crest of the hill a fringe of silhouettes: strangers wanting to attend, always a source of potential trouble. Their spokesman came down and consulted with the groom's father, who told the newcomers to go to a separate section of the field and calm down.

"Now," said Tayson, "is the time for dignified people like ourselves to depart. Otherwise, we will get mixed up in the fun and have our heads bashed in."

I HAD PROMISED Prince Ndeshend, deputy to the Zulu nation's acting paramount chief, that I would take a Polaroid picture of him. But when I arrived at his kraal, west of Nongoma, I noticed a strange silence. A group of children sat lackadaisically near a pile of twigs and branches used for firewood. After Tayson had sung the izibongo, the prince came out of his mud-brick hut and announced that a young girl of the kraal, a granddaughter, had died.

To the Zulus, death is far more than the sudden departure of a person. Since they believe that all death results from sorcery or from the anger of spirits, the living, too, might be contaminated. Furthermore, the spirit of the dead person is wandering around on the veld—a potential cause of mischief. Custom demands that the spirit be brought safely back into the kraal.

The child's Christian funeral was held in the Anglican Mission Church near Nongoma, and afterward the family observed a week of mourning. Those who were closest to the girl

City-bound Zulus put on their best for a ten-mile stroll from their kraal to the Saturday market in Nongoma. The heavy-handled umbrella carried by the man does not necessarily imply fear of rain. Trained from early childhood in the art of stick fighting, Zulu males rarely leave their homes without a cudgel, a cane, or an umbrella.

Taking his medicine, a Zulu in Durban laps up powder purchased from coverall-clad Mgcika Hlongwane (**below**). The itinerant combination of *sangoma* and *inyanga* —diviner and medicine man—diagnoses ailments through communication with spirits. Then he prescribes from his grab bag of herbs and potions.

Tradition in the family: With two medicine men as grandfathers, Dr. M. V. Gumede went a giant step further to become one of about 175 black South Africans who have earned medical degrees. He practices in Kwamashu and Inanda—two of Durban's black-only suburbs. He also directs a pilot project for treatment of alcoholism.

mixed strengthening "medicines" into their food—black powders, roots, and bark.

Because death had defiled the kraal, rites of purification were necessary. The people took mixtures to make them vomit; the women cut their hair; and the floor of the hut where the girl had lived was smeared with fresh cow dung. Everyone was active and busy, but in a quiet way.

"If you are idle now," a man told me, "you will be idle forever."

The calling home of the spirit takes place several months, sometimes as long as a year, after the death. Dr. Barbara Tyrrell, a noted author and painter of South African tribes, told me of an unusual ceremony she had witnessed, also involving a child. We were sitting in the warm winter sun on the open porch of her home in Richmond.

"There had been much sickness in the kraal," she told me. "The people consulted a *sangoma*, a diviner, who told them that the spirit of the girl, even though not very powerful, was the cause of the trouble. They

protested that it was not yet time to call the spirit home, but the sangoma explained that the girl was a frail one, and she was lonely wandering in the spirit world.

"One night we gathered in the kraal and the headman began killing a goat with an iron spike. Mingled with the cries of the goat was the voice of the dead child's grandmother as she invited the spirit into the kraal and promised to take care of her. My blood turned to ice. I knew that when they spoke to the spirit they were seeing the child.

"Scenes like that are becoming harder to find. That is why I am in the field so much these days, to paint traditional life while it still survives. Even though the cry of the goat will be heard for many more years, the acculturation of the Zulus is proceeding at a rate far too rapid for my liking."

The acculturation began the day Briton and Boer arrived in Zululand, the first from the sea, the second from the mountains. In the autumn of 1837 a party of Boers, who had been trekking eastward across the wide inland

plateau in their covered wagons, came to the edge of the Drakensberg escarpment.

"From the heights," wrote their leader, Piet Retief, "I saw this beautiful land, the most beautiful I've ever seen in Africa."

Retief led a column of armed men down through the passes to Mgungundlovu, the huge royal kraal of King Dingane (page 744), who had succeeded Shaka, to negotiate the purchase of land. On the 4th of February 1838 Dingane—who feared the Europeans as sorcerers—put his mark to a document granting the Boers the use of a huge piece of territory, a large part of which he had already promised to the English. Two days later, as Retief's party sat inside the cattle pen watching the warriors perform a dance, Dingane leaped to his feet. "*Bulalani abathakathi!*" he shouted, "Kill the wizards!"

All 71 Boers were dragged to a nearby hill and murdered. The Zulu army then mustered and left for the Boer encampments. The slaughter that followed was unspeakable. The warriors, reaching the unsuspecting settlers at night, engulfed sleeping families in a wave of assegais. The 97 Boers and more than 200 servants who died that night would be mourned, but it was the cruel killing of 185 children that moved the Dutch to a cold hatred and a lust for vengeance.

Within the year, Andries Pretorius set out with 464 riflemen, who vowed to God that if He would "deliver the enemy into our hands . . . we shall observe the day and the date . . . like the Sabbath in His honour."

ON THE NIGHT of December 15, Pretorius drew up his wagons in a superlative defensive position, bounded on one side by the Ncome River, on another by a deep ravine. The next morning, the Zulus threw 12,000 warriors against this fortress.

Young Daniel Pieter Bezuidenhout remembered little afterward except "shouting and tumult and lamentation, and a sea of black faces, and a dense smoke that rose straight as a plumbline upwards. . . ." The river ran with blood. More than 3,000 Zulus were slain. Ever afterward the Ncome has been known as Blood River, and the 16th of December has been a national holiday in white-ruled South Africa.

THE SANGOMA STRODE toward me from a distant hut, singing in a high-pitched voice to the insistent pounding of drums and the rhythmic chanting of the women. He carried a white shield and an assegai, which he held by the blade. He sang "One Who Kills the Enemies of the People."

The enemies are the abathakathi, evil human beings, wizards who cause untold misery —taking human life, sending illness, creating drought, making the cattle sicken and die. The potions and powders the wizards use to do their evil work are revolting to civilized man, the most powerful being made of parts of the human body.

Wizards have various familiars, but the most dreadful is the *umkhovu*—an exhumed corpse with animal eyes and a tongue snipped off at the tip. As it goes about its master's business, slipping quietly into kraals at night, the zombie's passage can be detected—a sound like the soft swishing of a skirt.

A person who becomes ill has clearly been bewitched by abathakathi. The sangoma diagnoses the curse and provides the remedy by consulting the spirits of the ancestors, with whom he has a special relationship.

He can also divine by reading thrown bones —specifically, astragali from the legs of deer, duiker, lion, goat, sheep, cow, and other animals. Mixed in the bag with the bones may be chips of zebra hoof, small shells, pieces of carved ivory, stones, and other bric-a-brac. One bag I examined, confiscated by police after a ritual murder, held a pouch of dried blood.

We retreated into the sangoma's hut and sat in an expectant silence as he untied his bag, filled his hands with the bones, spat on them, and tossed them out before him. He studied them for a long time.

"Your family is well," he said to me. "They worry about you. They do not know if you are dead or alive. They do not know how to get in touch with you. I see here also a baby boy that is coming to you. Fifty cents, please."

It was true that my family did not have a

Growing up in South Africa means a minimum of social contact with people of other colors for this child of Umlazi township. The apartheid policy assigns the republic's 15,000,000 blacks, 2,000,000 people of mixed blood, and 600,000 Asians to living areas and reserves apart from each other and from lands occupied by the 3,800,000 whites, in whose hands all political power rests.

forwarding address for me, and I later learned they had indeed been worrying. As for the rest, only the spirits know.

THERE IS A ROAD OF A SORT, a skin of dust, that runs west through Babanango over spectacular mountains toward Nqutu, and another that angles south into the valley of the Buffalo River and a place called Isandhlwana.

I first saw that haunting place in morning light. I rounded a curve on the road descending from the Nqutu plateau, and suddenly there it was—a huge crouching sphinx of red rock overlooking a plain rimmed with abrupt escarpments, a vast stage seemingly designed for Armageddon (pages 750-51).

When, in 1877, Great Britain annexed the Transvaal, she inherited the inflammatory borderlands dispute between Boer and Zulu. Sir Bartle Frere, British High Commissioner of Native Affairs for South Africa, convinced himself that the Zulu power was a menace to the peace and security of his domain—especially after a boundary commission had supported Zululand claims.

Frere served upon King Cetshwayo an ultimatum demanding the demobilization of the Zulu army and the subservience of the Zulu king to the British. Cetshwayo rejected it.

In January of 1879, Lt. Gen. Frederic Augustus Thesiger, the second Baron Chelmsford, launched an invasion in three columns aimed at the heart of Zululand: Ulundi, Cetshwayo's royal kraal on the wide Mahlabatini plain. On January 20 Chelmsford camped at Isandhlwana, pitching a line of tents across the stony slope at the foot of the rock wall.

Early on January 22, scouts reported a large force of Zulus in the valley ahead. Chelmsford, eager to fight, lost no time. He pulled six companies out of the camp and marched off down the valley, white helmets shimmering in the dawn mist. Several hours after Chelmsford left, the 1,700 troops who manned the camp looked up to behold a sight that will not be seen again on this planet.

Along the entire five-mile length of the Nqutu plateau, 20,000 Zulus were spilling over the rim—a breaking sea of shields with a spindrift of spears. It was not a mob but an army of disciplined warriors under able leaders like Mavumengwana, Tshingwayo, and Cetshwayo's prime minister, Mnyamana, converging at a dead run upon the camp and its astounded defenders.

A murderous rifle fire began to lash out from the widely spaced units that were defending the slope of Isandhlwana—harvesting unbelievable numbers from the packed

ranks before the camp. Then it faltered and faded. The paper cartridges had been packed in boxes with screwed-down lids. There were too few screwdrivers. Men tore frantically at the wooden planks as the waves of spears swept toward them.

A few lucky ones managed to fight their way out, but of those who tried to hold the position, some 1,300 soldiers, there was not a survivor. Chelmsford, hopelessly out-maneuvered, received a garbled message at the other end of the valley, but not until it was too late did he learn what had happened—one of the worst defeats ever suffered by a modern army at "savage" hands.

AS THE ZULUS CHARGED down the Nqutu escarpment, others—the Undi Corps, several thousand strong—swept to the rear of Isandhlwana to block the British escape route. Then, toward late afternoon they turned south to the Buffalo River, forded it, and trotted off toward Rorke's Drift.

None of the detachment there knew they would soon be part of an epic. There were 141 men under Lt. John Chard—8 officers, 97 able-bodied NCO's and men, and 36 laid up in the mission building that served as a hospital.

Alerted by the arrival of a survivor from

Advice on the airwaves: King Edward Masinga counsels fellow Zulus on personal matters over the government-subsidized African-language network.

Waffling the countryside south of Durban, Umlazi township's 20,000 government-built houses (**below left**) provide shelter for 160,000 blacks. A Zulu couple take tea on the lawn of their four-room home (**below**). Dwellings in the black-only, predominantly Zulu suburb rent for about $10 a month and sell for about $750.

Isandhlwana, Chard hastily organized a perimeter of heavy sacks of cornmeal, large biscuit boxes, and some wagons around the hospital, a storehouse, and a small cattle kraal. The makeshift wall was still rising when lookouts came tumbling down the hillside behind the station, one yelling, "Here they come, black as hell and thick as grass!"

The soldiers who manned the perimeter looked out in awe as more than 4,000 shouting Zulus cascaded toward them. It was 4:30 in the afternoon, and the steady fire from the single-shot breech-loading rifles kicked a cloud of smoke toward leaden skies.

For hour after hour, rattling rifle fire and bayonets working with the rapidity of sewing machines blunted and stopped each charge. The ferocity of the fight left mounds of dead before the boxes and bags, but eventually the Zulu horde broke into the hospital building. As the roof caught fire, the sick and wounded were dragged from room to room by comrades who turned to fight at every step. Most of them miraculously made their way by the shaking glare of the conflagration to the last redoubt, a circle of meal bags thrown up in front of the storehouse. There the battle closed to massive rushes of Zulu bodies, shields forming a solid wall, assegais glittering in the firelight, met by thundering volleys from the densely packed survivors.

The attack raged for 12 hours (page 750). At about 4 a.m. it slowed, then stopped. Men fell exhausted against one another, grasping for canteens. Seventeen soldiers had been killed, and untold hundreds of Zulus. By the light of morning, Chard and his men saw that the Zulus had gone.

If medals are a measure of anything, that fight has few if any equals in the annals of traditional warfare. Eleven of the defenders of Rorke's Drift won the Victoria Cross, Great Britain's highest military decoration—one of the largest numbers ever awarded for a single engagement.

As for the rest of it, the Anglo-Zulu War of 1879 was a grim colonial formality, a turkey shoot. Chelmsford mounted a second invasion and pushed on to Ulundi where, from a huge square, he decimated the remains of the regiments. The Zulus became and remain a subject people.

"TO BE A ZULU," the old man said, "you must sit by the fire with the men." Nine other men of varying ages huddled on a log near the welcome blaze. We were all guests at the opening of a new store owned by Julius Chonco, a Zulu businessman, in Chief King Mbele's tribal district.

Julius had waited until the moon was auspicious, and then had killed two cows and pleaded with his ancestral spirits for prosperity. The whole neighborhood had been invited

Sneak-peek at a classmate's slate may or may not enlighten a Zulu student at a Bantu school near Nongoma. Taught in Zulu for the first six years, the youngsters must also study English and Afrikaans from the seventh year on. South Africa claims the highest literacy rate for blacks in all Africa, though only one in 240 earns the equivalent of a high-school diploma. The need to earn a living forces many to drop out of school.

to the feast, many came in threadbare coats. It struck me that a Zulu in his traditional dress always looks dignified. In Western clothes, he often manages only to look poor.

As a matter of courtesy, the old man, Minya Ngubo, inquired about my own country, even though he had no idea where it was.

"How large are the farms there?"

"About as large as here, but one, in Texas, is bigger than some countries."

He considered this, consulted briefly with the others, and replied, "What do you take us for, donkeys?"

There was an awkward silence.

"You have heard, I am sure, about the American landing on the moon?" I inquired. His eyes searched mine for a full minute.

"What are you telling me?"

"American astronauts have taken a ship and flown to the moon and set foot on it."

"This white man," he said, "is the grandfather of all liars!"

"Wait. I have heard of this thing," another old man said. "On the FM from Durban."

"Why are you alive?" Minya demanded, jabbing a finger toward the ground. "To be here you must have a spirit."

"I have one. We call it a soul."

"And where does it come from?"

"Heaven."

"And you are telling me your people flew to heaven!"

He waited while I groped for an answer.

"When a cow is lost," I said, "and you think it is on the nearest hill, and you go there, sometimes you see it on the farthest hill. When we reached the moon, we found that heaven was on a further hill."

"If what you say is so," he continued, "what do they drink on the moon?"

"Nothing. There is no water."

"Then how are cattle kept?"

"There is nothing there. No one lives there. The moon is all dead, a round ball floating in space."

"A round ball! Then why doesn't it fall down?"

An explanation was beyond me.

"Because Nkulunkulu, the maker of all things, wants it where it is," I said. He smiled for the first time, exposing a row of gleaming yellow teeth.

"You see," he said, "you sit here by the fire like a Zulu and you learn something.

"Something *true*," he added.

He took a long swig from the common beer pot and said, "It is also true that the old men who wore their hair in rings are all gone and these fellows with the white shirts are running everything. How can a nation grow without having an army? You people have the soldiers, and we are left only to die."

THE ZULU IN SOUTH AFRICA—officially classified as a Bantu, together with all other black people—may move from a reserve into a town only through a tightly controlled system of "influx regulations," registration, reference books, permissions, and residential requirements. He has to live with others of his race in Bantu townships, most of which have been divided into ethnic neighborhoods.

I drove out one morning with Bantu Affairs Chief Commissioner A. L. Schaffer to Umlazi township, south of Durban: 11 square miles of four-room brick houses—20,000 in all—sheltering 160,000 people (page 762). There are similar Bantu towns outside every South African city.

"There was a period, after the Second World War," Mr. Schaffer said, "when many thousands of Bantu moved to the cities in search of work and created extensive shanty-towns. What you see replaces those hovels. Good houses make good citizens."

Most of Umlazi's population empties out each day to ride trains or buses into Durban. Since skilled and clerical jobs are reserved largely for whites, the blacks, with some exceptions, hold unskilled or semi-skilled jobs. They work as construction laborers (pages 770-71), servants, custodians, janitors.

"The children are all in school," Mr. Schaffer said as I remarked on the quiet streets. "Umlazi is divided into 19 neighborhoods of about 800 to 1,500 houses each, whose affairs are run by an elected zone committee. We have a primary school for every 300 families and a post-primary school for every 900. There are also 36 churches." The citizens of Umlazi may buy their homes for a modest sum—about $750.

I talked to a resident of Umlazi, a young Zulu now tied to the cash economy of the city but nostalgic, as many Zulus are, for the free life of the countryside.

"Most Zulu men have a wife in town," he said, "but they also have a wife in the country, keeping the kraal and the family land. Unless the land is worked, the chief can take it away and give it to another family. The kraal is the Zulu's security. When he is old and cannot work in the city, he goes home and the family cares for him. But now the land will not support all the people, and there is no more to give. So men must come to town, and register, and become town men."

Every South African "town man" carries a reference book, a kind of internal passport. The first I saw belonged to a Zulu dishwasher. It resembled the folder in which traveler's checks are bound. On an inside page was the man's picture and description, and on succeeding pages were monthly entries, signed by his employers, indicating the places and dates of his employment. Later I watched in the echoing concourse of a railroad station as police examined books at random. The reference books became compulsory for all black South Africans over the age of 16 in 1952 under the Natives (Abolition of Passes and Co-ordination of Documents) Act, which requires the books to be produced on demand. Tight construction of that phrase means immediately, and the penalty for failure to obey may be instant incarceration.

IT IS NOT SURPRISING that so many Zulus, caught in the peculiar vise of South African reality, find comfort in religion. Fundamentalist churches abound. The largest, with between 80,000 and 100,000 members, was founded 60 years ago by the late Isaiah Shembe: a latter-day prophet and faith healer. His sons, Johannes and Amos, have carried on his work. Many of the Shembe flock live in a settlement of huts and shacks

Heady staple of Zulu parties, thick yellow beer passed around in a communal pot enlivens a festive gathering at the Buthelezi kraal **(above).** Women prepare the drink for their families from fermented home-grown sorghum or maize.

Town dwellers share laughs and beer at a tavern in Umlazi **(below).** Women slake their thirst in another part of the bar. Alcoholism, rare in early Zululand, now ranks as one of the major social problems among South Africa's urban blacks.

called Ekuphakameni. It sprawls over a hillside west of Durban. Two large sunburst symbols decorate the hills on either side of the community, reminders of the heavenly sign sent to Isaiah by God in 1910—also the year of Halley's Comet.

I found Amos Shembe sitting at a bare table in one of the huts. It was a cold day and he held the frayed collar of an overcoat against his throat as we talked. A mild man with intense eyes and the exquisite manners that one comes to expect of the Zulu people, Amos held open a small prayer book.

"In my time," he said, "I met a man whom I will not meet again. He was my father.

"Once he took a span of oxen into the veld and the sky darkened and lightning struck, killing both of the beasts, and a voice said, 'I have called you, Isaiah.'

"After that the miracles began. A man from Botha's Hill came to plead for a dying child, and the child was restored. Then a blind woman, Lottie Shangase, walked to Durban, to the uMzinyathi Mission, and my father put his fingers on her eyes and her sight was restored. I tell you, I saw a man in my life, and sometimes I doubt if he was my father."

As I walked through the settlement, I felt as though I were floating among saints. Rugged men in white surplices, young girls dressed only in beads, greeted one another and me with the utmost gentleness and kindness. I heard drums beating a slow cadence and turned off into a small grove where more than a hundred unmarried girls were dancing under leaves illuminated by a late sun. A large man in a robe paced up and down before the line, shouting out a string of praise songs—to whom?

"To God," said Amos. "This dancing is their way of praying."

"What does the song say?" I asked.

"It says—'Lover of Samaritans, love me too, and set me free!' "

THE NATIVE LAND ACT OF 1913 set aside extensive regions as "Bantu Homelands" for the major South African ethnic groups. A vast disproportion between population and land ownership led to the Native Trust and Land Act of 1936. Under the terms of that act, the South African Government spends about 14 million dollars annually to enlarge the homelands by acquisition of white

Par golfer tees off on the rugged government-built Umlazi course. The township also has a soccer stadium, where enthusiastic fans gather on Sunday afternoons to watch games played by a league of 42 local teams.

Religious brotherhood leaps racial barriers as Bishop Alphaeus Zulu, Anglican Bishop of Zululand, confirms new white church members at Melmoth (right). Unlike his white counterparts, however, Bishop Zulu cannot legally manage church property in his diocese. More than half the Zulu people now profess the Christian faith, first brought to their country by missionaries 150 years ago.

Where white values prevail, the promise of lighter skin lures buyers. Rural Zulus care little about skin color as a measure of feminine beauty—preferring such attributes as robustness, diligence, and respect—but the standards of city-dwellers are changing through exposure to white-oriented movies and advertising.

property. Nevertheless whites, outnumbered five to one by blacks, still own 300 acres of land for every 100 acres in the native reserves. Zulus now hold 7,363,000 acres throughout Natal Province and, under the act, will receive 166,000 more. The exchange takes place by negotiation rather than by condemnation proceedings.

I looked up a man who could be directly affected by the new land allocations. J. Dreyer Pohl, a former diplomat, had served South Africa for many years as an ambassador before retiring to breed cattle in Zululand. From the front of his comfortable house we watched as the herd boys drove the sulky beasts homeward along dusty paths.

"Certainly," he said, "I am worried about losing the farm. I am on the exact edge of reserve lands. But if I must lose it, I still believe that separate development is the only thing that makes sense in this country."

The policy of separate development—a term the South African Government prefers to "apartheid"—has been relentlessly pursued since 1948, when the National Party came to power. Its goal is the eventual creation of national states for South Africa's tribes through a staged process bringing more autonomy at each step.

PICKS RISE AND FALL
to the beat of a chanted work song as a Zulu railroad crew labors under the gaze of a white overseer. KODACHROME © N.G.S.
770

The Transkei, homeland of the Xhosa, is farthest along this path; it now has a parliament. Until the promised day comes, however (if ever, skeptics comment), blacks cannot vote, own property except in their homelands, or move about without supervision.

The government enforces an absolutely rigid segregation of all peoples: white, Bantu, Asian, and "Coloured"—those of mixed blood. Most multiracial societies practice segregation informally to some degree, but South Africa does so as an avowed national policy, and because of this the South African Government exists today in a state of determined international isolation.

It has chosen to pay the price of alienation because, in its view, the alternative to separate development is what one official described as "the seething caldron of internal racial conflict." Since the National Party came to power, however, clashes between tribal blacks, blacks and Asians, and in some cases, blacks and whites, have occurred.

Opponents of the policy, who view nondiscrimination as an absolute moral value that cannot be compromised, are especially chagrined by the social horrors that result from apartheid. One example, involving individuals rather than ethnic groups, is that of a Bantu woman whose child was classified as Coloured; since the rules of apartheid require the two groups to live separately, the child was taken from her mother.

While there is growing agitation among some whites to relax the social restrictions of apartheid, surprisingly little opposition is shown to the general scheme of establishing separate Bantu national states. Most white South Africans point out that in a population of 13 million blacks, 2 million Coloureds, 600,000 Asians, and 3.8 million whites, an open, democratic society would lead to the whites' political obliteration. This is the hard demographic fact that the scaffolding of political theory surrounds.

"How long do you think it will take," I asked Mr. Pohl, "to work it all out?"

He gave me the same answer I heard in Johannesburg, Pretoria, and Durban.

"Who can guess? Twenty years? Fifty years? A century?"

ON A WINDY HILLTOP between the valleys of the White and Black Umfolozi Rivers, a modest home faces north from a grove of trees. It is called Phindangane, "Come Again," and here many of the hopes of the Zulu people have come to rest in the figure of Chief Mangosuthu Gatsha Buthelezi, chief executive officer of the Executive Committee of the newly created Zulu Territorial Authority—a step toward eventual political autonomy for the Zulu people.

The chief, a handsome man in his 40's (pages 740-41), sat before a bookcase containing works by Lincoln, Khrushchev, Churchill, Martin Luther King, Jr., and John F. Kennedy. I asked him whether separate development could work for his people.

"It is the only alternative we are allowed," he replied. "But the Zulus must have more land. There are a hundred separate units in our reserves, poor, crowded fragments set in the midst of thinly settled white-owned areas. The population density is as high as 95 people per square mile. How can a real country be fashioned from so many pieces, especially a country without a viable economy?"

One form of economic help being provided by the South African Government is the establishment of "border industries"—white-owned and white-managed enterprises at the edges of black reserves, from which they draw labor and to which they provide economic assistance in the form of payrolls.

As we talked, work was in progress on the plain of Mahlabatini, not far away, on a railroad to connect inland South Africa with a new port complex building at Richard's Bay, geographically a part of Zululand, but designated as a white area.

"It will be a second Durban," Chief Buthelezi said. "An aluminum refinery is being built now, and soon it will be joined by a second plant. But there is no provision for black ownership of property there, and blacks will continue to be excluded from managerial jobs. In what way, then, will it benefit us as much as it will the white people?"

"Why do you participate in the separate development scheme?" I asked.

"Because only within its framework can I help my people," Chief Buthelezi replied.

Thumb-up salute from a worker greets photographer Durrance in the Umlazi railroad station. The "we-shall-overcome" gesture symbolizes the determination of South Africa's blacks to attain higher economic status, more social freedom, and a greater degree of self-rule.

Tin-can virtuoso uses a twig to coax sound from his homemade instrument (**below**)—a flattened and punctured metal container with rubber bands for strings. The music-loving Zulus, who have tunes for nearly every function, employ the timeless lyrics of praise songs to pass along the history of their people.

Following his heart through the grassy hills of Zululand, a youth in city clothes strums his guitar (**opposite**). Warriors with broken spears, a people stripped of influence over the events that shape their lives, the Zulus still possess much of the pride and spirit that once made southeast Africa tremble.

"Anything outside the framework of separate development is not allowed."

ONE EVENING I stopped by the farm of Mr. Ian Player, outside Howick, in the Karkloof valley. Ian, the chief conservator of game in Zululand, had helped save the white rhino from extinction. He had told me earlier that he wanted to introduce me to "the last of the old Zulus."

The old man was waiting for us. His name was Maqubu Nthombela. He was wearing the uniform of a Natal Parks Board game guard and was standing at attention. We walked a short way to the side of a grassy hill overlooking the gentle farmland; yellow grass glowed gold in the late sun, and the green hills blurred to blue.

Maqubu proved to be a veritable Charlie Chaplin. He told me how Shaka toughened his impis. Playing the part of a hapless warrior being tested, Maqubu in pantomime drove an assegai into his side, at which he laughed in a high, trembling falsetto. Just as I was about to burst into laughter, he sat down again with a face so serious and dignified it instantly stifled comment. He was not there to entertain, only to instruct.

"My great-grandfather," he told me, "served Shaka, and later Dingane. The Boers captured him, tied him to a cart wheel, and killed him. My grandfather fought at Isandhlwana, with the iNgobamakosi regiment, the 'Humbler of Kings.' What I tell you, my father told me."

Ian's grandfather had also served in the Zulu War, as a sergeant with the Natal Hussars. On the very day that Maqubu's grandfather was washing his spear with English blood at Isandhlwana, Ian's grandfather was killing Zulus at the Inyezane River with a flanking column pushing toward Eshowe.

Now the sons of their sons sat together in the tall grass, watching the evening darken over a land they both cherished. Later that night, after dinner, Ian and I went out to observe the magnificent southern sky, a cascade of stars spilling toward the great coil of Scorpius. In his hut, Maqubu was singing, all by himself, at the top of his voice, a song from the past called "*uziThulele*—We Are Silent," a kind of national Zulu prayer.

"Everything I know, that old man taught me," Ian said. "If I know anything about animals, or nature, or people, he taught me. He is like my child in many ways, and he is, in a way, my other father." □

Shy

By GILBERT L. VOSS, Ph.D.
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Photographs by ROBERT F. SISSON
NATIONAL GEOGRAPHIC PHOTOGRAPHER

OCTOPUS BIMACULOID, SLIGHTLY LARGER THAN LIFE-SIZE. ©N.G.S.

Sinuous arms billowing, a young octopus prepares to paralyze a fiddler crab with its venomous saliva. Nimble enough to pass a pebble down its arm from one sucker to the next, the voracious mollusk is capable of gathering 25 crabs at a time before eating them one by one.

A FELLOW MARINE BIOLOGIST came into my office carrying a glass jar. He looked puzzled.

"I've been stung by these octopuses," he said, lifting the jar for me to see. "Yet an octopus isn't supposed to sting."

"How did it happen?" I asked.

"I was netting animals in midocean from the collecting platform of our ship," he said. "Now and then the sea washed against me. Suddenly, my legs were stung by a swarm of creatures. I scooped some up, and here they are."

Monster; the Octopus

My friend set down the jar. In the formalin solution I could see dozens of tiny blanket octopuses.

I laughed. "You're right—no cephalopod can sting. Let me show you what happened."

I placed one of the delicate creatures under the microscope. There, stuck along the base of each arm, lay a slender gelatinous string held in place by the octopus's suckers. They were sections of the stinging tentacles of the Portuguese man-of-war, a kind of jellyfish.

"Young blanket octopuses collect these tentacles," I explained, "cut them to the right length, and put

Undersea fight to the finish? "Not at all," laughs marine biologist William L. High. "Octopuses are so shy you've got to grab them before they jet away!" Skillfully avoiding the mollusks' powerful beaks, the scientist captures and tags "devilfish" to study their behavior (**following pages**). Here he wrestles a 35-pound *Octopus dofleini* from its anemone-covered lair in Puget Sound.

Boneless as a worm: A 70-pound *dofleini* becomes a flaccid heap when Mr. High, a biologist with the National Marine Fisheries Service, takes it ashore for tagging.

Tangled coils of two mollusks writhe in territorial battle, sparked when one 18-inch *Octopus briareus* was placed in a tank already occupied by another (right). The arms of octopuses, like lizards' tails, regenerate if broken off; one at lower left, lost in a previous encounter, has partially grown back.

them to work—for what purpose we don't know. Possibly they are implements of defense, but more likely the immature octopuses use them to shock and kill the tiny shrimp they feed on. When a *Tremoctopus* grows big enough to kill its prey without help, it discards the man-of-war tissues."

My visitor shook his head in wonderment. Did this "tool" use, he asked, demonstrate an instinctive trait or was it acquired through learning? That is a moot point. I believe it is inherited behavior. Certainly it typifies one of the extraordinary habits of Octopoda, the name (from the Greek for "eight-footed") given to the order of cephalopod mollusks to which octopuses belong.

Not Pretty, Perhaps, but Smart

With its writhing arms, big staring eyes, and bulbous body, the octopus arouses distaste in many people. Lacking a rigid skeleton, it seems a ghostly monstrosity as it flows stealthily along.

Students of the octopus recognize it, however, as perhaps the most marvelous of all marine creatures. Possessing a highly sophisticated nervous system, it is endowed with intelligence superior to that of any other sea dweller—except, of course, the marine mammals.

Octopuses have fascinated me since school days. As an undergraduate, I once found an octopus sunning itself in a submerged grassy spot in Lake Worth, Florida. With some hesitation, I dived and seized it. The creature's eight arms and hundreds of suckers wrapped around my wrist. After maneuvering it into a jar, I studied my prize. A small animal, it had a body hardly larger than my thumb, but each arm was more than a foot long. I marveled at the play of colors over the mantle, rippling hues that outdid the performance of any chameleon.

No book was able to help me identify my catch, and two specialists couldn't name it. Twenty years after its capture, I finally found its twin in the Royal Institute of Natural Science in Brussels, Belgium. It was *Octopus defilippi*, previously known only from the Mediterranean Sea and the west coast of Africa. The very first octopus I had ever captured also proved to be the first of its species identified from the western Atlantic!

The pursuit and study of octopuses has taken me to Newfoundland, South America, Europe, and West Africa. I have sent students as far as Antarctica and the Indian Ocean to collect these fascinating creatures.

My home base at the Rosenstiel School of Marine and Atmospheric Science of the University of Miami lies close to prime octopus hideouts along the Florida Keys. The names—Triumph Reef, Fowey Rocks Light, Ragged Keys, Soldier Key, Long Reef—recall delightful hours spent swimming with snorkel and face mask amid sea grass and coral heads in search of octopuses.

Like their close relatives the squids,* octopuses lack

(Continued on page 786)

*Dr. Voss wrote of "Squids: Jet-powered Torpedoes of the Deep" in the March 1967 NATIONAL GEOGRAPHIC.

Ensuring future generations, two denizens of the Miami Seaquarium (**left**) mate in a tank modeled after their natural habitat.

Courting octopuses first approach each other with curious, stylized touching motions. Arms snake out and back. Skins turn pebbly; waves of red, brown, and gray wash over their bodies. Then the male, here clinging to a fiberglass wall, inserts sperm into the female's mantle cavity with the hectocotylus, a spoon-shaped structure on the end of one of his arms. Sperm somehow stay viable until the female spawns, days—or even months—later.

By egg-laying time, the female has found a nest (**above**). This octopus at the University of Miami took refuge in a broken terra-cotta crock, patching it with stones as expertly as a mason. Her eggs were extruded in strings, fixed to the crock in clusters, and protected by her arched arms. She washed and fondled the 5/8-inch-long eggs almost continuously to keep them free of fungi.

For 78 days, until the eggs hatched (following pages), the mother never left her den. During the last half of the incubation period she rejected all food, even tidbits placed on her doorstep. She always snatched such offerings and threw them as far from the crock as she could.

FREE AT LAST, *a just-hatched octopus jets from its ruptured case by forcing water through the siphon beneath its head. The trailing yolk mass—remnant of a self-contained food supply—will soon drop off. Nearby, brothers and sisters await escape. Paired dark spots mark their eyes, already well-developed and remarkably similar to man's.* KODACHROME © N.G.S.

784

Changing color at eye-blinking speed, a minutes-old *Octopus* clings to its empty egg case. These photographs, taken only a quarter second apart, show the hatchling's ability to flush brown. The leopardlike spots are chromatophores; tiny muscles radiate from each one, enabling the animal to control their size and, thus, its overall color. Adults of this species can assume shades ranging from deep red-brown to light aqua.

shells and have evolved into highly mobile animals. They share with squids the ability to change colors rapidly. Both mollusks also are jet-propelled. They dart swiftly through the sea by ejecting water through a tubular siphon below the head.

Octopods have two fewer arms, or tentacles, than squids. Both groups of cephalopods have eyes remarkably like those of vertebrates in form and keenness of vision.

Patience Pays for an Eight-armed Hunter

Inhabiting all oceans at all latitudes, octopuses dwell as deep as 17,000 feet. In the Antarctic, individuals of the same species range from shallow surface waters to depths of more than two-and-a-half miles. Few, if any, other living creatures match this adaptability.

Most octopuses are voracious predators, ambushing crabs, clams, shrimps, and many other marine animals from holes and caves, crevices and burrows. An octopus is patience personified; I've seen one sit for hours on a coral head waiting for prey. When an unwary crab showed up, the octopus whipped out an arm and immobilized its victim with hundreds of suckers.

Rarely in nature is an octopus seen in the act of eating. But I've found crab shells completely empty of meat, with only the tiniest of punctures. The octopus apparently bites out a small piece of shell with its parrotlike beak. Then it injects a poisonous salivary fluid that almost liquefies the flesh, making it easy to suck out (page 791).

Octopuses, again like squids, are mottled with myriad pigment sacs, or chromatophores, which they consciously control to change color. The adult of a familiar Florida species,

Octopus briareus, can be blue-green one instant and brown the next. Moments later it can turn reddish or nearly snow white. *Briareus* can even wear different colors on opposite sides of its body. In its scare display, *Octopus chierchiae* flaunts neat zebra stripes of chocolate brown and white.

A layer of platelike prismatic cells called iridocytes underlies the octopus's color cells. By their orientation, these reflect the sun's rays in shimmery iridescence and add to the richness of color display.

Blushing Tones Betray Emotions

An octopus makes no attempt to hide its feelings. On the contrary, its emotions are closely linked to the color mechanism. I've watched an animal in the sea showing soft iridescence and subtle hues of brown, green, and pink. If a crab approaches, the octopus's colors intensify. Now on the alert, the animal turns dark red or deep brown. These displays seem to be staged primarily to dazzle, or confuse, enemies.

"A moray eel or some other fish zeroing in on an octopus," observed one of my students, "slows its charge when the object of its attention totally changes appearance." This moment of hesitation gives the cunning octopus a chance to give its foe the slip.

A host of marine animals, especially fishes, prize octopus as food. Years ago, when I was studying sailfish along the Florida coast, we took one that had 24 beaks of the octopod *Argonauta* (page 796) in its stomach. Dolphin stomachs often are packed with octopus remains. Collectors in the Antarctic frequently find that marine birds and mammals have feasted on octopus and squid.

Of all the octopus's enemies, eels undoubtedly are the most destructive. Their long, slender bodies easily probe the crevices and holes in which octopuses lurk. And in direct attack the octopus seems to be completely at the mercy of the eel's razor-sharp teeth.

Against moray eels and their relatives, the octopus's main defense, according to accepted belief, is to discharge its ink as a smoke screen to hide escape (page 793). One scientific report, however, advances an intriguing theory: that the ink paralyzes the eel's senses of smell and sight.

In mating, no less than in escaping their enemies, octopuses display amazing specializations. One day a friend caught a female blanket octopus on the beach and brought it to my office, where it nearly filled a large tub. As I turned a hose into the mantle cavity to wash the sand out of the specimen, a peculiar wormlike form with suckers and an oblong head fell out into the tub. One of my students picked it up.

"What under the sun is this?" he asked. "Is it a parasite?"

"That's what it was first thought to be," I explained. "Even the famous French zoologist Georges Cuvier thought it was a worm. He gave it the generic name *Hectocotylus*."

I added that the Swiss physiologist Rudolph Albert von Kölliker wrote a paper describing the creature's digestive, circulatory, and respiratory systems—though it had none! He thought it was the male *Tremoctopus*. Later, it proved to be the copulatory arm of the male blanket octopus. He inserts it in the female's mantle cavity at mating. It breaks off and remains there.

Only the blanket octopus and a few others have sperm-carrying arms that separate at mating. Nevertheless, the name given by Cuvier is now applied generally to the sperm-bearing arms of all male octopuses and squids. These hectocotylized arms transfer the sperm to the female in small packets called spermatophores.

In some octopuses, the female stores the sperm bundles in a special sac and holds them for days, weeks, or even months until she is ready to lay her eggs. Somehow the packets break at the right moment and the released sperm fertilizes the eggs, which are then attached to rocks or other objects on the sea bottom in clusters or festoons (page 784).

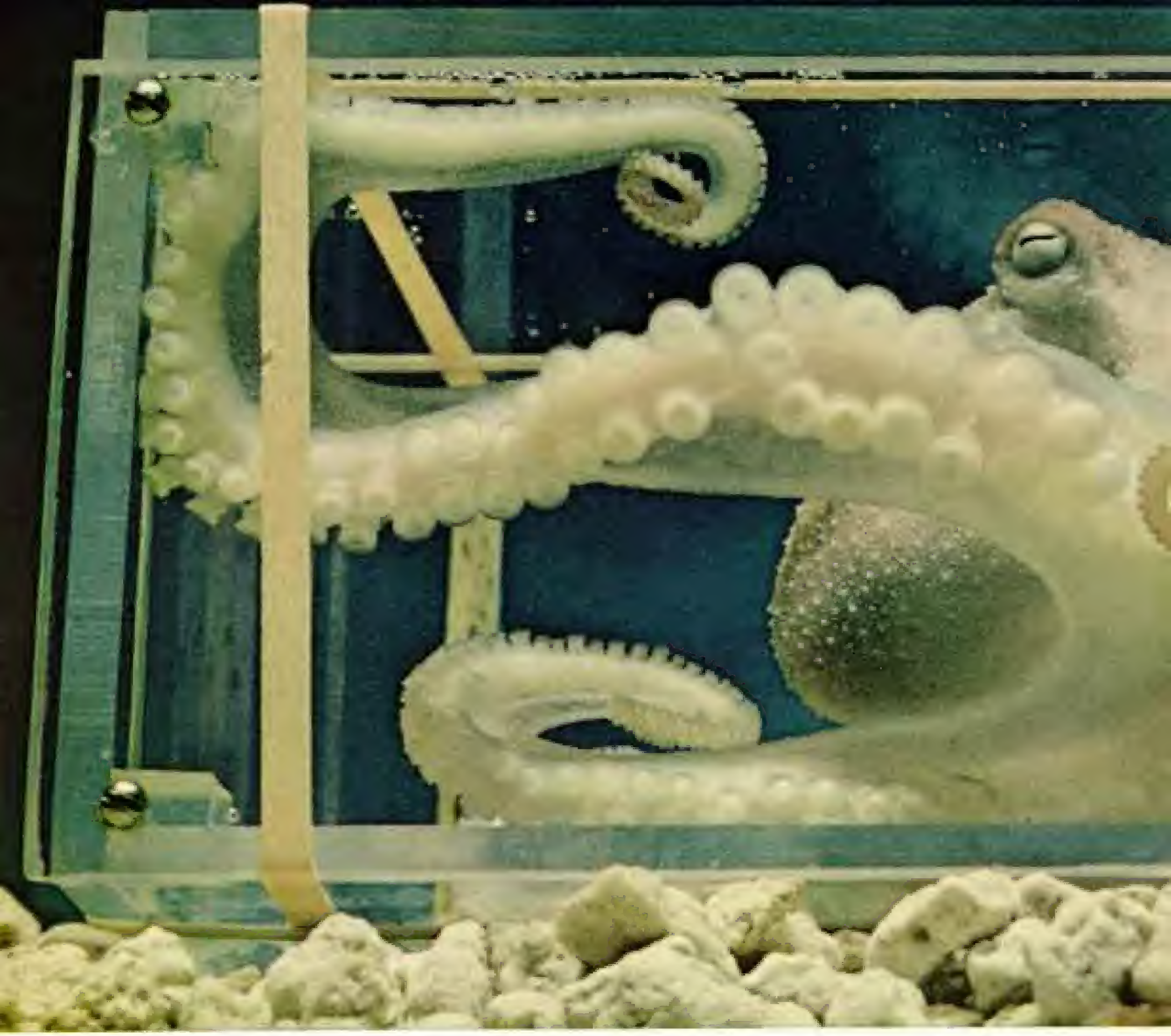
Babies Hatch for a Quick Getaway

One morning I was diving with a group of students a hundred yards off Soldier Key. Muffled by the water, a shout reached my ears. Turning, I saw one of the students excitedly pointing to the bottom.

I gave a quick flip, shot past a clump of waving purple sea feathers, and glided over to his side. He motioned toward a large female octopus crouched on a coral slab. She stared at me with unblinking eyes as she guarded a clutch of eggs that lay before her.

Tentatively, I stretched out my hand toward the eggs. The octopus reared up threateningly. Her body flushed from greenish to reddish and then paled. Two long arms shot out and pushed at my hand.

I wanted those eggs for studies of embryo development, but I hesitated to force the mother away with my bare hands. An



Undersea escape artist, a 15-inch *briareus* named Billie squeezes through a half-inch hole (**above**) in the side of a plastic-box prison designed by photographer Sisson. Rubber bands secure the lid in this University of Miami experiment.

Normally, one arm would fill the escape hole, but Billie compresses herself, thrusting her arms through one after another. Like a gear chain, each sucker in turn grasps the edge of the hole, pulling the arm farther out (**left**). With all eight arms outside, Billie slides her head through, distorting her eyes (**right**). Twenty minutes after the start, her viscera-filled mantle, largest part of any octopus, popped out like a champagne cork. After this fantastic exhibition of elasticity, Billie was allowed to rest before staging another escape. Her record time after ten exits was 1½ minutes, start to finish.

Hunter in disguise: Wrinkled, mottled skin temporarily mimics a tank's coral environment as a Hawaiian *Octopus cyanea* lies in wait for a meal.

Living asterisk pins a crab to an aquarium's glass floor and sucks it clean. The creature's flesh has been

octopus bite from the beak hidden in the mouth can be poisonous. I made another advance and again was fended off.

Would a small pry bar help? When the animal's arms touched the bare metal, she pulled back and looked at me as if weighing the problem. To my amazement she then began to break open her eggs.

With arms doubled back, she brushed the capsules with her "elbows." At the touch, each delicate membrane split open. Out shot half-inch-long baby octopuses. Each youngster squirted a small cloud of black ink and vanished into the turtle grass. When the last of her released babies had escaped, the mother slid over the side of the coral head and glided away.

Carefully, I collected the remains of her clutch. Back in the laboratory I counted the capsules of 130 eggs. Only three still held

BLUE-RINGED OCTOPUS, LIFE-SIZE (SHOWN) AND 4× (INSETS), DRAWN FROM LIFE BY MARY BUILDER AND DEBORAH BRANNON. INSET DETAILS ABOVE, BY ROBERT F. BEHLER © N.G.S.

partly liquefied by the octopus's paralyzing saliva. The pistonlike center of each sucker moves independently, creating a grip so tenacious that an octopus yanked from a rock often leaves some disks behind. The umbrella-shaped web between the arms helps the animal enfold its prey.

young octopuses. Was this spectacular defense of her babies just mother instinct, or had the octopus shown true intelligence in saving her young ones? I believe it was intelligence.

Experienced in escaping enemies, octopuses also combine wits and agility to make human jailers look foolish. An octopus can pour its boneless body through unbelievably small apertures. Its best method of escape from that nemesis, the moray eel, is to dart into the nearest hole and hope it is too small for the eel to follow.

In our laboratory, I've often had octopuses flee their tanks, especially at night. Even when tops are fastened securely, they slip through cracks much too thin to allow egress—or so we think! Octopuses have escaped from covered tin cans, securely tied wooden boxes—even from steel strongboxes.

Bob Sisson, whose superb photographs illustrate this article, had listened to such stories with some skepticism. To find out once and for all, he designed a clear plastic box with a removable lid held on by rubber bands. In the middle of one side he bored and smoothed a half-inch hole.

Bob placed Billie, his favorite octopus, in the box, and placed box and occupant in a 30-gallon aquarium.

Billie S-q-u-e-e-z-e-s Through

Billie's body was about tennis-ball size, her arm spread measured more than a foot. It was instantly apparent that she didn't like that plastic prison. She explored the hole with one arm, tried shoving several limbs through it, and then sat back to reconsider.

I was in my office when Bob called on the phone. "She went through it," announced Bob, an edge of pride in his voice. "Come on over and we'll try her again."

I wouldn't believe it if I hadn't seen it. Billie, back in the box, sat for a moment, then ran a tentative arm through the hole. She moved forward and shoved a second arm through (pages 788-9). Another followed, then another until all eight were outside.

Now came the puzzler. What would she do with her eyes? I soon found out. They were pushed through together, slanted and distorted from being squeezed. With a mighty tug the head plopped through. Only the body still hung inside the hole.

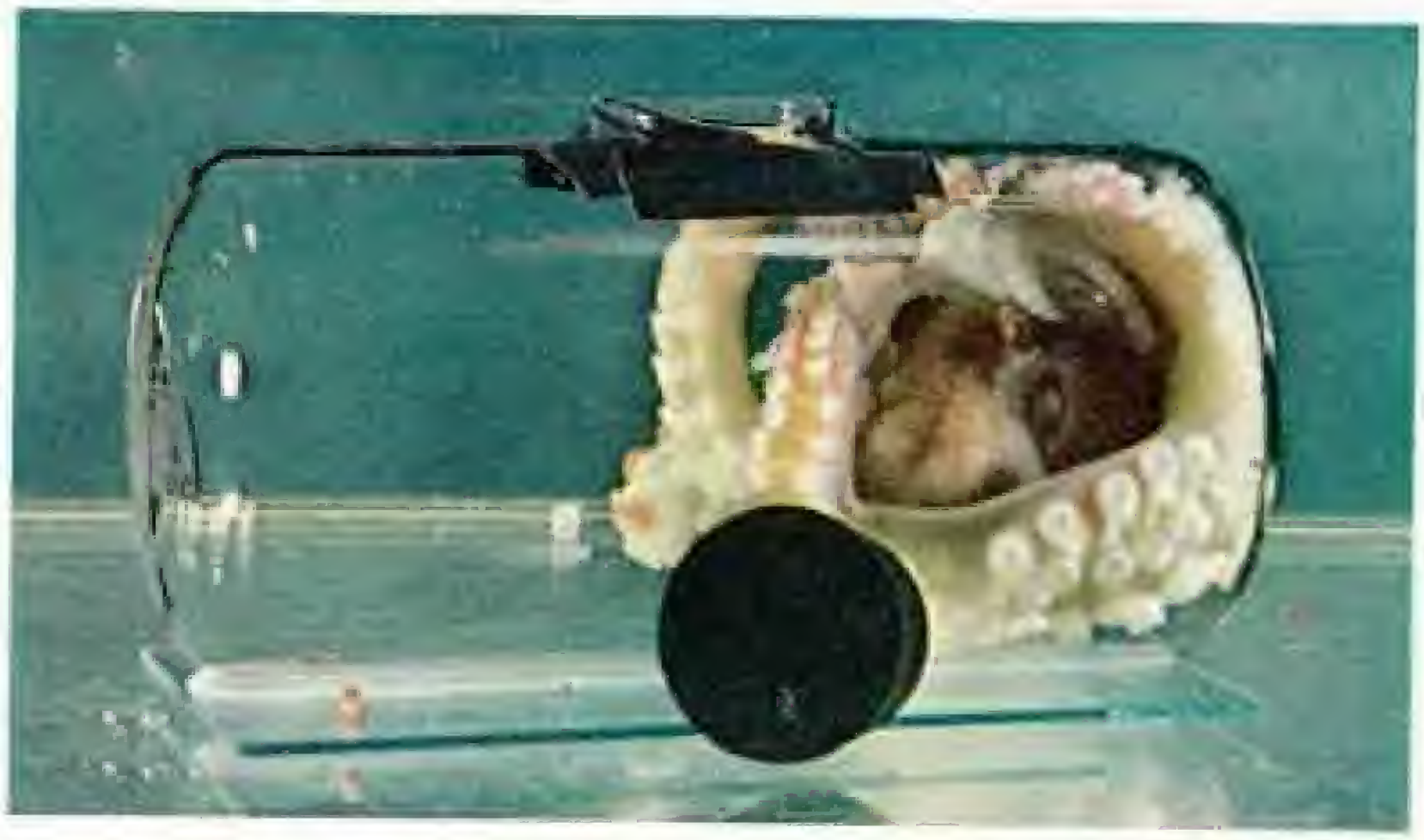
Both of us burst out laughing at the next move. The octopus gave a hitch here, a hitch there. Then, with a final yank, she popped out and made for the familiar corner of the tank. The first escape had taken about twenty minutes. By week's end Billie could do it in a minute and a half.

Over the years I have spent studying octopuses, such behavior has never failed to fill me with admiration and appreciation of their varied talents. But there is no doubt that the animals arouse fear in some people. I often receive letters asking me about the dangers of octopus attack, or clippings about long-armed "sea monsters" that assault divers. One writer illustrated an article with a photograph of the very octopus that nearly killed

(Continued on page 797)

Streamlined as a cigar, an octopus prepares to jet off (**left**). *Octopus dofleini* can also glide by flattening its mantle into a broad delta of flesh.

Evading death's jaws, *Octopus cyanea* turns red-brown as it jets from a lunging moray eel (**above**). Another fleeing *cyanea* darkens, then squirts a dense octopus-size blob of ink and mucus at its archenemy (**below**). As the moray attacks this inky fake, its prey, now blanched and pocked to match the corals of its Pacific home, crawls off to the right. Octopuses employ other escape tricks; they may spread a smoke-screen of mucus-free ink, or dart into a rocky hole too small for toothy pursuers.



Popping a cork for lunch, a female *briareus* named Lee demonstrates the ingenuity of octopuses, which join with squids in having the most complex brains of all invertebrates. Laboratory raised from the clutch on page 783, Lee became the first octopus trained to open a bottle.

Enticed by a shrimp, Lee snakes an exploratory arm around the cork (**left**), then drapes herself over the plug, grasps it with the bases of two arms, and slowly rocks it out (**top**). She then reached in for the snack.

Lee often crawled inside the 8½-inch-long bottle as photographer Sisson tried to rebait it (**above**), almost as if to say, "No tricks this time. Now that I'm in your silly jar, let's have the food!"

Mr. Sisson, who designed the jar, put in a shrimp, and first offered the container to Lee without a cork. Temporarily baffled by the clear glass, Lee soon learned that the hole was her only entrance. The photographer gradually trained her to remove the cork by putting it askew atop the hole, and then in it. Eventually the octopus learned to remove the cork after it had been pressed tight, setting a ten-minute record.

him. Close scrutiny proved it to be a rubber octopus used in a Hollywood film!

The largest octopus of record measured 28 feet from arm tip to arm tip, a wide reach for a body that was hardly as big as a football. Undoubtedly, one of the large heavy-bodied octopuses could be dangerous, especially if surprised and cornered.

Though rarely inflicted on man, an octopus's bite can wound painfully. A duct within the animal's mouth is served by a set of glands that in most cephalopods secrete a toxin with which they kill or paralyze their prey.

Florida's common octopus can give a troublesome stinging bite that causes inflammation and numbness. Along the coasts of Australia, however, lives a small octopus that may be the most beautiful—and most deadly—member of its family (below). Iridescent markings adorning its body, head, and arms give it the name blue-ringed octopus.

Octopus maculosus is an attractive menace. Unwary strollers in the surf sometimes pick it up. If it bites the hand of its admirer, the result is usually fatal. Some scientists consider the little blue-ringed octopus the most poisonous creature in the sea.

Early this year, Thomas Leo Roach was walking through beach foam at Shoalhaven Heads, New South Wales, Australia, when he cried out, "I've been bitten." Despite resuscitation efforts, Mr. Roach was dead within five minutes, a puncture mark on his left big toe the almost positive evidence of the bite of a blue-ringed octopus.

Tender Morsel Belies Rubbery Look

Fortunately octopus bites man far less frequently—and with much less gusto—than man bites octopus. For cephalopods can be delicious eating.

One day I took a guest to lunch at the Madrid, a small restaurant in Miami. I ordered the meal in Spanish. When the trencher of pale meat in wine sauce was set on the table, my guest eyed it questioningly.

Shipwright and voyager, the female paper nautilus (**left**) builds a thin milk-white shell about her chromatophore-spotted body. *Argonauta argo*'s two upper arms broaden into membranes that secrete and mold calcium carbonate into the combination home and nest. As she jets slowly along just below the surface, plankton touching the membranes is caught by her other arms, which then sweep it to her open mouth.

Deadly treasure of Australian shallows, a blue-ringed octopus (**above**) packs one of nature's most powerful poisons. Aroused, its body flashes peacock-blue markings, hence the name. Bathers attracted by its brilliance and diminutive size occasionally pick one up. If bitten, they can die within minutes. Fortunately, like most of its kin, *Octopus maculosus* usually flees, and so only rarely proves dangerous to man.

End of the line for an octopus near Campeche, on Mexico's Yucatán Peninsula. This fisherman lures his quarry with live crabs, hauls them up when he feels a tug, and bites his eight-armed catch between the eyes for an instant kill. In autumn tons of the creatures are harvested daily and shipped to Mexico City. Mexicans sometimes beat octopus flesh to make it tender, then serve it boiled in a salad, or stew it in its own ink, with wine and onions. The flavor? A tasty something between chicken and scallops, says the photographer.

"It's octopus," I said, to resolve his doubt.

My friend bit into a sucker-studded piece of arm—and looked up in surprise.

"But it's tender! I thought octopus was supposed to be tough."

The calumny continues to be spread that octopus is rubbery and nearly inedible. This is true only if it is improperly cooked.

One of the most delectable dishes ever put before me was *pulpo a la vinagreta*, marinated octopus, served in a little seafood restaurant overlooking the harbor at Santa Cruz de Tenerife in the Canary Islands. And my mouth waters still, remembering Mexico City's Circulo del Sureste—a Yucatecan restaurant—and its octopus served with yellow rice, pimientos, and sliced plantains.

The Yucatán Peninsula of Mexico supports the only major octopus fishery in the Americas. Fishermen draw bright lures across the sea bottom to attract the animals, or snag them from their lairs with hooks (left). During October and November, landings total as much as 15 tons a day, most of it hauled by refrigerator truck to Mexico City markets.

Other major fisheries, often using large otter trawls, are located in the Mediterranean Sea, along the northwestern coast of Africa, and in Japan. Octopus brings as much as $500 a ton. Demand far exceeds present supply.

Lee Learns Fast for a Shrimp Dinner

Though easily caught in fisheries, octopuses in captivity exhibit incredible sagacity. Dr. J. Z. Young of the Naples Zoological Station in Italy recently published an atlas of the brain and nervous system of the common octopus, following up an earlier book in which he compared the octopus brain and its sensory system to a complex computer.

To test and portray in pictures the amazing learning ability of an octopus, Bob Sisson took up my challenge to devise an octopus-training exercise.

The laboratory's glassblower made a jar to Bob's design, and we placed it in an aquarium where Bob had been feeding shrimp to a female octopus named Lee. While Lee watched, Bob put a live shrimp in the jar. The octopus went for it immediately, but had trouble finding the round opening in the clear glass. Bob ringed the hole with black tape and also affixed strips of tape from the aperture to each end of the bottle to allow the octopus to relate to something visible.

At the next try, Lee insinuated her arms into the jar, grabbed the shrimp, and carried it to the side of the aquarium. There she sucked it clean.

Another feeding, then another. They went like clockwork day after day.

One evening Bob called me at home.

"Gil, you've just got to come over and see the show," he said. "This morning, when I went to the storage tank for shrimp to feed Lee, she popped into the jar and sat there waiting for it. I need as many arms as she has to keep her out of the jar and get the shrimp inside."

Stranger Brings on Stage Fright

At morning feeding time I was in Bob's lab—but Lee wouldn't perform!

"I can't understand what's wrong," Bob muttered. "She always takes the shrimp in less than ten minutes. Do you think she actually recognizes you as a stranger?"

"There's one way to find out."

I got up and stepped behind the blackout curtain through which Bob aims his camera to avoid reflections on the tank. I opened the laboratory door and slammed it. Then I tiptoed back to a slit in the curtain and looked into the aquarium. Lee was changing colors rapidly, her eyes raised and turned toward the shrimp. Within moments she scuttled across the tank, grabbed the bait, and returned to her lair.

After five days of letting the octopus take her food from the jar, Bob placed a shrimp in it again, but now balanced a heavy rubber stopper across the edge of the opening. Lee never hesitated; she knocked the stopper off and seized the shrimp.

Gradually over the next five days Bob moved the cork to cover more of the hole, finally setting it loosely in the opening. Lee had no trouble pushing aside the loose stopper.

Then came the big event: Bob jammed the stopper firmly into the opening in the jar. What would Lee do? Without hesitation she flowed over the stopper, gripped it with her suckers—somewhat as a man might lift a heavy object—pulled it out, threw it aside, and reached for the shrimp. Over and over Bob plugged the jar and Lee unstoppered it (pages 794-5).

Intelligence? Certainly a kind of intelligence. Octopuses may never be trained like porpoises to carry messages or act as trained helpers to undersea divers, but these soft-bodied, bizarre-looking creatures have been wondrously endowed to survive amid the dangers of the deep. □

Return to Changing China

ARTICLE AND
PHOTOGRAPHS BY
AUDREY TOPPING

Until recently, few reporters have been permitted more than brief, carefully guided visits to the world's most populous nation. One of the first to move widely in China was Audrey Topping. Her perceptive account reflects both two years of experience in pre-Communist China as a college student and the viewpoint of a Canadian, whose country has traditionally maintained a tolerant stance toward the land of Mao Tse-tung and Chou En-lai.
—THE EDITOR

EVERY MORNING for a week my sister Sylvia woke up to exclaim with a look of utter amazement, "Well, here we are in China!" She knew, and I knew, that she sounded naive, but I think I would have exclaimed in the same way, except that Sylvia always woke up first.

It was hard to comprehend that we were actually back in China—to us almost our ancestral land, for our grandparents had lived much of their lives here and our father had been born here. Sylvia had spent her early childhood in China, before I was born, and I had lived here in my teens. We were both eager to compare the new and old Chinas.

We found at once that the new China is highly visible—even palpable. The air seemed to bear an electric charge. There was obviously a job to do, and the Chinese moved with a sure step, vigor, and a look of determination to get it done. They were the first to admit there is still a long way to go and no time to waste. Portraits of Mao Tse-tung were everywhere, and the "little red book" of his sayings was in every pocket, from nursery-school toddlers' to army soldiers'.

But old Cathay, that exotic, enchanting land, was still around, too. The gold-tiled roofs of the imperial palaces glowed in the Peking sun. The Great Wall gamboled like a dragon's back over the northern hills (pages 810-11). Thousands of Buddhist pagodas and Confucian temples spotted the landscape.

Gone, however, but not grieved for, were the camel caravans laden with tribute silks and treasures for the emperors; gone too, were the mandarins, embroidered robes, bound feet, terror gangs, beggars, robbers, and opium dens.

Sylvia and I were traveling with our father, Chester Ronning, who had been a Canadian diplomat in China. Invited by his old friend Premier Chou En-lai, he was making his first trip back in twenty years. Our main purpose was to visit Fanch'eng in Hupeh Province to pay our respects to the memory of Dad's mother, Hannah Rorem Ronning. She,

The final authority: Soldiers of the People's Liberation Army turn to the words of Chinese leader Mao Tse-tung during a sight-seeing visit to Peking. Everywhere the author traveled, she saw Mao's "little red book" in use. Sometimes its text rails against U. S. "imperialism," but other sections carry gentler messages. "Of all the things in the world . . . people are the most precious."

A TEN-WEEK, 7,000-MILE TOUR OF MAINLAND CHINA

BY TRAIN, plane, car, and boat, the author saw much of the eastern third of the People's Republic of China, where nine-tenths of its population lives. She traveled to China with her father, who was born there and returned as a Canadian diplomat in the 1940's. The Chinese press billed Mr. Ronning as a "Canadian friendly personage."

Communist China forms the heartland of eastern Asia, walled off by mountains, plateaus, and deserts. Two great rivers—the Yangtze and Huang, or Yellow—flow out of the western highlands, and in their fertile valleys civilization has flourished for more than 4,000 years. The Chinese gave the world such creations as woven silk, porcelain, gunpowder, paper, printing by wood block, the compass, the wheelbarrow, and the philosophies of Lao-tzu, Confucius —and Mao Tse-tung.

During their 22 years of power, Chinese revolutionaries have brought drastic change, collectivizing agriculture and industrializing a nation slow in developing its natural resources. Most of China still lives by farming.

AREA: 3,691,500 sq mi **POPULATION:** 772,900,000 (1971 est.) **LANGUAGES:** Mandarin the official national tongue, spoken by 70 percent, many regional dialects. **ECONOMY:** Rice, wheat, fruit, cotton, hemp, soybeans, tea, tobacco, and sugarcane important crops. Coal, iron ore, tungsten, antimony, copper are mined. Major industries include iron and steel, machinery, textiles, chemicals. **LARGEST CITIES:** Shanghai, Peking (capital), Tientsin, Shenyang. **CLIMATE:** In north, warm humid summers and long cold winters. Extreme south is tropical. Peking's average daily high in July is 89° F., average January low, 15° F.

U. S. S. R.

Lake Baykal

MONGOLIA

• Ulan Bator

Amur

Sungari

MANCHURIA

• Harbin (Haerhpin)

• Vladivostok

LIAONING

Shenyang (Mukden)

• Fushun

Changchun

Sea of Japan

P'yongyang

KOREA

• Seoul

JAPAN

• Tokyo

Alashan Desert

Hsilinhot'e

Paot'ou

PEKING

T'angshan

Dairen (Lüta)

Tientsin (Tientsin)

Po Hai (Gulf of Chihli)

Yinch'uan

T'aiyüan

HOPEH

Wuwei (Liangchow)

Tsingtao (Ch'ingtao)

Yellow Sea

Lanchow (Lanchou)

Yenan

Chengchow

Hsüchou

SHENSI (Shensi)

Sian (Hsi'an)

Nanking (Nanching)

Shanghai

East China Sea

Hangchow (Hangchou)

Hankow (Hankou)

Wenchow

Changsha

HUPEH

KIANGSI

Hengyang

Foochow (Foochou)

Kweiyang

Kunming

Luichow

KWANGTUNG

Canton (Kuangchou)

Nanning

HONG KONG (U.K.)

MACAO (PORTUGAL)

*AUTHOR'S ROUTE by rail, air, and road (shown in red) begins at Hong Kong–China border.

Taipei

TAIWAN

Only 100 miles from the mainland, Taiwan harbors the government of the Republic of China whose president, Chiang Kai-shek, (left) is the island with many han a million followers in exile.

Hanoi

Luang Prabang

Gulf of Tonkin

Haifong

Haikou

LAOS

• Vientiane

VIET NAM

Mekong

THAILAND

CAMBODIA

Phnom Penh

• Saigon

South China Sea

PACIFIC OCEAN

Manila

Quezon City

PHILIPPINES

like her husband, Halvor Ronning, was a Lutheran missionary and teacher. She died and was buried in Fanch'eng in 1907 at the age of 36, leaving her husband and seven young children.

The prospect of revisiting Fanch'eng was also exciting because no foreigners, to our knowledge, had been in the area since the Communist Revolution. For a month we could explore a broad segment of China. As things turned out, I actually stayed two and a half months and saw much more of China than I had dreamed possible.

Smiling Welcome at the Red Border

We began our trip by train from Hong Kong. At Lo Wu on the border, we got off and carried our bags across a railway bridge into Communist China. Red flags over the customs buildings were flying full in the wind. Two People's Liberation Army soldiers with bayoneted rifles looked at us curiously.

"*Ni hao*—hello," I ventured.

Their faces broke into wide smiles. "Ni hao," they answered and pointed the way to the customs hall. A large color portrait of Chairman Mao hung outside the door and a huge white statue of him stood inside.

We were met by a representative from the Chinese People's Association for Friendship with Foreign Countries, Chu Chiu-sheng, assigned to accompany Dad on his travels. After a gourmet Chinese lunch, we boarded an immaculate air-conditioned train for Canton, sank into reclining seats, and were served hot jasmine tea in rice-grain china cups.

My father, who last saw China in 1951, was amazed. "I remember," he said, "when Chinese passenger trains were more like cattle cars, and sanitary conditions were unspeakable."

As we rolled through Kwangtung Province toward Canton, Dad was surprised to learn that the girls serving tea, as well as the passengers from the south, all spoke Mandarin, rather than Cantonese. In former days, the only southerners who knew Mandarin were the wealthy and well educated. When Dad talked with one of the attendants, everyone stared at this gray-haired giant of a man who spoke their tongue like a native (which indeed he was); then they began to exchange jokes and old Chinese riddles with him.

Thus, all through the journey, Dad eased our reception among ordinary Chinese. He was calling on firsthand experiences in China

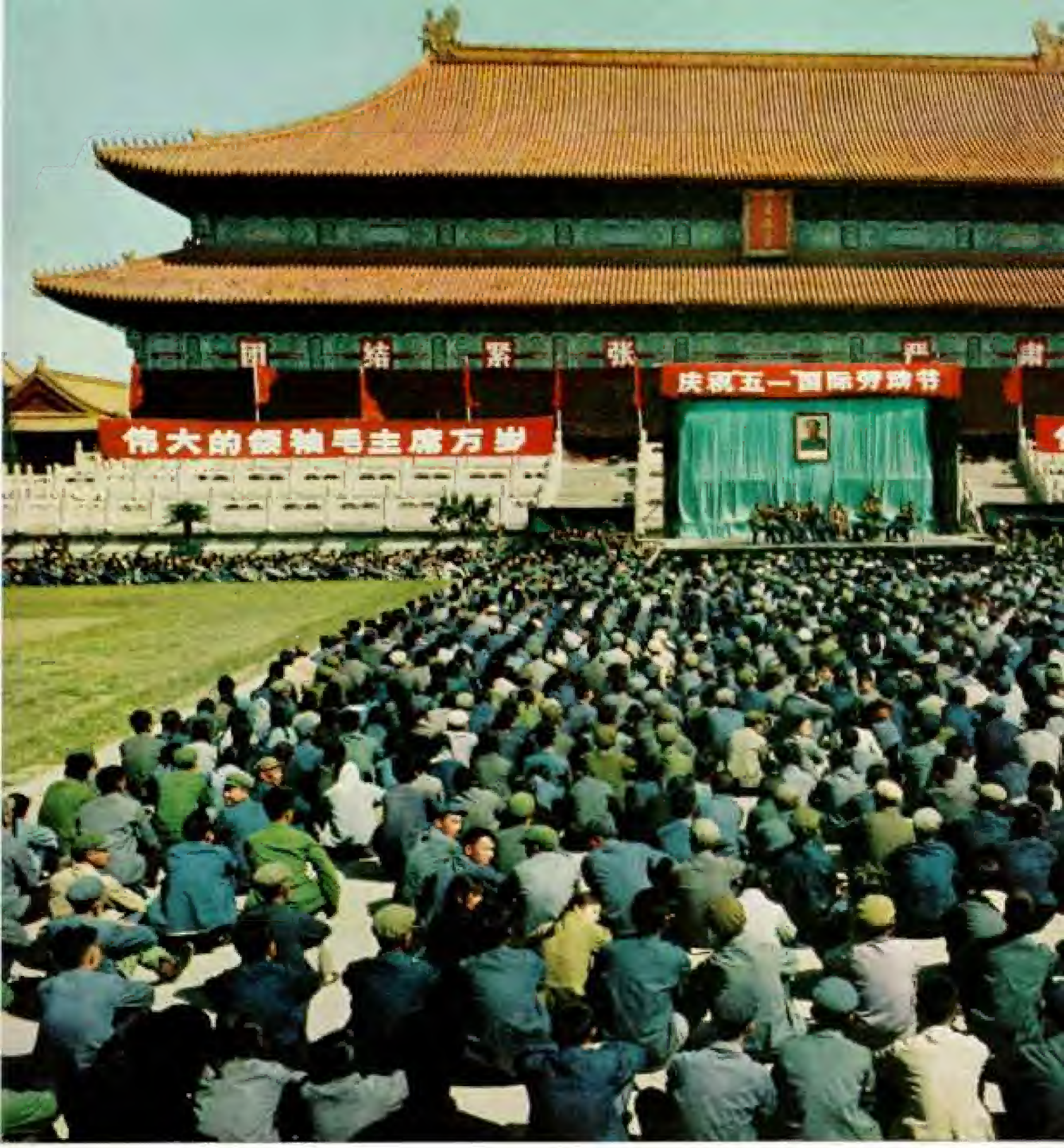
Schoolgirls in holiday dress swing into action during a tumultuous Peking welcome for Rumanian President Nicolae Ceaușescu. Half a million Chinese gathered to see his cavalcade roll down the city's main boulevard, Ch'ang-an, or "Eternal Peace." Beating drums, clanging cymbals, jumping, dancing, and waving banners, they shouted "Welcome! Welcome!" The bright-patterned garb of these girls contradicts the Western impression that everyone in modern China wears drab pajamalike garments.

from the 1890's to the 1950's. He was born in Fanch'eng in 1894, during the reign of the Manchus. When he was 12, he left for the United States and later went to Canada, where he married Inga Horte, my mother, then brought her and an infant daughter—Sylvia—back to China.

Between 1922 and 1927, when the warlords dominated the country, Dad taught school in Fanch'eng and Peking, until chaotic conditions forced him to return to Canada. He went back to China in 1945 as a Canadian diplomat, during the civil war period when power passed from Chiang Kai-shek to Mao Tse-tung. Dad advocated recognition of the new government, but when the Korean war ended that possibility, he closed the embassy and returned to Canada.

Change Visible in Every Direction

As our train sped toward Canton, Sylvia and I were enchanted by the countryside. The barefoot peasants plowing fields behind shiny water buffaloes were still there, and so were lotus-filled ponds and distant pagodas. But a new setting frames these scenes from eternal



Revolutionary music entertains a holiday crowd in a people's cultural park within the confines of the old Imperial City. Once the scene of solemn ceremonies staged by the Chinese emperor and his court, the five-century-old pagoda-roofed Temple of Ancestors has been restored and is now open for the enjoyment of everyone.

All morning long last May Day, here and on ten other temporary stages set up in the park, professional troupes presented excerpts from the five operas, two ballets, and one concert work that comprise China's "modern revolutionary dramas." Sponsored by Mao's wife Chiang Ch'ing, the dramas put art to work as an educational tool in a government effort to keep alive the spirit that drove revolutionaries to establish Communism in China.

Life-size figures (**right**) in a museum within the Forbidden City dwell on the evils of life before the Communist Revolution. Here a grandmother, at left, clutched by the lackey of a greedy landlord, thrusts a hungry baby toward its mother, who is being dragged off by another lackey to nurse the landlord's child. After the Communists took power in 1949, uncounted thousands of landlords were condemned at mass trials and executed.

Small-shoe adjustment interrupts a family outing near Peking's Temple of Heaven. The father is a soldier, but he does not necessarily live in a camp, apart from his wife and children. Many in the People's Militia are assigned to civilian tasks and remain at home, reporting for duty in the morning like other jobholders. Since both parents usually work, leaving child care to grandparents or day centers, most Sundays are devoted to family excursions. In a country long plagued with overpopulation, the government actively campaigns for birth control and late marriages. A couple with two children is now considered the ideal family, the author was told.

China. The fields are big compared to the small private plots of former days. The clusters of mud-and-straw huts where peasants once lived with their chickens and pigs have in many places given way to tile-roofed brick houses, with detached chicken coops and pigsties. Communist slogans in large red characters cover walls and houses: "Down with U.S. imperialism," "Long live our great leader Chairman Mao," or, simply, "Be frugal, diligent, and honest."

We knew that these changes on the land had not been accomplished without convulsive changes in the society. The new rulers took farms from the landlords and gave them to the tenants. In mass trials, vast numbers of landlords and others deemed counter-revolutionaries were executed. When the communes were first organized in 1958, the forced pace of collectivization caused dislocations, food shortages, and some peasant resistance. But gradually the collective system took hold and began to prosper.

When we got off the train in Canton, we were surrounded by curious but friendly Chinese, all staring at us. They responded immediately to our smiles and hellos. They were all pictures of health and carried themselves with dignity. Dad remarked that this was a pleasant change from the old days, when we would have been assailed by hungry, ragged beggars.

Memories Re-create a Vanished World

I knew exactly what he meant, remembering my own introduction to China. It was New Year's Eve, 1946, and my mother, my sisters Meme and Kjeryn, my brother Harmon, and I arrived by ship in Shanghai to join my father, who had gone ahead to his diplomatic post a year earlier.

Dad met us at the gangplank and guided us through the swarms of hawkers and children begging for coins with outstretched hands. One coolie grabbed Kjeryn's handbag from her shoulder and fled down the street. In a flash, Dad was racing after him, followed by little brother Harmon yelling, "Stop, thief!" Soon the whole family was in hot pursuit. The robber took one quick look backward. The sight of these foreign devils after him was too much. He flung the bag into the air and disappeared in the crowd.

Our family piled into rickshas, and the coolies pulled us through cluttered streets toward the Cathay Hotel. A slew of beggars, some with open sores on their faces, followed us. When Kjeryn, then 12, had no more coins for them, one spat full in her face.

But when we walked into one of Shanghai's most luxurious hotels, we stepped into a different world. Chinese women in brocade gowns and smartly suited Chinese businessmen and officials mingled with the international set. Numerous servants escorted us through red-carpeted corridors to our suite.

For the next two years we lived in Nanking among the foreign diplomats, and I attended Nanking University. The civil war was wracking the countryside around us, and most of my fellow students were in sympathy with the Communists. Riding to school in a ricksha each morning, I often passed corpses of people who had died in the night—from starvation, disease, or accident. Bodies sometimes lay unclaimed for days. In the evening I would attend elaborate dinners and diplomatic balls. Contrasting the lives of the very poor and the very rich, I sensed that the revolution in China had been inevitable.

Canton Moves by Muscle Power

Now, in Canton, surrounded by the new Chinese, I thought that, instead of comparing the standard of living in China today with that of the industrialized United States or Europe, we should rather weigh modern China against China's backward past.

Industrialization is increasing, but slowly. The contrast with Hong Kong's automobile-choked streets was startling.* Canton's wide, tree-lined avenues were full of people walking, riding bicycles, and pushing carts, but there were few vehicles apart from a scattering of trucks, taxis, official cars, and buses. Man-pulled rickshas have been banned, but there are still a few pedicabs, which look like rickshas pulled by bicycles. All over the city are large political posters, portraits of Mao, and signs urging the people to keep the city clean, deposit refuse in the proper container, and refrain from spitting on the street. The admonitions seem to work, for the streets are impressively clean.

From Canton we flew to Peking in a Russian-made Ilyushin 18, just in time for May Day. That morning dawned warm and sunny, and Ch'ang-an, the city's main street, filled

*Joseph Judge described present-day Hong Kong in the October 1971 GEOGRAPHIC.

with thousands of people, marching or strolling to a people's park in the old Imperial City. We followed the crowds across a marble bridge into the gardens, where 11 outdoor theaters had been set up (pages 806–7). Each presented excerpts from the Eight Revolutionary Exemplary Works (five operas, two ballets, and one concert) produced under the sponsorship of Mao's wife Chiang Ch'ing. A hundred thousand people had come to profit from the new culture.

Pollution Not Yet a Major Problem

That evening we were informed that Chou En-lai would like to see us, and so we proceeded to the Great Hall of the People, situated on T'ien-an Men Square, Peking's main plaza.* The air was vibrating with music and the hubbub of a huge throng assembled for the May Day fireworks.

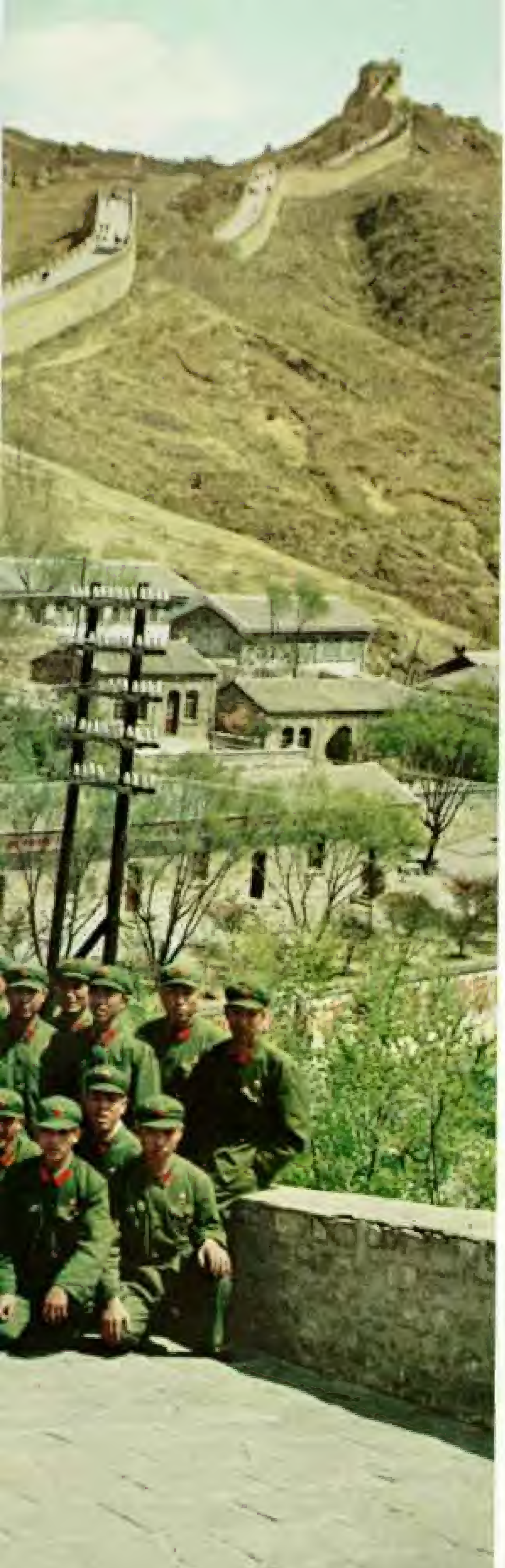
We walked through the open doors of the Great Hall to meet the Premier. He wore a neat gray Chinese tunic suit with a small Mao button reading "Serve the People." His eyes sparkled as he grasped my father's hand and welcomed him back to China. Then, after introductions, we went in to tea (below).

While the Premier and Dad sipped and chatted, I sat transfixed, staring at this living legend. It seemed incredible that this suave, handsome, almost delicate-looking man of 73 had been one of the leaders of the torturous Long March that saved the hard-pressed Red Army to fight again another day. The vanguard, about 90,000 men of the First Front Army, left Kiangsi Province in the south in 1934. After 368 days, 18 mountain ranges, hundreds of skirmishes, and untold difficulties, 7,000 arrived in Shensi, in the north, where they were joined by other Red forces (map, pages 802–3).

The Premier and Dad, whom Chou often referred to as his *lao p'eng-yu* (old friend), reminisced about their various meetings in

*See "The City They Call Red China's Showcase," by Frank Shor, and Brian Brake's "Peking: A Pictorial Record," GEOGRAPHIC, August 1960, and "This Is The China I Saw," by Jarmo Bosch, November 1964.

Old friends meet: China's Premier Chou En-lai, at right, welcomes the author's father, Canadian diplomat Chester Ronning, whose fluent Chinese made the interpreter unnecessary. The two statesmen first met in 1945 when Mr. Ronning was stationed in China. Jokingly, the Premier accused his 76-year-old guest of having retired "too early." "I know you are three years older than I," said Chou with a smile, "but we are exceptions to the rule. Take me, for instance. Now why should I retire?"



former days. Then Dad said that if *his* lao p'eng-yu would come to Canada, he would personally cook Chou a Chinese meal there.

Chou said he would like that, but asked, "Do you still have fish to eat in your area, or have they died as a result of pollution?"

Dad assured him that there were still plenty of fish, but added that pollution was a big problem. Chou showed much concern, and went on, "The greatest pollution has taken place in the most advanced industrial countries. Developing countries, like China, not as far advanced industrially, can benefit from the experiences of those countries and avoid similar problems."

I thought of this remark of the Premier's later, when I was struck time and again by the clean air in most Chinese cities. The lack of pollution, I think, is mostly due to the scarcity of cars with their exhaust fumes.

Confidence Flows From "People Power"

The Premier invited Dad to return another day for dinner, then took him off to review the fireworks from a rostrum atop the Gate of Heavenly Peace. In the course of the festivities, Dad saw Chairman Mao make a ten-minute appearance and disappear.

Sylvia and I went to the stands near the gate. The fireworks were stupendous—and so was the ocean of humanity viewing them.

Later Dad told us he had been "wild with excitement," not only at the fireworks display, but also at the sight of the hundreds of thousands of people in T'ien-an Men Square. In them, he said, he could feel the presence of a new power.

This is a power no visitor to modern China can fail to discern. People power. Nearly eight hundred million people all thinking the same thoughts, reading the same books, talking about the same things, wearing similar clothes, living in a similar style.

There is little room for tolerance or dissent. "Armed with Mao's thought," they believe that nothing is impossible, that they can move

(Continued on page 816)

Mustering at battlements of old, soldiers-turned-tourists gather atop a section of the Great Wall restored with army labor. Chinese from every province pour in by the truckload to marvel at the colossal barricade, here only 35 miles from the capital. Built 22 centuries ago to hold off barbarian invaders from the north, it writhes 1,500 miles across mountain and desert.

Supper at bedside ends a day of farm work and Mao-thought study for two community leaders undergoing ideological training at a Peking school. The program, designed to give intellectuals the labor experience of common workers, began in the late 1960's during the Great Proletarian Cultural Revolution. The movement aims to strengthen the Communist ideal of a classless society. When the author asked, "How long is the course?" one woman replied, "It depends on our attitude."

Practitioner of an ancient art, an army specialist in acupuncture treats a deaf-mute. Inserting needles at specific nerve points—here in the wrist—acupuncturists claim to cure many cases of deafness caused in childhood. Developed thousands of years ago but still scientifically unexplained, acupuncture is used throughout China as a means of anesthesia and as a treatment for afflictions ranging from appendicitis to migraine.

Tapped for higher education, military men attend a mathematics lecture at Peking's Tsinghua University, most wear buttons bearing Mao's profile. In the tumult of the Cultural Revolution, Mao closed the nation's secondary schools and universities. Only last year did Tsinghua reopen to an enrollment of 2,800 students.

In the kaleidoscope of Chinese life, the author found these faces. The pipe-smoking young man (**below**) called himself "an ordinary peasant"; to Chinese Communists, the once degrading word "peasant" now is the proud designation of one who farms. He and his wife—a pediatrician—their two children and a grandmother are members of a rural commune near Peking. They love music; both parents play the lute and sing.

Skin crinkled with age, this 85-year-old man (**right**) lives near Yenan. "The classic Chinese regard for the elderly endures," notes the author, "but not to the fanatical extent of the past."

Girls of Hangchow, in a region noted for its lovely women (**below**), labor in a commune that produces fine green tea.

Diplomat's daughter, 17-year-old Hsiao Chou (**right**) took leave from the army to accompany the author's party to Fanch'eng. The girl's father, former Chinese Ambassador to the People's Republic of the Congo, served as escort for the journey. Asked why she joined the army, Hsiao Chou replied: "For the adventure! There are so many girls my age in the army, it's more fun than being at home."

Shaved head of a boy in Sian (**right**) retains the topknot that his parents believe will trick evil spirits into mistaking him for a girl, unworthy of being harmed.

No diaper, no laundry. Caring for a tyke while his parents work, a Fanch'eng grandmother (**opposite**) dresses him in a practical garment.

mountains with teaspoons, turn deserts into arable land, change the direction of rivers, and harness the tides. All with people power.

For the Chinese Communists, the power of what they call "collective positive thinking" is enormous. To take a single example, on one day during the building of the Yangtze River Bridge at Nanking, 50,000 soldiers and civilian volunteers pitched in to assist the 6,000 regular bridgeworkers.

Red Guards Brought a Period of Chaos

No one knows the power of the people better than Mao Tse-tung. In 1958 he wrote, "Apart from their other characteristics, the outstanding thing about China's people is that they are 'poor and blank.' This may seem a bad thing, but in reality it is a good thing. Poverty gives rise to the desire for change, the desire for action, and the desire for revolution. On a blank sheet of paper free from any mark, the freshest and most beautiful characters can be written, the freshest and most beautiful pictures can be painted."

Sometimes the artist who wielded the brush encountered difficulties. In 1966 Mao summoned millions of young people known as Red Guards to a great proletarian cultural revolution—to purge the society, party, government, and schools of those he accused of returning to the "capitalist road."

The Red Guards carried out the purge too enthusiastically, often acting without close direction from Peking. Commanded to sweep away the "four olds"—old culture, old ideas, old customs, and old habits—some Red Guards attacked historical buildings and treasures and humiliated college faculty members. In the provinces thousands were killed or injured in clashes between rival Red Guard factions. By 1968 the army had to step in. Revolutionary committees were set up to administer the provinces, and Mao regained full control of the country.

Today, Mao is a revered father figure.

Many of the Chinese peasants learned to read after the Communist Revolution, and the first and probably only book many have ever owned is the little red book, *Quotations From Chairman Mao*. They study it as 19th-century evangelists studied the Bible. To Mao's wisdom they attribute their new sense of security and well-being. All over China we asked farmers and workers over 30 years of

Doorway to industrial China, smoke-shrouded Shanghai throbs as the nation's largest city and busiest port. Home of ten million people, it sprawls strategically at the mouth of the Yangtze River, funnel to China's heartland.

On a Yangtze tributary, the silt-clouded Han River, freight junks with worn bamboo-ribbed sails breast the current (**below**).

Tug-of-war with water: Brother and sister pull a junk around a bend in the Han River (**following pages**). On deck, mother shouts orders and steers, while father poles to keep the boat off the bank. Towing harnesses slip off easily should the current drag pullers backward. Foot by laborious foot, such hauling may go on for hours, even days. If the wind picks up, the two hop back aboard.

Best show on the road—a foreign visitor cutting grain (**left**)—enthralls a small-fry audience (**below**). Ambassador Ronning swings a basket-fitted scythe in a barley

age to tell us what, for them, was the most important thing Mao had done. "I never have to worry about my children. I know they will never be hungry, as I was," said a woman at a workers' settlement in Shanghai. "I have a warm house to live in. Before, I had nothing," said a bearded old shepherd on the road.

Not only the Chinese peasants believe that if the "thoughts of Mao" are studied and applied correctly, there is a solution for everything, from improving crops to curing the deaf. In a Peking school for deaf-mutes, Wang Chen-ying, a member of the school's propaganda team, told me, "Previously our doctors said that deaf-mutes were incurable, but nothing is incurable. Mao teaches us that if we understand the problems, we can master the way."

Patient Conscious During Heart Surgery

Through such indomitable thinking, the Chinese claim they have found a cure for deaf-muteness. In 1968 an army medical team began applying acupuncture, the ancient Chinese medical practice of stimulating certain nerve points with needles, to the cure of deafness (page 813).

Wang Chen-ying explained: "Chairman Mao says, 'If you want to know the taste of a pear, you must eat it yourself.' We tried needles on our own bodies to find the proper acupuncture points. We sometimes feared we would injure ourselves, but with Mao's thought 'Die for the people' in mind, we continued the experiments." Now, Wang said, after a year's treatment, 90 percent of the students at the school have a certain capacity for hearing.

"After hearing is recovered, we teach them how to speak. In little more than a year, 11 of our 238 students have been completely cured. We can thank Chairman Mao's teaching for this."

We saw startling demonstrations of acupuncture in Hankow, where we were invited to observe some major operations in which needles would be used as the sole anesthetic—another development attributed to the inspiration of Mao. We

field near Fanch'eng, his birthplace. The youngsters popped up to watch from a nearby village.

Most of rural China lives under the commune system. A single commune may consist of only a few villages or more than 200, organized in brigades. A revolutionary committee representing the army, the party, and the peasants administers each brigade.

watched both open-heart surgery and the removal of a tumor from the throat of a 54-year-old woman. It was true—the only anesthetic we saw used was acupuncture needles.

When the surgeon, Dr. Chu Yu-kuang, made the incision into the throat to remove the tumor, the fully conscious woman never twitched—which is more than I can say for the observers. Seconds after Dr. Chu tied the last suture, she sat up and ate mandarin orange sections. Then she rose unassisted from the operating table, thanked the surgeon and the two acupuncturists, and walked out.

Women machinists operate a precision metal cutter (*top*) at a shop in fast-industrializing Fanch'eng. Women enjoy pay and promotions equivalent to men's; female managers run several of China's largest textile mills.

Made in China: The 10,000-ton freighter *East Wind* rides at anchor in Shanghai harbor. Shipbuilding is a relatively new industry for China, and blueprints for future construction call for vessels of 30,000 tons—still small compared to Japanese-built behemoths of ten times that size.

waving and smiling at the amazed observers. She was not even pale.

Professor Chu Fa-tzu, head of the surgical department, explained to us that thirty minutes before the operation, two needles had been inserted into the nerve points of each wrist, numbing the tumor area. Throughout the operation, the acupuncturists kept twisting the needles; the moment it was over, they withdrew them.

For the heart surgery, in addition to the needles in the wrists, a needle was placed in each forearm. The chest was opened, a rib and some tissue removed, and the rapidly beating heart exposed. The woman patient remained fully conscious, and while the surgeon cupped her heart in his hand, she drank orange juice through a straw and smiled at observers. We almost passed out.

Professor Chu told us, "There are 500 to 800 nerve points in the body that we know we can use in acupuncture. We know the results we will get, but we cannot explain scientifically why we get them."

Leaving Hankow, we entrained for Fan-ch'eng, 300 miles up the Han as the river

Taking fun to work, students rehearse for an operetta in a bucket factory, where they share the life of workers while undergoing ideological training. Chinese delight in amateur concerts and dramas, invariably on revolutionary themes.

Dragon mouths of open furnaces breathe fire in the huge Anshan Iron and Steel Works, set amid Manchuria's vast coal and ore deposits. When the Japanese—who occupied the region for 14 years—surrendered to Soviet troops in 1945, they were put to work dismantling industrial plants for removal to the U.S.S.R. Despite such massive disruption and the subsequent ravages of civil war, the northeast now stands as the powerhouse of the Chinese nation.

flows (map, page 803). Too excited to sleep, we rose with the sun to see the countryside from the train window. It was hilly and green, bordered with rich red soil. Lush weeping willows hung low over streams, where in the early morning peasants beat their clothes clean on flat rocks.

As we passed a group of white adobe houses, Dad said, "The walls and watch-towers are gone. In the old days the villages were clusters of mud huts surrounded by high mud walls. Every village had a tower as a lookout against robbers and wandering, looting soldiers."

When we arrived, we were installed in a comfortable guesthouse in Fanch'eng's twin city of Hsiangyang, across the Han River. The management, worried about the quantities of hot water Sylvia and I might require, assigned four girls to bring us all we could use. Each time we returned to our adjoining rooms, we were ushered into the bath.

Dad took us to the old Lutheran mission compound in Fanch'eng, where he and my grandparents had lived, and where my sister Sylvia had lived for four years. In the courtyard my grandmother's tombstone still stands. The old church that grandfather built is no longer used for formal services, though some of the older church members meet occasionally in one of the smaller rooms. The school my grandparents founded and where Dad taught still functions, the number of students has risen from 200 in 1927 to 8,000 today. My parents' old home has been rebuilt and is now occupied by soldiers.

Beds Heated by Charcoal Stoves

In Fanch'eng I learned the truth of the old adage, "Poverty is a state of mind." While visiting a commune, we were taken to see the peasants' houses.

The grandparents, who stay home with the children while the parents work in the fields, were eager to show us how they live. The typical house was small, built of whitewashed brick, with a gray tile roof. It had a living room with a wooden dining table, a few hard-backed chairs, and perhaps a radio or chest of drawers. The two bedrooms had wardrobes and mirrors and broad beds called *k'angs*. The beds were warmed by charcoal stoves inside concrete casings, and were covered with cotton mattresses and colorfully embroidered quilts. Some houses had separate kitchens with iron stoves; others had the stoves in the living rooms. All the homes were immaculately clean, and the old people showed them to us with touching pride.

The next day we sailed on the Han in a *pien-tzu*, a freight junk. We fell in with a picturesque fleet of similar craft, heading upriver with their patched, bamboo-ribbed sails full blown in the wind (page 817).

When the fleet got into the lee of a bend, it was forced to stop, and then we saw a scene from centuries past. The boat immediately in front of us was a one-family enterprise. The two grown children, a boy and girl, jumped off carrying harnesses and a bamboo cable and climbed to a path on the bank. Mother stayed at the rudder, steering, while father stood on the bow with a long bamboo pole with an iron point, which he used to prevent beaching or collision.

The son and daughter slipped into their harnesses. The other end of the cable had already been fastened to the mast—at the very top, so that, if necessary, it could be tossed over the mast of any passing boat. The young people pulled against the swiftly flowing current (pages 818-19); mother shouted orders, slowly, grunting in unison, leaning almost flat against the harnesses, the boy and girl got the junk moving upstream.

Foreigners Pass as "Lumps of Mud"

Being aboard a pien-tzu again brought back vivid memories for Dad. In just such a boat, he and Mother, Sylvia, Meme and my brother Alton (both babies then) had fled Fanch'eng in 1927, during the fighting when Chiang Kai-shek came to power. The British consul had ordered the family to leave because of brigandage and violence against foreigners. Dad persuaded the captain of a pien-tzu to take them down the Han River to Hankow. The captain and crew of the freight junk were members of the secret Red Spear Society, organized for self-protection against warlords, marauding Kuomintang soldiers, and bandits. At Shayang, about halfway to Hankow, they met boats coming upriver that had been fired on by brigands. Sailors' bodies still lay on the bloody decks. The captain of Dad's boat refused to go any farther.

After two days in the Shayang dock, Dad set out with two other foreigners to find the telegraph office and send word to the British consulate in Hankow. Having got the message off, they stopped on the way back for tea and buns. Before long, a group of hostile students came into the teahouse.

"Look at these foreign devils!" they

shouted. "Destroy the foreign devils! Down with imperialism!"

On impulse, Dad jumped onto the table and shouted in a flawless local accent, "You are absolutely right! Down with foreign imperialists! Let us destroy them!"

As the amazed students listened, he went on: "That is exactly why we want to go down the river and cross the Pacific to our homes. If we attack imperialism from our side and you from yours, we shall crush it."

The mood of the crowd changed. Here was a foreigner who sounded like a true "lump of mud"—which is what the natives of the area jokingly called themselves. They escorted him and his companions back to the boat and persuaded the captain to go on.

Author Greeted by Birthday Surprise

The 500 miles from Fanch'eng to Hangchow is measurable in time as well as distance. Old Cathay survives almost untouched in Hangchow. Known to the Chinese as "a paradise on earth," it was a resort for the emperors for centuries.

Today a luxury hotel stands beside West Lake. The calm blue waters are interspersed with islands dotted by pavilions and moon bridges. A Sung Dynasty garden named the "Park of Orioles Singing in the Willows," a monastery known as "Soul's Retreat," the "Cave of the Morning Mist and Sunset Glow," the "Pavilion of Calm Lake and Autumn Moon"—all these fantasies are real in Hangchow. Few propaganda posters mar the landscape, and martial music is rarely heard.

Hangchow is renowned for beautiful women—ladies with high cheekbones, large almond eyes, glowing complexions, long, flowing, often braided hair, and smooth carriage. On secluded benches around West Lake, one often sees courting couples.

I began to feel a little forlorn, having been parted from my husband Top and our five children almost a month now. But I had a pleasant surprise. Top, who is assistant managing editor of the *New York Times*, came to China on assignment, and, by some mysterious Oriental manipulation, was delivered to me in Hangchow on my birthday.

Top had still another surprise for me. He and our children had talked things over and agreed that I should stay on with him. So, a few days later in Shanghai, we parted with Dad and Sylvia, who were to spend a week in the south before leaving China.

Top and I, accompanied by his interpreter,

Right arm duels left as a Peking resident performs a sword dance. Each morning across the land, streets and squares fill with physical-fitness buffs vigorously exercising or moving gracefully through such ancient, stylized rituals. Body building bears the blessing of Chairman Mao and enjoys enormous popularity among Chinese of all ages

Woven portraits of Chairman Mao roll from the looms of a Hangchow silk mill. Distributed to department stores, they will find their way into homes in the most remote villages. One of the most striking aspects of life in China today, the author discovered, is the reverence paid to the wisdom of Mao Tse-tung. His thoughts are given credit for all manner of successes.

Shrines of the Revolution: Arched entryways lead into the hand-hewn caves of Yenan. In 1934, facing annihilation by Nationalists in south China, Mao led 90,000 troops on the epic Long March—a 6,000-mile retreat across 18 mountain ranges and 24 rivers. A year later, the survivors reached Shensi Province and eventually the safety of Yenan's caves, there to rebuild for the revolt that swept China from 1946 to 1949. A sign quoting Mao (lower) marks one of four cave complexes where he and other leaders lived. Inside one cave (upper), a photograph of Mao hangs above a desk he worked at during the war.

Muckbusters on a new frontier. peasants till a rice field (**left**) recently brought under irrigation near Shenyang in the northeast. Water buffalo and horse compete with a red tractor, evidence of a beginning in farm mechanization. But only hands can do the job of these women (**below**). Toiling elbow to elbow, they bundle rice seedlings for transplanting.

Only 12 percent of China's land is cultivated. In a continuing effort to increase food production, the Chinese push ever farther into the dry, rugged interior. Intensified farming and controlled distribution of grain have banished scenes of starvation that marked the China of decades past.

Yu Chung-ching, flew to Peking and later to Manchuria, an area which the Chinese now call the Northeast. Our first stop there was Shenyang (formerly Mukden), capital of Liaoning Province. Seen from the air, the capital's back country seemed a sea of paddy fields, and it was hard to believe that two decades ago, rice had to be imported to this area. It was also hard to believe we were flying into one of China's chief industrial centers.

Top had been in Shenyang in 1948 during its siege by Communist troops. He had flown in on a U. S. plane bringing supplies to the Nationalists. After the city had been surrounded for almost a year, the Nationalists tried to break out and were defeated.

Today there are few reminders of the former ravaged and exploited Manchuria. This land of forests, fertile plains, and enormous mineral wealth was victimized by imperial Russia and then by the Japanese. After decades of exploitation and 14 years of occupation, the Japanese surrendered Manchuria (or Manchukuo, as they called it) to Soviet troops in 1945. The Russians systematically dismantled and shipped home much of the region's industrial machinery. Extensive looting as well, and the subsequent fighting during the civil war from 1946 to 1949, left Manchuria in sad shape.

Today the Chinese are proud of the way they have put it back together. At the once-ruined Shenyang Machine Tool Plant No. 1, the chairman told us that the large complex of brick buildings now employs 6,000 people. But when we asked about production, we got a classic evasive reply: "In 1969 the total output increased 90 percent over 1966. That increase was 100 percent over designed capacity. On this basis, in 1970 we fulfilled production 42 days ahead."

Present Speaks Loudest in Old Sian

We returned to Peking; and shortly Yu Chung-ching and I joined a group of correspondents for a nine-day trip southwest to Sian and Yenan. Top had to stay in Peking.

Our plane was due to leave "approximately in the morning," so, hoping for the best, we were at the airport by 9:30. At 11:30 we were treated to a multicourse Chinese lunch, while we watched costumed teen-agers on the airport tarmac waving banners and shouting welcome to a Peruvian trade delegation. Then we listened to a long concert, after which the teen-agers gave another wild welcome to a newly arrived North Korean delegation.

About 4 o'clock, we got the word, "Sorry to keep you waiting. The weather has cleared now. Please hurry."

We landed three hours later in Sian, ancient capital and cultural center of China. Here, more than two thousand years ago, the first emperors ruled by the Mandate of Heaven over the Middle Kingdom, which the Chinese regarded as the center of the earth. Masterpieces of enduring art and literature were created in Sian during the golden T'ang Dynasty (A.D. 618-906). It was a cosmopolitan city of travelers, merchants, and people of many faiths—Confucians, Buddhists, Taoists, and even Christians and Moslems.

Aside from great museums tucked away in temples or behind earthen garden walls, I saw few traces of Sian's glorious past. But its Communist present was much in evidence when we visited one of the brigades of a commune near Sian. The chairman, Liu Shu-chen, who had a weather-beaten face and shaven head, welcomed us.

"There are 11 administrative units, or brigades, in this commune," he said. "This brigade consists of five villages. We have seven production teams, 356 households, and 1,812 members. We have 2,750 *mou* of land [about 460 acres]. Before the liberation there were 49 households here. Four were landlords and the other 45 were poor peasants. Thirteen of these families were forced to sell their children as slaves and servants. Seven families became beggars and seven other families died out completely.

"In 1949 we became the masters. We organized this people's commune in 1958. Of our brigade's 812 laborers we have 419 model members [especially

Where people move by pedal power: Crammed to capacity, a bicycle minibus zips across Tien-an Men Square in Peking (**above**), on the way to a day-care school. Cycling squad of commuters (**right**), passing a colossal statue of Mao in Shenyang, pumps homeward through evening shadows with only buses for competition. Everywhere workers, peasants, and officials travel by bike in a China that counts the private auto an extreme luxury. But they enjoy one blessing: an almost complete absence of pollution from car exhausts. Premier Chou En-lai believes that by starting late to industrialize, China may avoid the pollution now plaguing other nations.


中国共产党万岁

Wearing journalism's tools, the author pauses before the venerable Convent of Scattering Clouds at Fanch'eng, midway on her journey. Daughter of an "old China hand," Mrs. Topping grew up on stories of the vast land; then, in 1947 and 1948, she studied at Nanking University. She returned briefly to China in 1966 during the Cultural Revolution.

sincere workers], and 66 activists in the study of Chairman Mao's works."

From Liu's exposition, and from discussions with other people all over China, we gained a basic picture of commune life:

Each is a self-sufficient unit, as are many of the brigades. The families work together, and even the leaders labor in the fields.

Commune members rise early and get lots of fresh air and exercise. They have adequate food and clothing. Each brigade has a health station giving medical care at nominal cost.

Children are pampered and educated in commune schools. Adolescents are completely involved, and have no time for drugs or vandalism. They travel extensively to other parts of China to help out as needed on large projects such as dams, canals, and bridges.

A propaganda team in each brigade is responsible for political education. Brigade members put on shows and concerts. They listen to government broadcasts. They discuss and rediscuss ways of improving their production and their lives.

Revolution Nurtured in Yenan's Caves

From Sian we flew 150 miles north to Yenan, the shrine city of Chinese Communism. The people of Yenan live in cave houses carved into the slopes of dry loessial hills. It was in these caves that the Communist leaders found sanctuary at the end of the Long March. Mao Tse-tung, Chou En-lai, Lin Piao, Chu Teh, and many others arrived exhausted at the head of the Red Army. They lived in Yenan from 1937 to 1947 (page 827). The armies were expanded and directed from Yenan, and there Mao wrote most of the articles that comprise the *Selected Works of Mao Tse-tung*.

The people of Yenan have lived in cave houses since time out of mind. One early morning we watched Yenan wake up. The cave dwellers emerged from the snugness of their abodes with buckets of water and willow brooms to sprinkle and sweep, sprinkle and sweep. The swishing noise was punctuated by an occasional rooster's crow or the bleat of a white goat scrambling up the yellow honeycombed hills.

Feeling that we had intruded on a fairy-tale scene, we drove back to the hotel. There we learned that the Premier had requested us to return to Peking and dine with him.

The event took place in the Great Hall of the People. William Attwood, publisher of *Newsday*, his wife Sim, and Robert Keatley

of *The Wall Street Journal* and his wife Anne also attended. The Premier shook hands and escorted us to dinner. Leading us past a lacquer screen, he motioned us to be seated at a round table set with blue-and-white porcelain, place cards, silver knives and forks, ivory chopsticks, and glasses for beer, wine, and the Chinese liquor known as *mao-t'ai*.

When we had found our places, the Premier offered a toast to peace in Viet Nam.

"Can you all drink mao-t'ai?" he asked.

"Oh, yes," replied Top. "When trade develops between China and America, this may be one of your most successful commodities."

"Well, we probably won't be able to supply so much mao-t'ai," laughed Chou.

The Premier recalled that during the Long March, the Red Army passed through a small valley and discovered mao-t'ai. He explained that it is made from sorghum, and that the water from that valley is especially good for making liquor that doesn't go to one's head. "But the percentage of alcohol is high," he warned. "If you don't believe it, try lighting a match to it."

Then began a nine-course dinner superbly prepared and served. The first course included small dishes of cold chicken and paprika, crab meat, spiced pork, bean curd and string beans, ham, mushrooms, and cucumbers. The second course was a cloudy broth with a jellylike mushroom floating in it. This was followed by sea cucumbers (slippery creatures reputed to cure hardening of the arteries), abalone, and spicy meatballs.

Premier Espouses Women's Lib

As we began the next course—chicken slices, shrimp, and peas—Chou said in answer to a question, "You asked why China doesn't want to be a superpower? Countries should not think in those terms."

He went on to explain that China had learned from watching the difficulties experienced by superpowers. "China should not be a superpower. All countries are equal and nations and races are equal, and men and women too. Like tonight. You all have the right to raise and answer questions."

At that moment no one exercised that right, for we were all eyeing the shad arriving on huge platters. It was served with sweet-and-sour sauce and sprinkled with almonds. Miss Tang, one of the Premier's interpreters, explained that the shad came from where the fresh water meets the salt.

She apparently triggered a connection in Chou's mind. "Is it true there is a women's liberation movement?" he asked.

We all assured him there was, and Anne Keatley added, "I'm impressed by the equal pay for equal work you have for women here."

"Yes, but there are still a lot of old customs hindering progress," Chou said. "We must admit the hindrances and support the women—not throw cold water on them. Old customs take effort to overcome. Chairman Mao says, 'Don't believe everything they say if you didn't look into it yourself.' In some places it is just like the old days. First there is a girl born, then a second, third, fourth, until there are nine girls. By that time the wife is 45, and only then can she stop trying for a son. Is this equality?"

"As a father of five girls, I sympathize," laughed Top.

"No sons?" asked Chou, surprised.

"He's tired," Bill Attwood quipped.

"No," answered Chou quickly, "Mrs. Topping is tired. I'm talking on behalf of women."

"There Is Only One China"

As we ate mushrooms and lima beans, our questioning resumed. Chou replied adroitly.

Why does China conduct nuclear tests? "For the purpose of breaking down the nuclear monopoly and blackmail and to try to bring about a complete solution to the disarmament problem."

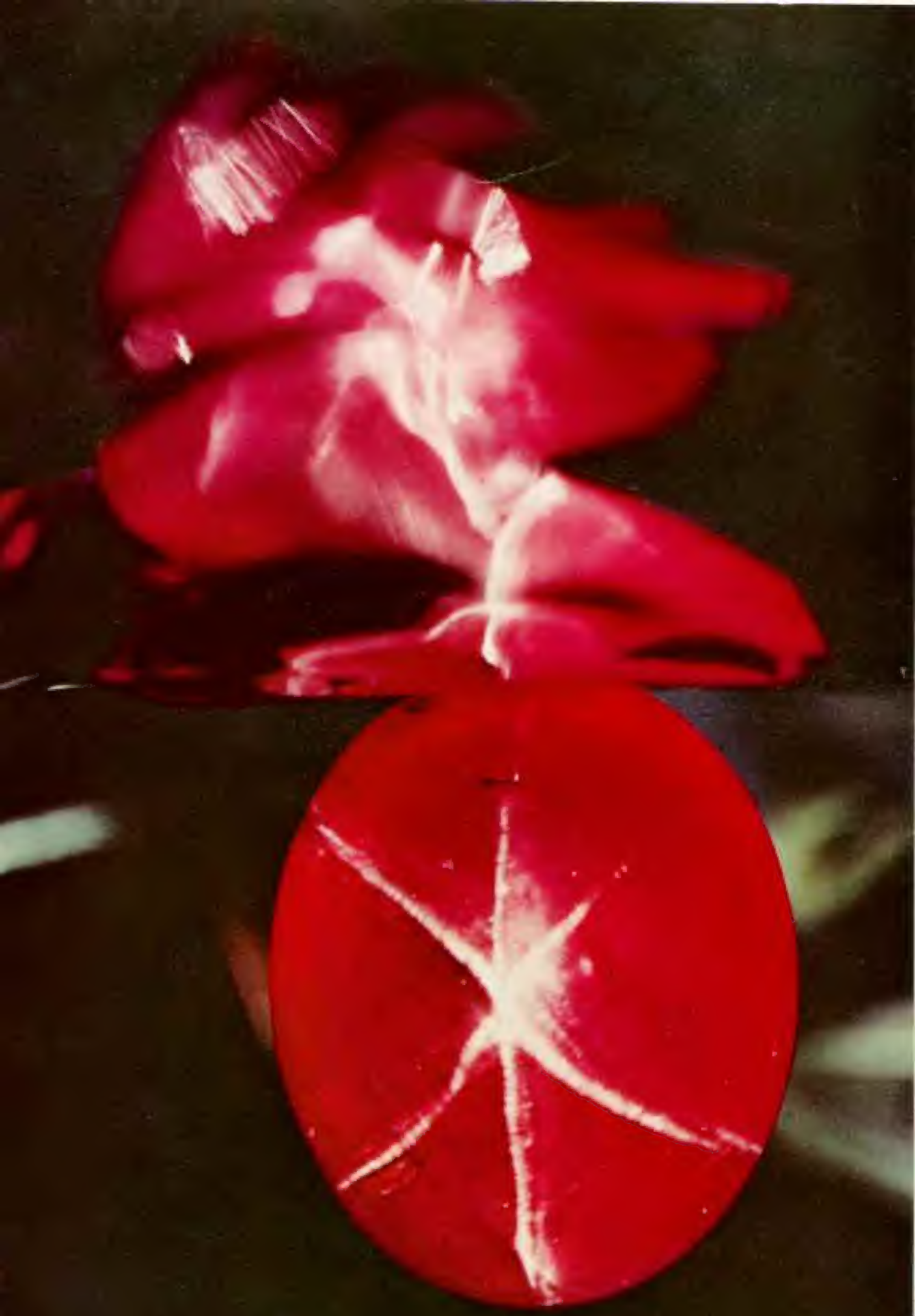
About Taiwan? "Even Chiang Kai-shek is opposed to the concept of one China, one Taiwan. Although we fought for decades, we agree on that point. There is only one China."

Not knowing that President Nixon was already negotiating to come to China, Top recalled that Mr. Nixon had expressed a desire to see the country. Would the government receive the President? The Premier replied obliquely: "Since he made the suggestion himself, he would know under what circumstances he would come."

As we finished dinner, we thanked Chou, expressed a wish to return his hospitality, and said we hoped for an improvement in relations between China and the United States.

"I'm certain it will come," he answered. "When, depends on you. We have already opened up the Chinese contacts."

We left China two days later, and I thought of those words as our plane headed homeward. As Chou seemed to understand, China and the U. S. have much to learn from each other. If there is wisdom and goodwill on both sides, the learning can begin. □



QUESTING FOR GEMS

By GEORGE S. SWITZER

CURATOR, DEPARTMENT OF MINERAL SCIENCES,
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AS MY FINGERS CLOSED around the Hope Diamond and quenched its magnificent blue fire, I thought of Sita's revenge—and for a moment I paused. The glowing gem I held, legend tells us, once adorned a statue of the Hindu goddess Sita, wife of Rama. It was stolen by a Brahman priest, and the curse of the angered goddess has been visited upon owners of the diamond ever since.

My position as curator of the Smithsonian Institution's famous collection of gems has taken me to many parts of the world, but I have never become immune to the romance of fabled jewels. On this day I was to carry the Hope Diamond from its permanent home in the Smithsonian to the Louvre, in Paris, where it would be a chief attraction in a gem exhibition. Chiding myself for idle daydreaming, I left my office and hurried by car to Baltimore's Friendship International Airport.

Still, one cannot carry the Hope Diamond about in a trouser pocket without being nagged by the curious coincidence that its owners (following pages), through 300 years of its known history, have been unluckier than most. They include Marie Antoinette; a British heir to the stone who died in bankruptcy; a Folies Bergère star slain by a jealous lover; a Greek broker who drove off a cliff with his wife and children; and an American millionairess whose husband and two of four children died in tragic circumstances.

Small Troubles Mar a Goodwill Visit

I felt some uneasiness when my plane, stopping in Philadelphia, landed so roughly that the flight had to be canceled. I knew that a police escort was waiting for me at Orly Airport in Paris, so I went on to New York, but the only transatlantic flight I could get that night was to Frankfurt, West Germany.

After a long flight and a nerve-racking four-hour delay in Frankfurt, during which

Impurity brings virtue to the largest star ruby on earth. Unseen slivers of rutile—a common mineral—reflect light in a vibrant six-point design. The Smithsonian Institution exhibits the inch-wide, 138-carat Rosser Reeves Ruby, thought to be from Ceylon. It was appraised at $150,000 in 1964, the year before its owner, an advertising executive, donated it to the Nation PHOTOGRAPHS BY NATIONAL GEOGRAPHIC PHOTOGRAPHERS JAMES P. BLAIR AND VICTOR R. BOSWELL, JR. © N.G.S.

The legacy of the Hope

MOST NOTORIOUS GEM in history, the flawless Hope Diamond has left behind it a trail of so many ill-fated owners that superstitions persist about a curse.

Mined in India, the steel-blue stone weighed 112 carats when it reached France in 1668, with a haunting tale that thieves had brought a jinx upon it by plucking it from an idol's eye. Gem trader Jean Baptiste Tavernier sold it to Louis XIV, who had it cut into a 67-carat heart shape and dubbed it the "Blue Diamond of the Crown."

Louis XVI and Marie Antoinette inherited the Blue. During the French Revolution, Marie, shorn of gems, faced the guillotine (**top**).

In an unsolved robbery, the diamond disappeared from Paris in 1792. It reappeared in London in 1830 in its present 44.5-carat oval cutting; banker Henry Hope bought it for $90,000. After his death, his heirs suffered assorted scandals; one, Lord Francis Hope (**below**), died penniless.

BROWN BROTHERS

The Hope moved on. An eastern European prince gave it to an actress of the Folies Bergère and later shot her. A Greek owner plunged to his death over a precipice with his family in an auto accident. Turkish Sultan Abdul-Hamid II (**right**) had owned the stone only a few months when a revolt of military officers—the Young Turks—toppled him in 1909.

The Hope's first American owner, Evalyn Walsh McLean, had seen the diamond in the sultan's harem. She purchased it, mounted as a necklace with 62 white diamonds (left), on the installment plan from French jeweler Pierre Cartier for $180,000. Undeterred by legend, she delighted in displaying it (**lower**). Fatal accidents claimed two children; mental illness, her husband.

After Mrs. McLean's death in 1947, New York jeweler Harry Winston purchased her jewels, including the Hope. He donated the famed gem to the Smithsonian in 1958. There, glittering in a burglarproof case, it charms some 3,000,000 viewers a year (page 863).

DRAWING BY ANTONIETTA CRUZ FROM "THE DIAMOND" BY BEVERLY BIRKS, INC.

BROWN BROTHERS AND (BELOW) WIDE WORLD

PHOTOGRAPH BY JAMES L. STANFIELD AND OTTO E. RENTZ, JR. © NGS

the million-dollar jewel seemed to burn a hole in my pocket. I finally arrived in Paris. A relieved group of museum officials met me, and we drove into the city—straight into an automobile accident.

Fortunately, the accident was not serious, the gem arrived at its place of honor in the exhibit, and eventually returned to Washington, D. C., as one of the features of the Smithsonian collection, where we all feel not a bit unlucky to have it.

Gems Blossom in Earth's Rocky Depths

The Latin word *gemma* originally meant "bud"—an apt term to describe precious stones as they are so often found in nature, crystals like flowers, budding amid solid rock. The Smithsonian collection includes not only a number of famous jewels, but also many outstanding examples of gemstones in their natural state. Such specimens—emerald crystals sprouting from a matrix of shale, topaz growing from feldspar and quartz—amaze the many visitors who visualize gems only as they appear in the jeweler's showcase, cut and polished.

If you asked a child to define a gem, he would probably tell you it was a beautiful stone, and that, of course, is essentially correct. While experts may refine the meanings of the term, most men since antiquity have agreed that a gem must be both beautiful and

Earth's artistry rivals man's: The two large crystals of blue Siberian topaz (**left**), rising from a matrix of feldspar and smoky quartz, took shape atom by atom in a mineral-rich solution trapped far below the surface. The faceted orange topaz, a 93-carat gem from Brazil, owes its flashing clarity to skillful cutting.

A natural diamond crystal commonly forms an octahedron—two pyramids, base to base. The regular shape reflects the orderly arrangement of atoms within. The blue beam of a scanning electron microscope made this picture of a 1/16-carat mite resting on a rivethead. "Carat," a word derived from the carob seed, refers to weight, not size; 142 carats equal one ounce.

"Most apt . . . to fingers of kings," wrote a 15th-century admirer of sapphire, a stone once believed to banish fraud and attract divine favor. This 423-carat prize fills the author's hand (**below**); under the microscope's harsh light, red flesh tones show through the transparent stone. A variety of the clear mineral corundum, sapphire gains its color from traces of titanium and iron. If chromium is present instead, a ruby results. Mrs. John A. Logan, Washington, D. C., philanthropist, presented this $750,000 brooch to the Smithsonian last June.

durable. The beauty of a gem depends on its color, or on its distinctive ability to reflect, refract, and disperse light.

Today, as always, the value of a gem depends on the additional factors of rarity and fashion. These qualities, combined with the remoteness of so many gem mines, have surrounded gems with an aura of romance and mystery, and with good cause. Nature does not make many of them.

Beauty Created by Heat and Pressure

Think of our planet and its cooling crust as a vast brew, very slowly but constantly forming and reforming its mineral constituents. To make the brew, nature has poured in some 90 basic ingredients, elements of which the earth is composed, ranging from actinium to zirconium. Some, like cobalt, copper, and iron, are familiar; others, such as scandium and germanium, are less well known.

These elements are unevenly distributed. Two of them, oxygen and silicon, make up 74 percent of the earth's crust. With only six others—aluminum, iron, calcium, sodium, potassium, and magnesium—they account for 99 percent of the material of the crust.

This planetary mixture of a few elements, with traces and pinches of scores more, is searing hot in the earth's interior. Its parts are sometimes buried deep in the "pot," sometimes thrust to the surface.

Mineralogists have been able to identify about 2,000 distinct combinations of the basic elements; these are the known minerals. Fewer than 100 qualify as gemstones.

Writers in antiquity seem to have had an inkling of the processes of nature when they described sapphire as a drop of *amrita*, a drink of the gods which had solidified, bloodstone as a drop of Christ's blood; and rock crystal as ice frozen so hard it would never melt. The vast majority of gems are indeed crystals formed by cooling of hot gases, solutions, and melts—not amrita, blood, or water, but the elements of our planetary brew, sometimes in their pure form but more often mixed.

As the excited atoms in a hot solution lose energy through cooling, they form the lattice arrangement typical of crystals. The natural laws that create gem crystals also create common table salt and the dancing snowflake.*

Some crystals, such as diamonds, require tremendous pressures and temperatures. Diamond is composed of pure carbon. Scientists now know how to make it from more ordinary forms of carbon, such as the soot of your fireplace or the graphite in your common lead pencil. But they must reproduce the conditions—a million pounds of pressure per square inch and temperatures above 2,500° F.—that exist in the earth only at depths of at least 150 miles.

As the earth's crust changes and weathers, and rivers cut through geological strata, gem-bearing deposits may be exposed, and the valuable crystals themselves find their way into river gravels, where men may simply bend over and pick them up.

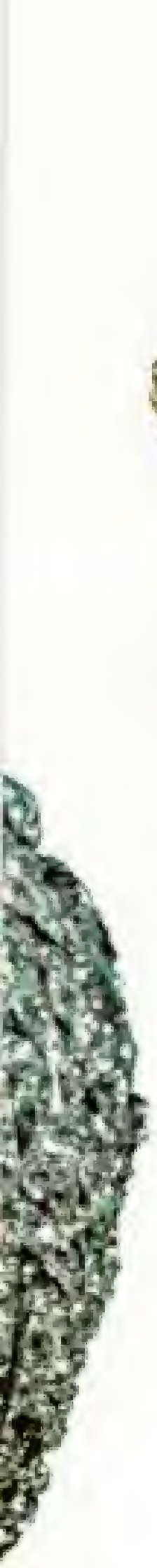
Search Ends in an Emperor's Turban

History's first diamonds almost certainly came from the river gravels of India in the district near the ancient city of Golconda—a name that became a synonym for wealth. And what diamonds they were! The very name Koh-i-noor summons up centuries of romantic lore. What became the Koh-i-noor was probably a large diamond first reported in 1304 in the possession of the Raja of Malwa. It later fell into the hands of Baber, who founded the Mogul dynasty in 1526. For the next two centuries the diamond was the jewel among jewels in the treasury of the Mogul emperors.

In 1739 Nadir Shah of Persia invaded India, looted the Mogul palace, and rummaged through the capital city of Delhi for 58 days—looking for, among other things, the famous diamond. A harem woman told him that the emperor had hidden it in his turban. The conqueror thereupon invited the conquered to a feast and offered to exchange turbans as a sign of amity. The emperor, having to make a fast choice between his head and his diamond, doffed his turban. Nadir Shah, in the privacy of his tent, unrolled the turban and

*See "Snowflakes to Keep," by Robert F. Sisson, National Geographic, January 1970.

India, antiquity's font of gems, still shelters untold treasures in private collections. Here a sampling of the Maharaja of Gwalior's wealth—pearls, topazes, emeralds, and uncut diamonds—lies displayed on the roof of his palace. Easily carried and readily cashed, jewels served generations of shahs and rajas as ransom, dowry, bribe, and wages.



Hallmark of majesty, the British Imperial State Crown (above) graces Queen Elizabeth II each time she opens Parliament. Rebuilt for her coronation, the masterpiece features historic stones: from top, the blue St. Edward's Sapphire; the Black Prince's Ruby, actually a spinel; and below it, a flawless 317-carat diamond, smaller sister of the stone in the scepter at right.

CROWN COPYRIGHT RESERVED
HER MAJESTY'S STATIONERY OFFICE
(ABOVE AND RIGHT)

Russian Imperial Crown (left), designed for Catherine II in 1762, rests in a Kremlin museum. Oakleaf-and-acorn arch, framed by enormous pearls, supports a 399-carat spinel. The 4,936 diamonds probably came from India. Today the U.S.S.R. mines diamonds in Siberia and competes with South Africa as the leading gem-diamond producer.

SOVFOTO PRESS AGENCY

World's largest cut diamond, the 530-carat Great Star of Africa in the Royal Sceptre came from the 3,106-carat rough called the Cullinan, a gift from the Transvaal in 1907. Shown actual size, the gem can be removed and worn as a brooch. The Tower of London guards and exhibits the British Crown Jewels.

found the brilliant gem. "Koh-i-noor!" he exclaimed—"Mountain of Light!"

Nadir Shah was assassinated in 1747, and it is said that his son died by torture rather than give up the priceless gem he had inherited. Eventually, though, it passed to other rulers with other armies—first to the Afghans, then to the Sikhs, and finally to the British, who found it in the treasury at Lahore, the Punjab capital, in 1849. Two officers took it off to London to present it to Queen Victoria.

The British found it rather dull. In an attempt to give it greater brilliance, the queen had it recut from its original 186 carats to 108.93 carats, at a cost of $40,000, and almost everyone was displeased with the result. Victoria wore the huge diamond as a personal ornament. She willed it to her daughter-in-law, Queen Alexandra, who wore it at the coronation of Edward VII in 1902.

In 1911 the Koh-i-noor was placed in the crown of Queen Mary. Twenty-six years later, Elizabeth, the consort of King George VI, had a crown made to wear at her husband's coronation. It is now known as the Queen Mother's Crown—one of nine splendid British crowns—and from it flashes the Koh-i-noor. It is one of the most popular treasures displayed in the Tower of London.

Fist-size Diamond Dug Up by Penknife

The world's two largest and finest diamonds—Cullinan I and Cullinan II—are also there in the British Crown Jewel Collection. Cullinan I, also known as the Great Star of Africa, is a pear-shaped giant of superb quality weighing 530.2 carats; it rides in the head of the Royal Sceptre, flashing light. Cullinan II weighs 317.4 carats. Incredibly, both came from a single crystal, a mammoth diamond that was cut into nine major stones and 96 smaller ones (page 843).

"This is where it was found," said Mr. J. M. Prout, assistant general manager of the Premier Mine near Pretoria, South Africa. We were standing on top of the 150-foot headframe of the mine, looking down into its huge open pit. "It was here in 1905," he went on, "when the pit was only 50 feet deep, that the superintendent, Frederick Wells, dug out that unbelievable chunk of diamond with his penknife. It weighed 3,106 metric carats—one pound, six ounces—and was named for Sir Thomas Cullinan, discoverer of the Premier Mine. It was purchased by the Transvaal Government for about $750,000, and presented to King Edward VII on his birthday."

Storm-harried coast of South-West Africa (**opposite**) holds a Midas treasure in diamonds, washed from inland deposits over the ages. Machines strip the overburden, sift the diamond-bearing sand and gravel, and dump the tailings in huge hillocks—a hundred million pounds for each pound of gems recovered.

Better than any machine, sorters classify rough diamonds into dozens of categories by size, shape, and color. Some 80 percent of the stones here at De Beers Consolidated Mines in Kimberley, South Africa, go to industry for use in grinding wheels, drills, and phonograph needles. The remainder—gem-quality stones—are divided into lots for sale in London and Johannesburg, bringing the firm four-fifths of its total revenue.

The Premier Mine was worked as an open pit to a depth of 600 feet before underground mining began.* Today the mine plunges 2,000 feet into the earth.

The material in which diamonds are found is a dark, basic rock called kimberlite, after the famous mines in the vicinity of Kimberley, South Africa; miners call it "blue ground." It occurs in pipelike bodies having nearly vertical sides and a roughly circular cross section, from a few feet to hundreds of feet across. Diamonds were probably formed in this kimberlite very deep in the earth, and the ore somehow "drilled" its way upward.

Spotless Mines Plumb the Blue Ground

With Mr. Prout, I donned a hard hat and descended by elevator—or "skip"—into a vertical shaft sunk some distance from the side of the pipe, which was then reached by horizontal tunnel.

I asked a foreman, "How often do you see a diamond in the mine?"

"I have worked down here for 16 years," he replied, "and have yet to see one."

"No wonder," said Mr. Prout. "The ratio of diamond to waste rock is 1 to 14,000,000."

In spite of these staggering odds, I kept looking. After all, it was in this very mine that Mr. Wells found the fist-size Cullinan.

The mine is one of the cleanest on earth, well ventilated, with its haulageways painted white and everything spick-and-span. Even so, I was surprised when Mr. Prout glanced at his watch and said, "Time for tea."

At the main level of the mine, 1,100 feet down, we entered an immaculate tearoom, with tables and chairs and a white-jacketed waiter. "Sugar or lemon?"

We later watched as the kimberlite was broken down by crushers to 1½-inch pieces for processing. Any diamond larger than that, if not discovered beforehand, would be smashed. The gemstone, while the hardest substance known, is also brittle. More than one sad housewife has come into my office with the remnants of a precious diamond destroyed by a blow against a kitchen sink.

In 1954 a great diamond was almost lost to the crushers in the mine. A piece weighing 426.5 carats and actually greater than 1½ inches in one dimension passed through the crusher in just the right way to escape serious damage. From it was cut the $2,000,000, 128.25-carat Niarchos Diamond.

The final step in the recovery of diamonds from blue ground is to wash the concentrate on shaking grease-covered tables. The rough diamonds, because of their surface properties, adhere tenaciously to the grease, while fragments of other minerals vibrate past and are discharged to the tailings pile. Then the tables are scraped and the grease placed in perforated steel pots. Workmen immerse the pots in boiling water that melts the grease. The pots are sent to a sorting house and the diamonds dumped out.

Violence Haunts the French Blue

Grease-covered tables and hot water seem prosaic when measured against the romantic histories of diamonds that have left behind them a wake of bloodshed and murder. Such a tale begins in 1792, as the revolutionary mob storms across Paris and Louis XVI and Marie Antoinette are imprisoned; thieves scale the colonnades of the Garde Meuble, break into the glass case containing the French Crown Jewels, and make off with three storied gems.

One was a magnificent blue stone of 112 carats brought out of India by the doughty French traveler and gem merchant, Jean Baptiste Tavernier, and purchased from him by Louis XIV in 1668. The king had it recut in the form of a heart weighing 67 carats and called it the "Blue Diamond of the Crown."

After the theft, the French Blue, as it was popularly known, disappeared. Or did it?

Gemologists have pieced together enough clues to satisfy themselves that the Hope Diamond, purchased in 1830 at a London

*The author told of early mining in Africa in "The Many-sided Diamond," GEOGRAPHIC, April 1958.

Bonus for a back-straining day: a tiny clutch of gem diamonds. After gargantuan scoops remove overburden near Oranjemund, South-West Africa, men use shovels and whisk brooms to lay bare every inch of bedrock, often finding the best stones lodged in crevices. Working on year-long contract, these Ambo tribesmen turn in finds at day's end and face thorough search when leaving the desolate area. Of 18 diamond-producing nations, 12 of them in Africa, South-West Africa supplies the most valuable gemstones.

sale, had been cut from the French Blue—but when and where remains a mystery. A gem resembling the Hope appears at the neck of Queen Maria Luisa of Spain in a noted portrait painted by Goya in 1800. If she came into possession of the largest part of the French Blue, where is the rest of it?

The answer might well involve the former collection of Karl II, Duke of Brunswick, which included two deep-blue diamonds when sold in 1874. At least one, weighing about six carats, is thought to have come from the French Blue, but today the whereabouts of both are unknown.

Slave's Find Leaves Trail of Death

Also taken in the famous 1792 theft was the glorious diamond known as the Regent, 14.3 carats of yellow fire. It had been found in 1701 by a slave working in the Partcal mines on the Krishna River in India. The poor man wounded himself in the leg and concealed the diamond in the cut. Making his way to the coast, he enlisted the help of a British sea captain, who offered to help him escape for half the profits of the diamond. Once at sea, the captain killed the slave.

After selling the great gemstone, the captain squandered his small fortune and hanged himself. In time, the stone was purchased by Thomas Pitt, an ancestor of William Pitt and then the governor of Madras, India. Pitt had the gem cut to its present form and sold it to the Duke of Orleans, Regent of France.

Unlike the French Blue, the Regent Diamond was found shortly after the robbery, in a ditch near the Champs Élysées. Napoleon later had it set in the hilt of his imperial sword. It is now a treasure of the Louvre.*

The third great diamond in the thieves' bag was the Sancy, named for the man who purchased it in Constantinople in 1570. The Seigneur de Sancy later became the French superintendent of finance. His king, Henry IV, asked to borrow the diamond to use as security against a loan. A messenger was sent with the gem toward Paris, but he never arrived. According to one account, Sancy followed his route and found the lad dead, slain by robbers, and the diamond missing. But he trusted the boy's loyalty and, after a grim search, found that he had swallowed it.

After its theft in 1792, the Sancy popped up several times in different parts of the world. In 1906 William Waldorf Astor bought it as a wedding present for Virginia-born Nancy Witcher Langhorne, who married his son, later Viscount Astor. Upon the famous Lady Astor's death in 1964, the British declared the jewel a national treasure.

In 1962, when I delivered the Hope to the Louvre, I had the rare thrill of holding in the palm of one hand all three of these famous gems—the Hope, the Regent, and the Sancy—reunited 170 years after the theft.

Unlike diamonds, the number of other precious stones with long histories and honored by names is small. One is the Black Prince's Ruby, reputedly worn by Henry V in his helmet at the Battle of Agincourt, during which the helmet deflected a nearly fatal sword blow. The great gem, not a true ruby but a red spinel, has never been fashioned, only polished in its natural, irregular shape. Today the Black Prince's Ruby occupies the central position in the Imperial State Crown of Britain (page 843).

Actually, rubies and sapphires are the same mineral, corundum, a very hard substance consisting of aluminum oxide. Corundum with a rich red hue is called ruby. Corundum of any other color is called sapphire, of which the blues are most favored.

Gravel Glitters With the Rays of Stars

The finest rubies and sapphires come from Asia, and the finest rubies from the gravels of Burma, with the richest deposits at Mogok, where mines have been worked since prehistoric times. The production, now under government supervision, is auctioned each spring in Rangoon (page 853).

Thailand and Ceylon also have ruby- and sapphire-bearing deposits, their blue sapphires rival the Burmese in quality.

Corundum is one of the gemstone materials in which impurities—inclusions of needle-like foreign material—are advantageous. Three sets of inclusions, in different directions, produce the effect known as asterism: light is reflected in three intersecting bands. Such gems are called stars. One set of inclusions forms a single ray of light, giving us the cat's-eye gems. Chrysoberyl cat's-eye, found chiefly in Ceylon, is most valuable.

Large rubies of superior quality are among the most valuable gems, exceeding even diamonds in price. The United States is fortunate in having two exceptional star rubies on display—the 100-carat DeLong Ruby at the American Museum of Natural History in New York City, and the finest star ruby anywhere,

*See "The Louvre," by Hereward Lester Cooke, Jr., NATIONAL GEOGRAPHIC, June 1971.

the 138-carat Rosser Reeves Ruby at the Smithsonian (page 834).

Emerald and aquamarine give us another example of two popular gems deriving from the same mineral. In this case, it is beryl, a beryllium aluminum silicate. The colors in beryl are produced by trace elements. Beryl that is tinted blue or greenish blue by a trace of iron is called aquamarine. Beryl colored green by a touch of chromium is the stone we call emerald.

Bandits Vie for Colombia's Emeralds

In antiquity, one of the most prized of all gems was the emerald. Mines were worked in the Zabara Mountains of ancient Egypt as early as 1650 B.C. Emerald mines today are scattered about the world, in the U.S.S.R., Austria, India, North Carolina, and other places, but without question the finest stones come from Colombia. Three years ago, I joined mineralogist and gemologist Martin L. Ehrmann on a trip to the famous Colombian emerald mines at Chivor and Muzo.

We first glimpsed the town of Muzo, nestled in a lush green valley deep in the Andes, as our jeep rounded a curve in the rough mountain road that led from Bogotá, some 200 road miles to the south. I recalled the warning a few days earlier by an official of the U. S. Embassy in Bogotá. "Don't plan to stay in Muzo," he had said. "The town is full of bandits. You will be safe only at the mine, behind barbed wire with the army."

Muzo proved squalid and dirty, much less inviting than from a distance. We stopped only long enough to buy a machete—not for protection, but as a souvenir for my son.

As our jeep struggled on up the steep road, I eagerly awaited my first sight of the prime source of the world's finest emeralds. Finally, there it was, a great black scar across the face of a precipitous green mountainside.

The administrator of the Muzo mine at the time of our visit, Sr. Jaime Collins, was a gracious host. As we sat around the table after dinner, I asked him if there actually were bandits in the area. He replied by telling us about a gang of bandits with a 50,000-peso reward on their heads; they sold protection to buyers coming to Muzo with large sums of money to buy contraband emeralds.

Muzo, and the nearby Cosquez mines, are operated by the government, and most of the production is marketed legally through a national agency, ECOMINAS. However, Señor Collins told us, the Peñas Blancas Mine,

Armed trooper sprints toward a man illegally panning in a Sierra Leone diamond field. Illicit gem traffic siphons off thousands of dollars of needed income from the African nation. In Sierra Leone's Wild West town of Koidu, Lebanese dealers, Liberian traders, and African miners openly bargain over contraband stones. Probably 400,000 carats of diamonds are smuggled over the border to Liberia annually.

only 14 miles from Muzo, is operated illegally by "700 miners, all armed to the teeth," and all its production is sold as contraband.

Though Muzo is a major gem producer, only about 5 percent of its emeralds are of gem quality. When a vein containing emeralds is found, it is immediately covered and guarded, and ECOMINAS is notified. The next day two men go to the mine from Bogotá, one from the government controller's office and one from ECOMINAS. They, with the mine administrator, supervise the uncovering of the vein and the removal of the emeralds. The stones are then placed in a vault in the mine office. There are three locks on the vault, and each of three men has a key to one of them. The uncut emeralds are cleaned and sorted and then taken by helicopter to ECOMINAS in Bogotá.

Ancient Mines Supplied Two Continents

The privately owned Chivor Mine, about 50 miles northeast of Bogotá, was worked by the Chibcha Indians long before the Spanish conquest. No emerald mines have ever been found in either Peru or Mexico, and it is assumed that the Aztecs and Mayas, as well as the Incas, received their emeralds from Colombia by trading.

To reach Chivor, we set out in early morning from Bogotá in a jeep driven by Dr. Tomas Feininger. The U. S. Geological Survey geologist was working in Colombia on an AID-supported study of the nation's mineral deposits. After an hour on a paved road, we headed into the mountains.

By lunchtime we reached the mine warehouse. The road beyond this point was passable only by four-wheel-drive vehicles. As we prepared for the final two-hour climb to the mine, a Colombian national policeman, armed with an automatic rifle, climbed into the back of the jeep. He was one of a dozen guards who maintain a 24-hour watch over the mine and accompany vehicles in and out.

Spaniards located the mine shortly after their conquest of the area in 1537, and they worked it until 1675. After they left, the mine quickly became overgrown, was lost for two centuries, and was not rediscovered until 1896. Traces of the mining carried out by the Spanish are still visible.

The scene before us would have been familiar to the conquistadors, for the mining methods are essentially those of centuries ago. Along a series of terraces cut from the steep mountain ridge, small groups of miners laboriously removed the rock with bars, picks, and shovels. As the rock was broken, foremen carefully examined it for signs of emeralds. Most of the emerald being recovered was *moralla*, a poor-quality opaque material. The miners pushed the waste rock into gullies and flushed it into the valley below with water from a reservoir at the top of the ridge.

Far down the mountainside a group of perhaps a hundred men were gathered.

"They are *canalonerros*," Willis F. Bronkie, the mine's administrator, said. "They remain just off the mine property and search the waste rock for any emeralds overlooked by the miners. If word spreads that a particularly rich find has been made at the mine, the number of canalonerros may swell to as many as 2,000. At times only the presence of our guards has prevented them from rushing us and taking over the mine."

Mud Beds Yield Blazing Crystals

From Colombia I went on to Brazil, the world's leading producer of gems of the quartz family—citrine, jasper, carnelian, agate, and amethyst (opposite). Brazil also holds rich deposits of aquamarine, topaz, and tourmaline.

Fortunately for the quester after gems, most of the minerals are mined in two Brazilian states. I found dozens of mines in central Minas Gerais and southern Rio Grande do Sul, but one in particular remains in my memory. It is the Galilea Mine, about 36 miles southeast of Conselheiro Pena.

After negotiating an incredibly bad road

Sisters in stone, members of the quartz family find their individuality in infinitesimal chemical impurities or differences in atomic structure. Abundant water-clear quartz, foreground, goes by the name "rock crystal." A blush of titanium colors the rose quartz at upper right. Jewelers prize purple quartz as amethyst and yellow as citrine. When gemologists heated purple quartz from one area of Brazil, they produced a rare green quartz. Unlike these single crystals, the slice of banded agate—also a form of quartz—contains many microscopic crystals deposited by water seepage, layer by layer.

barely passable with a jeep, we reached the Galilea site, a tunnel driven into a steep brush-covered hillside. At the end of the dim, wet passageway, a dozen miners had just broken into a pocket of crystals. The feldspar surrounding them had decomposed to white clay, which completely filled the pocket. Rainwater seeping from above had transformed the clay to thick mud. I felt a thrill as I groped in the mud and pulled out several fine crystals of kunzite and morganite.

Historic Gems Light the Smithsonian

Adventuring to South America and Africa and other faraway places has always been a delight to me, but I can travel the world of gems without leaving the Smithsonian. In addition to the Hope Diamond and the Rosser Reeves star ruby, there are many other treasures, among them the Portuguese Diamond, a 127-carat emerald-cut gem from Brazil, the Star of Asia, an extraordinary deep-blue star sapphire weighing 330 carats; two fine chrysoberyl cat's-eyes weighing 58.2 and 171.5 carats; a 31-carat heart-shaped blue diamond that once belonged to Empress Eugenie, a recent gift to the Nation presented by Mrs. Marjorie Merriweather Post, and a splendid 98.6-carat deep-blue sapphire, the gift of Countess Mona Bismarck.

Jade in its finest form also can be seen in our collection (above), which houses the Maude Monell Vetlesen group of 130 Chinese

(Continued on page 858)

Years of thought and labor went into the shaping of this 15-inch-wide nephrite boulder. Carved in China in the 18th century, it details the visit of the Taoist Immortals to their mentor Shou-lao, god of longevity, at the Sacred Cave. To the Chinese, who brought gem carving to a high art, jade in its two forms—nephrite and

By milton a. rumbel, jr., assisted by harry l. stanfield (right) and mayo mohs, black star [illegible]

jadeite—was the most important, the most benevolent stone. Diamonds and crushed rubies served to cut and polish jade. Before making the first cut, carvers studied rough blocks for months, recalling the first-century adage about jade, "Upon examining its exterior, its interior is revealed to those who understand the stone."

Heir to that ancient art, Dr. A. Worth Hobby likewise visualized the five-inch fisherman (**above**) before he began to carve a seven-pound block of Australian opal. The tools of the Atlanta, Georgia, physician include modern dental drills.

Intent on value, Hong Kong dealers examine fine translucent jadeite before bidding at the annual gem auction in Rangoon, Burma.

Lustrous legacy of old Persia, a cascade of pearls spills from an enameled chest amid the Crown Jewels of Iran. Once the personal property of the shahs and still ranked as one of the world's most valuable collections, the gems evoke bygone glories while underwriting present-day progress. They constitute a priceless national asset that now backs nearly four hundred million dollars of Iranian currency.

Offspring of the sea, pearls form when certain species of mollusks coat irritants with glowing nacre. Divers harvested this bounty from beds off the island of Bahrain in the Persian Gulf. The envelope holds a list of the chest's contents.

Ancient Orientals revered pearls as a gift from the gods, an emblem of the moon, and insurance for long life. In the Persian winter palace at Susa, archeologists uncovered the oldest known pearl necklace, dating from at least the fourth century B.C. The historian Pliny told how the gems were strewn like petals on Roman temple floors. "It is not sufficient for the women to wear pearls, but they must trample . . . them."

The rage for pearl jewelry spread throughout Europe and America. Then, early in this century, the Japanese learned how to insert mother-of-pearl beads in pearl oysters and produce cultured gems by the millions. Many are of such high quality that natural pearls are now little sought after.

Iran's Fort Knox: The National Bank in Teheran astonished the world when it began displaying the fabled Crown Jewels in 1960. Profuse as a child's hoard of beach pebbles, unmounted emeralds (**above**) recall West-East trade in the 16th century. After Spaniards discovered

emeralds in Columbia, they marketed many by way of the Philippines to India and Iran. In 1739 Persian conqueror Nadir Shah sacked Delhi, returning with chests of emeralds, diamonds, and pearls from the Great Mogul's treasury. This booty forms the bulk of the collection.

Later shahs dipped into the trays of stones to fashion their own regalia. In 1926 the present king's father, Reza Shah, ordered the Pahlavi Crown of State, visible from the entrance of the well-guarded vault (**upper left**).

The exquisite little diamond-studded box (**left**), made of 92 cut emeralds set in gold, is priceless, despite the fact that the 35-carat stone in the center of the top exhibits the flaws common in large emeralds.

Other treasures dazzle as well: bejeweled tiaras, swords, globe, and throne; unrivaled Burmese rubies, and six cut diamonds larger than 100 carats.

jade carvings of the 16th to 19th centuries.

The word "jade" is used to describe two quite different minerals, jadeite and nephrite, which are similar in appearance.

Nephrite, a calcium magnesium iron silicate, was mined near Khotan in ancient Turkestan as long ago as 1,000 B.C. Called *yu* by the Chinese, it was first found as boulders in stream beds. Since then, deposits have been worked in Alaska, British Columbia, Wyoming, California, Siberia, and New Zealand.

Jadeite, a sodium aluminum silicate, is now the more valued variety of jade, especially in its fine emerald-green, translucent form. The world's only source of this Imperial jade lies in Burma, near Mogaung. At first the jadeite was found only in the bed of the Uru River, but in the late 1800's a deposit was discovered on the Tawmaw plateau. With this abundance of material at hand, Chinese sculptors—who had long fashioned objects from nephrite—turned to the production of large ornamental pieces from jadeite.

The art and craft of jade carving, handed down through generations, often has a miraculous air about it. I have seen the old carvers at work—or, rather, *not* at work as they sat and pondered a particular stone, sometimes for months at a time. They try to visualize the form within the stone. When the inspiration comes, they draw forms of incredible beauty from the various tints of color within the jade —green leaves, a brown twig, a white bird, all from the same piece.

Telephone Call Heralds a Dazzling Gift

The Smithsonian receives no funds from Congress for the purchase of specimens. All the major gems in the collection have been donated. Some of these gifts have been the result of long negotiation. Others were totally unexpected.

One day in May 1964, I received a telephone call from gem dealer Harry Winston, who said, "I have something for you. Can you come to New York tomorrow to see it?"

The next morning I sat across the desk from him in his plush Fifth Avenue office. He opened a small box and literally rolled across the desk toward me a magnificent 253.7-carat, uncut, gem-quality diamond crystal.

As I gasped, he said, "If you want it, I would like to donate this crystal in memory of Sir Ernest Oppenheimer." Indeed we did want it, and the Oppenheimer Diamond, named for the late chairman of the board of De

PHOTOGRAPH BY VICTOR R. BOSWELL JR., NATIONAL GEOGRAPHIC STAFF; ARRANGEMENT BY HARRY WINSTON, INC. © N.G.S.

The real and the counterfeit: A one-carat $2,500 natural diamond (fifth from left) possesses durability, brilliance, and fire—the ability to break light into flashes of color. The first gem diamond made by man (3) shares these qualities, but its cost prevents marketing. This 1/3-carat gem was cut from a crystal produced by General Electric in a program to improve synthetic industrial diamonds.

The other stones testify to man's dream of duplicating diamonds at low cost. Synthetic white sapphire (1), now worth about $3 a carat, and synthetic spinel (8), also $5, lack fire; synthetic rutile (4), $15, possesses too much fire and has a yellow cast. Zircon (6), $10, glimmers fuzzily because of double refraction. Strontium titanate (7), $40, shows scratches after a few months of wear. While somewhat harder, the YAG (2)—yttrium aluminum garnet—$50, still falls short of a diamond.

Beers Consolidated Mines, Ltd., is now displayed in the Smithsonian's Gem Room.

On a pedestal to the left as one enters the Gem Room is the world's largest and finest crystal ball, a flawless 12⅞-inch, 106-pound sphere cut from a 1,000-pound quartz crystal. I need no other magic than imagination to gaze into it and conjure up, say, the opal mines of Australia.

Opal, one of the showiest of all gems, is a form of silica, silicon dioxide, which makes up, as I mentioned, much of the earth's crust. The most common form of crystalline silica is quartz. Uncrystallized and containing a little water, silica becomes opal—one of the few gems that are not crystalline.

Australia's famous opal mines, mostly small one-man pits in a hot, arid region, produce both white and black opal.* White opal was discovered in 1889 at White Cliffs, and black at Lightning Ridge some years later. Both varieties are more brittle and softer than most crystallized gems, but they more than make up for it by magnificent flashes of fire. The huge Andamooka Opal, presented to Queen Elizabeth II, weighs 203 carats and measures 2⅞ inches across.

I am often asked who owns the world's most valuable collection of precious stones. It is a difficult question, for there are many treasures. Moviegoers who saw *Topkapi* became familiar with the riches of the Topkapi Saray Museum in Istanbul. In 1965 I visited this fascinating place, formerly the palace of the Ottoman sultans, standing on a bluff above the Bosporus. The dagger featured in the film has a handle fashioned from three huge emeralds, each measuring more than an inch across. Other gems may be seen here in great profusion—emeralds and rubies, pearls and diamonds by the thousands.

Russian Treasury Dazzles the Eye

Another breathtaking store of gems lies in the Kremlin's Hall of Facets in Moscow. Here may be seen notable diamonds and large numbers of emeralds, spinels, sapphires, and pearls mounted in jewelry once worn by the czars' families. Among the gems is a 399-carat red spinel, one of the world's largest; a blue sapphire, also among the world's largest; several emeralds of more than 100 carats each; and rubies of 18 and 40 carats.

*Howell Walker described Australia's opal mining in "South Australia, Gateway to the Great Outback," National Geographic, April 1970.

Fillip to glamour, foiler of thieves: A YAG on the left duplicates Elizabeth Taylor Burton's 69-carat drop, purchased in 1969 for more than $1,000,000. Copies such as this $3,500 Diamonair permit owners of large jewels to leave their gems in a vault and avoid excessive insurance costs.

The YAG sparkles beside a marquise-cut 29-carat diamond from the Smithsonian. When both stones are immersed in a pool of mineral oil (**right**), the counterfeit lies unmasked. The YAG is so close to oil in its refractive index—the measure of ability to bend light—that rays pass through the two with only a slight change in direction. The YAG seems to fade away, while the diamond sparkles on. Litton Industries introduced the first diamondlike YAG in 1969. Now manufactured by other companies as well, it succeeds as one of the most popular of the imitations.

Cleaving: tense moment of truth in the diamond-cutter's trade. A misdirected mallet can shatter a fortune—a mistake that in early days cost some craftsmen their lives.

For weeks Pastor Colon, Jr., cleaver at Harry Winston, Inc., pondered the 601-carat $640,000 Lesotho, eighth largest rough diamond yet found. Painstakingly, he plotted to garner the largest possible number of flawless pieces. With meticulous care, he mapped cleavage planes inherent in the crystal along which the diamond would split.

On a plastic replica (**top**), Mr. Colon inks an experimental line; part of it shows through from the back. Satisfied, he transfers the mark to the Lesotho, imbedding the stone in shellac that hardens to steady it for the forthcoming surgery (**center**).

Staking all, Mr. Colon poises a blade on the line and strikes with a mallet (**below**). Result: a perfect break (**lower right**). The 150-carat fragment on the right yielded two ring stones, while the 450-carat remainder produced 16. The final faceted gems will bring several times the rough's original cost.

Grand finale of the cutter's art, diamonds twinkle before buyers in the Diamond Exchange of Amsterdam. Of colored stones, called fancies, red, blue, and green are the rarest. Before World War II, Jewish cutters and traders made Amsterdam and Antwerp world diamond capitals. Today Israel is also a major cutting center.

But the showpieces of the collection are the Orloff and Shah Diamonds.

The Orloff, weighing 189.62 carats, resembles half a faceted egg. Like the French Blue, this stone by legend formed the eye of a statue of a Hindu god—Sri-Ranga in the Temple of Srirangam in southern India. It was stolen, and after passing through several hands, was sold in 1774 to Prince Gregory Orloff, who the following year gave it to Catherine the Great. Catherine had it mounted below the double eagle in the Imperial Scepter, where it remains to this day.

The Shah, an 88.7-carat, bar-shaped yellow diamond, bears three engraved markings. The first one reads "Nizam Shah Boorhan II [in the year] 1000," which identifies the stone as having been owned by the ruler of the Indian province of Ahmadnagar in A.D. 1591. The next engraving reads "Jahan Shah 1051 [son of] Jahangir Shah." This puts the stone in the possession of Shah Jahan, builder of the Taj Mahal, in A.D. 1641.

The Shah was apparently among the gems captured in 1739, with the Koh-i-noor, by Nadir Shah of Persia, for the third inscription is "The Sultan Fath Ali Shah Kajar 1242," indicating the Shah of Persia in 1826.

In 1829 the diamond was given to Czar Nicholas I of Russia by Persia to appease him for the assassination of Russian Ambassador Alexander Griboyedoff in Teheran.

Perhaps the greatest jewel treasury of all, however, still belongs to Iran—including what remains from the sack of the Mogul Empire by Nadir Shah. The magnitude of that vast treasure staggers the imagination. There were said to be 13,000 chests filled with gold and silver coins alone, and "an inconceivable number of chests filled with diamonds, pearls, and other jewels."

For many years, the Iranian treasure remained behind closed doors, but in 1960 a permanent exhibition was opened in the National Bank in Teheran—a museum gallery housed literally in a bank vault. On display are a jewel-encrusted throne, crowns, swords, and other regalia. There are pearls here by the trunkful, and heaps of emeralds of large size and magnificent color, as well as treasures in rubies and spinels (pages 854-7). The largest single item is the throne, more than seven feet high. Built of wood, it is covered with sheet gold in which are set thousands of gemstones. The largest single diamond in the collection is the 185-carat Darya-i-noor—Sea of Light.

Many visitors to the Smithsonian ask me if there are any "new" gems—minerals that qualify as gems that were unknown earlier.

Glowing like a hot coal, the unique Hope Diamond phosphoresces red for several seconds after exposure to ultraviolet rays in a laboratory experiment. Geologists classify it as a Type IIb diamond. All other known Type IIb stones glow blue.

Phosphorescence, triggered also by sunlight, occurs in a number of gems, a trait exploited by early fortune-tellers to "prove" a stone's supernatural powers. Actually, ultraviolet rays upset the course of orbiting electrons. As they return to normal paths, they release pent-up energy in the form of visible light.

Back in the Smithsonian (**right**), the Hope holds schoolboys in thrall as it reflects on the inner surface of its glass case.

On November 20, 1968, Tiffany & Co. for the first time displayed jewelry made from a mineral that the firm's vice president, Henry B. Platt, had christened tanzanite. It is, in effect, a new gemstone. Tanzanite was discovered, in circumstances still unclear, in Tanzania, East Africa, in 1967.

In chemical composition tanzanite is a variety of zoisite, which is found in many parts of the world but has never yielded gem-quality stones. This has led some authorities to believe that tanzanite may be a fluke of nature, a onetime creation.

Pocket-size Mine Yields a Giant Reward

Have all the dramatic discoveries of great gems been made? No indeed. Miracles still happen. The world's eighth largest diamond, the 601.25-carat Lesotho Diamond, was found in May 1967 by Ernestine Ramaboa, wife of the owner of a 30-foot-square diamond claim in Lesotho, the enclave in South Africa formerly known as Basutoland. She came upon it while panning gravel.

Petrus Ramaboa, a farmer-turned-diamond-miner, had staked out his tiny claim and dug patiently for five years, averaging only 25 to 30 cents a day with rice-size stones—until his wife unearthed this egg-size gem.

Alone, for her husband was in Maseru, Lesotho's capital, Mrs. Ramaboa wrapped the gem in a cloth and pinned it inside her dress pocket, telling no one except her two brothers until her husband returned.

Since he had only $4 cash, Ramaboa could not afford the $19.50 air fare back to Maseru. So, slipping the treasure into his pocket, he and his wife walked and hitchhiked for four days over 110 miles of dirt roads.

I heard this fascinating rags-to-riches story at Harry Winston, Inc., in New York City. Winston had bought the gem from J. W. Verney for a reported $649,000. Verney had bought it from Eugena Sarafini, who in turn had bought it from Ramaboa for $302,400.

After the purchase, Winston sent the diamond—by registered mail—to New York. The Ramaboas followed, at his invitation, to see "what would happen to their baby."

After months of study, during which more than 20 replicas were made, the decision was made and the stone cleaved on March 5, 1968, by Mr. Pastor Colon, Jr. (page 860). Cutting has now been completed; the rough yielded 18 gems of various sizes and shapes, the largest of which weighs 71.73 carats.

In that story of miraculous good luck and sudden wealth lies a part of the romance of gems, which have imparted lasting beauty to the life of mankind for centuries. □

ST. PETER'S

By AUBREY MENEN

Photographs by ALBERT MOLDVAY

NATIONAL GEOGRAPHIC PHOTOGRAPHER

IN TWENTY YEARS of living in Rome, I have come to know St. Peter's stone by stone. I have learned about the extraordinary men who put those stones together—the Roman Emperor Constantine, Raphael, Michelangelo, and many others. As a result, I have come to look upon St. Peter's as one of the most fascinating and beautiful monuments of Western civilization—and I suppose I have seen most of them.

When I first saw the basilica, however, I thought it somewhat boastful. St. Peter's is, of course, the largest church in Christendom. On the floor of the nave there are bronze letters giving the measurements of other big churches—Notre Dame in Paris, St. Paul's in London, St. Patrick's in New York. Each is smaller, and could fit easily within St. Peter's 163,000 square feet—St. Paul's, for example, covers only about three-quarters that area.

Those bronze letters on the floor put me off St. Peter's for years. It seemed to me then that a church that says, "I am bigger than these," is like a person who says, "I am holier than thou." The truth is that I was ignorant. One does not have to know anything about Notre Dame to enjoy it. One just walks inside. I thought I could do the same with St. Peter's, but I was mistaken.

I think my present admiration of St. Peter's began when I met an Irishman called Hugh O'Flaherty. He was a monsignor, and a domestic prelate to the pope. This meant he

REJOICING IN SPLENDOR (left), St. Peter sits enthroned in bronze in the colossal basilica that bears his name. The statue of the fisherman to whom Jesus entrusted the keys of the kingdom of heaven wears the pontifical finery reserved for his feast day. Roman Catholics look on Peter as the first and foremost vicar of Christ, and his church as the seat of their faith.

HEAVEN-SENT SHAFTS of sunlight pierce the basilica's dome (above). Emperor Constantine built the first St. Peter's to glorify the traditional site of the saint's grave. Rebuilt in the 16th and 17th centuries, the church is the world's largest.

AT THE HIGH ALTAR, under a 95-foot-tall bronze canopy, Pope Paul VI celebrates Mass on the feast day of Sts. Peter and Paul (following pages).

was part of what is known in the Vatican as the "papal family"—priests who are very close to the pontiff. He was six feet tall, handsome, with graying hair, and he had a way of doing things that was all his own.

I asked the monsignor to show me the Vatican, and with him I saw the place as few people have done, before or since. He could come and go anywhere, "in and out of any door, like a cat," as he put it. But, for many days, he did not take me to St. Peter's.

Then, one day, after hours of tramping palace corridors, he said, "Me boy, we need a drink." He took me from the papal palace into St. Peter's Square (page 870). I looked thirstily at the sign of a bar down the street, but my friend turned and made for the great tawny facade of St. Peter's. We went inside, I with a sinking heart, fearing a dissertation when what I wanted at the moment was to quench my thirst.

ENLARGEMENT BY DU BRUEA, ARNO MINZLOFF © N.G.S.

Some traditions I knew: that the first basilica on this site was built over the grave of the Apostle Peter by the Emperor Constantine; that it was consecrated in A.D. 326. And some facts: By the early 16th century this ancient edifice was so decrepit that it became necessary to demolish and replace it. The foundation stone of the new basilica was laid in 1506 by Pope Julius II, and the new church was consecrated in 1626, on the thirteen hundredth anniversary of the original consecration.

St. Peter's, built in the form of a Latin cross, is 700 feet long and 450 feet across the transept. It can hold at least 20,000 people. The dome has an internal diameter of 137 feet, 6 inches, is nine feet thick at the base, and rises to an external height of 452 feet. Even the carved cherubs of the holy-water stoup are colossal—seven feet high.

There is only one painting in the church today; more than a hundred other pictures are now reproduced in mosaic (pages 876-7). The exterior walls are of travertine, the interior pavements of colored marble.

Monsignor O'Flaherty surprised me. Not a bit of this did I hear from him. Instead, he walked straight through the enormous basilica, without giving it a glance. He went into the sacristy, then into another sacristy, and then pushed open a door. Beyond it, but still within the walls of St. Peter's, was a typical Italian cafe, with espresso machine, bottles, advertisements, and a tempting array of things to eat.

We ordered refreshments. I learned that as many as twenty priests at a time may celebrate Mass in St. Peter's, sometimes simple country priests for whom the ceremony is the climax of their lives. The cafe is for their relaxation when the emotional experience is over. For the first time, St. Peter's seemed to come alive to me.

The Human Side of Becoming a Pope

The next day, in the Vatican Palace, the monsignor led me into a vast chamber, deep in shadow. He moved away and disappeared into the darkness, fumbling with switches. Then suddenly the place blazed with light. I found myself in the Sistine Chapel, alone, under the stupendous ceiling by Michelangelo. I was left quite by myself for five minutes, a privilege, as my companion remarked when he rejoined me, that not even presidents and kings enjoy.

The Sistine Chapel is the place next to St. Peter's where the conclave of cardinals is held and a new pope elected. The cardinals sit round the walls, each on his own throne. Each throne has a canopy. When the name of the new pope is announced, all but one of the cardinals pulls a rope beside him, and his canopy descends. Only the canopy of the new pope remains in position. He is asked if he will accept the office. If he says he will (secrecy cloaks whether anyone has ever refused), the fisherman's ring is slipped on his finger, and he announces his new name.

"Now come with me," said my friend.

I followed him to a small door. We went through it and climbed a narrow staircase to a small, rather shabby room with a couch.

GUARDIAN OF ST. PETER'S, Pope Paul VI speaks with visitors following an audience. Elected by the conclave of cardinals in 1963, the 74-year-old pontiff serves as the 262nd spiritual successor of St. Peter. A tear streaks the face of a Czech pilgrim (**opposite**) as she receives the blessing of Pope Paul in the basilica.

EXQUISITELY MADE WOODEN MODEL (**above**) survives to show how the 16th-century architect Antonio da Sangallo visualized St. Peter's. Michelangelo scrapped the design, charging that its dark crannies would provide shelter for bandits, for coining false money, ravishing nuns, and committing "innumerable rascalities."

REACHING FORTH in the "maternal gesture" planned by 17th-century designer Giovanni Bernini, twin colonnades (**below**) crowned with statues of saints and martyrs embrace all who enter St. Peter's Square. Here, on holy days, surging throngs receive the papal blessing and shout "*Viva il Papa!*"—Long live the Pope!"

"The new pope," said Hugh O'Flaherty, "rests for a while on that couch. Three sets of robes are ready—large, medium, and small. He is dressed, and his red slippers are put at his feet. The clothes never really fit. Now," he went on, "imagine yourself a pope. Your shoes pinch, your cassock is tight under the arms. Follow me once more."

We went into an adjoining great hall. Gigantic shutters swung open, and then a window. I walked through onto a balcony. I looked down, and beneath me lay St. Peter's Square. I was on that central balcony in the facade of St. Peter's from which the pope gives his first blessing.

Seat and Center of the Papal Domain

I stayed for a while, then went inside. I must have had a very solemn expression. The monsignor said with an Irish twinkle, "A penny for your thoughts."

"I don't think I had any thoughts," I said. "It is too big to grasp."

"Let me help you," he offered. "Come here." We crossed the great room, which I now realized was the audience hall that runs right across St. Peter's. In the middle of the far wall was a small window. I looked through it. All St. Peter's lay at my feet: the great nave, the four gigantic columns of Bernini's baldachin over the papal altar (pages 866-7), and, at the far end, the stupendous shrine with its saints holding aloft the spectacular bronze throne of St. Peter.

"What name would you have chosen?" I was asked.

"Benedict."

"Well then, Pater Sancte Benedicte," said the monsignor, intoning the pope's title, "all this is in your care. Every stone of it. If you want to tear it down, you can, and nobody can stop you. One pope did."

"Julius II," I said.

"Yes," he confirmed. "And remember that one of his reasons was that he wanted the new church to be big enough to hold his tomb, which was to be the biggest papal tomb ever seen, with huge statues honoring his earthly achievements. And that's one key to St. Peter's. Though built to the glory of God, it is the pope's domain. When you grasp that, everything falls into place."

Of course, for a sixth of the people of the world, St. Peter's is *their* church. It is the outward sign of the spiritual power of the Roman Catholic Church. Every Roman Catholic prelate and every good Catholic layman hopes to visit it and pray there. But the basilica's special significance derives from its association with St. Peter, and he was the first pope. Each succeeding pope inherits it from him, as he does the office of the papacy.

Some time after my visit, I saw this inheritance passed on. A pope had died. The cardinals had sat under their canopies, and at last the only canopy that was not lowered sheltered the head of a man who was the son of simple Italian peasants.

I was in St. Peter's Square when this man made the journey from the Sistine Chapel that I had made, and I saw him stand on the balcony of St. Peter's, where I had stood. A prelate called out in loud tones:

"I bring you glad tidings. We have a pope." Then he said the name that the son of a peasant had chosen not thirty minutes before: "Johannes."

John XXIII approached the balustrade. He gave his first blessing. It was a historic moment, but I could not help noticing that John was finding difficulty in raising his right arm. I knew what had happened. John was a very portly man. Not even the biggest of the three robes had fitted, a fact which the pope later confirmed with great good humor.

Coronation Ride May Prove Unsettling

A few days passed. Then an official came to my door bearing a large engraved card. I was invited to the pope's coronation.

It was early morning when I went to St. Peter's. Suddenly trumpets sounded, and the new pope was borne in on his portable throne, looking decidedly uneasy. I was sorry for him.

Hugh O'Flaherty had introduced me to the chief of the *sediari*, the men who carry the platform on which the pope rides. He had said, I remembered, "For the first few times, it's very hard on new popes. We go as steady as we can, but it makes them seasick."

The pope was led to his throne, directly

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under the great bronze throne of Peter. It dwarfed Pope John, big man as he was, but it glorified his office. In terms of consummate art, it clearly proclaimed, "This is the 261st successor to Peter, first among the disciples of Christ. Obey him."

The pope moved down the church, followed by the cardinals. He came to the central altar that only a pope may use, or a cardinal specially named by him to stand in his place. He celebrated Mass. He raised the Host toward the dome. He lifted his eyes. On the vast golden frieze beneath the dome were the words in Latin, "Thou art Peter and on this rock I will build my church."

Jesus had said them, giving his leading disciple, Simon, a new name that meant "rock" in Aramaic. This name, Cephas, was later translated into Greek as Petros.

Constantine Raises a Basilica

The pope lowered the Host to the altar. He knelt. Directly below him, deep down in the bowels of the basilica, were the bones of Peter, the fisherman, whom Jesus had chosen from among all his followers.

Or *were* they? The fact was, at the time, nobody really knew.

Peter had come to Rome and there he had founded a church—not a church of bricks and mortar, but a group of Christians who met in each other's homes. About 25 years later he lost his life in the first of the persecutions. Tradition holds that he was crucified upside down in Nero's Circus near Vatican Hill. His body was given to his friends, and he was buried close by.

Three centuries passed, and the numbers of Christians grew—so much so that Emperor Constantine finally declared their faith lawful. He himself died a Christian. But he was a strange man. He killed his supposedly unfaithful wife by locking her in a steam bath. So it would not appear that he was unduly impressed by the Sermon on the Mount. At all events, he raised a great temple over the place where the fisherman was thought to be buried, and this was the first St. Peter's.

When Julius II pulled much of it down and began the church that is there today, the tomb of St. Peter was lost to view. For centuries there was no chance of knowing whether St. Peter's bones were still there, for Pope Gregory I had warned that disaster would befall anyone who disturbed them. Historians thought Peter's bones were gone, his tomb sacked long before by Saracens.

It was arranged for me to have a look at the tomb area. I went down into the crypt of St. Peter's, and then down some more steps. Suddenly I came upon what seemed to me a village street. There were little housefronts with pretty doors. I went into one of the houses. It was painted with bright frescoes. On a shelf was a stone urn, open, with whitened bones. The official who accompanied me stirred them absently with his finger while explaining where we were.

I learned that in 1939, while excavations were being made for Pius XI's tomb, Pius XII gave orders that the digging was to be extended in a search for the tomb of St. Peter. This "village" was one of the great discoveries. The houses and simpler tombs under them dated from the first to the third centuries A.D. They proved beyond doubt that Constantine had built St. Peter's over a cemetery.

But an even more exciting discovery was involved. A Roman presbyter named Gaius, who lived in the second and third centuries, had seen a grave memorial to St. Peter, and had mentioned it in a letter, a fragment of which has come down to us. Right under the papal altar, early in the excavations, a small ruined monument was found. This could well be the memorial Gaius had seen. At its foot was a slab like a gravestone let into the ground. The excavators raised it. They found a grave, but it was quite empty. Some bones were discovered nearby. For several years they were believed to be the bones of Peter, but anthropological study established that they were actually the bones of more than one person, including an old woman. Disappointment in the Vatican was great.

Inscription Leads to a Startling Find

That would have been that, except for one obstinate and learned woman, Margherita Guarducci. She is a professor at the University of Rome, and she deciphers ancient inscriptions (opposite, above).

She spent six years studying the scribblings made by Christian pilgrims on two old walls above the empty grave. One graffito on the older wall, when deciphered, delivered an electrifying message: "Peter is within." In the other wall was a recess lined with marble. To her it was clearly an ossuary, a niche for someone's bones. Had any been found?

HALLOWED TREASURE: Bones declared by the pope to be St. Peter's repose in boxes within a wall niche (**below**). Here, it is believed, they were placed by Constantine to safeguard them from desecration.

Much of the credit for the identification goes to Professor Margherita Guarducci of the University of Rome (**left**), an expert in ancient inscriptions. She based her opinion on the scrawled words "Peter is within," and on scientific confirmation that the bones had come from a man meeting the saint's description.

MASTERPIECES of religious art make St. Peter's a treasury as well as a church.

In its newest work, sculptor Emilio Greco captured the character of the beloved John XXIII (**right**). The bronze panel depicts the pontiff among the sick, the poor, the imprisoned—the wretched of the world for whom he showed so much compassion. As in life, John here leads fellow churchmen to the people.

In 1499 Michelangelo at 24 years of age completed the basilica's most cherished work. The Pietà (**below**) shows the Virgin grieving over the body of Christ.

The professor got hold of a workman who seemed to remember that something had been found there years ago, but he thought it was a piece of wall with a graffito. Undaunted, she searched St. Peter's storage rooms. There, in a box marked for graffiti, she found bones.

The bones, she learned, were indeed from the ossuary in the ancient wall. Ten years before, a monsignor, during his daily inspection of the excavations, had put the bones in a plain wooden box and deposited it in storage.

Pope Paul Resolves a Scholarly Dispute

Professor Guarducci had the bones examined by Professor Venerando Correnti, an anthropologist of the University of Rome, who, as she puts it, "entirely bore out what could be expected for the bones found in the *only* niche built by Constantine in his monument to St. Peter."

It was plain to her what had happened. When Constantine had erected the first St. Peter's, he had cautiously moved the bones of the saint from his grave to this hiding place, a few feet away, to protect them from deterioration and grave robbers.

That the bones Professor Guarducci found are those of St. Peter, she has no doubt. They are the bones of a man of 60 or 70, and in the box with them were bits of earth and shreds of purple-and-gold cloth. The age tallies with Peter's traditional age at the time of his crucifixion. Tradition says that he was buried in plain earth. And when Constantine had the bones removed to the niche, it would have

UNHERALDED VATICAN ARTISANS labor quietly to reproduce some of the world's greatest religious paintings. Their copies, in glowing mosaic, will last for ages to come. Beginning in the 16th century, they replaced more than a hundred fragile canvases in St. Peter's, dimmed by gradual deterioration from candle soot, dampness, and grime. Copies of masterpieces from other churches and museums, such as Raphael's "The Transfiguration" (**left**), also now adorn the basilica's altars.

The Vatican studio today translates great paintings into mosaic copies for shipment to many parts of the world. Anselmi Odoardo, for thirty years a craftsman in the shop, re-creates a painting by Murillo (**right**). Working from photographs, he sketches the oil, then fixes the drawing to a stucco base as a guide. Carefully matching the painting's colors from 28,000 shades of glasslike tiles (**above right**), he chips and places each tiny piece to duplicate every line and hue of the original work.

seemed only fitting to have had them wrapped in precious purple-and-gold cloth.

Scholars disputed these conclusions; some still do. But Pope Paul VI settled the question for the Catholic world. Speaking in St. Peter's on June 26, 1968, he announced that the bones of the saint had been found.

Today the bones are back in the niche of the tomb, hidden from public view (page 873). But the bones are not the only things the ordinary visitor does not see within the walls of the basilica. Indeed, some marvels are literally hidden within the walls.

Basilica That Never Came to Be

My most remarkable tour of St. Peter's was on a walk through the walls. It came about while I was studying the architects who had built the new basilica. They worked in fits and starts, between wars and political strife—and often the money ran out and the construction stopped.

One result of this financial stress was that Pope Julius II never got his gigantic monument to his accomplishments. A much smaller version of it was placed in the Roman Church of San Pietro in Vincoli thirty years after his death, but Julius does not lie within it. He rests in one of the humblest tombs in St. Peter's, under a simple stone let into the floor behind the organ, buried, most economically, with his uncle, Pope Sixtus IV.

Though it was Julius who gave the main impetus to building a new St. Peter's, some work had been done by his predecessors, and it was completed long after his death. The architect under Julius was Donato Bramante; both died before much could be done. Pope Leo X called in Raphael, but he, too, died within a few years.

Other minor artists followed, until a tough, practical man was found to carry on the work. His name was Antonio da Sangallo. He made a huge model of his idea of St. Peter's, and this is what the church might be today, if Michelangelo, by then a very old man, had not taken a great dislike to the model and to Sangallo, whom he accused of incompetence bordering on stupidity.

The model was abandoned and the job given to Michelangelo. He, too, died before the basilica was completed. A competent but uninspired man, Carlo Maderno, finally finished the building—in a manner that would certainly have enraged Michelangelo, and Bramante, Raphael, and Sangallo, too.

Now, I knew that Sangallo's model still existed, and in St. Peter's. But where? I was told, very reluctantly, that I could see it.

An official took me into the basilica, opened a door, and led me up some steps. Soon I found myself in a winding corridor built inside the basilica's thick walls. The top was arched, the walls were white, and it was exactly as though I were walking in the narrow alleys of some Moroccan town.

We walked a long way, then, going through a heavy wooden door with an antique lock, we came into a vast room. We were inside one of the gigantic piers that support the dome of St. Peter's. Against one wall was a dusty model, 17 feet tall, of an organ that had never been built. We passed to yet another room. It was in total darkness. We switched on flashlights, and there, filling the room, was Sangallo's model (page 870).

It is made of wood, with joinery so perfect it left me marveling. One side of the model opened. I walked inside. I stood under the dome, its top ten feet above my head. Sangallo's church, I thought, would have been better, at least in the interior, than the one we have. It would have had more mystery. It would have been full of nooks and crannies. That is why Michelangelo condemned it. It would be impossible, he said, to winkle out all the people at closing time.

Custodians Are No Longer Acrobats

Architects have practical minds, and after studying their work for so long, my thoughts took a practical bent as well. I wondered how this vast church was maintained.

I talked to Francesco Vacchini, the man in charge of what is known, picturesquely, as the Reverend Fabric. I knew, I told him, that St. Peter's is maintained by the *sampietrini*, workmen who have been famous for generations for being like one big family.

"No longer," he replied, sharply. "They used to live here, near the Vatican, under the shadow of their church. Now, at 5 p.m. promptly, they are off in their cars to their flats in the suburbs, for supper and television."

The sampietrini have long amazed visitors by the acrobatic feats they perform in getting to far-off parts of St. Peter's. But that, too, is largely a thing of the past.

"Sometimes, yes," said Signor Vacchini. "Sometimes you can get to a spot only by swinging from a rope. But I discourage it. St. Peter's isn't a circus."

I imagined the basilica would need an army of workers to maintain it.

"I have 50," said Signor Vacchini.

"Why so few?" I asked.

He spread his arms wide. "What with wages, social security, family allowances, and the rest, those few cost me 10 million lire a month."

That is only $16,000. But the Vatican is economizing. Even the number of Swiss Guards is slowly being reduced. Austerity is the keynote of Paul VI's pontificate.

Here Popes Touch Their People's Hearts

Besides worrying about the basilica, the chief of the sampietrini also frets about us—you and me, the visitors to St. Peter's.

"I wish people would remember this is a place of worship," he said, "and not a tourist attraction. Remember, St. Peter's is a *church*, not a museum."

St. Peter's belongs to all civilization, but, first and last, it is the pope's church, and I have found it is the place where the popes are most at home.

Pius XII was a man of Roman courtesy. When I first met him in the Vatican Palace, he was, like other popes I've since met there, not quite at ease. He left me in awe, but nothing warmer. Yet I recall this same man in St. Peter's. On that day, he found himself in front of tens of thousands of Italian children, come on a pilgrimage on his birthday. He took some papers from an aide, and the children settled down for a sermon.

Suddenly he put the papers aside. He looked at his young audience.

"Are you good children?" he asked them.

"Yes," came a rather wavering answer.

"Do you say your prayers?" asked the pope.

"Yes," came the reply, a little stronger.

"Do you eat your spinach?" he demanded.

"YES!" they answered in a delighted roar, and St. Peter's echoed with young laughter.

Or again, in the great square in front of the basilica, I stood one night with the concourse of Romans who had come to welcome John XXIII home from a journey. The church was very dark against the night sky.

The pope appeared at his window. He talked for a while to us. Then the dome of St. Peter's became edged with a silver glow. The pope broke off his address. He looked up.

In tones of wonder, he said, "The moon is rising. You cannot see it from down there, but I can. It is very, very beautiful."

The glow on the dome increased. We all looked, and it was as the pope had said, a beautiful sight.

KISSES AND CARESSES of the faithful have worn smooth the right foot of St. Peter's statue. Overwhelmed by the basilica's awesome splendor and artistic treasures, Goethe recalled: "St. Peter's has made me realize that Art, like Nature, can abolish all standards of measurement."

"Well," said the pope, "that means it is time for us all to go to bed. So now I am going to give you my blessing. Take it home with you: to those who could not come tonight, to those who are sick, to your children who are sleeping. Tell them that it comes from me." He raised his right hand. "In the name of the Father, the Son, and the Holy Ghost. . . ." □

First Glimpse of a Stone Age Tribe

EXTACHROMES BY JERRY JONES © N.G.S.

BEYOND the clattering blades of the helicopter, the nearly naked figures emerged from the forest—and stepped out of the Stone Age into the year A.D. 1971.

They were members of the Tasaday tribe of Mindanao island's green interior—a people unknown to the outside world until the arrival last June 7 of the airborne party of Manuel Elizalde, Jr., chief of the Philippine Government's Presidential Arm for National Minorities.* Cameras of a National Geographic TV crew soon captured historic first footage of the tiny tribe of forest dwellers.

For the Tasadays, the height of technological sophistication has been a knife with a bamboo blade or a hammer of chipped stone bound with rattan to a wooden handle (**above**). With such Stone Age hardware, family groups pound and scrape the pith from wild palms (**left**), a staple food.

*See "Help for Philippine Tribes in Trouble" by Kenneth MacLeish, GEOGRAPHIC, August 1971.

Isolated in their forest-locked highlands, the Tasadays apparently have no words for "sea" or "boat." When first contacted, they knew nothing of a nation called the Philippines. Never, it seems, had they tasted salt or sugar.

A far-venturing trapper of Mindanao's Manobo Blit tribe stumbled on the Tasadays in 1966. Though their languages are related, he communicated with them only with difficulty. Five years passed before he arranged a meeting between the shy forest-folk and Elizalde.

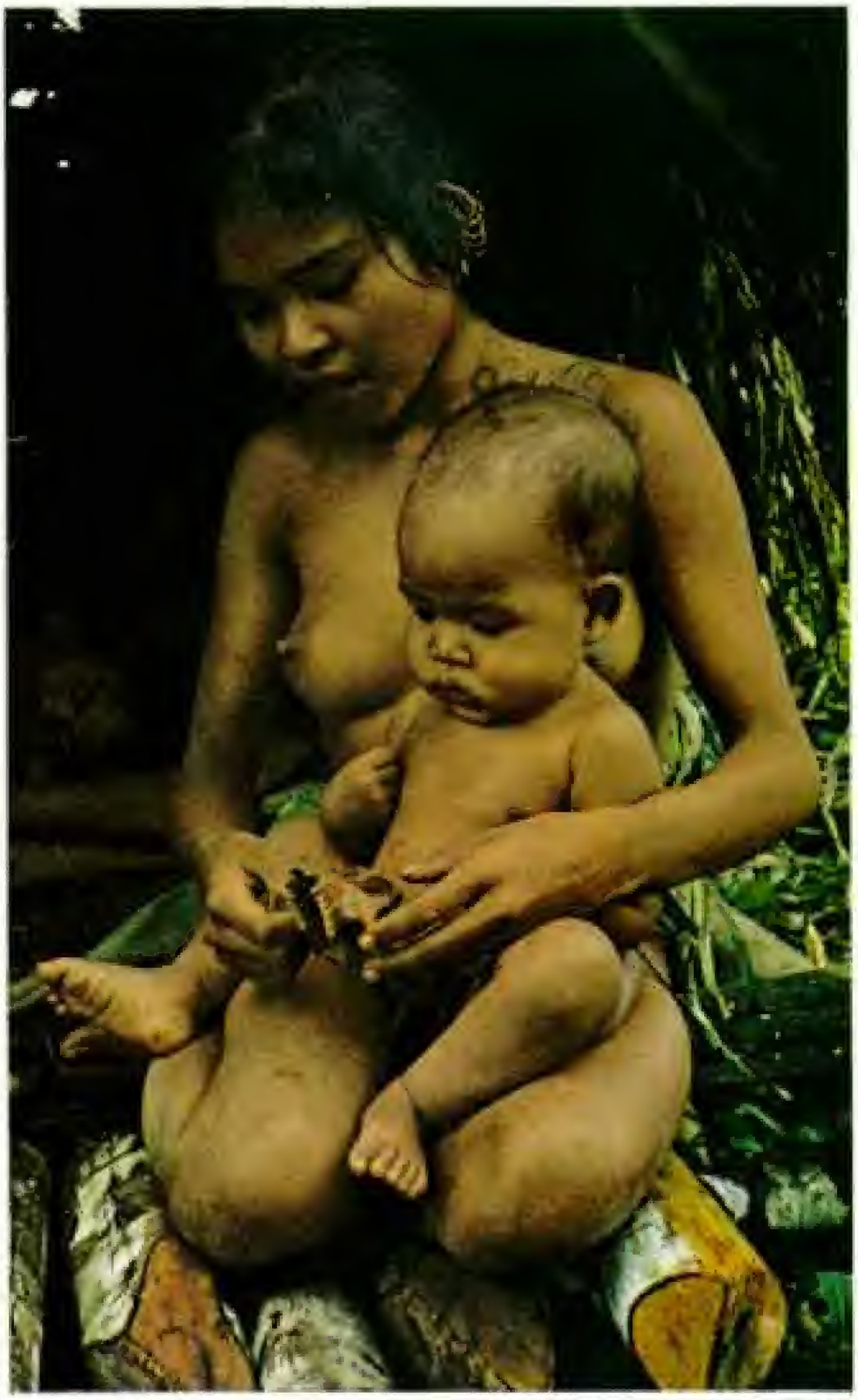
HOME OF THE TASADAYS, ON THE ISLAND OF MINDANAO IN THE PHILIPPINES

Finally the Tasadays journeyed to a clearing at the edge of their territory, there to meet Elizalde's party: strangely clad men from the sky, bearing miraculous gifts—beads, mirrors, metal knives, even a flashlight.

Elizalde has now petitioned his government to have the domain of the Tasadays declared off limits to loggers, miners, and ranchers who nibble away at the shrinking realm. Without such help, the tribe—numbering perhaps a hundred in all—could disappear entirely.

Meanwhile, anthropologists look forward to the rare opportunity of studying firsthand a people who, it is thought, have lived in isolation for hundreds of years.

What do the Tasadays themselves think of all this? Not much, apparently. Their chief desire seems to be to ignore the 20th century and melt back into their own shadowed world.



ANTHROPOLOGY BY JERRY JONES © W. E. S.

A MONKEY'S SKULL captures the attention of a Tasaday child. Mother and son sit on the log floor of a shelter built by Dafal, the Manobo Blit trapper who first contacted the tribespeople.

Dafal taught them how to make more efficient traps than they had been using. In an effort to persuade them to respect his own traps, Dafal also gave them bows, arrows, and metal knives—weapons that have already brought changes to the Tasadays' way of life. Members of the tribe occasionally put aside the new implements, however, and revert to stone axes and bamboo knives.

One highly appreciated gift: brass wire for ear ornaments. The Tasadays already were acquainted with this material—probably through long-forgotten contacts with other peoples who had dealt with traders from the outside world.

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ON MOST OF THESE CBS TELEVISION STATIONS

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*See neighboring states

WONDER IN HIS EYES, A TRIBESMAN TILGUTS STEEL TRAMMING TUBES FROM A KIT—
A RAMBOLAN BOY'S DART. ESTABLISHING BY JERRY JONES © N.G.S.

Man with a mission: Manuel Elizalde, Jr., the young Philippine official dedicated to saving his nation's beleaguered tribes, addresses a gathering of Ubos

Ancient mode of metal casting may disappear as modern technology obliterates traditional crafts. This Ubo artisan blows life into a bed of embers as he makes a brass knife handle.

Whatever the trader brings becomes high fashion. This woman wears beads, gold tooth caps, and a turban of toweling

Dancers wield spears and stomp to frenzied drumbeats in a traditional Higaonon ritual.

Trapped between yesterday and tomorrow

UBO, MANSAKA, T'BOLI . . . the unfamiliar names ring and throb like the pulsings of the bush telegraph in jungle backlands. They are the tough-spirited tribes of Mindanao, the Philippines' "Wild Wild South"—an island test tube of primitive peoples being rudely shaken by the 20th century.

To the CBS television screen on January 12 will come the drama of their struggle for survival—their sometimes violent battle against the encroachments of modern Philippine society.

Tear out this page and prop it on your set as a reminder. You won't want to miss "The Last Tribes of Mindanao," the second of National Geographic's 1971-72 series of color documentaries. Included will be the first films made of the newly discovered Tasaday tribe (pages 880-82). Leslie Nielsen narrates the hour-long program, produced in association with Wolper Productions, Inc.

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Inside, there's plenty of room in front and back. And deep-foam bucket seats that recline.

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Everywhere there're little things usually not appreciated until a car has been lived in awhile. Tinted glass. Armrests. Assist grips. Parcel tray. Courtesy lights. Electric rear window defogger.

The Toyota Mark II is more than just another little around-town car. If that sounds a bit far-fetched for an inexpensive economy car, stop by a Toyota dealer and take one around the block a few times.

Any body will feel what we mean.

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Last year the accident rate on old highways was more than double the accident rate on the modern Interstate Highway System.

In fact every thousand miles of the Interstate freeway in use today saves 150 to 200 lives each year. That adds up when you consider there are about 30,000 miles of Interstate now open.

But we still have 12,000 miles left to finish. We could be saving 2000 more lives each year. That alone is reason enough to push the Interstate Highway System to completion without delay.

Let's get it finished.

Before more lives are.

We can make the world a better place to live in. Caterpillar machines will help.

CATERPILLAR

Surprise him with a Smith-Corona in December and he may surprise you with better grades in June.

After the holidays, your teenager faces a mighty rough year. That's when a Smith-Corona can start looking like the greatest Christmas present ever.

With our electric portable, for instance, he can learn to type twice as fast as writing by hand.

His spelling can improve, too. (A typed word that's misspelled just begs to be corrected.)

Thinking can get a jolt also, because a typewriter can accept ideas as fast as they come up.

And then a quiet little miracle called Organization can occur. When that happens, pride, confidence and self-esteem can gain a toehold.

So with a little application (plus ability, needless to say) your teenager's schoolwork could very well improve. Only June will tell.

But why a Smith-Corona?

Because all typewriters are not the same, that's why.

We invite you to compare a Smith-Corona against any other typewriters to prove it.

Compare durability, portability, features.

Compare years of experience in actually "making" typewriters (especially electric portables).

Then remember that Smith-Corona is the only completely American-made portable typewriter, and you'll know why more people in the world buy Smith-Corona Electric Portables than any other. And why you should too.

Our dealers are in the Yellow Pages.

SCM

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