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COVER: Telemetry pack helps scientists decipher a penguin's life processes (page 623). WILLIAM R. CURTSINGER © N.G.S.

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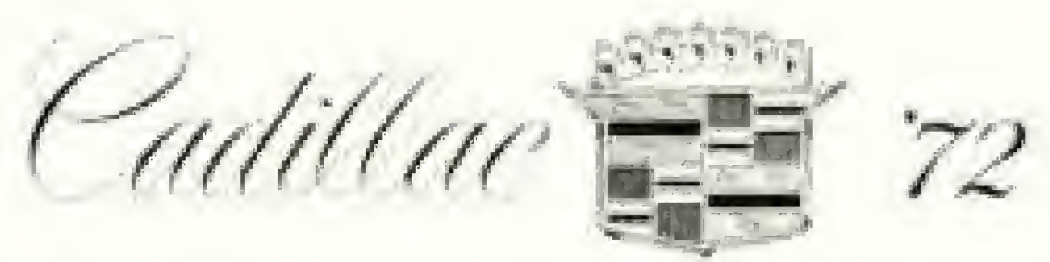

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(Medals shown actual size)

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Gilroy Roberts:

Gilroy Roberts is the dean of American medallic sculptors. His work has been exhibited widely—at the Pennsylvania Academy of Fine Arts, the Corcoran Gallery of Art, the National Sculpture Society and in many cities abroad. In addition to Roberts Birds, his Zodiac designs and the John F. Kennedy portrait on the U.S. half-dollar have won him world-wide fame. It is probably fair to say that more people collect coins and medals designed by Gilroy Roberts than by any other sculptor who ever lived.

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An important announcement to members of the National Geographic Society– You can now reserve Gilroy Roberts' newest bird sculptures. But you have only until November 30th to do so

In August, 1970, National Geographic Society members were the first to learn of an exciting new adventure in limited edition medallic art. The great American artist Gilroy Roberts had begun a new and major work.

He had accepted the commission to create a series of individual bird sculptures in the form of sterling silver art medals—to capture for all time the beauty, the grace, the delicacy, the individuality of birds in his own medium of medallic art.

As persons of taste and substance, with a strong interest in nature and an appreciation of fine art, National Geographic Society members responded immediately to that first announcement — and their interest has been well-rewarded.

Previous issues of Roberts Birds have been widely acclaimed by art experts and by collectors. Today, of course, they are closed-edition rarities, coveted and sought after by many who missed the original opportunity to acquire them.

Now, Gilroy Roberts has completed five new bird sculptures, which are shown on the facing pages.

These Roberts Birds, like those previously issued, will be struck under Mr. Roberts' watchful eye at The Franklin Mint, the world's foremost private mint, in solid sterling silver with a brilliant Proof finish.

The medals will measure a full 2 inches in diameter and contain at least 1000 grains of sterling silver each.

Patrons may order one, two, three, four or all five of the new designs, but *no more than one specimen* of each design. The issue price is $20.00 per bird or $90.00 for the complete set of five.

These five new Roberts Birds complete the major cycle of work originally undertaken by Gilroy Roberts. The reaction to his creations has been so enthusiastic, however, that Mr. Roberts has agreed to design a limited number of additional bird sculptures. But Mr. Roberts will now limit his work on this important project to only one group of five new bird medals per year.

Patrons are assured of receiving special notice of future issues. If you wish to enroll as a Patron—and acquire one or more of the limited edition sterling silver art medals shown on the facing pages—fill out the application provided and mail it with your remittance before the deadline of November 30, 1971. No orders postmarked after that date can be accepted.

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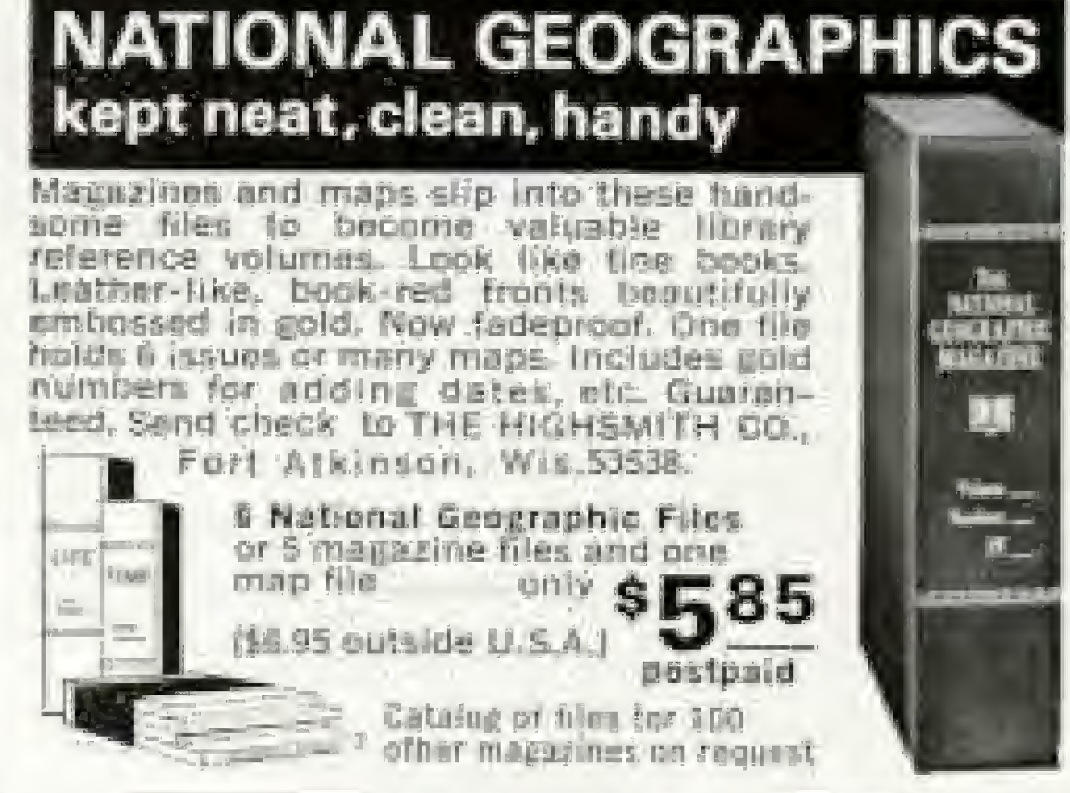

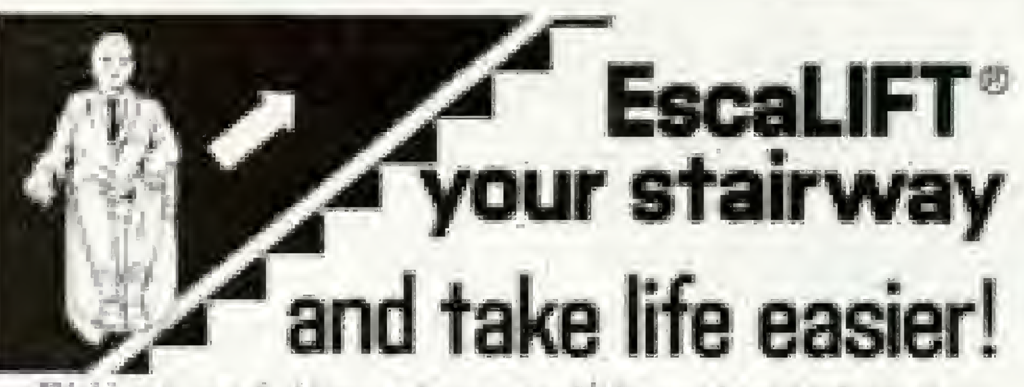

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NATIONAL GEOGRAPHIC

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The People of Cumberland Gap

By JOHN FETTERMAN

Photographs by BRUCE DALE

NATIONAL GEOGRAPHIC PHOTOGRAPHER

I KNOW A PLACE where there are still a few of them: free spirits, independent, proud, and self-sufficient, living in harmony with the remnants of the great Appalachian forest their ancestors settled more than two centuries ago. They are all that remain now of the true mountaineers, the children of the pioneers who came to tame the Appalachians. They cling to the values and habits of the frontier: devotion to the land, deep loyalty to family, physical courage, respect for the pledged word, patience, curiosity, fatalism, and superstition.

But the mountain people are now found deeper and deeper in remote hollows, driven almost to extinction by the region's poverty and by a society that has little patience with pioneers, while strip mining and logging ravage their land and sully their streams.

For years I have sought out these people, visited with them in their isolated homes, enjoyed their hospitality, hunted and laughed with them, written about them. And with great sadness I have watched their numbers decrease, despite their amazing talent for overcoming adversity.

Sometimes I stand upon a sheer, high place of rock near where Kentucky, Virginia, and Tennessee meet and think of these people as I look down into the V-shaped cleft named Cumberland Gap (following pages). The gap was carved by a stream following a fault line through massive Cumberland Mountain, a wall across the path of westward expansion. The gap was discovered in the mid-1700's; but not until a quarter of a century later did the dramatic migration into Kentucky really get underway.

As you look down into the gap from the place they call the Pinnacle, you are 1,300 feet above the lush valley of the Powell River and 800 feet above the saddle of the gap.

East Kentucky's hills — "Cumberland Country" — preserve a self-reliant way of life inherited from the pioneers who streamed westward through Cumberland Gap.

EKTACHROME (ABOVE) AND KODACHROME © N.G.S.

"I get up at daybreak," says 70-year-old John Caldwell, "and I still don't have enough time to do my chores." But night brings ease here in his home on Laurel Fork near Hyden, Kentucky. He and his wife Lottie, 65, typify the industrious folk who dwell in the state's mountain hollows.

Mr. Caldwell's ancestors, with 300,000 other pioneers, moved westward in the late 1700's. To reach the wilderness, they funneled through Cumberland Gap (**right**), which had been explored by Dr. Thomas Walker—a Virginia physician turned land speculator—and later by Daniel Boone. Today a highway ribbons the passage where three states meet. This view looks southeastward from Kentucky; over the mountain lie Virginia and Tennessee.

KODACHROMES © N.G.S.

"Sure, I fall in sometimes. Just change my shoes." For 49 years Lottie Caldwell has used a log to cross this creek beside her house. With her dog Rover, she heads out to pick poke and other wild greens.

Forging a wagon brace, John Caldwell works at his blacksmith shop in a cliffside cave behind his home. With his wife toiling beside him, he cultivates tobacco, corn, and a variety of vegetables on his 300 acres.

It might have been only yesterday that some 300,000 hardy people passed there—but that flood of pioneers came between 1775 and 1800.

On a day of spectacular blue skies and huge white clouds, I stood there with Joseph Kulesza, the cigar-smoking Superintendent of Cumberland Gap National Historical Park, and two National Park Service historians, Bernard Goodman and Bob Munck.

"I wonder what we would have seen if we could have been standing here for the past two centuries," I mused.

Goodman is a quiet, meticulous historian with a unique feeling for the flow of human events. "The people who passed here were a tough stock," he said. "It took a lot of nerve to leave civilization and come into this uncharted country."

Later, in his office, Goodman showed me a quote from Frederick Jackson Turner, the noted historian of the American frontier:

"Stand at Cumberland Gap and watch the procession of civilization, marching single file—the buffalo following the trail to the salt springs, the Indian, the fur-trader and hunter, the cattle-raiser, the pioneer farmer—and the frontier has passed by."

Outside his office in park headquarters, civilization was still passing: huge interstate diesel-powered trucks, tourists towing trailers in which they would camp that night, perhaps on the same spot Daniel Boone once chose.

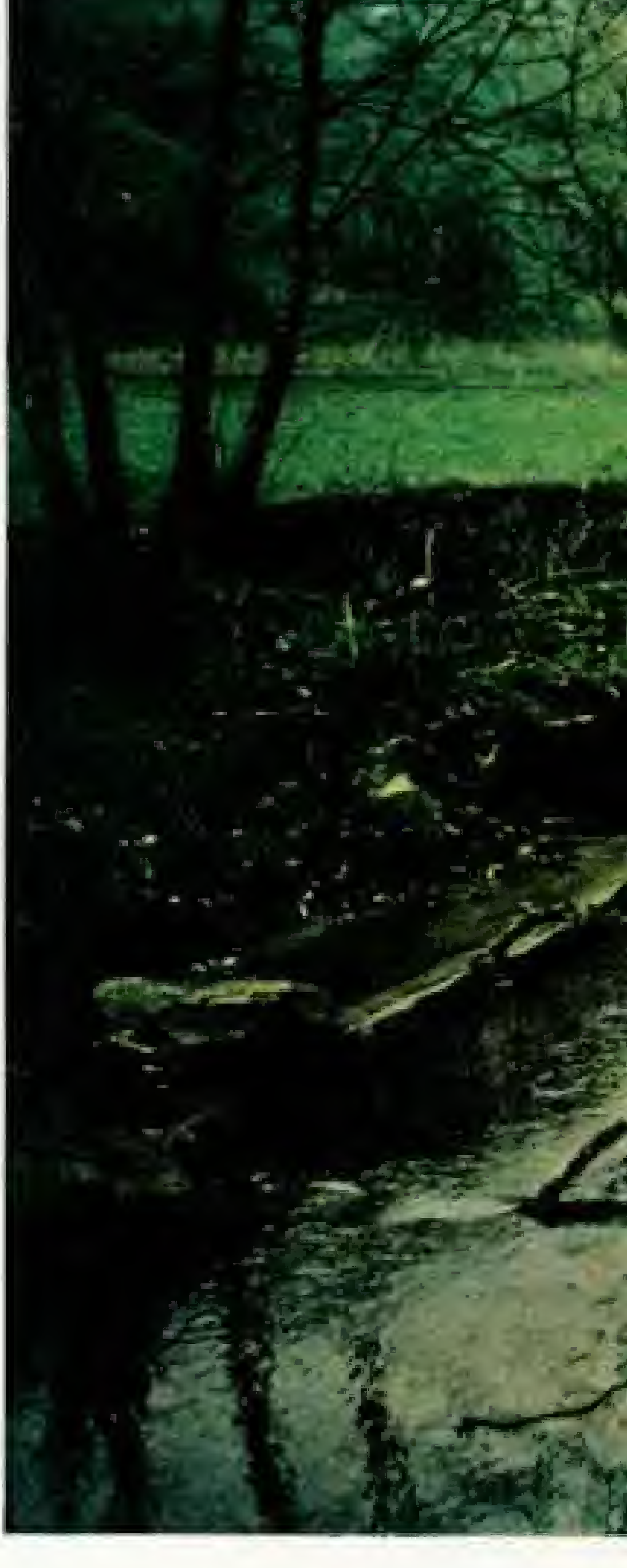
"The traces of the old pioneer are almost gone now," Goodman was saying.

But he is not completely gone, and I had several aching muscles in my legs as a reminder. I was still sore from a high-ridge hunt for rattlesnakes a few days earlier with a 70-year-old mountaineer named John Caldwell.

ON A CLEAR, warm spring morning when the fog shroud had lifted from the lonely and lovely creek called Laurel Fork, I walked across a log bridge with John Caldwell to watch while he made some small parts in his blacksmith shop. The shop consists of a hand-cranked forge, an anvil, and a few tools, all of which John keeps in a shallow cave, or rock house, near his home south of Hyden (opposite). The term "rock house" is one of those handed-down phrases. Indians, early hunters from the Carolinas, and pioneer families lived in these rock houses while en route, while hunting, or while a cabin was being built.

John Caldwell fired up the forge, cranking the bellows until the coals in the fire bowl were

Creek and road nearly merge when spring rains deluge the countryside near Pippa Passes, Kentucky. In such narrow, isolated vales live the so-called hillbillies of Appalachia. "Like the land they live on, they are torn and bleeding, and have survived without hope or champion," says author John Fetterman. "The descendants of strong men who wrested the hills from the Indians and then defended them from the British, they now sit disconsolately in poverty." Industry, the author laments, has scarred east Kentucky's mountains with rapacious mining and logging practices. Eroded slopes, polluted streams, and ravaged forests have turned a land of plenty into a bleak region peopled by welfare recipients.



Shy eyes peek over the edge of a porch when a stranger comes to visit a rural home.

glowing. Then he pounded a piece of hot metal into shape for a brace for his wagon. He is an erect, proud man in bib overalls and heavy work shoes, a man who can wear a three-day stubble on his face and a weathered hat with great dignity.

"Everybody 'round here is studying something to make some money on," John told me. In many east Kentucky counties, more than half the people are on welfare. But not John Caldwell. "I been over in Harlan in a supermarket onc't and saw a big stout man with a buggy full of food and he paid for it with food stamps." There was a tinge of disgust in his steady voice.

"I'd say 20 or 30 years ago, back about that time, people had plenty to eat. There are people on these creeks now who don't even have a potato patch. They live on the giveaway. They don't care for pride no more. I never got a nickel of that stuff in my life. Long as I'm able to work, I don't want nobody to give me nothin'." He punctuated the last sentence with sharp blows with the heavy hammer. At 70 he appeared to have many years of independence left.

WIELDING LONG TONGS, John held up the piece of metal and examined it carefully. "Little things, I make them myself," he said. "No use for brought on tools." "Brought on" means store-bought, and on farms such as John Caldwell's 300 steep acres, things like hoes, plow blades, rakes, hinges, knives, even furniture, are usually made as the need arises.

I asked him about his early years on Laurel Fork, and he settled onto a huge rock, his eyes

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

lighting with the pleasure of a mountain man who has found a listener.

"Why, I wouldn't have in mind calling no names," John said, "but back then there was no kind of work in here. There were some who would carry moonshine out in half-gallon fruit jars in their saddlebags. They'd leave about midnight and get over Pine Mountain into the coal camps around Harlan about daylight, doing their traveling when there were not too many people stirring. Why, during World War I, moonshine went to $40 a gallon. It only sells for $10 or $12 now and there ain't much of it."

John leaned nearer. "I knowed one fellow broke his moonshine jars and he was carrying a miner's carbide light. He caught on fire and burned up right there on the mountain."

He looked silently at the high ridges across the creek for several minutes, and a new excitement was in his eyes when he spoke again. "I don't reckon you would care to go huntin' rattlesnakes," he said. I had heard of John Caldwell's reputation as a snake hunter. He studied me for a few moments, and his voice was gentle, seeking understanding.

"There never was a man loved to outwit wild things like me," he said. "Why, I'll hunt a week for a bee tree just to know I can find it, then go on back home and never go back to that tree. I like to find me a rattlesnake that thinks he's got hisself good and hid from me." John was still watching me closely, measuring my reaction, and he added, "Now, I suppose you've played some golf?" I nodded. He said, "Well, sir, snake hunting is like that . . . like a sport to me."

I jumped at his invitation and, aloud, he

began to plan. "We'll go on a Sunday, and we better take Earl Chappell. Ol' Earl is the snakingest man around."

Several weeks later, on the Saturday before the hunt, I drove the 200 miles from my home in Louisville to a tiny cabin on the banks of Cutshin Creek, east of Hyden, where I had been instructed to go. The cabin belongs to William Dixon, whom everyone calls "Billie," and who had celebrated his 66th birthday the day before. Billie met me there and confirmed that I was to spend the night.

Before nightfall, another member of the party arrived, and I recognized him immediately. He was B. Robert Stivers, a compact, virile man of 48 who, like Billie Dixon, is a stalwart in mountain Republican politics and who also, like Billie, had been a circuit judge. Now he was a member of the Kentucky Alcoholic Beverage Control Board.

Six years earlier I had heard Bert Stivers deliver a speech in the Barbourville courthouse, in which he mentioned a nearby stream called Stinking Creek. That remark set me off on a project that resulted in a book about the creek with the unsavory name.*

There was a temptation to settle down there on the bank of Cutshin and reminisce, but Billie Dixon, our host, reminded us that John Caldwell would be "getting a mite edgy" knowing that the party was gathering and that he was not there to enjoy it.

There are no telephones on Laurel Fork, so we drove the 30 or so miles to John's place to

*E. P. Dutton & Co., Inc., New York, N.Y., published the author's book, *Stinking Creek*, in 1967.

"**Because it's fun**—that's all the reason we do it." Capturing poisonous snakes is sport in Cumberland country, and Earl Chappell, who lives near Hyden, enjoys a reputation as "the snakingest man around." Finding a copperhead (**below**), Earl snares it with a homemade "snake stick," a metal rod with a clamp on the end. When the author went snaking with Earl and John Caldwell, the mountain men apologized for finding only seven. Once they caught 42 copperheads and rattlesnakes in a day—"one heavy sack."

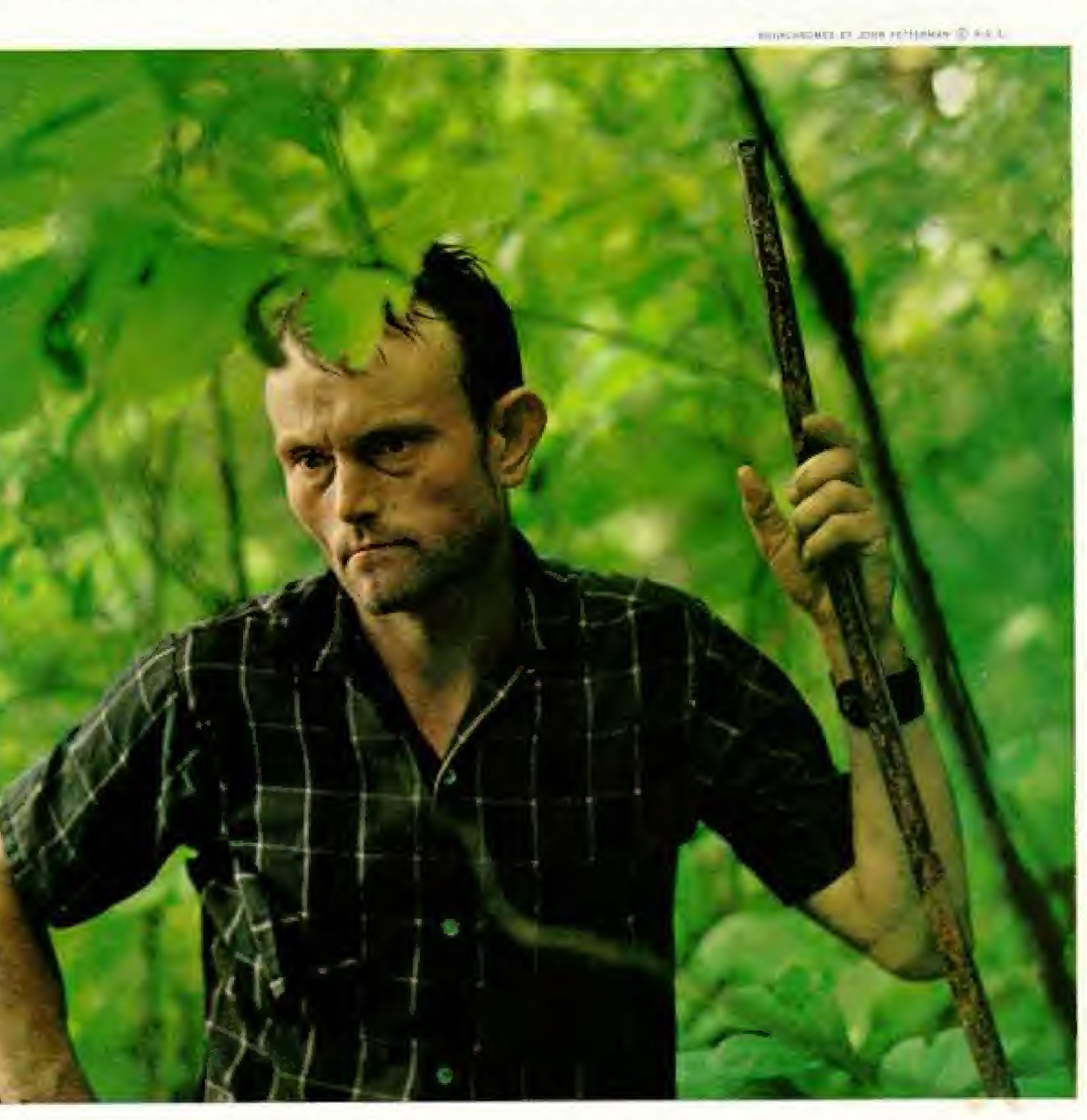
fetch him. From John's house we drove a tortuous route along the creeks until we came to a wide stream called Lower Bad Creek, where Earl Chappell lives.

Earl, whom John had called "the snakingest man around," is a dark-complexioned, slender man of 36 (below). He is lean and quick of action and eagerly agreed to go along next morning. "I'll be there to meet you on Laurel Fork if something don't bad happen," he promised. We all shook hands on it and drove back to Billie Dixon's cabin on Cutshin.

Meanwhile, John's daughter, Alice, a slender, quiet mountain woman who lives nearby, had gone to the cabin to work those miracles mountain women perform in their kitchens. While the aroma of Alice's late supper of ham, biscuits, corn bread, green beans, fried potatoes, and coffee wafted out to us, we sat by the creek, and some of us "settled our stomachs" with a drop or two of bourbon.

AFTER SUPPER we sprawled content and stuffed. And with two veterans of the local political wars such as Bert and Billie, and a weathered mountain man like John on hand, one thing was inevitable. Above all else, mountain friends cherish the telling of tales. So with the soft gushing of the creek as a background, and an early evening breeze nudging the poplar trees overhead, the three friends told their tales.

Billie Dixon, squatting comfortably and chewing on a blade of grass, recalled, "There was a lawyer around here called in a repairman and got charged $60 for some little job.



That lawyer said, 'Well, now, I'm a lawyer down in town with a right good practice and I don't make that kind of money.' The repairman looked at him sort of sad and said, 'Well, I didn't either when I was a lawyer.' "

Bert said his new car reminded him of something that had happened over near the Cumberland River. "Man in an air-conditioned car picked up an old farmer on a hot, dusty road and had the air conditioning turned up until the car was downright chilly. The farmer pulled his collar up and was slapping his arms to get warm. Fellow asked him where he was going. The farmer said, 'Well, sir, when you picked me up I was going down to the bottoms and cut me some hay, but with this here sudden change in the weather I guess I'll go back and kill hogs.' "

Billie Dixon, the son of a mountain sheriff and a veteran of the judiciary, placed a hand on John's shoulder and announced with exaggerated sadness that there are some men who don't always tell the truth.

"Puts me in mind of the time John here was 'lectioneering for me when I was running for judge, and he went to this house where I had some deadly enemies. A man came to the door with a rifle and said, 'You here to 'lectioneer for that no-account Billie Dixon?' Well, John said right away, 'No, sir, I would not do such a thing as that. I'm here buying cattle. You got any cows for sale?' "

THE WIND WAS KICKING UP, there was lightning across the ridges to the west, and Billie Dixon reminded us that we would be arising before daylight. "Best way to get a good night's sleep is to retire with a clear conscience." So we did. I lay by an open window, and when the storm broke I could feel the cool rain misting in through the screen. I wondered briefly whether the thunder and the excitement of the approaching hunt would keep me awake.

The next thing I knew, Billie Dixon was standing in his small kitchen, waving a skillet of bacon, and calling, "We best have a bite before we set out." It was not yet 5 a.m.

En route to the high ridges where the rattlers hunt and sun, our party grew to seven, as Earl and two of John's grandsons, Duane Lewis, a boy of 14, and Wayne Russell, a muscular 19-year-old, joined us.

Each hunter carried a "snake stick." Earl's was of metal; the rest were ingeniously fashioned from a stout hickory or oak stick and a piece of cord. The stick has two holes bored near one end, about three inches apart, and the string passes through them, forming a loop. When the loop is dropped over a snake's head, a quick tug on the string snares it, enabling the hunter to extract the snake from its hiding place.

NEAR WHERE BEAR BRANCH empties into Greasy Creek, John pointed toward the fog-shrouded ridge with his snake stick and said, "In my opinion, we'll find them up there." Within a few yards we were soaking wet as we clambered upward through thickets of rhododendron and mountain laurel, their waxy leaves glistening with rain from the night's downpour.

Earl Chappell, racing like a deer through the tangle, led the way. Within a mile, I was panting and blowing, and when Earl slumped to the ground for a quick rest in deference to me, I was immensely grateful.

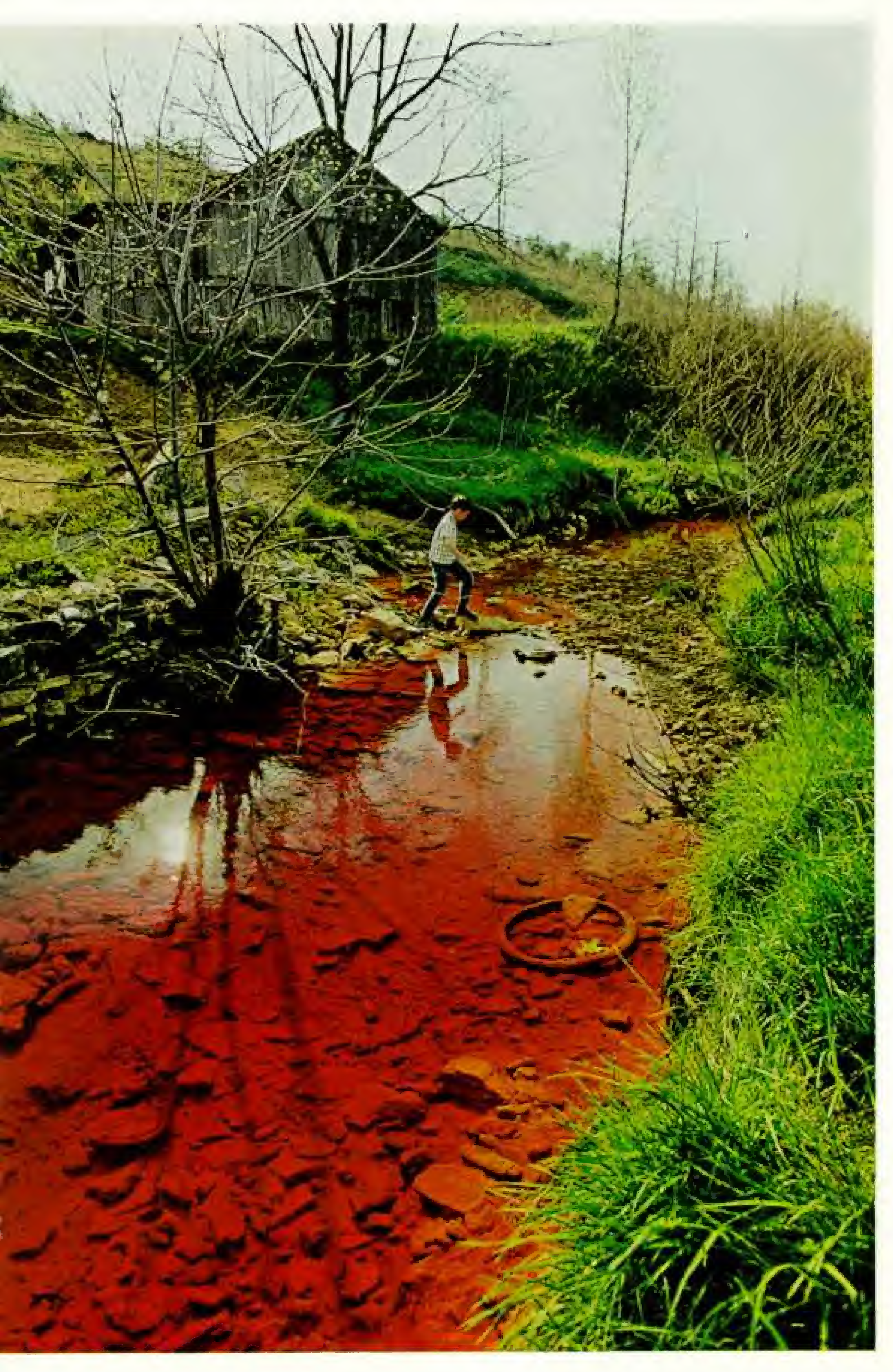
Earl pulled out an ancient pocketknife and observed that "this old thing won't hardly cut a piece of bologna," then felled an inch-and-a-half-thick hickory sapling with the knife's razor edge, and with a few strokes fashioned a walking stick. "Might do something for you," he said, handing it to me. It did. From then on, I could take several steps up the steep wet forest floor without slipping back almost as far as I had climbed.

Once on top of the ridge we were in "snake country," and there was a new intenseness and silence as we walked, frequently catching breathtaking views of the mountains through openings in the forest canopy. But there was little time to sight-see. From a few feet ahead, Earl's low voice reported, "Fellows, I reckon I got me a copperhead here."

He held the poisonous creature aloft, writhing futilely in the jaws of his well-used snake stick. It is his own invention, a long rod with angled jaws of steel that grip the snake's neck. He fashioned it from parts scavenged from

(Continued on page 605)

Red tint of death colors a creek south of Berea. Trickling past a weathered barn, the polluted stream carries poisons leached from mining wastes that can kill any wildlife or plants they touch. Only a few streams deep in the hills are still pure enough for drinking and cooking. Many of the younger mountain people have abandoned creek life and moved to cities and towns. KODACHROME © N.G.S.



Fingers of fog probe the hollows of Harlan County before the morning sun burns them away. Since 1965 the United States Forest Service has been buying acreage on such wooded ridges, whose natural resources have

been exploited and abused. Under government control the land—and its people—benefit from improved logging and mining practices, fire protection, reforestation, and rehabilitation of abandoned strip-mining areas.

an old car. He popped the copperhead into a burlap bag and strode off, resuming the hunt.

At one point the ridge led out to a narrow spur where the rock outcrop was heavy and the undergrowth was more sparse. It was here that John predicted, "There'll be a rattler right around here." There was.

The hunters, often on all fours, shoved their faces near the shallow crevices to search the dark recesses where rattlers take refuge. When I asked whether this was not dangerous, John assured me, "A rattler can only strike about half the distance of his body. So you see a four-foot rattler, you keep your face two feet away." I had no intention of testing this bit of mountain wisdom.

John, peering into the opening beneath a rock, soon said, "Well, boys, this one's a rattler." He poked his snake stick into the opening, fishing for the snake's head, and the unmistakable buzz of the snake's rattles filled the air. "He's a-singin' now," John said happily. In a few moments he hauled the snake out, held it aloft for all to inspect, and dropped it into the sack.

From ridge to ridge we fought our way through the undergrowth, and twice I fell heavily, tripping over the tough saw brier vines. My companions politely pretended not to notice my clumsiness. Sometime after noon, when the fog had long been gone and a wet, sweltering heat was lying upon the mountains, we stopped for a quick lunch of canned minced ham and bread—and long drinks from one of those miniature cool creeks born in heavily wooded mountain coves that remain in perpetual twilight.

The snake hunt was not going well. It would be over soon, and the total bag was four copperheads and three rattlers. I knew that John and Earl often catch as many as thirty rattlers in a day. John was embarrassed. Once he fell into step beside me and said, "I was wondering that if you put my picture in your magazine, could you write something like, 'This man has caught 42 rattlers in one day.'" I assured him that it was possible and that as far as I was concerned, the hunt was a huge success, much more fun than golf.

WE CAME OFF THE RIDGES ahead of the twilight, along a creek that led us toward John's farm. Mrs. Caldwell, a dark-eyed, friendly woman, threw me a huge smile, pulled a heavy hickory chair into the yard for me, and said she had "a little snack 'bout ready."

John was still worried about the dearth of rattlers. "Snakes are smart," he said. "A hard critter to figure out."

"Not as smart as coons," Earl said. "Smartest animal in the woods. I laid a trap along Lower Bad Creek for a big wildcat I saw. Baited it with some canned salmons and buried it. A coon came by that night and dug up the trap and ate the salmons and turned the trap over and buried it under a pile of dirt. Then he messed on the pile of dirt and went on about his business and he never did spring that trap. How do you figure to outwit a critter like that?"

Mrs. Caldwell called us into the kitchen.

KOCHHOMER © N.G.S.

High-jumping hound, yapping in triumph, wins the "first-tree" award at a drag race of the Clay County Coon Club. The scent, laid by dragging a sack of raccoon fat, leads to a caged animal placed high in a tree. These dogs outran eight others to find their quarry; the first to bark took top honors. A coon pelt (**above**) dries on a barn.

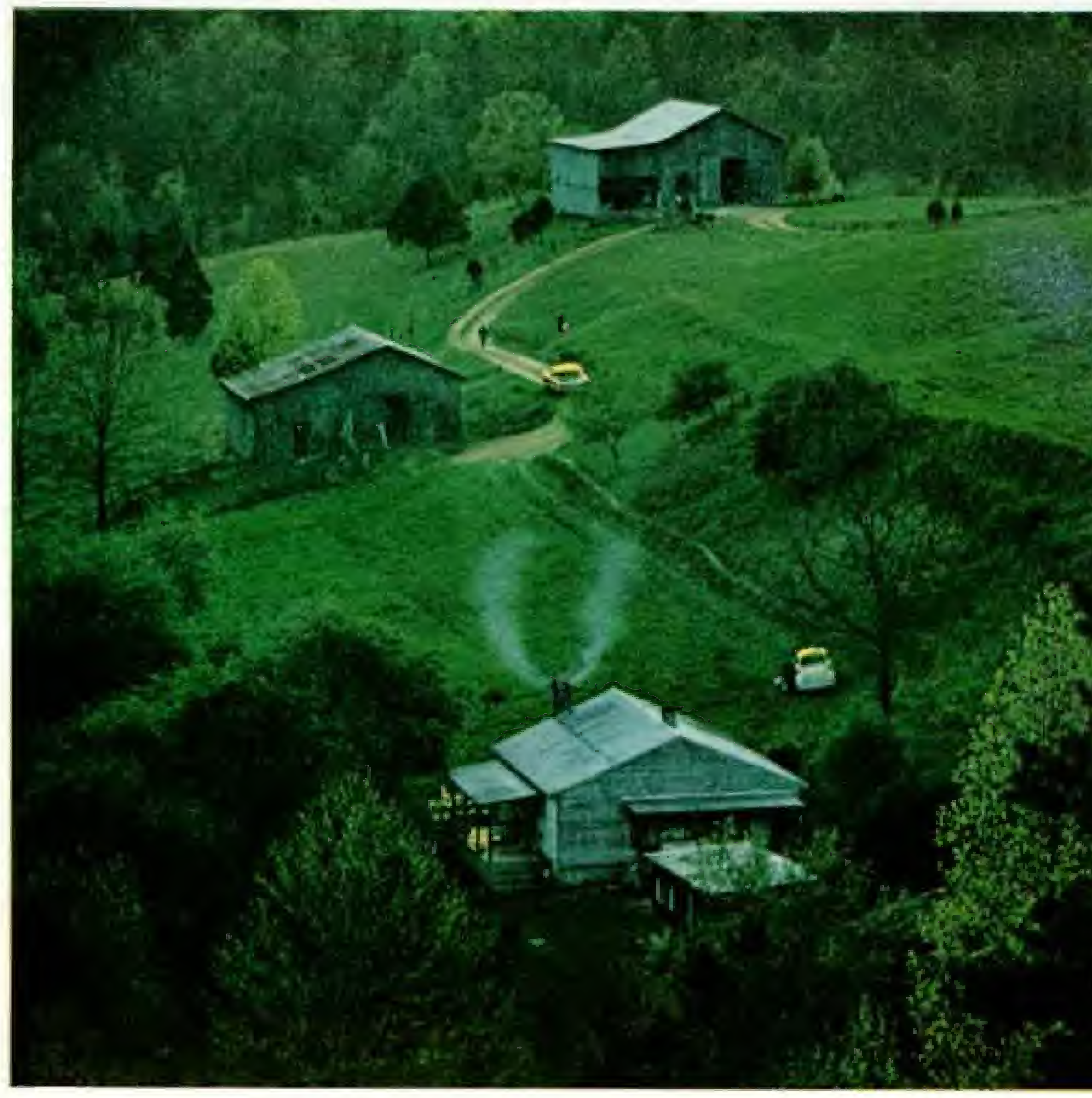
Furrowing a tilted field, Golden (Bunt) Howard guides a bull-tongue plow behind pony Bill (**following pages**). Bunt lives south of Hyden on a two-acre homestead beside Greasy Creek, only half a mile from the farmhouse he was born in 44 years ago.

where her "snack" was spread on a sturdy wooden table: fried chicken, sliced yellow and red tomatoes, fried green tomatoes, green beans, fried okra, boiled potatoes, cucumbers, Jell-O with fruit, slaw, corn bread, homemade butter, frozen strawberries, stack cake, Kool-Aid, and coffee. I ate like a condemned man.

DESPITE THE LACK of telephones and the few travelers to be met, news somehow moves swiftly. Soon after the snake hunt I called on a friend on Greasy Creek named Golden Howard. Golden, whom they call "Bunt," was plowing a bottomland tobacco patch with a bull-tongue plow drawn by a stout pony (preceding pages). Bunt is a small, wiry man of some 115 pounds, and his tanned hands are capable of extraordinary strength and dexterity.

He leaned upon the ash handles of the plow, polished from long use, and watched me approach. "Heard you're a snake hunter," was his greeting. Bunt then did the only thing I have ever seen him do badly. He pulled a sack of tobacco from his overall pocket and rolled a lumpy, distorted cigarette.

Bunt, using only a pocketknife and long strips of white oak, makes baskets that have found their way to such places as the Smithsonian Institution in Washington, D. C. (opposite). He has built a lathe from odds and ends of an old bulldozer and a gasoline engine; when he needs a cutting bit, he fashions one from a steel bolt. He turns out



furniture and tools for relatives and friends, using the techniques he learned from his father. But he prefers hunting and mountain farming to what he calls "crafting," and he is amused that outsiders sometimes offer him as much as $12 for a handmade basket that they obviously do not need for gathering eggs or carrying seed potatoes. So he does not make many.

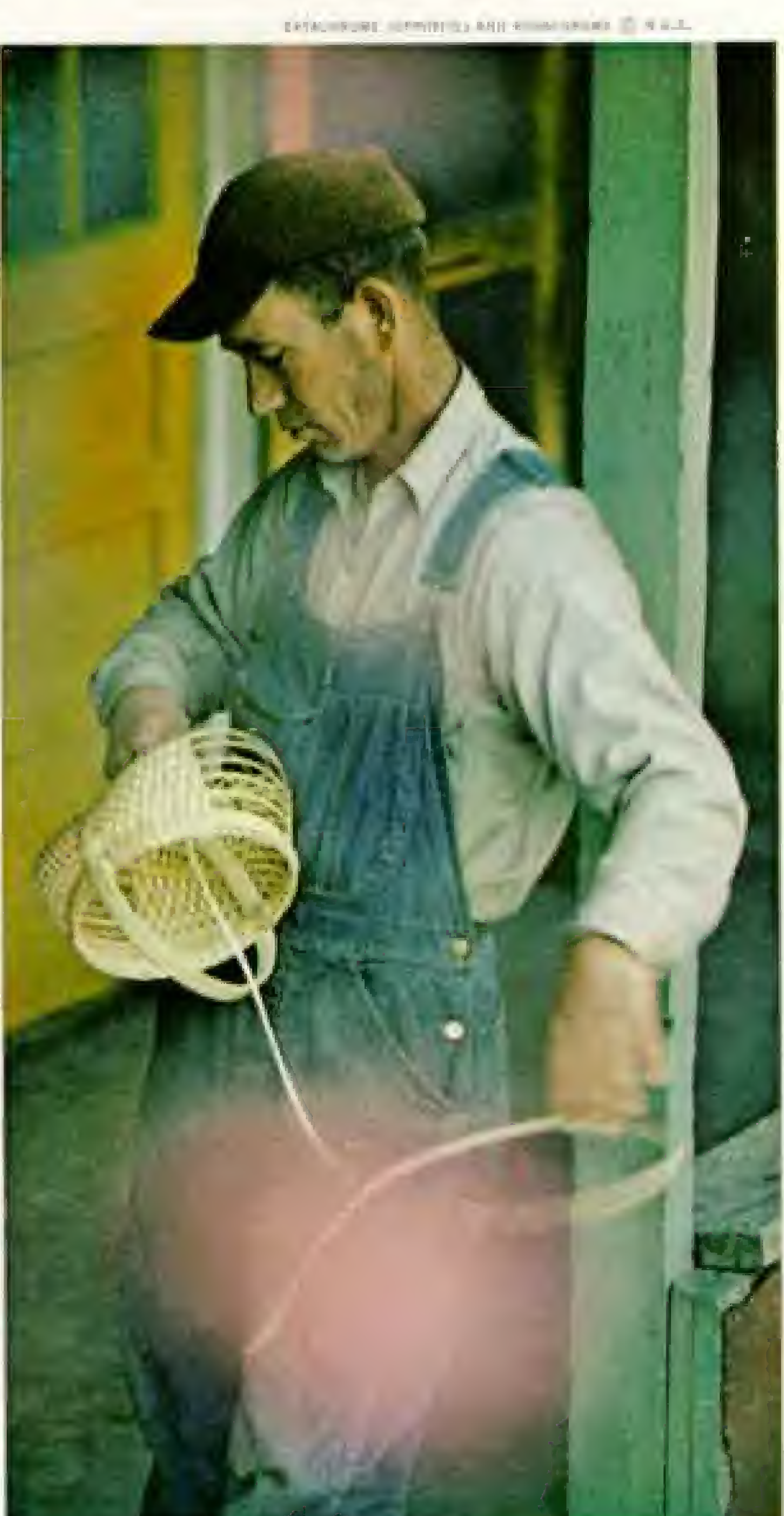
Bunt, like John Caldwell and all true mountain men, will go to great lengths to stay away from cities and towns, which they find intolerably crowded. Bunt once was excused from jury duty when he told the judge, "It bothers me to sit in a town." The judge, a mountain man himself, understood.

As we talked, Bunt sat on his bull-tongue plow. He grimaced and admitted to tenderness in his mouth where a tooth had recently been. The tooth had begun to ache one night and the only dentist available was in town.

"When a tooth gets to hurtin', a fellow will study a way to get it out," Bunt said. "I took me a 20-pound-test fishline and doubled it. That made it 40-pound test, to tell the truth. It was plenty stout. Well, sir, it pulled the tooth for me with no trouble." Better, it saved him a trip to the hated town.

Bunt is modest and reluctant to show visitors the things he has created with little more than a few handmade tools and imagination. But his dark-haired wife Eula Lee proudly shows off beds and gunstocks made of curly maple and black walnut, knives and tools

As day nears its end, wisps of smoke from a woodburning cookstove signal suppertime for "Loggie" Renner and his wife. Their neat frame house and its outbuildings sit atop a hill south of Berea. Like most mountain families, the Renners eat dinner, their heartiest meal of the day, at noon. Also like most, they eagerly pull up extra chairs for guests who drop in to "set a spell" and swap stories.



Self-taught craftsman Bunt Howard weaves long strips of white oak, still green and pliable, to make a strong but graceful basket. He built his trim wood-and-stone house and—with handmade tools—produces handsome furniture, looms, and musical instruments for family and friends. His main power tool is a lathe fashioned from a gasoline engine and parts of an old bulldozer.

In a demanding land that offers few rewards, religion provides sustaining comfort. This concrete sign, built to withstand the years—and, paradoxically, the bullets that regularly pock it—issues its prediction near the town of Cumberland in Harlan County. Similar messages adorn barns and boulders throughout the hills of Cumberland country.

Sharpening their aim, Bunt Howard and his son Wade practice target shooting in the yard of their home. Bunt, firing at a tin can, steadies a .22-caliber pistol on the handle of a lawn mower. Wade waits his turn with a rifle. Like most mountain men, both are exceptional marksmen and kill for meat as well as for sport.

EKTACHROME (BELOW) AND KODACHROME © N.G.S.

made from old blades salvaged from abandoned sawmills, a banjo that Bunt made for his father, and a dulcimer he had just made for his son Wade. Wade had taken to that instrument of ancient origin, and eagerly showed me how well he could play "This Land Is Your Land" and "When the Saints Go Marching In."

When the sun reached the height of its arc above the hollow, signaling noon, Eula Lee called us into the kitchen for a feast of baked young coon. Later, Bunt rested in the warm sun, smoking one of his horrendous cigarettes. He looked at the green hills and volunteered, "I like it here. I like a little room. Besides, I got nowhere to go."

AN AFFECTION FOR THE LAND, the vast unwritten lore of the frontier, and the memories of the early settlers are preserved in the minds of the older men, a fragile archive that too soon will be gone. Two such older men who impressed me were 75-year-old Logan Renner, the finest hand at splitting shingles I ever saw, and Irvin Pratt, who at 68 delivered mail three times a week, rain, snow, or shine, on horseback over a treacherous 18-mile mountain route. The two men live many miles apart and do not know each other, but they share a common legacy.

The last time I visited Logan, or "Loggie," as his friends call him, he made a handle for my froe from a stout length of hickory. It was a gesture of friendship and he wished me luck with the crude tool, although he knows full well that I never will be able to rive perfect oak shingles with it the way he does. There is practically no market for handmade shingles, or shakes, now, but Loggie proudly clings to the skill. An oak-shingle barn roof will last a lifetime, he assured me. "That is, if a man will die by a hundred, like he's supposed to."

A rainstorm, one of those sudden gully washers that spring from quickly darkening skies, came upon us, and we retreated to the front porch of Loggie's house, south of Berea. We munched shelled black walnuts from a gallon glass jar and visited while Loggie offered gems of hill-country wisdom.

"Take that froe of yours and always split down the tree," he advised. "Else the blade will run out on you and spile your shingles."

He turns his head slightly to one side when he talks because most of his life he has been blind in his left eye. Despite the handicap, he is one of the best shots around, and he can document this by killing a young groundhog on the next hill, some 200 yards away, with a single shot from his .22-caliber rifle.

When he was a small boy, he was blind in both eyes, but he walked to a tiny one-room school "where the teacher let me say my lessons. I learned to spell and such as that, but they didn't let me do any arithmetic or geography. One day the teacher said to squirt warm milk from the cow into my eyes. My mother did that, and one eye cleared up."

The blindness in one eye did not prevent Loggie from serving briefly in the Army during World War I. He got as far as a camp in Macon, Georgia, before the Army discovered that the young sharpshooter had only one good eye.

"I asked them to keep me awhile," Loggie recalls, "bein's I already went that far. They said they didn't need me so bad. So I just walked away from that place. I figured I could shoot good as any man they had in that army. I could hit a chicken in the head, and him a-walking."

THE RAIN WAS A DRUMBEAT on the galvanized tin roof of the porch, and I led Loggie into a discussion of mountain medical lore. Any veteran hillman knows that the woods contain a storehouse of herbs, or "arbs" as he calls them.

"Yeller root will cure anybody's stomach trouble," Loggie said. "We make tea out of the root. And black snakeroot is an awful good medicine. You make a tea and it will make a bowel runnin' off quit right now. Make the tea hot enough to scorch the tail off a lizard."

"Close to 40 years ago" Loggie was bothered with rheumatism. He collected a pile of the tiny aromatic plants called mountain tea and made a gallon of tea, which he sipped faithfully. "And chewed some plants and swallered the juice and dried some plants and made them into cigarettes and smoked them." He says he hasn't been bothered with the ailment since.

I admired Loggie's cure all the more for knowing that mountain tea can be poisonous if not processed properly, and I strongly advise readers against experimenting with any of these home remedies.

Research has shown, however, that many of the mountain plants do, indeed, possess curative properties, and many are used in the manufacture of medicines and drugs prescribed today. One of the more fascinating research projects in this field is conducted at

Berea, Kentucky, by the U. S. Forest Service. In addition to determining the proper time and way to harvest such plants, the researchers under Dr. Arnold Krochmal, an economic botanist, hope to develop ways for mountain people to supplement their incomes by cultivating and selling the plants to pharmaceutical firms. The Forest Service says that there are at least 126 marketable species of medicinal plants growing in Appalachia.

Loggie Renner said that "during the depression some folks lived pretty good on sassafras tea, sorghum, and corn bread. Nothin' wrong with that. Besides, in times such as that we take care of each other. I principally kept up six or seven families. They'd a' done it for me."

The Great Depression lay far behind Loggie Renner. There were fat cows and pigs on his hilly farm, a cash crop of tobacco was planted, and the big vegetable garden was green and growing.

Loggie has great faith in his garden. He plants it according to the chronology of the mountains. The moon tells him when, he said.

"The moon and the stars around the moon are like a big nature's clock. I plant the potatoes just before the full of the moon, then they won't go down too far in the ground and they will be easier to dig. You plant your corn when the moon is shrinking. My daughter once happened to plant corn on the new moon, and it got so tall she had to bend the stalks over to pick off the roastin' ears."

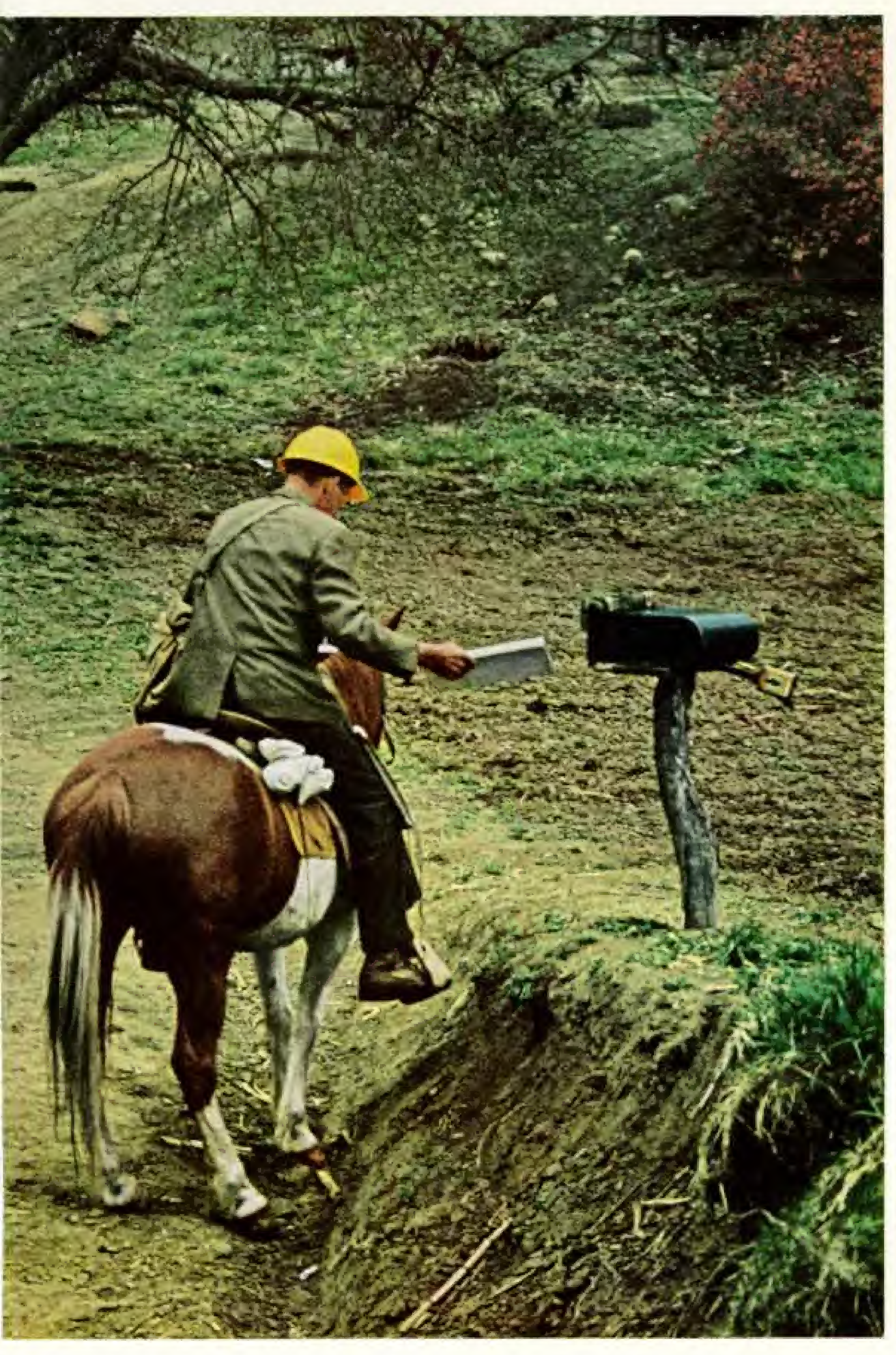
The rain stopped, and I prepared to leave, but Loggie put a thin, strong hand on my shoulder and said in mock seriousness, "A friend don't get out of here alive without eatin' with me." So we ate, and then I left. As we walked along the dirt path toward my car, Loggie handed me the froe with the new handle and warned, "Be keerful. Old man I know cut his throat with a froe. Took only one lick."

IRVIN PRATT was 68 last Christmas Eve, but a $1,500-a-year contract and a deep sense of responsibility have kept him carrying the mail three times a week from Pine Top, Kentucky, to Pippa Passes (following pages). There are still a dozen or so horse-mounted rural mailmen in eastern Kentucky, holders of so-called "star route" contracts, who must carve their profits from the contract payment, bearing the expenses themselves. I have accompanied several of these mounted postmen, and Pratt's route is by far the most difficult I have seen. He has carried

Extravagance of color under a warming spring sun lures a young rider to join her grandfather on his rounds (following pages). Redbud blossoms create a rosy glow, soon to be followed by the snowy white of dogwood. May sees a wash of flowering laurel and rhododendrons.

But winter yields reluctantly. An April snow sprinkles eastern Kentucky's Pine Mountain with a coating of powdered sugar. Now the hill people must brace for the flood season, when rain swells the streams and water rages unchecked through the valleys. A 1957 flood claimed a dozen lives and left hundreds of families homeless.

Man with the mail meets a youthful welcoming committee at one of the stops on his horseback route in Knott County, Kentucky. Irvin Pratt has worn out five mounts in the 16 years he has carried the mail from Pine Top to Pippa Passes. The 68-year-old postman delivers "anything within reason," but now draws the line on the mail-order tires he once toted. When the author asked Mr. Pratt how long he planned to ride the exhausting 18-mile mountain route, the Cumberlander replied promptly, "Long as they're expecting me."



KODACHROME © N.G.S.

Afflicted with an age-old student virus —spring fever—a pupil gazes longingly through a window of Double Creek School, west of Hyden. The one-room schoolhouse is named for a stream that flows nearby.

the mail, through isolated steep country, off and on since 1955, and has worn out two mules and three horses that he can remember. "Seems like there was another mule or two in there somewheres."

The last mule he had was named John, and Irvin said he cost $200, an item that cut heavily into his annual net profit. But Irvin understands why the mail must go through.

His clients depend on him for delivery of welfare and pension checks. "And when one's got a boy off in Viet Nam, they're looking hard for me," Irvin said. "It gets seven or eight below zero and the ice is on everything and you think nobody's alive, but when they see me coming, they know there's news."

Irvin's route led us up a creek called Nealy Branch, then across two lonely high mountains, until it reached the birthplace of another creek, called Hollybush. We followed this creek down toward the tiny community of Pippa Passes, where the post office is on the campus of picturesque Alice Lloyd College, which serves the youth of that isolated area. There Irvin picked up more mail and retraced his route. It was a journey of 18 miles, and in perfect weather we completed it in a little over six hours—uncomfortable hours for me, since I had not ridden a horse in 20 years.

All the clients live near the beginning and end of the route, and for years most of Irvin's ride over the almost trackless ridges has been a ride among ghosts. Once 15 families lived up there, but now the roads and trails have disappeared. All that remain are the shells of sturdy log houses and outbuildings, and the ruins of a schoolhouse.

"The Howards and the Honeycutts lived up there in the old days," Irvin said. "They had a good life. Been gone a long time. I haven't seen a soul on these two ridges in years." He patted the bulge in his pocket where he carries a "right good .38-caliber special Smith & Wesson shootin' pistol," and said that infrequently he found it necessary to shoot a rabid fox.

Irvin made his round with dignified dispatch and declined the invitations to "come in and set." He waved a greeting and kept moving as he called back, "I reckon folks will be expecting me." He said he rarely had more than a dozen or so pieces of mail to carry, including magazines, but he tried to deliver anything addressed to people along his route. "Used to carry those big mail-order auto tires. Now I just say, 'You'uns go to the post office and fetch 'em.' Man's got to be reasonable. You can ask a horse to carry so much."

One woman on his route became a saleswoman for a home-products firm, and for a long time Irvin delivered packages from the manufacturer to her house. "Then it got to be upwards of 80 pounds. Lord, I'd have to have six arms. We worked it out where she goes and gets most of that stuff now."

THERE WAS ONLY ONE PLACE where Irvin lingered for a few minutes, and that was at a small, neat cemetery. He pulled the horse over to the encircling fence and made a check of the graves so he could report to kinfolk that all was well. He remembers most of the people who are buried there, and after we left the cemetery he was silent for a long time.

Irvin's mail route seems certain to continue its decrease in numbers of people and increase in numbers of abandoned homes. Poverty,

mechanization of the local mines, and the impossibility of wringing an existence from small steep farms, all combine to drive people from Appalachia.

An estimate based on the 1970 census indicates that more than a million people left Appalachia during the preceding decade. Eastern Kentucky is typical. The census showed that the two legislative districts that encompass nearly all Kentucky's mountain counties are still being drained steadily of their people. The Fifth District had 417,544 people in 1960, and declined by more than 26,000 by 1970. The Seventh District, with 444,821 people in 1960, lost more than 34,000 in the same period.

The young adults have flocked to northern and midwestern cities seeking jobs, leaving the region with increasing percentages of old people, young children, households headed by women, and the mentally and physically handicapped. There are not many people left who will preserve the legacy of the pioneers.

Many of the rural young fret away in poorly financed and understaffed schools, awaiting the day when they will be able to leave, too. But their faces still reflect the wonder and aspiration of their venturesome forebears.

In Kentucky there are approximately 70 one-room schools, and these will disappear. The last one I visited, 13 miles west of Hyden, is called Double Creek School, named for a nearby stream. It had 15 pupils spanning eight grade levels. There always is a warm welcome in such a school, because the bright-eyed and handsome children are eager to discuss "way off" places such as Louisville. They are attractive, friendly, and inquisitive, and they join eagerly in discussions.

At Double Creek, amid the wooded slopes of Daniel Boone National Forest (map, page 591), we talked, and then went outside to play marbles and basketball on the dusty playground. Then we washed our hands in the creek and returned to the small white building.

Inside there was a potbellied stove, an American flag (of 48-star vintage), and refrigerators and a cookstove to facilitate preparation of meals (following pages). For good or for bad, there soon will be no such schools. And there will be no naive mountain children gathered in such schools to charm and haunt visitors. No shy little girls who instinctively begin to smooth their hair when they see the camera; no little boys eager for friendship who slip you notes so you can compliment them on their spelling and writing.

WHEN THE CHILDREN are finally gone from the hills, the only monuments to the pioneers will be the hundreds of tiny carefully tended mountainside cemeteries. There is among these people the lay-led fundamentalist religion that promises a Resurrection Day, upon which there will unfold a better life; there is the unshakable faith in mountain and family. The cemeteries are testimony to these traits.

Late in May, on Memorial Day weekend, the hollows are clogged with the automobiles of mountain natives who come home from Detroit, Chicago, Cincinnati, Dayton, and dozens of cities where they have found employment. The mountain people know this gathering as "Decoration Day," and it is a weekend of mass reunion across the mountains, a time to groom and decorate the graves of kinfolk, a time to pray, a time to feast—a time of reassurance that the mountain way of life still exists.

A few days before Memorial Day I sat with Mr. and Mrs. Shelby Mosley on their front porch south of Hyden and shared the excitement as cars bearing Michigan, Ohio, and Illinois license plates streamed past on the narrow road along Beech Fork. On the hill above the house, in a cemetery enclosed by a white board fence, are buried the families who settled the land. Their descendants still live there. The names are Mosley, Howard, Simpson, Muncy, Baker. Many appear on the earliest deed records in the county courthouses.

Shelby Mosley is 75, the son of a mountaineer who in his time walked barefoot along the creek to teach in a log school. Shelby's father, W. S. Mosley, was also a hunter, logger, and farmer. "He managed around and got ahold of 800 or 900 acres," Shelby said. A bit of that land is the spot high on the hillside bench—safely above the spring floods—where the cemetery sits. Long ago, the Mosleys gave it to the community. "I told them to just take all that land they need," Shelby said. "Anybody is welcome to bury their kin there."

Nearly all the displaced mountaineers I have encountered in the cities are quick to confirm that they plan to be buried back home in the family hillside cemetery.

Shelby Mosley's grandson, Bill Simpson, is no exception. He had recently been discharged from the Marines after duty in Viet Nam and had brought his 17-year-old wife Chris back for the Memorial Day reunion. "Being here is being somebody," he said. "You don't have to buy your spot to be buried in. I want

Batter up! On a bright May day a softball game highlights recess time at Double Creek. The narrowness of the hill-walled playground dictates that any drive hit into the stream (**below**) counts as an automatic out.

School's out! Double Creek's pupils eagerly put away books and help clean the big room. Then they head homeward on foot, through the hills and hollows of Daniel Boone National Forest. Last term 15 students, from

KODACHROMES BY JOHN ZETTERMAN (ABOVE) AND BRUCE DALE © N.G.S.

6 to 16 years of age, attended the eight grades taught by the school's one teacher. A flag with 48 stars adorns the wall. Pot-bellied stove provides the only heat on winter days when the temperature may hover near zero. Refrigerators at left contain food for morning and noon meals. With new buildings and all-weather roads nearing completion, eastern Kentucky is rapidly phasing out such one-room schools.

my children to always come see this place. It's beautiful and the people are that way. I can remember Grandma. She was so gentle that wild birds would eat out of her hands."

All day Saturday and all day Sunday I stayed in the little cemetery, with its spectacular view of the mountains, and watched the families come; some from deep in the nearby hollows, some from other states. They brought hoes and fresh flowers, and boxes of plastic flowers. They cleaned away the Johnson grass and the saw briers from the graves, reshaped the mounds, reread the inscriptions, embraced, and traded family gossip.

There are modern headstones and hand-carved native sandstone slabs whose legends are almost erased by the years. Here and there, only a bare weathered board marks the resting-place of some forebear whose name is now forgotten. Much of the cemetery is shaded by dogwood and holly trees transplanted from the surrounding forest. Rosebushes climb for the sun and spread their displays of pink and red.

The people who came there were of all ages; some came alone, more in family groups. Each went first to the graves of his own kin and stood mute before the inscriptions:

MATT MOSLEY
"FOREVER IN OUR HEARTS"

DALLY PERRY
"SWEETLY RESTING"

POLLY HOWARD
"GONE BUT NOT FORGOTTEN"

There are memories and unbreakable ties. Just by being there, decorating and cleaning the graves, hoeing the rocky ground, they were sharing a testament, a reaffirmation.

Walter Mosley and his wife Grace live in Dayton, Ohio, and had been gone from the hills for 20 years, but they were back again, helping decorate the graves. His father and sister are buried there.

Mrs. Shelby Mosley was there, slender, frail, and aging. She stood before a stone marking the grave of her son, Grant. "My boy—he was just 12 years old," she said. "Big and husky and he just died. Had pneumonia." A white lamb is carved into the top of the stone, and Mrs. Mosley stood there a long time, letting her veined hand caress the lamb.

A 13-year-old boy, scrubbed, freckled, and excited, pointed out to me the graves of all his relatives who lay there. His name is Derick Snyder, and already he has formed his own inviolate link with the hills.

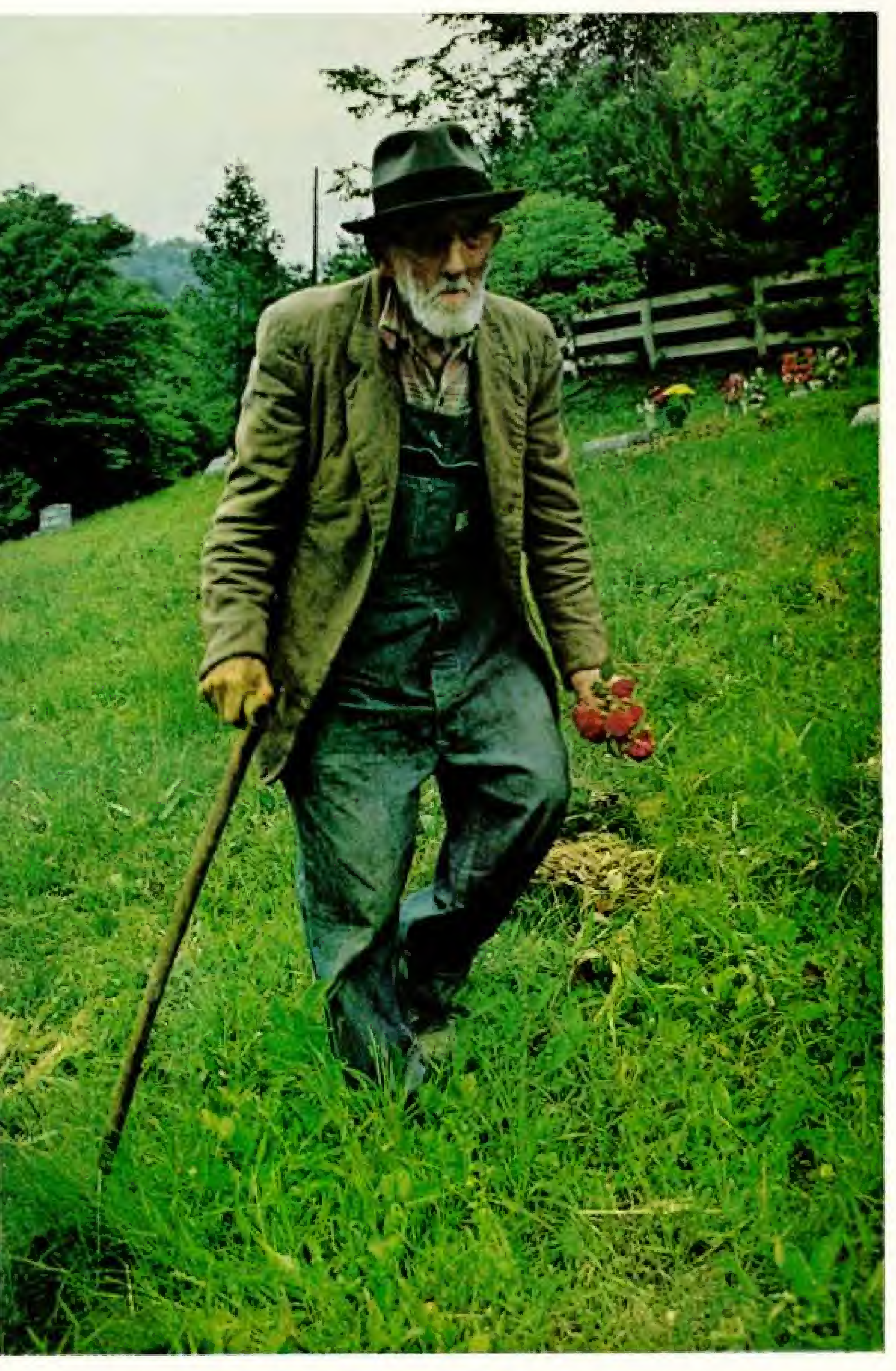
And Bill Muncy. He is 89, and people along Beech Fork say, "That Muncy. He's worked enough to kill three men." But Bill Muncy is bent and leaning now, like the oldest oaks atop the far ridges. He came to the cemetery slowly, leaning upon his walking stick and nodding to acquaintances. In one gnarled hand he held a tiny bunch of roses (opposite). "From Sarah's favorite rosebush," he told me. Sarah was his wife, and she died early in 1966. Bill Muncy laid the floral tribute upon his wife's grave and began the slow walk back down the hillside.

ON SUNDAY AFTERNOON there was a brief service in the cemetery, led by the Reverend Wilbur D. Payne from the nearby Red Bird Mission, an agency of the United Methodist Church. He used a headstone for a lectern, and the assembled people sang "Faith of Our Fathers" and "Onward Christian Soldiers." A cowbell pealed as a black-and-white heifer tore at vines growing in a nearby pine thicket. Somewhere a rooster crowed, which could be considered a good omen. Roosters are associated with dawn, and most of the people in the little Appalachian graveyards are buried facing the east so they can greet the rising sun of Resurrection Morn.

Late in the afternoon everyone walked down off the hill to join in family reunions and to enjoy huge suppers. I was a stranger there, but during that Sunday afternoon I received seven invitations to supper. I like to remember that when I hear people speak of "sullen and aloof hillbillies."

I was back upon the Pinnacle above Cumberland Gap again recently. It was early in the morning and the wind was chilly. U. S. Highway 25E, which passes through the gap, was bustling with traffic, and I could hear the blare of a truck's air horn. Civilization was still passing that way. □

Bringing a gift of roses from his wife's favorite bush, 89-year-old William Muncy visits her grave in a small white-fenced cemetery on a shaded slope near Hyden. "We always pick out the prettiest spot to rest in," explained a Cumberlander. Mr. Muncy lives alone with his pet guinea pigs. In spring he plants a tiny garden and weeds it regularly. Every Memorial Day he and other mountain people, many traveling long distances from city homes, gather at family burial plots to revive memories of years gone by.



Antarctica's Nearer Side

By SAMUEL W. MATTHEWS
SENIOR EDITORIAL STAFF

Photographs by
WILLIAM R. CURTSINGER

OFF OUR BOW, sharp-etched in the summer sunlight of January, towers a wild, gaunt island of black cliffs and glacier-cloaked mountains. Icebergs drift all around us, a stark white fleet riding an ink-blue sea.

Across half the horizon, south and east, marches a jagged succession of snow peaks. They seem only a few miles off, but our chart shows that they lie more than 50 miles away. They stand on the Antarctic Peninsula, the long, beckoning finger of the Antarctic Continent that reaches north toward Cape Horn and South America (maps, pages 624-5).

I brace between bulkhead and hatch rail to keep from sliding across the ice-lookout house. Belowdecks, cans crash from stowage shelves and the cook shouts dark oaths. Each time we roll, water cascades over the side onto the weather deck.

The stubby little trawler flies a blue flag with the initials USARP—U. S. Antarctic Research Program. Her name is *Hero*.

"*Hero* is wet, cramped, and uncomfortable as a bucket in a heavy sea," Philip M. Smith, deputy head of polar programs for the National Science Foundation, had told me in Washington, D. C., weeks before. "But you'll see a lot of the peninsula by living aboard her. She's hard used—always on the go."

How right he was, I think, as I hang on.

For more than a month I've ridden *Hero* as she roved hundreds of windy miles, carrying Antarctic researchers from outpost to outpost along this icebound coast. Now, on yet another scientific foray, she rolls and yaws along, driven by two rumbling diesels. She carries two stout wooden masts, with heavy orange sails furled to her booms. Timbered of thick oak and Guyana greenheart, sheathed at the bow with steel ice plating, she sails alone in this far-southern realm of sudden storm and uncharted rock.

Yankee Skipper Sights a Forbidding Land

Through these waters, just 150 years before, another wooden ship named *Hero* sailed south. Only 47 feet long (we measure 125), she was the scouting sloop of a sealing flotilla from Stonington, Connecticut. Her captain, Nathaniel Brown Palmer, was 21 years old.

Historians are not sure who first saw and recognized the mainland of Antarctica, last of earth's continents to be found. Nat Palmer

Waddling through the snows of a continent reserved for research, a gentoo penguin wears a radio backpack that provides monitoring biologists with data on blood flow and pressure. The neck rig draws blood samples by remote control. After a few days in the service of science, the bird will be released in a nearby rookery, unencumbered and unharmed. This project—helping man understand penguin physiology and adaptation to a harsh environment—is part of the multination Antarctic research program that began with the 1957-58 International Geophysical Year.

ANTARCTIC
PENINSULA
Drake Passage
SOUTH SHETLAND ISLANDS
ELEPHANT ISLAND
CLARENCE ISLAND
KING GEORGE ISLAND
NELSON ISLAND
GREENWICH ISLAND
LIVINGSTON ISLAND
DECEPTION ISLAND
Bransfield Strait
JOINVILLE ISLAND
DUNDEE ISLAND
JAMES ROSS ISLAND
GRAHAM LAND
Danco Coast
Gerlache Strait
BRABANT ISLAND
PALMER ARCHIPELAGO
ANVERS ISLAND
Port Lockroy
Arthur Harbor
Bismarck Strait
ALMIRANTE BROWN STATION (ARGENTINA)
ROBERTSON ISLAND
Weddell Sea
Larsen Ice Shelf
BISCOE ISLANDS
LAVOISIER ISLAND
ADELAIDE ISLAND
Marguerite Bay
Elevations in feet

has been credited with the discovery, just north of the Antarctic Circle, that southern summer of 1820-21. But so have two British mariners, Edward Bransfield and William Smith, who were there earlier in 1820.

All through the off-lying South Shetland Islands that year, American and British ships and shore parties were hunting—and nearly exterminating—the southern fur seal. Any of them could have seen Antarctica.

Two Russian exploring ships, the *Vostok* and the *Mirnyy*, reached these waters in January 1821, under Capt. Thaddeus Bellingshausen. He was startled to find eight or nine sealing vessels anchored in one strait, and he met and spoke with Palmer.

Years later Palmer recalled that Bellingshausen, upon learning the extent of the young American's discoveries, exclaimed to him:

"What do I see and what do I hear from a boy . . . that he is commander of a tiny boat the size of a launch of my frigate, has pushed his way . . . through storm and ice, and sought the point I . . . have for three long, weary, anxious years searched day and night for? . . . What shall I say to my master [Czar Alexander I]; what will he think of me?"

Science Mounts a Peaceful Assault

Today ships of many flags ply the same freezing, treacherous waters that Bransfield and Smith, Palmer, and Bellingshausen sailed. Scientists of five countries huddle in small shore bases through black Antarctic winters.

In the past 15 years a great invasion of Antarctica has occurred. It was sparked by the International Geophysical Year of 1957-58. A dozen nations, joining in that far-reaching study of our planet, sent teams of scientists to the ice-locked southern continent.*

"The project proved so successful, its findings so important, that the joint assault on Antarctica has continued ever since," Dr. Louis O. Quam, acting head of NSF's Office of Polar Programs, told me. "Many of the IGY bases are still manned."

In 1959 the Antarctic Treaty was written and signed, reserving the entire continent for peaceful pursuit of scientific knowledge. Today 16 nations abide by that treaty.

*For 77 years, the GEOGRAPHIC has chronicled man's achievements in Antarctica, including Amundsen's attainment of the South Pole (February 1912 issue). The most recent accounts include the author's "Antarctica: Icy Testing Ground for Space," in October 1968, and "First Conquest of Antarctica's Highest Peaks," by Nicholas B. Clinch in June 1967. A complete list appears in the two-volume National Geographic Index.

Antarctica's panhandle, the peninsula (**left**) survives from a land bridge that once connected with South America. Continents wandering westward and an eastward thrust by the Pacific floor wrenched the original link into a scar of isles and undersea arcs known as Scotia Ridge (**above**). Today scientific stations of five countries probe its secrets.

On the Antarctic Peninsula, Dr. Quam said, men have lived longer, in a greater number of stations, than anywhere else in Antarctica. More than two dozen major bases, plus numerous small refuges, have been built there since 1900. Argentina, Chile, and Great Britain established most of them, originally to support overlapping territorial claims. The Antarctic Treaty set those in abeyance for at least 30 years. More recently, both the United States and the Soviet Union have built year-round research bases on islands just off the peninsula.

Yet, oddly, this first discovered and longest inhabited part of Antarctica remains little known to the outside world. Nor has it been changed appreciably by man's coming. After

Dwarfed by sheer crags, the U. S. research vessel *Hero* anchors in calm Antarctic waters.

This photograph was made from an Argentine station overlooking ice-dotted Paradise Harbor.

a century and a half, it remains a region scaled for another world, another time.

To reach the peninsula, one must go by sea. An extension of South America's Andes, it and its fringing islands are basically a jagged chain of peaks thrusting up from the ocean, mantled by glaciers and edged by ice shelves. The northernmost tip lies 600 nautical miles southeast of Cape Horn, across a strait seamen fear as the stormiest in the world.

The Drake Passage lay flat calm, however, the week I first crossed it. From Punta Arenas, Chile, on the Strait of Magellan, I sailed south aboard the 133-foot biological research ship *Alpha Helix*, of the Scripps Institution of Oceanography in California.

Porpoising schools of Magellanic penguins and piebald dolphins escorted us, and seabirds wheeled around us—black-and-white Cape pigeons, wandering albatrosses, snowy Arctic terns, tiny flittering Wilson's petrels.

Sudden Fog Announces a Key Boundary

On New Year's Eve we nosed into fog as sudden and thick as a smoke screen. "The Antarctic Convergence," said *Alpha Helix*'s lanky gray-bearded captain, Robert B. Haines. "Cold water from the south, meeting warmer Atlantic and Pacific surface water. Presto, fog." To scientists, this meeting of waters is the true boundary of Antarctica, rather than its ice-locked shoreline or the 60th parallel specified by the Antarctic Treaty.

On our fifth day out, with the convergence far behind us, I climbed to the bridge at 3 a.m. to watch the sun rise above a mountain-notched horizon. *Alpha Helix* was sailing close under a low, rounded snow dome that caps the southern end of Anvers Island, a quarter of the way down the peninsula.

"Keep a close watch in there." Bob Haines handed me his binoculars. I caught a flash of sun on glass. Against the glacier, screened by rocky islets, lay two buildings and two oil tanks—Palmer Station (pages 630-31).

Palmer is one of four year-round U. S. Antarctic bases operated jointly by the National Science Foundation and the Navy. The other three this year are McMurdo, the big supply center and air crossroads on the Ross Sea; Amundsen-Scott Station at the South Pole itself; and Byrd Station, buried in cavernous ice tunnels in Marie Byrd Land. A new wintering-over base, Siple Station, will be opened in the southern summer of 1971-72, and Byrd Station will be closed (map, page 625).

"Of them all," Phil Smith of NSF had told

More in bluff than ferocity, a young male elephant seal bellows a guttural protest to a U. S. marine biologist intent on photographing the

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teeming bottom life of the peninsula's tidal areas. Once slaughtered wholesale for oil, *Mirounga leonina* now numbers half a million. Feeding on fish and squid, males may attain a weight of four tons and a length of 20 feet—making them the world's largest seals.

me, "Palmer is in many ways the most isolated, even though it's the northernmost. Without aircraft contact, with supplies and new personnel coming in only once a year by slow ship, it has precious few links with any of our other stations, except by radio."

But for work on and along the jagged coastline and island fringe of the peninsula, it has the *Hero*. Owned by the National Science Foundation and operated by a civilian crew, *Hero* bases at Palmer three to four months a year, before storms and pack ice force her back to South America. Now I saw her for the first time. She lay at a short steel-bulkheaded jetty directly in front of the main station building, which stands on a rocky spit protruding from the ice.

Robert L. Dale, USARP representative for the peninsula, and Lt. (jg.) Don McLaughlin, the young Navy officer in charge at Palmer, welcomed *Helix*'s newcomers.

"Please don't go up on the glacier without a guide," Bob Dale warned. "You can fall into a crevasse before you know it's there. We're here to help you in your research in any way we can—but we'd rather not have to do it with rescue ropes and stretchers."

Science in Antarctica today is no longer a lonely struggle by rugged explorers driving dog teams (though the British still prefer dogs, page 655), or by ships beset in pack ice (though this, too, still happens). Instead, at shore stations and on shipboard, I saw men probing science's frontiers with the most sophisticated

Between snows and seas, inconspicuous Palmer Station clings to a tiny ice-free spit on Anvers Island, at center. Icebergs strew the water, and crevasses promise more. The icebreaker *Westwind* and a smaller research ship, *Alpha Helix*, anchor offshore; *Hero* lies at the dock. A *Westwind* helicopter surveys the scene.

One of Antarctica's four year-round U. S. stations, Palmer is the closest to South America. Built at water's edge, it seems exposed, but summer storms are few, and winter congeals Arthur Harbor into an icy, rigid plain.

Christmas comes in midsummer at Palmer (**below**), where books, music, and card games help pass leisure time in the lounge. The station, which includes a well-equipped biological laboratory, served 24 working scientists during last year's warmer months.

equipment. More than two dozen scientists worked at Palmer and from the *Alpha Helix* and *Hero* last summer.

Gerald L. Kooyman of Scripps is a quiet young physiologist who has spent seven summer seasons in Antarctica, "chiefly studying seals, on and under the ice of McMurdo Sound," he told me. Joseph Peter Schroeder, tall and ebullient, is a veterinary surgeon from Solana Beach, California.

Together, Jerry Kooyman and Pete Schroeder had come to Palmer aboard *Alpha Helix* to learn what happens in the bodies of penguins and other Antarctic birds when they dive deep into near-freezing water for their food. They had brought a heavy steel pressure chamber with them, as well as sensitive

blood-sample analyzers and heartbeat recorders. Within a few hours of our arrival, they were hard at work.

I rode with them in a slow-chugging motor whaleboat out to Cormorant Island, one of many clamorous, strong-smelling rookeries that lie near Palmer. Against a porcelain-blue sky, Mount William on Anvers Island soared to a snow-corniced peak 5,000 feet above us. The sea was smooth, sun washed, and spotted by swimming birds that vanished and reappeared as if by magic.

"Blue-eyed shags, a kind of cormorant," Jerry said. "They're fishing—diving and out-swimming their catch. But we don't know how far down they go, or for how long....

"There!" Like a string of jack-in-the-boxes, another raft of birds abruptly popped into view. Jerry looked at his stopwatch. "Well over a minute, if they're the same ones."

The sea-sculptured rock crag where we landed held thousands of little Adélie penguins, all cackling stridently at their fuzzy gray chicks. Nesting side by side with them were the shags, which seemed at first glance to be penguins with long necks.

Penguins don't fly—except through the water—but the cormorants wheeled and dived around the rookery islet, landing and taking off from the sea like underpowered old flying boats. Jerry and Pete set up a movie camera to record their comings and goings. As shags returned, craws filled with half-digested fish for their young, their arrivals were unbelievable. Swooping straight in, wings widespread, webbed feet extended, they would crane their necks downward as if awaiting a landing officer's signal, then suddenly pitch down, each to its nest.

The penguins paid them no heed. But they screeched and pecked indignantly whenever we—or another penguin, or a gull-like and predatory skua swooping overhead—ventured too close.

Penguins Ride a Watery Elevator

In the days that followed, a succession of shags and penguins—Adélies and red-beaked gentoos—took trips for science to Palmer's laboratory. Wired for heartbeat and strung with blood-sampling tubes, they found themselves inside Jerry Kooyman's diving chamber.

Pete worked a hand pump to "dive" the birds to pressure-depths as great as 200 feet. Every 30 seconds, Jerry Kooyman took blood samples from tubes leading inside the chamber; an electrocardiograph spewed data on

Painless plug-in for science: An Adélie penguin is connected to water tubes that reach its hypothalamus, the temperature-control center of the brain (**right**). When warm water flows through the tubes, the bird feels hot, regardless of its real temperature. This experiment, one of several aboard *Alpha Helix*, sought to discover how penguins regulate body heat.

In a related study, injection of red plastic into the leg artery of a dead penguin produced a net-like vascular cast (**below**). A caustic bath dissolved soft tissue, revealing an abundance of small blood vessels that dilate or constrict to expel or conserve body heat.

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heartbeat. The readings complete, a pump sucked out the seawater, the penguins were released unharmed, and eventually went home to their own world.

"Someday," said another Scripps biologist, Dr. H. T. Hammel, "our human attempts to live and work deep in the oceans may be helped by knowing better how penguins and seals thrive in seas as cold as this.

"My own specialty is making animals think they are hotter or colder than they really are," he added. For hours I watched his patient, gentle work with penguins in one of *Alpha Helix*'s superbly equipped laboratories.

By inserting hair-thin water tubes into the temperature-control center of an anesthetized penguin's brain, the physiologist was able to trigger and study his subject's normal reactions to extreme heat and cold (right).

When warm water circulating through the sealed tubes in their heads made them feel hot, the penguins held out their flippers, panted, and ate ice—even though the ice bath in which they lay already had cooled their bodies below normal. Conversely, when the brain's temperature center was cooled,

the penguins shivered violently, even while standing in hot water.

Another of Ted Hammel's contrivances was a motor-driven canvas belt, running on rollers within a wire-mesh enclosure. Here his penguin subjects waddled briskly along, hour after hour, getting nowhere but yielding readings of their body temperature and blood flow during protracted exercise.

As Dr. Hammel's birds trudged on, *Alpha Helix*'s projects at times resembled a five-ring circus. A University of Washington team fitted penguins with yellow vests that carried radio-telemetering transmitters (page 623). Released on their nesting grounds, the birds broadcast blood-flow data into a recorder. Two UCLA scientists fed other penguins miniature transmitters the size of rolls of mints, and from a tent on the rookery listened to changes in their body temperatures.

A senior Scripps physiologist, Dr. Per Fredrik Scholander, who designed *Alpha Helix* as a world-ranging biology laboratory, studied the oxygen-carrying capacity of penguin muscle tissue.

"These are all bits and pieces of basic knowledge," he told a shipboard seminar, "that help us better understand life itself."

Hero Fishes for "Gaping Head"

Through these long sun-filled days, *Hero* went out each morning in search of one of the most unusual creatures in Antarctic seas. She was having little luck catching *Chaenocephalus* (meaning "gaping head") *aceratus*.

"Commonly known as the ice fish," said Dr. Edvard A. Hemmingsen, a Norwegian who led *Alpha Helix*'s scientific team. "It and other species of this Antarctic family are the only vertebrates that have no red cells in their blood—no hemoglobin, which in most animals carries the oxygen essential for life."

He wanted to study the ice fish's breathing and cardiovascular systems—but the fish was elusive, and Dr. Hemmingsen was becoming anxious. "We go farther," he decreed. So I moved from *Alpha Helix* to a berth aboard the *Hero*, to sail with her on a long-distance trawling expedition.

We stood north through the spectacularly beautiful Gerlache Strait, named for the first scientific expedition to winter over in Antarctica—a party under Belgian Adrien de Gerlache, whose ship *Belgica* was beset in the ice in 1898. Its first mate was Roald Amundsen, who 13 years later became the first explorer to reach the South Pole.

Mountains fell sheer to the sea on both sides of the strait. *Hero* butted her way through broken pack ice, leaving smears of red bottom paint on the white floes. A pod of fin whales, each 50 feet long or more, blew and rolled past us. Killer whales raced alongside, their high, sharp fins outpacing *Hero*'s plodding nine knots.

Off Brabant Island, under the massive 8,274-foot pyramid of Mount Parry, Dr. Hemmingsen found his ice fish. Again and again *Hero*'s big trawl went over the side, dragging along the bottom 300 feet down. Each time it came up, it held one, or two, or even four ice fish. One to two feet long, their pale-gray bodies seemed half mouth, usually wide open.

"Get them into the tanks quickly," Ed Hemmingsen warned. His grin was as wide as that of the fish.

"If we can learn in detail how the ice fish transports oxygen without hemoglobin," he told *Hero*'s hardworking crew, "it will

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Moment of hatching: Dominican gull chick pecks out a window on the world with its egg tooth, a thickening at the end of its beak that will disappear as the bird matures.

increase our understanding of respiratory functions in general. We may even get clues that could aid in the development of artificial blood—an emergency substitute, so to speak, that could be used for a limited time."

Two days later, as we came slowly around Bonaparte Point into Palmer, we could see the foretops of two large ships lying in Arthur Harbor—the white, broad-beamed U. S. Coast Guard icebreaker *Westwind* (page 630), and a bright-red hydrographic ship of the Royal Navy, H.M.S. *Endurance*. Behind them *Alpha Helix* swung at anchor.

There was also a totally unexpected newcomer—a slim, high-masted sailing yacht, blue and buff, flying the Stars and Stripes. And ashore in Palmer's paneled mess hall and lounge were six strangers—including a woman.

Skipper of the 53-foot *Awahnee* was a burly, grizzled, squint-eyed romantic named Robert L. Griffith, a retired veterinarian from California now living in New Zealand.

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Full grown and hungry, *Larus dominicanus* snatches a chunk of hot dog tossed by a scientist. At winter's onset, the scavenger will fly north on wings that span three feet.

With him were his wife Nancy—small, freckled, and friendly—their 16-year-old son Reid, and three young New Zealand crewmen.

"We built *Awahnee* ourselves, of ferrocement—steel mesh and mortar," Griffith told Palmer's incredulous Navy complement. "We've been around the world three times in her—but this time with a difference."

By sailing almost entirely below 60° south, Griffith said, they were retracing as closely as they could the historic circumnavigation of Antarctica by Britain's Capt. James Cook between 1772 and 1775.*

"We left Bluff, New Zealand, on the tip of the South Island, 30 days ago. We have a small auxiliary engine for emergencies, a battery radio, and a sextant and compass for navigation. We plan fewer than a dozen landfalls in 12,000 miles. By staying down close to the ice, out of the roaring forties and furious fifties, we miss the really bad winds. So far, we've averaged 155 miles a day at sea."

"We don't need a refrigerator aboard on this trip," Nancy answered a question about fresh food. She added cheerfully, "And this time I really don't mind being sent below to cook. The galley is the warmest place on the boat."

"I Think This . . . to Be a Continent"

Next day Arthur Harbor filled to the bursting point. The big gray Navy cargo ship *Wyandot*, veteran of many voyages into the ice, came in from Valparaiso, Chile. She brought a new work crane for Palmer, a year's groceries, and half a dozen more scientists. Aboard also were Dr. Quam, chief of USARP, and retired U. S. Ambassador Paul C. Daniels, who helped draft the Antarctic Treaty and signed it for the United States.

A few days later Dr. Quam and Ambassador Daniels sailed with *Hero* and *Alpha Helix* for a goodwill visit to Argentina's nearby Almirante Brown Station (map, page 624). Thus it was that on February 7, 1971, an Antarctic anniversary was commemorated.

"Only about 60 miles north of here, the first men to set foot on the Antarctic Continent landed just 150 years ago," Dr. Quam had told a group of us at Palmer Station. "They were a party of sealers from the American schooner *Cecilia*, Capt. John Davis of New Haven, Connecticut, master."

Captain Davis noted in his log for that date: "I think this Southern Land to be a

*See "The Man Who Mapped the Pacific," by Alan Villiers, NATIONAL GEOGRAPHIC, September 1971.

Mixed maternity ward: Blue-eyed shags and gentoo penguins crowd a rookery at Port Lockroy, where flensers once butchered whales for their oil. Snow covers most of the land even in summer, forcing the two bird species to share some nesting

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sites. Shags usually build nests of seaweed; gentoos prefer to lay their eggs within pebbly rings. Plant life thrives in the vicinity of many rookeries (next page), in part because of the nitrates and phosphates in the rich deposits of guano.

Spongy moss blankets rocks where entomologist Jim Pearson probes for mites and insects (**right**). Stakes outline plots used to estimate population densities on Anvers Island.

Largest land animal at the bottom of the world, the wingless fly *Belgica antarctica* (**below**) strides over a fingertip in the company of even smaller springtails. Both feed on the fungi and algae that flourish near summer's scattered melt pools.

20 TIMES LIFE-SIZE

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Microscopic predator, the land mite *Rhagidia gerlachei* (**left**) feeds on adult springtails and their eggs. Unique to Antarctica, the creature survives winter temperatures as low as −32° F. in any stage of development: egg, larva, nymph, or adult. Some biologists think the secret lies in a natural "antifreeze"—a high percentage of glycerol in the blood.

Continent." Twenty years later a United States exploring expedition under Lt. Charles Wilkes proved him right.

Geologically as well as historically, the Antarctic Peninsula that Wilkes helped define is young. Its seagirt mountains crumpled and uplifted only in the past 100 million years. "And parts of it are still being violently reshaped," Dr. Quam said with a certain understatement.

Hot Spot on Antarctica's Rim

Deception Island in the South Shetlands, like a number of other places on Antarctica's rim, is an active volcano—so active that it has erupted three times in the past four years. A famous old sealing and whaling port, Deception held three year-round stations—Argentine, Chilean, and British—until it erupted in December 1967, again in February 1969, and most recently in August 1970.

In a heavy swell, rising wind, and snow, *Hero* came to Deception at three o'clock one morning. Sheer cliffs of black and red rocks, vanishing upward into the overcast, framed a narrow entrance in its forbidding coast.

"Hells Gates, Dragons Mouth, Neptunes Bellows—you can find it under all three names in old sailing directions," said *Hero*'s Capt. Richard J. Hochban. "And little wonder—look at it!"

We hugged one side of the surf-washed gap; against the opposite face, canted and broken in two, lay a rusted old whale catcher. Then, suddenly, we were inside the island, in a five-mile-long bay stretching away into the driving mist. The wind whistled off black slopes and drove whitecaps across the great caldera. For that is what forms Deception's central bay, Port Foster—the collapsed cone of a huge volcano, a jagged, ice-covered ring of rock enclosing one of the finest harbors in Antarctica (map, following page).

Here, in shore-whaling days of the early 1900's, Norwegians by the score cut up blubber each summer on a wide beach for an evil-smelling tryworks, whose ruins still stand. Later, in the 1920's, as many as eight ocean liners, converted to whale factory ships, lay moored at Deception at one time. It was a port of entry to Antarctica, with a British magistrate and regular mail service.

In the dawn gloom *Hero* slid past Whalers Bay to another cluster of low abandoned buildings across the harbor. There she lay to and blew her whistle, raising rolling echoes.

Camped at Argentina's Decepción base, three glaciologists—a Norwegian, an American, and a Russian—awaited our coming. Olav Orheim and Terence Hughes, of Ohio State University's Institute of Polar Studies, and Leonid Govorukha, from the Soviet Union's Arctic and Antarctic Scientific Research Institute at Leningrad, had been working on the island for nearly two months, studying its glaciers and the effects of the recent eruptions. They were the last still there of an 11-man scientific party landed by an Argentine ship and supported by Chile, Britain, the Soviet Union, and the United States.

They were grimy, tired, and very glad to see *Hero*. "We could use a hot bath," said Olav Orheim as the trio clambered over the rail. Dr. Govorukha, smiling widely through a bristly black beard, added a fervent "*Da, da.*"

They were already in the showers, and their ash-caked clothing in the ship's washing machine, as *Hero* swung back to a sheltered anchorage in Whalers Bay. There we found we had company—an oddly rigged yacht flying the Italian flag. Her two short masts and slanting yards were those of an Arab dhow—lateen, in sailors' terminology.

San Giuseppe Due—St. Joseph II—had arrived at Deception ten days before, her captain, Giovanni Ajmone-cat, told us that night in their dark-varnished main cabin. He and his amateur crew of three were making a two-year voyage around the world.

Only the captain spoke any English. So our gam that night in the old whalers' harbor consisted of an odd mixture of Spanish, French, Italian, Russian, and English. The Italians were trying in vain to contact Rome with their shortwave radio. "*Roma . . . Roma . . . Roma . . . Roma . . . barca San Giuseppe Due, Antarctica . . .*" the captain shouted through the static.

The answering silence daunted them not a bit. Far from home, these adventurers were anxious only to be on their way, west across the Pacific to Australia, before winter caught them too far south.

Eruption Bares Island's Icy Diary

The glaciologists' study was not yet complete; *Hero* was there to lend them support. So for two arduous weeks that followed, photographer Bill Curtsinger and I joined the scientists at their work.

Doing our best to keep up with the wiry, untiring Leonid Govorukha, we slogged and labored up mountainsides of ice buried under deep layers of black ash thrown out by

Deception's three recent eruptions. In 1967 the deluge pelted the three scientific stations at Deception and forced their evacuation by helicopters from rescue ships.

"Fourteen months later, early in 1969, more vents exploded, opening a three-mile-long rift," Olav Orheim told us. "A flood of hot mud and rock utterly destroyed the Chilean base. Six men who had returned to the British station had to run for their lives with iron sheets held over their heads."

No one remained on Deception for the 1970 blast. That eruption blew a chain of craters, one of them a quarter of a mile wide and 400 feet deep, through solid ice. On the ice cliffs thus exposed, the three glaciologists were reconstructing the history of Deception by charting the successive layers of ice and ash built up over the years (far right).

"We have read back already to the mid-1700's," Olav said. "The glaciers show many eruptions that historians missed. In 1842, for example, a sealing captain reported seeing the whole south side of Deception on fire, with 13 volcanoes in action, but no one believed him. We know now that Deception had a major eruption that year."

Steam rose from the base of the great rift slashing across the mountainside. A deep cave had melted out beneath the glacier.

"Vkhod v ad!" Leonid Govorukha described it. "Doorway into hell!" As we tried to scramble down into the cave, the heat drove us back. An earlier measurement, Olav said, had placed the rock temperature there at nearly 500° Fahrenheit. Hades indeed!

Unbroken Snow Cloaks Hidden Hazards

Another day, on another glacier, Olav and I both fell through doorways into danger.

With Terry Hughes, we had roped together to cross a deceptively smooth snow slope, to remeasure ice-movement stakes set out two years before. Olav stabbed carefully with the point of his ice ax as we crossed a 1,200-foot-high ridge. Then, suddenly, he disappeared. Where he had stood a second before, only a small hole in the snow remained. The rope led to the edge of the hole, and Terry was desperately braced, his feet straight out ahead of him in the snow.

"Crevasse," he grunted as I helped take up the strain. With the rope anchored to our ice axes, Terry slid forward headfirst to peer down the hole. Olav had dropped more than 30 feet into a narrowing cleft in the ice; his feet were jammed into the crack.

Hotbox in an icebox: Its harbor the collapsed cone of a giant volcano, Deception Island still erupts periodically—three times since 1967. A 1969 eruption opened the 100-foot-deep rift (**right**), where layers of ash alternate with the snows of successive winters like the growth rings of a tree. By studying the face, scientists date past eruptions and changes of climate, and seek correlation with Northern Hemisphere records. This wall spans only 70 years, but in a huge ice crater blown open in August 1970, glaciologists expect to trace such layerings back to A.D. 1400.

Fumaroles heat a Deception pool to 100° F (**below**), giving Russian scientist Leonid Govorukha a hot bath amid falling snow and chill air.

Undaunted, he yelled instructions to us: "Hold the strain on my lifeline, and drop another rope with a bight in it."

Laboriously, he worked the loop over one foot, then loosened his lifeline and passed a loop around the other foot. Then, alternately heaving and holding, Terry and I helped him walk his way to the surface. The process took more than half an hour.

Minutes later, I knew what he had experienced. As we marched single file back across the ridge, gingerly following our original footprints, the world dropped out beneath me. Suddenly I was swinging wildly in an icicle-walled pit that yawned below into total darkness.

Although Olav and Terry were less than forty feet away, the snow muffled their shouts, and mine to them. It was as if I had dropped into a soundproof void.

Then Olav's face appeared in the hole above me. "Are you O.K.?" I heard him call.

"Yes. But I think my sunglasses are still falling. That's a long way down."

"Can you swing over to that ice knob?"

"I think so . . . yes. Now what?"

"Make like an ice fly," he said, laughing. And in short order, with the help of the two men above, I was able to walk my way up the wall of icicles and into the sun again.

Wind Wafts New Life to Deception

Days that followed added experiences enough for a lifetime. We swam in 100° F. water in a crater lake walled by ice and ash (pages 640-41). We dug snow pits in another glacier, and walked the new harbor shoreline formed in the 1970 eruption. Beside steaming fumarole cracks on a beach still almost too hot to touch, moss grew in long green stripes.

"Spores must have come in on the wind since August," Olav said, "for life to have reestablished itself so soon."

Below the surface of the bay, other new life was blooming. Two marine biologists aboard *Hero*, Stephen Shabica and Michael Richardson of Oregon State University, spent their days in black-rubber wet suits and scuba gear, scanning and sampling the bottom.

"Under about 30 feet, beyond the sunlight, there's not much except cinders," Mike reported. "But above that depth, algae are already growing, and quite a few bottom creatures are feeding on the slime and plants."

One strange 12-legged, foot-wide sea spider (pages 646-7) that Steve Shabica took from a trawl as we left Deception made worthwhile the entire 14 months he had spent at

Eyes of a killer glow through a veil of plankton—a leopard seal! Named for its silver-and-black-spotted body, *Hydrurga leptonyx* usually preys on penguins, even chasing them short distances across floating ice. Hunger can drive these seals to attack man, and their speed and teeth make them formidable adversaries. This 10-footer apparently was attracted by the bubbles from the air regulator of photographer Curtsinger, who made the flash portrait 120 feet down in the sea.

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Streaking beneath the surface, a leopard seal displays his speed. The sleek hunter can smash through three inches of ice to snatch a penguin.

Spawned by a glacier, sculptured by seawater and summer sun, an iceberg ferries penguins north. Mariners shun the icy leviathans, which may become top heavy as they melt and roll over, abruptly raising waves huge enough to capsize a boat.

Palmer as station scientific leader. "It's a *Dodecolopoda mawsoni!*" he exclaimed. "Only three others have ever been found!"

The Deception Island study completed for the year, *Hero* returned briefly to Palmer, then sailed north again to return Leonid Govorukha to the Soviet Union's Bellingshausen Station on King George Island (map, page 624).

Pitching in the swell came a bargelike Russian craft to take us ashore. A burly smiling figure in a blue wool cap clambered over *Hero*'s rail, to greet Leonid with a bear hug and a kiss on both cheeks.

Leonid introduced him with a flourish: "Igor Simonov, base leader."

We clung to steel braces as the Russian launch wallowed to shore—and, startled, felt it climb out onto the shingle beach with a grinding clash of gears. We were riding an amphibious rubber-tired truck, which drove us smartly to the station door.

Thirteen Russians, black-garbed and bearded, welcomed us royally. They were out of potatoes, out of fresh fruit, and—worst of all—out of vodka. Their annual relief ship, the *Professor Viese*, had crossed the Equator that day, southbound (page 648). But they heaped a table with the last of their delicacies, mushroom soup and *shashlyk* (shish kebab). Then they learned that we had brought a surprise of our own.

"This is geologist Alice Brocoum, of New York City," Leonid began the formal introductions. And added quickly, "And this is her husband Stephan, also geologist. They go with *Hero* to the South Orkney Islands."

"Not before we present a diploma, a certificate," countered Igor Simonov. And at the luncheon's end, the Russians produced a handwritten scroll honoring "the first American woman scientist to visit Soviet Antarctic Station Bellingshausen."

Next door to the Russian base, built in 1968, stands an even newer Chilean station, Presidente Frei. The two outposts provided striking contrasts.

The Russian station abounded in mechanized equipment: two amphibious trucks, a tracked glacier vehicle, several big tractors. Each man had a green plant growing in his room, or a fishbowl flashing with guppies. Pictures of wives and children hung beside beds, portraits of Marx, Lenin, and Engels covered a wall of the dining hall (page 649).

The Chileans across the beach, still building, dug gravel and mixed concrete by back and arm power. But their radio room far surpassed Bellingshausen's—or Palmer's. It held five radioteletype printers, high-powered transmitters, and a weather-satellite receiver to provide up-to-the-minute data for the World Weather Watch.

Hopeless Haven—After 24 Weeks at Sea

Hero's Captain Hochban had planned to anchor overnight off Bellingshausen, but the wind was rising, and we had 400 miles of open ocean to cross. By dawn the weather had indeed changed for the worse. *Hero* was rolling and plunging; long graybeard waves marched northeast across a gunmetal sea. They lifted our stern and swung our bow as they hissed past in spumes of white foam.

Abeam to the north, dark and ominous through the scudding overcast, rose a dim serration of forbidding cliffs and peaks. Elephant Island, Captain Hochban said.

To that black outcrop, in April 1916, British explorer Ernest Shackleton brought

his castaway party of 28 men, "huddled in the deeply laden, spray-swept boats, frost-bitten and half frozen." They had ridden the pack ice and dragged and sailed their three small boats for 24 weeks through the frozen waste of the Weddell Sea, after the "unsinkable" *Endurance* had been beset and finally crushed. When they landed through wild surf on Elephant Island, it was the first land they had set foot upon in 497 days.

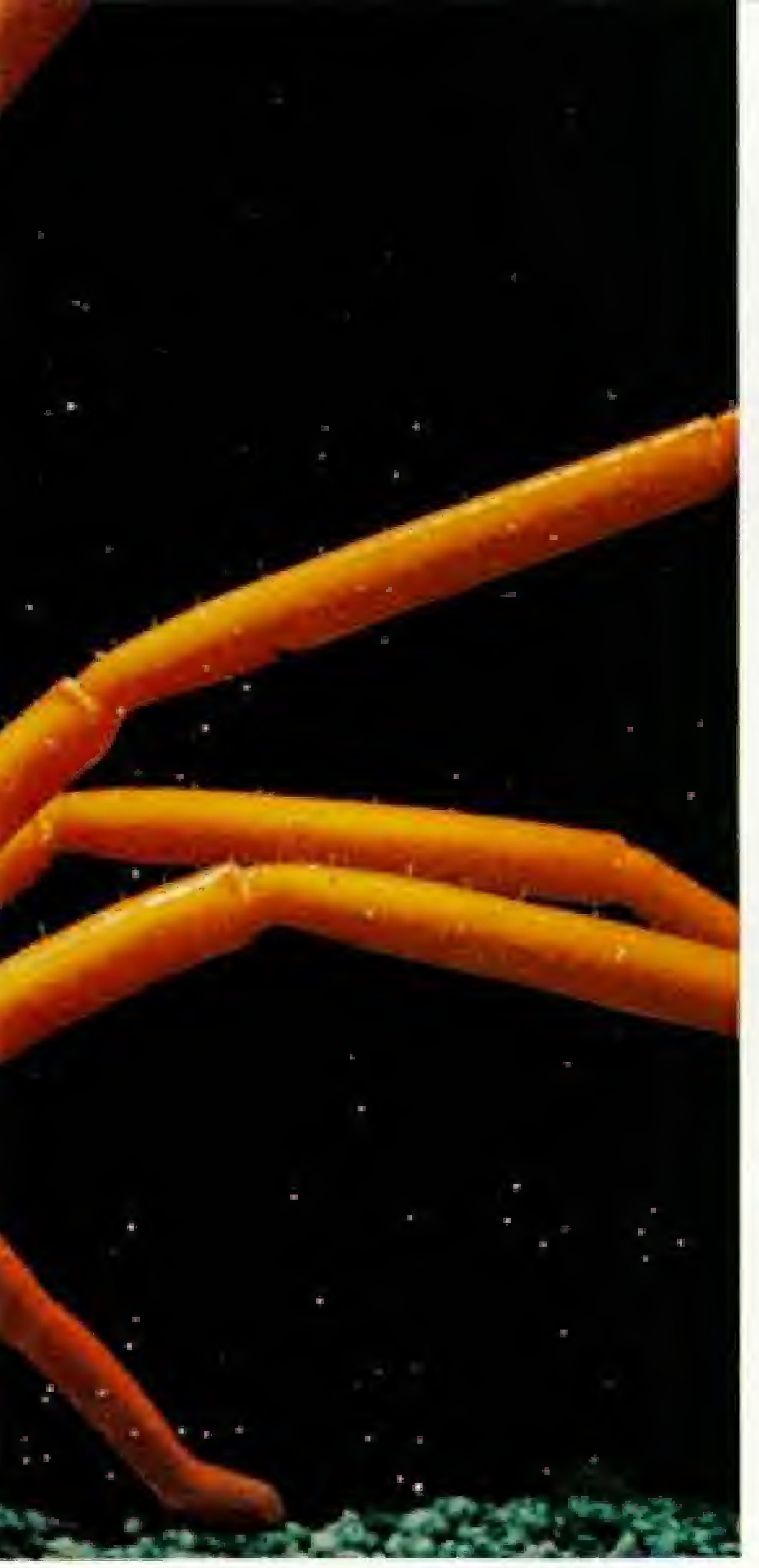
"South Georgia was over 800 miles away," Shackleton wrote. But ". . . there was no chance at all of any search being made for us on Elephant Island."

With five of his men, he set forth in a 22½-foot open boat. "We fought the seas and the winds and at the same time had a daily struggle to keep ourselves alive." But they made it.

Thrown ashore on the opposite side of South Georgia from its Norwegian whaling stations, Shackleton and two of his ragged, emaciated men crossed an all but impassable mountain range to reach safety and organize rescue for the others. His feat stands as one of the greatest epics of seamanship and will to survive in history.

Between Elephant Island and the South Orkneys, *Hero* growled gamely on. We passed ever-increasing flotillas of icebergs drifting north out of the Weddell Sea. One berg stretched seven miles; another, appearing by night out of a whitish iceblink, ran on for 16

(Continued on page 652)



Largest of sea spiders, *Dodecolopoda mawsoni* paces a laboratory tank on its dozen legs, each about eight inches long (**left**). Only four specimens of this bottom-dwelling predator have been found.

Snared in a sea anemone's tentacles, a starfish ends up as a meal in shallow Antarctic waters (**below**).

Tomorrow's main course? Feeding on plentiful plankton, shrimplike krill (**bottom**) provide food for baleen whales, penguins, and most seals. The two-inch crustaceans may also become an important protein source for humans. Researchers seek ways to process the abundant krill for world markets.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Russian researchers on the peninsula

FONT of scientific information, Antarctica also breeds goodwill. Formal protocol and international boundaries do not exist; men freely visit stations of other countries. Such was the tone and hope of the Antarctic Treaty, in which all signers agreed to forgo territorial claims to the continent for at least 30 years.

A scientific team debarks from the Russian research vessel *Professor Viese* (**above**) at Bellingshausen Station. The author found the 407-foot *Viese* "like an ocean liner—comfortable and spacious," accommodating the 200 scientists and technicians manning her computer center and many laboratories. Using rockets to probe the skies 60 miles up, she and a sister ship increasingly roam Antarctic waters for research.

Bellingshausen carries the name of a Russian explorer who in 1821 became first to sight land within the Antarctic Circle. At the station, scientists taking a chess break are watched by portraits of famous players in the game of history—from left, Marx, Lenin, and Engels (**right, above**). The "100" in the upper left corner salutes the centennial of Lenin's birth. The countdown calendar at upper right promises the annual shipment of food and new faces in four days.

Until then, time crawls. The cook (**right**) creates a morale booster—fresh-baked bread.

And then the day arrives! The *Viese* anchors with a team of scientists, including a comely oceanographer (**far right**) who will spend the summer analyzing seawater.

EKTACHROME (ABOVE) AND KODACHROMES © N.G.S.

Marooned in a sea of penguins, a lone fur seal on Laurie Island is one of a once nearly extinct species now reappearing on many Antarctic isles (**following pages**).

KODACHROME BY SAMUEL W. MATTHEWS © N.G.S.

miles. Each rose 80 to 100 feet out of the sea, which meant their total thickness was close to 800 feet.

Nathaniel Palmer and British sealer George Powell discovered and charted the South Orkneys late in 1821. Then, as now, the islands were the breeding ground of millions of chinstrap penguins (preceding pages) and other Antarctic birds. Bleak and totally forbidding, the South Orkneys interest geologists today simply by being where they are.

Steve and Alice Brocoum and Mark Barsdell, a young Australian, made up a field team led by Dr. Ian Dalziel of the Lamont-Doherty Geological Observatory of Columbia University. Athletic and dedicated, with a Scottish burr in his voice, Ian was pursuing the third year of a study of the ancient land connection between South America and Antarctica. He sought evidence written in rock of what happened when those continents drifted apart in the breakup of the ancient protocontinent geologists call Gondwanaland.

"There's little doubt the South Orkneys are displaced fragments of the original Andean mountain chain," Ian said. "As the South Atlantic opened, and South America and Antarctica moved away from Africa, the land connection across what is now the Drake Passage apparently broke and bent in a great eastward curve [map, page 625]. The Orkneys are remnants of that land bridge."

Day after day we scrambled ashore from *Hero*'s bouncing rubber boats, and Ian and his nimble rock hoppers showed me evidence of that massive geologic displacement. Along the crags and cliff faces of Laurie Island, they pointed out tiny ripples in ancient sediment beds that told them that the layers had been shoved and folded upside down.

On many a rocky beach we were outnumbered by glossy dark-brown seals basking in the sun. These were unlike any seals I had seen near Palmer Station. They had ears. They stood up on their flippers and broad tails, barked ferociously at us, then galloped away like bears on the run.

"Those are fur seals," Ian told me. "We

Giant of a miniature world, a two-inch-high lichen called *Neuropogon* spreads frizzy arms laden with black spore-bearing cases. Lichens, algae, and mosses stand tallest among Antarctica's vegetation, the equivalent of forests elsewhere, reflecting the relative primitiveness of the continent's flora. When snow recedes, these diminutive "woodlands" appear, sheltering a mini-ecology replete with insects, mites, and microbes—the hunted and the hunters.

Lettuce thrives under artificial light at Britain's Argentine Islands Station (**right**). Scientists at other Antarctic posts cultivate similar gardens, which occupy idle hours, remind them of warmer lands, and refresh palates jaded by tinned and frozen foods.

saw a few on Elephant Island last year, and others in the Shetlands."

The reappearance of this once almost-extinct mammal is heartening. Guidelines for its protection have been developed by signers of the Antarctic Treaty.

Repast at Antarctica's Oldest Station

At Laurie Island, when *Hero* anchored in Scotia Bay, Ian wore a bit of a grin as we went ashore. On a low isthmus stood the ruin of an old stone hut. Atop its door frame a weathered signboard read, "Scottish National Antarctic Expedition, 1903-1904."

Next to the hut stretched the blue and orange buildings of Argentina's Orcadas Station, established the year the Scots left. Orcadas thus ranks as the oldest continuously inhabited outpost in the Antarctic.

Its all-naval complement welcomed *Hero* with a startling repast: Hearts-of-palm salad ("from our palm grove across the glacier"), marinated artichokes, Argentine tenderloin of beef, and flaming crepes suzette!

An equally friendly crew of young Britons greeted us at Signy Island, 25 miles west—biologists, divers, mechanics, radiomen of a British Antarctic Survey base. Anchored off their two-story, fiber-glass station lay a red-and-white vessel, the spanking new royal research ship *Bransfield*. Commissioned the last day of 1970 at Leith, Scotland, the *Bransfield* sailed at once for the Weddell Sea.

Aboard was BAS Director Sir Vivian Fuchs, leader of the British Commonwealth Trans-Antarctic Expedition of 1957-58, first to cross Antarctica by surface travel.* Ruddy and still youthful under bushy brows and silver-gray hair, "Bunny" Fuchs is one of the world's most experienced Antarctic hands.

When our talk turned to the subject of tomorrow's Antarctic stations and research projects, Sir Vivian expressed views surprisingly similar to those Dr. Quam of USARP had voiced. Fifteen years after the start of the huge IGY effort in Antarctica, they both

*Sir Vivian wrote "The Crossing of Antarctica" for the January 1959 NATIONAL GEOGRAPHIC.

Fossil plant found by Chilean scientists on King George Island puts Antarctica's ancient past in a temperate clime (**above**). Further proof of the continent's warm ancestry lies in its coal, the transformed remains of forests long dead. Several grades of fossil fuel exist, but exploitation by conventional means would be far too costly.

The discovery of fossil plants and animals more than 200,000,000 years old lends weight to the theory that Australia, South America, Africa, India, and Antarctica once made up a single landmass.

saw one era ending and another beginning.

"Has it been worth it?" I asked them.

Dr. Quam: "Few if any other international efforts in history have produced as much basic knowledge of the world we live in."

Sir Vivian: "I agree. The Antarctic program is—and, to my mind, rightly so—one of Britain's largest research efforts."

Both men predicted that the patient unraveling of Antarctic mysteries will go on.

Stations will remain small and inevitably isolated. But U. S. use of large ski-equipped aircraft, able to land research parties in remote regions for short periods of intensive work, has shown that scientists no longer have to remain in Antarctica for one, two, even three years at a time.

The United States will continue to keep men at the very bottom of the world, Dr. Quam said. Construction of a new South Pole station, sheltered under a geodesic dome, will begin in the 1971-72 austral summer.

For such small inland bases, Navy stationkeeping for civilian scientists is on its way out.

"Where a small group must live close together and totally isolated for at least part of a year, as at the Pole, dividing that group between Navy support personnel and civilians no longer makes sense," Dr. Quam went on. "I foresee our smaller bases, particularly, becoming all civilian, like the British."

The U. S. will use women. Britain will not.

"We simply aren't equipped to have both men and women at our bases today," Sir Vivian said flatly.

In the past two years, U. S. women scientists have worked at McMurdo, Byrd, and in the Cape Crozier area. Geologist Alice Brocoum was the first woman to sail in the Antarctic with *Hero*. There will be others.

Further in the future lies possible economic development of earth's last great landmass. Tourist ships already sail regularly along the peninsula, and occasionally to McMurdo. Inevitably there will be more.

"The treaty nations must agree on ways to receive and safeguard visitors without disrupting scientific work," Dr. Quam said.

Minerals and other resources wait there too, for men to find—and find how to get them out.

"Almost certainly there is oil," Ian Dalziel told me. "The east side of the peninsula is similar in geologic structure to parts of southern Argentina, where oil is already known to exist." Sir Vivian agreed.

Someday the virtually limitless shrimplike krill, a vital link in the food chain of Antarctic waters, may provide a huge new food resource for a hungry world (page 647). Reduced to a protein concentrate, cheap and palatable, planktonic life from the southern ocean could feed millions of people, say both British and American marine biologists.

There may be other bonanzas as well, but they, too, lie far in the future. Antarctica's real wealth is already being mined, however—new basic knowledge of the earth, its weather and atmospheric circulation, the forces that impinge on it from space.

Homebound Race Against Winter

At Signy Island, Ian and his party went ashore with tents and field gear to camp for nearly a month amid the geologic record of continental drift. I, too, transferred from *Hero*. I was to sail with the *Bransfield* back to Punta Arenas.

From the *Bransfield's* broad helicopter deck, at four o'clock one gray gusty morning, I watched *Hero* swing from her anchorage and head out into a scudding, rolling, forbidding ocean. The little USARP ship was bound back to Palmer Station for the last visit of the waning summer. Gales and gathering pack ice would soon usher in the winter night along the peninsula. Bucking head seas and winds, *Hero* would have to hurry.

I had been aboard her for 50 days. She was cramped, sea-tossed, tired, and far from home. As I watched her go, I had the same thought as when I first saw her two months before. Uncle Sam's little wooden ship of the Antarctic is most aptly named. □

Basking in evening's glow at Britain's Stonington Island Station, sled dogs are reminders of Antarctica's heroic age, when animals provided the sole means of transport. In this mechanized era, the continent's snowy silence still beckons scientists eager for more precise, more extensive knowledge of our planet. Yet even today, Britons staunchly prefer dogs to powered vehicles, and their stations remain small. Anchored offshore, the royal research ship *Bransfield* keeps Britain's Antarctic bases well stocked. Continentwide, a total of 16 nations push forward in a unique research program. No other international effort has yielded so much information on the earth's weather, atmosphere, ocean currents, and geology.

KODACHROME © N.G.S.

Himalayan traders on the trail to Karnali urge pack-carrying goats

KARNALI, ROADLESS

Exploring afoot for 15 adventurous months, an American geographer and his family record the daily life of a little-known land

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

across a swaying toll bridge suspended above the Bheri River.

WORLD OF WESTERN NEPAL

ARTICLE AND PHOTOGRAPHS BY LILA M. AND BARRY C. BISHOP

KODACHROME © N.G.S.

TO THE NEPALESE, perhaps, it was all normal and routine. But our departure for remote mountain-creased Karnali Zone seemed to us anything but auspicious. A chilly mist shrouded the February morning. The scene at Kathmandu's Tribhuvan Airport was approaching bedlam. And the pilot of the twin-engine Otter had changed his mind.

Dubiously he surveyed our party of 11—Sherpas, assistants, Barry, myself, and our two children, together with a growing mountain of gear—and announced, "Remember, I can carry only a 2,600-pound payload."

"But last week you told me 2,900 pounds!" Barry objected.

"That was last week. I've decided I want a greater safety factor, and for that I'll have to carry more fuel. You'll just have to leave something behind," he said adamantly.

Our careful logistical planning of months, successful thus far, suddenly began to dissolve, like a mud fortress in a monsoon rain.

"Now what's all this?" Barry demanded, the edge of frustration in his voice.

Danu, our Sherpa cook, kept adding to the pile on the scales: dented, fire-blackened old *dekchis*—cooking pots—and empty glass jars, sacks of potatoes and onions; a half-empty tin of peanut butter; even leftover rice from the previous night's meal.

"We will need them in Jumla, Bishy-sahib," Danu declared, with his familiar suggestion of a smile. Famed as a climber and cook, he had participated with Barry in the American Mount Everest Expedition of 1963.*

"Daddy, you can't leave Mugu," our 5-year-old daughter Tara cried. Her new Tibetan mastiff puppy already weighed 20 pounds. Three-year-old Brent clutched several more pounds of dog—a hairy little mop of a Lhasa Apso named Suji.

Our two chief assistants, geographer Indra Narayan Manandhar and researcher Ramchandra Lal Shresta, had arrived, each with family entourage to see him off. With disbelief Barry eyed the staggering loads of personal bundles Indra and Ram deposited on the scales, and threw up his hands. We would have to make two flights to Jumla.

Already the bulk of our supplies had been ferried to the capital of Karnali Zone, 250 miles northwest of Kathmandu: rice, sugar, flour, beans, lentils, powdered milk, canned meats and vegetables—more than 12,000 pounds of foodstuff in all.

We were to need all this and more to support our 11-man team for 15 months in the field. We knew that the 170,000 inhabitants of spectacular Karnali Zone—the largest and

*The October 1963 GEOGRAPHIC included "How We Climbed Everest," by Barry C. Bishop, "Six to the Summit," by Norman G. Dyhrenfurth, and "The First Traverse," by Thomas F. Hornbein and William F. Unsoeld.

Towhead on the trail, Brent Bishop meets migrating hill people (**left**) at a pass 12,000 feet high in the Himalayas. Barely 3, he hikes with his parents through Karnali, most remote of Nepal's 14 zones. A Hindu friend playfully decorates the cheeks of 5-year-old Tara Bishop (**right**) with *tika* marks.

The children proved indispensable in melting the reserve of often-suspicious Karnali folk. The family's stay in Nepal renewed a longtime association that began in 1960 and included Barry's ascent of Mount Everest three years later as a member of the American expedition.

most isolated of Nepal's 14 administrative zones—grow no surplus food. Indeed, we were going there precisely for that reason: To launch a detailed study of how the people of so varied and often forbidding a region manage to stay alive.

While we waited for the day to clear, Sherpa friends descended on us, draping flower garlands about our necks and passing around flasks of *chhang*—a thick, potent home-brewed beer of barley or millet. Barry and I each emptied our glasses three times, the minimum required by etiquette, with a smear of rancid butter on the rims to enhance the flavor.

For good luck, Indra's mother carefully placed *tika* marks on our foreheads with vermilion powder she had blessed in the family temple. Each time she looked at her son, she sobbed resignedly into a corner of her sari, convinced that he would never return.

At last the sun burned through the morning mist, and to shouts of "*Namaste*"—which means goodbye—Danu, the children, and I boarded the Otter. Barry and the others would follow on the second flight.

Cattle Add Spice to Karnali Landings

We climbed westward over the rim of the Kathmandu valley and followed the buff-colored ribbon of highway toward Pokhara, in central Nepal. This Chinese-built, all-weather road soon will connect these two important midland valleys. Others are being constructed with Indian, British, Russian, and U. S. aid, but Nepal—about the size and shape of Tennessee—still has less than a thousand miles of motorable roads.

It was easy to see why, as we flew half the length of this roughly rectangular land (painting, pages 664-6). The formidable terrain climbs, rather like grandstand benches, from once-malarial jungles in the Tarai, the southern lowlands bordering India, through a broad belt of rugged central hills, to the awesome Himalayan heights on the Tibetan border.

Range after range of snowy peaks swept ever higher toward the north. In the morning light they seemed oddly depthless and unreal, like overlapping stage settings.

After an hour and a half the pilot turned northwest. Below, settlements and cultivated slopes grew fewer, the hillsides more heavily forested. We skimmed through a 14,000-foot pass, alarmingly close to high grazing grounds dusted with snow. Abruptly the plane dived into the open Jumla valley and made a low pass to scatter the cattle grazing on the airstrip. Then we were down.

When Snow Falls, People Turn Black

From every direction the people of Jumla converged on the plane—cowherds, elders, children. The rare arrival of an aircraft was an exciting event in this 7,600-foot-high valley, for it provided a tangible link with the outside world. In their strong-featured faces I could read the ancestry of most of Nepal's 11½ million people: seven out of ten Indo-Aryan, the rest of Tibetan stock.

They contrasted strongly with the brightly dressed people of Kathmandu; the swirling throng was a gray, brown, and black montage of faded, worn, and mended homespun. And their complexion seemed several shades darker than that of other Nepalese.

Ang Tsering, who had arrived with our supplies a few days earlier, explained it as we walked to a nearby farmstead selected for our base camp. "Here they say, 'When winter snows turn Jumla white, the people turn black.'" In their chimneyless homes they burn pine in winter, and it coats everyone and everything with oily soot (opposite).

When Barry landed with the rest of our team on the second flight, he launched into a lengthy discussion with the owner, Bhim Bahadur Chhetri, over the rental of part of his farm compound for our headquarters. Bhim's two wives and 8-year-old daughter, Lagna Maya, hovered behind him, delighted with the traditional bargaining session.

At last Barry and Bhim agreed on a price, which included a nine-month advance on the rent. Bhim, round faced and ever smiling,

Bridging a language gap. Tara's doll delights villagers of Munigaon. Soot-darkened skins testify to the arrival of winter, when smoke from pinewood fires fills Karnali houses. One blackened hand clutches money the Bishops paid for a chicken. The women, wearing nose rings called *bulaki*, are hill Hindus, or Paharis—the country's majority

explained this request apologetically. "I want to buy a buffalo cow and sell milk."

Thus our arrival immediately altered the very thing we had come to study, the economy of a Karnali household.

How do the people of this remote area make their living? How is Karnali Zone economically tied to neighboring regions—not only India to the south, but Tibet on the north? How is man affecting his environment here? Accurate answers to these broad questions would require detailed research into local agricultural patterns and methods—the raising and uses of livestock, the movements of people and their goods in trade, climate and topography, even cultural heritage.

Primary tools in Barry's study would be detailed questionnaires filled out during interviews, often lasting five or six hours, with Nepalese throughout the zone. The hundreds of standard questions would range from how far a farmer must walk to his most distant field to how much a family spent on its most recent funeral.

The information, assembled and analyzed, would form the basis for Barry's Ph.D. dissertation and, we hoped, prove useful to the Nepalese Government in its development planning for the Karnali Zone. We worked through the Tribhuvan University Research Council in Kathmandu, and the project was supported by grants from the National Geographic Society and the National Science Foundation.

Century-old Records Written on Rice Paper

We began setting up our headquarters for the next 15 months. By bedtime we were established in our nylon tents, three pitched in the tiny farmyard, and one on the low, flat roof of Bhim's house. Beside the cattle pen Danu set up his outdoor kitchen, a two-burner stove—cut from a pair of biscuit tins and plastered with mud and dung—sheltered from ever-present winds by a tarpaulin and a woodpile.

Supplies and equipment went into two small dank storerooms. And we converted a third room into a workshop, lining it with sheets of plastic to keep out the oily smoke that seeped everywhere through the house.

Barry, Indra, and Ram began long discussions with Jumla officials, poring over land-tax records—some scrawled on rice paper more than a century ago—and visiting district *panchayat* headquarters.

Panchayat means "five elders," a traditional informal council that runs the affairs of Nepalese villages. In 1962 King Mahendra reorganized his country's administrative divisions and later extended the panchayat principle to district, zone, and national levels, thus giving his people a greater voice in their government—something they have rarely enjoyed in the long span of Nepalese history.

Several millenniums ago two major waves of migration moved into what is now Nepal: Indo-Aryans from the west,

(Continued on page 670)

KODACHROMES © N.G.S.

"**How much land** do you farm? What crops do you raise?" Asking a long list of questions, Barry pieces together a mosaic of Karnali life. These men of Mangri, one with lensless glasses and another spinning a prayer wheel and fingering his beads, are Bhotias, high-country Buddhists of Mongoloid stock.

Bright tarpaulins of base camp rise behind women transplanting rice shoots. From this farmstead in Jumla, administrative capital of the zone, the Bishops hiked to remote Karnali villages.

KARNALI ZONE sits amid the temperate Middle Hills and the soaring Himalayas, two of the richly varied regions that make up sequestered, storybook Nepal. To the south lie moist lowlands; northward stretches the barren Plateau of Tibet.

The whole of 525-mile-long Nepal springs to life in this unique panorama by Heinrich C. Berann. The noted Austrian artist based his portrayal on maps and photographs, including an aerial survey at 14,000 feet by Barry Bishop and color pictures taken in 1968 by orbiting astronauts of Apollo 7 from 125 miles in space.

OPPOSITE PAGE FOLDS OUT

Breadbasket of Nepal, a narrow belt along the Indian border holds two-thirds of the kingdom's cultivated acreage and about a third of its people. Called the Tarai, this region produces more than enough rice and other cereals to feed the 11½ million Nepalese—if roads existed to distribute it.

Until recent eradication programs, the forested Tarai swarmed with mosquitoes; malaria for centuries thwarted invasions from the south. One of the last havens of the Indian rhinoceros, the Tarai also shelters tigers, elephants, wild buffalo, and deer.

Cradle of Nepalese civilization, the Middle Hills were peopled thousands of years ago by waves of settlers from east and west.

More than half Nepal's population lives in the Middle Hills, at whose heart lies the valley of Kathmandu. It is this spectacular 15-by-20-mile vale that most visitors see. Here Hindu pilgrims from India stream to ornate Pasupatinath temple on Shiva's birthday, and Bhotias, twirling prayer wheels, gather at Bodhnath to celebrate the beginning of the Tibetan year.

Stairsteps to the sky, the Himalayas march across northern Nepal. Crowned by 29,028-foot Mount Everest (right center), the range embraces eight of earth's ten tallest mountains.

On the shoulders of the Himalayas dwell hardy highland folk originally from Tibet. One group, the Sherpas, are famed for their stamina. Some have climbed above 27,000 feet without supplementary oxygen. Most famous of the Sherpas, Tenzing Norgay became co-conqueror of earth's highest peak when he stood with Edmund Hillary atop Everest in 1953.

Despite thin air and bitter cold, Himalayan farmers grow meager crops of potatoes, oats, and barley, thus sharing with Peru's Indians the feat of working earth's highest fields. In summer Bhotias drive herds of yaks to even loftier pastures just below the snow line.

Beyond the snow peaks, at an average 15,000 feet, lies the forbidding Plateau of Tibet. Brackish lakes dot this bleak, eroded land. Even in summer, chill winds sweep its heights; winter brings more wind and bone-numbing cold. Following an ancient caravan route, a Chinese-built road now spans the plateau to link Kathmandu with Lhasa, in the heart of Tibet. Elsewhere, Nepalese traders climb to the border with herds of goats, sheep, and yaks bearing grain from Nepal to barter for Tibetan salt and wool.

Tibetan ways persist in out-of-the-way border regions such as Mustang (top center). Here, in the tiny "kingdom" of Lo, a raja still holds honorary title, though serfs no longer till his fields. Manthang, his capital, lies within strong mud walls; at night, residents bar the town's only gate to keep out marauders. Lo's farmers believe the world is flat and shaped like a half-moon, while transistor radios tell them of space flights and their children come home from school to say the earth is round.

REACHING TOWARD EARTH'S ROOFTREE, *terraces shingle a Himalayan slope towering 1,500 feet above the Mugu Karnali River. Scrambling down from their villages, farmers sow the unirrigated fields with barley, oats, millet, and rice—then see a quarter of their yield go to marauding monkeys, bears, boars, and porcupines.* KODACHROME © N.G.S.

and people of Mongoloid stock from the east. Later, between the 11th and 14th centuries, Hindus from India poured into the western region, pushed northward by Moslem invaders.

Some 500 years ago the powerful Hindu Malla dynasty rose, and then fragmented into petty kingdoms. By the end of the 18th century the House of Gorkha had united the country by threat and conquest. Then, for more than a hundred years, the Ranas—who became hereditary prime ministers—ruled, until Tribhuvan, father of the present king, broke their grip in 1950 and began to move Nepal into the 20th century.

Higher Price for Uphill Going

In early March we prepared for the first field trip from our Jumla camp—a 40-day trek east from Karnali Zone that took us to Tarakot, in the Dolpa District. Much of southern Dolpa is traditionally tied to Jumla by an ancient trade route, and there we would find Buddhist Bhotias—a high-mountain people of Mongoloid stock—coexisting with Nepal's predominant Paharis, or hill Hindus.

Local labor was not as easy to come by as we had hoped, but Ang Tsering returned from a nearby valley with 20 barefoot porters he had recruited. Each carried his own small sack of grain, metal cooking pot, and striped hand-loomed blanket. Their leader, a wily bowlegged former horse trader named Karma, warned that half the men could carry our loads for only two days, when plowing would call them back to their farms.

"But no trouble," he assured us as we set out. "We find more porters in Munigaon—I know people there."

The men rose under their bamboo pack baskets with characteristic whistles of resignation. Though the loads were lighter than they usually carry—only 60 pounds—each time we took to the trail again after a rest stop they would groan good-naturedly, "Today I die!"

For a day we followed the valley of the Tila River, then climbed through grassy fields, parched in the premonsoon season. Winter still gripped the higher slopes, and we trudged through crisp snow over a 10,000-foot pass. In Munigaon ten porters left for their farms, and Karma went off in search of others. He returned looking glum. "In this village people do not want to carry," he said. "They want 15 rupees a day to go uphill, and 13 downhill!" A rupee equals a U. S. dime.

While interviewing Dev Prasad, the *pradhan panch*, or chief elder, Barry struck what seemed to be a better bargain.

"For 13 rupees we can give you a herdsman and five *jhuma*," Dev Prasad said. Thus we were introduced to the crossbreeding of cattle and yaks practiced in the Bhotia region of the high Himalayas. A yak cow (called a *nak*, or *dri*) is bred with a bull to produce a stronger animal that yields more milk. The female offspring is a jhuma; the male, which is sterile, a *dhopa*. Each shaggy, hump-shouldered jhuma could carry a hundred pounds.

That is, whenever they were so inclined. For several days we winced every time the wild-eyed beasts shied off the trail, banging their loads against trees and rocks. One bolted while we labored through steep snows over a 13,000-foot pass and splintered our medical boxes against a boulder. The herdsman defended his animals. "They are afraid. They do not like the smell of foreigners."

Not exactly flattered, we felt relieved when we encountered ten Bhotias going our way. They were returning to eastern Dolpa from a winter trading trip. After Barry's customary quiz on the route, distance, and purpose of their journey, they hoisted our loads onto their stocky frames and we all strode off, glad to see the last of the balky crossbreeds.

Tots Take Rugged Trek in Stride

Life on the trail quickly took on a comfortable routine. At dawn Lakpa, our cook's helper, awoke us with a cheery "Morning, Bishy-sahib!" and thrust steaming cups of tea and packets of biscuits into our tent. Tara and Brent raced to see who could dress faster and made straight for the fire to warm their boots. While Danu packed his traveling kitchen, a helper named Kanchu, mumbling his morning prayers, struck the tents.

The children walked as long as they could each day and seemed to thrive on the rugged outdoor life (page 658). Brent soon was able to cover as much as three or four miles before tiring, when Lakpa would hoist him lightly to his shoulders.

On our leisurely lunch stops Barry and Indra compared and recorded their morning observations, or interviewed an occasional passerby, while I gave Tara her first reading and spelling lessons. After hiking another four or five hours in the afternoon, we made camp, dining on *dal bhat* (lentils and rice) and *chapatis* (unleavened bread) together with vegetables and whatever meat or chicken Danu could acquire in the villages.

I never tired of the village scene in this part of the Himalayas—the clusters of blocklike houses with flat earthen roofs, clinging to steep valley slopes (pages 674-5). Smoke from the cooking fires curled out from under the eaves, and people in dark homespun moved constantly through the muted montage. Women pounded grain, tousle-haired children carried younger brothers and sisters on their backs, dogs barked, men huddled in groups puffing their short Nepalese tobacco pipes clasped in both hands.

Son Teaches Father That Earth Is Round

Wherever we camped, the villagers would gather around us, four or five deep, squatting on their heels and marveling at our strange nylon tents, aluminum equipment cases, and plastic water jugs. Although received warmly, we were seldom invited into their houses, for, not being Hindu, we were considered unclean.

Despite our strange appearance and customs, they understood our family unit; our children forged a bond between us. Barry's lengthy interviewing sessions, however, usually mystified them.

"I do not know why you ask questions of me," said Dip Bahadur Rokaya, a diffident farmer in worn cotton. "I am no one." Barry and Indra patiently explained our purpose.

"How far do you have to travel for a load of firewood?" they asked.

"One day," Dip replied.

"And how far did you have to travel for wood when you were a child?"

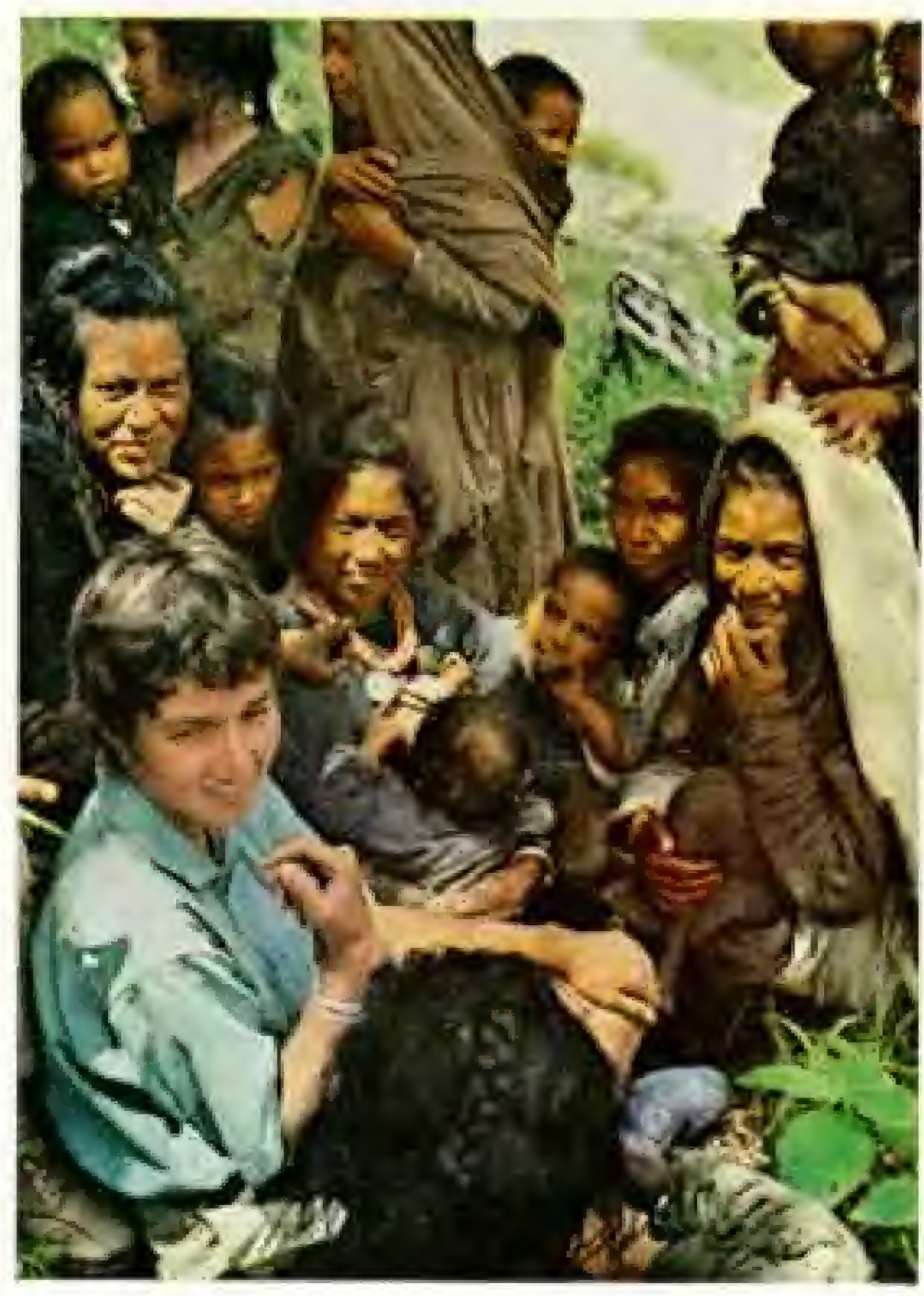
"One hour."

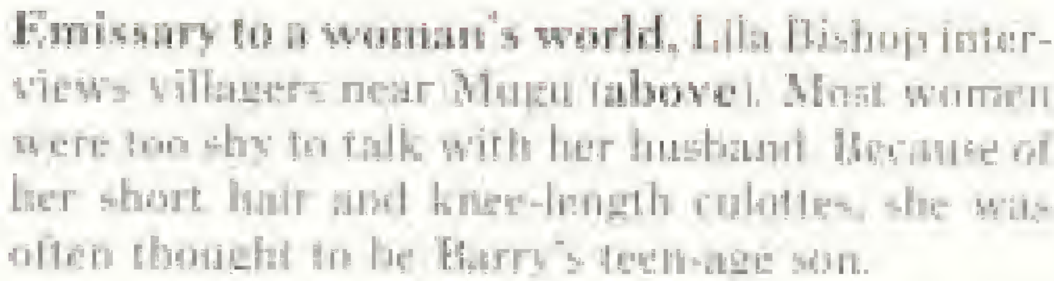
With hundreds of answers to these questions throughout our study area, Barry formed a fairly accurate picture of the rate of deforestation—a serious problem in Nepal.

The transistor radio and the new panchayat school were pulling Dip and thousands

Decked in her finest, a woman celebrates the day of the first rice transplanting. Families often help each other farm their holdings, which average less than an acre and may be divided into 30 to 40 scattered plots.

Lush amid barren heights, barley ripens in irrigated fields (**right**). The oasis embraces flat-roofed Jumla, home of 2,000 Nepalese. A bazaar with bank, police station, teahouses, and thirty-odd shops lines its flagstone main street.





Emissary to a woman's world, Lila Bishop interviews villagers near Mugu (**above**). Most women were too shy to talk with her husband. Because of her short hair and knee-length culottes, she was often thought to be Barry's teen-age son.

Mottled by monsoon clouds, Rara Lake perches at 9,800 feet beneath peaks of the Mugu region. Dramatically lifted during the past million years of Himalayan mountain forming, the kingdom's largest body of water floats a breathtaking mile above the Mugu Karnali River. The authors' tents stand on the meadow in the foreground.

like him abruptly into the 20th century. He listened to Radio Nepal whenever he was in panchayat headquarters, and congratulated us on the successful flights to the moon by U. S. astronauts. Until recently he'd thought the earth was flat, but his 12-year-old son had now learned in school that it was round.

Often our porters sat nearby, listening raptly to the interviews. Karma announced to the others that he finally understood the reason for the questioning.

"Bishy-sahib is going to write a book for King Mahendra, who will reward him with his weight in gold!"

Toss a Stone and Hiss *"Tso Tso"*

We moved on eastward through the Himalayas, where no trail runs level for long. On the high, chilly passes we often found bits of cloth, some with prayers stamped on them, tied to bamboo poles surrounded by piles of stones. We learned from our Sherpas and Bhotia porters to toss a stone onto each pile as we passed, hissing *"Tso tso. Tso tso."* Thus we gave thanks for reaching the crest.

It was still March when we descended into the Bheri Valley, but spring surged up to greet us. Winter barley, planted the autumn before, shone bright green in the terraced fields; ferns and wild flowers traced the watercourses; peach and apricot trees blazed with blossoms. Below us, Tibrikot stood on a shelf several hundred feet above the confluence of three rivers.

Like hundreds of Nepalese villages, Tibrikot was separated into two clusters of houses. The larger dwellings, white-and-ocher buildings of two and three stories with elaborately carved window grills, faced a central court. Here lived the land-owning Hindu families—Brahmans and Chhetris. Below the irrigated fields huddled the low, smaller homes of the occupational castes—usually tailors, blacksmiths, and leatherworkers.

The caste system in Nepal, similar to that found throughout India although somewhat more flexible, was entrenched and refined by the powerful Malla dynasties. As the western Malla kingdom spread, it pushed the Buddhist Bhotias into the high, remote, less fertile valleys to the north.

"The Malla empire broke up four centuries ago, and Tibrikot became one of 22 smaller kingdoms," said the village's old *mukhya*, or headman, giving us a brief history lesson. "Nearly 200 years later Prithvi Narayan Shah reunited this region." He referred to the first king of unified Nepal.

The grizzled Brahman elder was proud of his knowledge of Tibrikot's history. "Here we have many old records, some inscribed on copper plates, that tell us of our past," he said.

Leaving Tibrikot, we hiked toward Tarakot and met a wandering minstrel. He had left his home after a high official stole his wife, and now he roamed from village to village,

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dancing and singing in return for food and lodging. The end of his *dram-yen*, a lutelike instrument, was carved in the shape of a horse's head, and to this he sang his song:

Body like gold, head like turquoise,
My song comes from your mouth.
Sing a nice song
And I'll dance.

Spring snows blocked the passes beyond Tarakot, but we had come as far as planned. On this first trek we were primarily interested in practicing interview techniques along the trade route that lay between here and Jumla.

Fences of sticks, houses of stones crowd the Bhotia village of Mangri. A family twists grasses into twine inside a barnyard that will become a vegetable garden with the summer monsoon; pillbox of dung shelters livestock from winter snows. Beyond the nearest rooftops, used as work platforms to preserve level ground for crops, new framing repairs damage from a recent fire that destroyed half the settlement.

Good confronts evil on a street in Jumla. The crowned god Krishna, at right center, and his princely brother Balaram flank the demon Lakhe, ferocious under a hairdo of yak tails. At

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

the climax of this epic Hindu conflict, the wrathful Krishna slays the demon. Hill people flocking to the pageant in September, a slack time for farmers, swell Jumla's population fivefold.

Extra left hand of a wooden image grasps a *khukri*—the Nepalese knife. For good luck a passerby offered marigolds at this trailside dwelling of a spirit. Attesting the vitality of ancient animism, hundreds of such shrines dot Karnali Zone.

Burden of the past: A farmer shoulders a plow like those used in Greece five thousand years ago. Its wooden tip may break and need replacing several times a day, but Karnali farmers shun metal tips in the belief they would be too hard for their oxen to pull.

EKTACHROME (LEFT) AND KODACHROME © N.G.S.

In Tarakot, Tara came down with mumps. Rummaging through our medical supplies for penicillin, Barry found that every syringe had been crushed when the skittish jhuma had collided with a boulder. Within a week, however, Tara was ready for the long trek back to our base camp in Jumla.

Although we had suffered normal parental qualms about bringing two small children to so isolated a region, this was the only serious illness to befall either of them in more than a year in the field. Still, our remaining medical supplies proved invaluable, for villagers came to us with varied injuries: broken bones, ax wounds, and burns. Many also suffered from ailments far beyond our limited supplies and knowledge: goiter, worms, malnutrition, poor teeth, and tuberculosis.

Rice Culture Begins in the Home

When we returned to Jumla in April, the barley had not yet ripened, but already the time was approaching to transplant summer rice into the same fields. Himalayan farmers face not only a dearth of level land, but critical matters of time, and often distance.

They cope with the first problem by terracing impossible slopes; we saw many stair-step fields that climbed 40-degree hillsides (pages 667-9). Barry found the average Karnali peasant owns less than an acre, and the land is sometimes fragmented into as many as 30 to 40 tiny fields as much as two days' walk from the farmer's home.

To grow rice between 7,500 and 9,000 feet —higher than anywhere else in the world— Nepalese must utilize every precious sunlit hour of the brief growing season, and even cheat a little.

Legend has it that from Kashmir long ago came a yogi, or holy man, Chandanath. To the people of Karnali he distributed seed, with elaborate directions for cultivating rice. During the spring we watched Bhim Bahadur's wives following the ancient precepts of this Himalayan Johnny Appleseed.

On the 12th of Chaitra (the Nepalese month that corresponds to the period between mid-March and mid-April), they began force-germinating the seed in their home. We watched the women of Bhim's household spread the unhusked kernels carefully on birchbark mats on the floor, cover them with pine needles, and sprinkle them with water. The room literally became a hothouse as the women constantly tended the fire in the hearth and kept the seeds moist.

"After four days in the house the rice will be ready to plant," Bhim told us.

Thus prepared, the seed was broadcast into a carefully fertilized plot, and nurtured during the following month until it formed a dense green carpet. Rice-transplant time overlapped with the barley harvest, and every

available pair of hands was enlisted to reap the barley, spread manure, and flood and plow the fields for the next crop. The cooperative effort included Bhim and his family, neighbors and children, hired hands, and *jajmani*—occupational-caste Hindus who work in their patrons' fields in return for grain.

As soon as the terraces were flooded and plowed, a line of women waded in. Singing as they worked, they thrust the slender rice shoots into the muck, in sweeping rows six inches apart (pages 662-3 and 671). Tara cheerfully took her place in the line beside Bhim's daughter, Lagna Maya.

In the center of Bhim's largest plot, a row of sticks marked the *pulti dap*—a sacred area. Here the women planted a small crop to be sacrificed at harvesttime to Chandanath, the holy father of Karnali's rice culture.

Rice is the preferred summer crop, but Nepalese also raise maize, potatoes, buckwheat, and millet in unirrigated fields called *pakho*. Maize grows in the lowest field, buckwheat in the highest. With increasing elevation, yields dwindle. Even with marginal farming pushed to the limit, less than 1 percent of Karnali Zone can be cultivated, and families must augment their income with animal husbandry, handicrafts such as weaving and knitting, trade, and seasonal work outside the zone—even laboring in distant India.

Ten of our 15 months in Karnali were spent on the trail, where we often met traders and families driving their cattle and buffalo to grazing grounds. A few owned horses, and on one of our treks Barry decided to buy one.

"Leave it to me—I choose a good one, Bishy-sahib," said Karma, our chief porter, experienced in buying and selling horses. Inspecting a dozen shaggy, unshod Tibetan ponies brought into our camp by their owners,

Pint-size packtrain: This Karnali farmer uses sheep as beasts of burden. Each animal carries two bags of salt, obtained at the Tibetan border in exchange for grain. Farther south the farmer will again barter, trading the salt for several times as much grain as he began with—a profit necessary to feed his family. The region's precarious economy, the authors discovered, hinges on constant movement of people, animals, and goods.

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he rejected most as "too young," or "too weak." After an hour of deliberation between the final two, he chose a stringy gray stallion.

"Gray is the best color," he pronounced. Also the hair on the mane grew in the right direction, and the coat at the withers showed an auspicious clockwise swirl. "If you buy the other horse, you will lose a son this year."

Barry Backs the Wrong Horse

Nearly a full day of spirited negotiation followed; several times the owner stalked out of camp, in feigned insult at Karma's bids, only to return with a counterproposal. Finally, with great smiles, they agreed on the price: 1,500 rupees—the equivalent of $150.

"Now we must have a *puja*," said Karma, and Barry surrendered another handful of rupees to finance the ceremony to bless the horse. Most of the money went for *rakshi*, a potent Nepalese rice liquor. Karma solemnly sprinkled vermilion powder and rice over the shaggy animal, and Kalu, another porter, plastered red tika marks on our foreheads.

While everyone was occupied with the puja, Brent wandered about, unnoticed, freely sampling the refreshments. To my distress, I turned to see him draining the last of a full cup of rakshi. Wearing the sleepiest of smiles, he willingly stretched out on a blanket, and awoke none the worse for the experience.

Despite its favorable color and auspicious swirl, the horse proved next to useless. It stubbornly refused to carry anyone up the gentlest grade, seemed terrified of heights, and was anything but surefooted. Once, beside the foaming Mugu Karnali River, it spraddled on the rocks, almost pitching Barry into the rapids.

Exasperated, he complained, Nepalese style, "If I go home, my wife is dumb; if I go to the cowshed, the roof leaks. There is no happiness for an unfortunate man!"

I replied with my own favorite local proverb: "The well-fed person finds a stone even in his yogurt."

Karma, the shrewd horse trader, said nothing. He finally resold the animal for us—at a loss of only 300 rupees.

As the monsoon season—July through September in Karnali Zone—wore on, travel became increasingly difficult. During the summer, raging waters carried away every flimsy footbridge across the upper reaches of the Mugu Karnali, isolating Humla District in northernmost Karnali for weeks. One of four weather stations Barry set up would show 48 inches of rain in a year—75 percent of it between June and October.

Despite flood and landslide, trade goes on during the wet months. Several times we met men driving flocks of sheep and goats used as pack animals (pages 656-7 and opposite). Each carried 24 pounds of rice, barley, wheat, or oats northward toward the Tibetan border, where a pound of grain is worth two or three of salt. In central and southern Karnali, a pound of salt fetches two or three of grain.

The Chinese, occupying Tibet since 1950, still permit this traditional exchange, but they have stopped another age-old trade along the frontier—Nepalese grain for Tibetan consumer goods. Some traders now must go to incredible lengths to fill the gap.

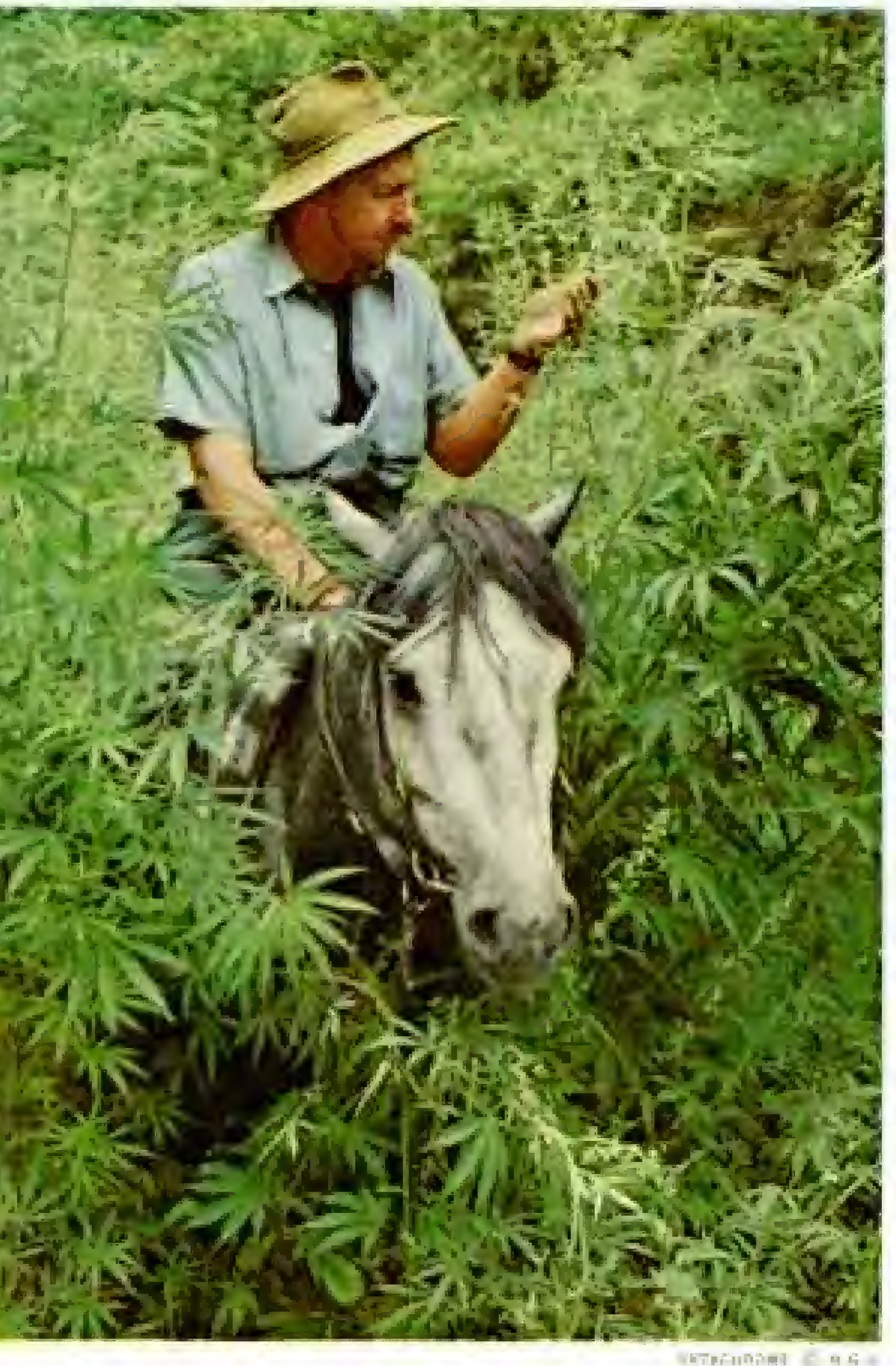
We learned about this from a trio of bronzed Mugalis (Bhotias from Mugu District) we met on our way to the village of Mangri. Barry and Ang Tsering launched into an informal interview that had now become routine whenever we encountered strangers on the trail.

"We are going to the high ridges above Lumsa to gather medicinal herbs," said one. "We will take them to Nepalganj."

Traders Take the Long Way Around

If the herbs fetched only the average price in that market town near the Indian border, he explained, they would trade them for cotton cloth and other household goods. If the price was high, however, they would sell for rupees and would: first, cross the border to the nearest railhead in India; second, travel by train and truck some 700 miles across northeastern India to Kalimpong, an old bazaar town 13 miles east of Darjeeling and on a major trade route to Tibet; third, each purchase one load of Tibetan goods, such as woolen *bakkhus* (robes), *lam* (felt-and-leather boots), brick tea, and snuff; fourth, retrace the journey to their village in northern Karnali, where these goods are in great demand; and fifth, make a second trip to Nepalganj to buy their ordinary household needs.

It used to take only a few days to walk to



EKTACHROME © N.G.S.

Marijuana growing wild surrounds Barry Bishop in the Mugu area. Seldom smoking their abundant *Cannabis sativa*, the Nepalese use it in other ways (**opposite**).

the Tibetan border and return with robes, boots, tea, and snuff. Now it requires two months and a journey of nearly 2,000 miles!

In addition to gathering wild plants for medicinal use, the mountain people frequently collect berries, roots, and leaves to supplement their limited diet, based largely on rice, lentils, and chapatis of ground wheat or barley. I soon acquired a sizable botanical collection, and one of our porters, Bhalu Ram, was constantly bringing me more specimens for our plant presses.

He showed me one plant bulb that Nepalese cut up, boil, and add to rice liquor to aid the fermentation process, and the sour berries of the *chinook* tree, used for pickling. He pulled up a wild iris and displayed its root. "You press against a bad tooth, and the pain goes away," he said.

Almost everywhere in the monsoon season we saw flourishing stands of *ganja*, or *charas*—technically *Cannabis sativa*, the source of hashish (left). Although few Nepalese smoke it, many grow it as a cash crop and put it to a variety of uses.

Fiber from the stems makes a serviceable twine, and oil pressed from the plant is rubbed into the skin to ease muscle soreness. We were startled to find the same oil used for cooking by Nepalese who cannot afford clarified butter made from buffalo milk. It appears to have no unusual effect, but one villager told us, "If you are not used to our cooking, I think it will make you a little dizzy!"

Rare Treat Grows Beside Rara Lake

Animals as well as plants often caught our eyes. Once we watched two sleek martens gambol for many minutes beside a rushing stream, paying no attention to us. We saw a lesser panda streak across a denuded hillside with a hungry jackal in close pursuit. Returning to Jumla after a six-week trip, we found that one of Bhim Bahadur's dogs had been carried off by a marauding leopard.

Wild boar, the Himalayan blue bear, porcupines, and especially *bandar*—monkeys—are regarded as pests by most Nepalese, who lose as much as a fourth of their crop to their depredations. On one trip to Rara Lake we observed a troop of several dozen monkeys brazenly raiding a field of millet, deftly plucking the heads of ripening grain.

Spectacular Rara, a sparkling sapphire set at 9,800 feet in the Himalayas, was one of our favorite camping spots (pages 672-3). Nepal's growing tide of tourists (some 40,000 visited Kathmandu last year) would find it a paradise, if only it were easier to reach. Lush grassy pastures and fields of millet and buckwheat fringe Rara's shores, and its crystal waters teem with fish.

At Raragaon, a village on the lake's northern edge, we found a single apple tree laden with fruit—one of only a dozen, we learned, in the entire Karnali Zone.

The tree's owner explained to us, "Fifteen

KODACHROME © N.G.S.

Toiling at rustic troughs, women of Tarakot knead a paste derived from wild marijuana. They press out a cooking oil—reputed to make the uninitiated dizzy—for use in place of butter. The oil also grooms the hair and soothes the muscles. Fibers of versatile *Cannabis* can be twisted into rope.

winters ago a friend worked in India and brought back some seeds, thinking they might grow here in Karnali. I planted some, and he was right." Although only one tree survived the haphazard planting, it now yields as many as 2,500 apples a year.

Spurred by the success of the few mature apple trees in Karnali, His Majesty's Government has recently imported some 100,000 seedlings from India and distributed them throughout the zone. But ironically, if they too flourish, they may create a brand-new problem when they reach bearing age in five years or so: a glut of apples that cannot reach markets for lack of transport and roads.

When we returned to our base camp, we found the rice harvest almost over. Bhim's fields had yielded only an average crop, he told us, but it was superior to that produced in the lower Tila Valley, where a hailstorm had destroyed 20 percent of the rice.

After the threshing, Bhim stored his grain in large wooden chests inside the house. Jumla rice, he said, is better than that grown elsewhere in Nepal. "It has more juice, and makes you strong!" The Rana rulers of the past century must have agreed, for they demanded that one *pathi*—about $7\frac{1}{2}$ pounds—be dispatched to their tables in Kathmandu each day by special runners.

Mailbox in his mail, a postman strides to a distant village. By expanding the postal service, the royal government in Kathmandu strengthens its ties with Nepal's remote west.

Terraced like the land, houses lean against an untillable hill in the village of Chhapru, on the north shore of Rara Lake. A farmer spreads pine-needle bedding in first-floor animal stalls as workers on a balcony above thresh barley with flails and then winnow it with a basket. Skillfully carved ladders, topped with faces that the villagers believe protect them against falls, lead to a roof piled with pine straw. Enriched with manure, it will provide vital fertilizer. Each family and its livestock occupy a vertical slice of the structure.

EKTACHROMES (TOP) AND KODACHROMES © N.G.S.

Ornaments reflect the wealth of a young hill woman (**left**). Below a strand of Indian coins she wears a hand-fashioned silver *tilari*.

Pipe charged with homegrown tobacco comforts a villager (**top**). Karnali travelers log distances in "smokes" —how far they walk in the 45 minutes or so one pipeful lasts.

Porter's earrings (**above**) have leather loops that fit over the ears to ease the ornaments' pull. A carrying strap has worn away her hair in front.

Autumn wore on, winter barley was sown, and the wind brought a brittle chill. The valley around Jumla evolved into a quiet, brown world of frozen fields neatly dotted with mounds of farmyard manure.

Under a contract with the U. S. Agency for International Development, Barry had stationed five Tamangs, who spoke Hindi, Nepali, and Tibetan, at key points on the trails around Jumla. From dawn to dusk for an entire year they questioned travelers, gathering data on the movements of people within the zone. By mid-November our trail-watchers confirmed that the annual out-migration had begun.

Each winter members of almost every family journey south to Nepalganj and other towns in the Tarai lowlands to buy the coming year's household needs: cloth, kitchenwares, tools, spices, tea, and the like. Many from poorer villages also seek work for a few months in winter in the hills of northern India to augment the family income.

Hurried Trip to Avoid a Bad Star

After Christmas we joined the annual trek, to view how Karnali Zone is economically linked to the lowland regions to the south. Our fellow travelers carried baskets filled with medicinal herbs, hashish, hand-knit sweaters, and blankets to trade in Nepalganj.

As we began the steep climb over Hari Lekh, an 11,350-foot, windswept ridge, a handsome Chhetri woman of about 30 turned the tables on us.

"Where are you going?" she asked—the question we had put to hundreds of others over many months.

"To the Tarai—to Nepalganj," I replied.

"Your clothing is strange; you are from a distant village," she observed. "Did you come on the wind ship I have seen in the sky?"

"Yes," I said, and then she asked a favor that exhibited, poignantly, how small a universe still surrounds many people in the hinterlands of Nepal.

"Fifteen years ago my husband left to find work in the Tarai. I have asked, but no one has seen him. Perhaps he has moved on to your village. Please look for him and tell him to return. He is needed here."

In an oak and rhododendron forest at 9,000 feet we passed a party of eight or nine men working around a small fire. They were processing *silajit*—a tarlike deposit that oozes from the rocks in their home valley of Sinja, far to the north. Shaped into flat ten-ounce discs, it would bring 60 rupees per disc in Nepalganj, for pharmaceutical use in India. When boiled with milk, "it cleans the insides and makes you pure and strong," one of them said.

Why not process the silajit before leaving Sinja?

"We could not wait, for we would have been under the influence of a bad star," he replied. "One must begin one's trip when the propitious day arrives."

As we descended to lower elevations, winter gradually lost its grip. The trail passed through a strange forest of skeletal-looking *sal* trees, with scarcely a leaf left on them, and we heard the sound of chopping from several directions. High in the trees (opposite) women were lopping the few remaining green branches and dropping them to the ground to feed their goats. It was evident that in a few years these slopes would be bare and eroded.

When Barry pointed out this prospect for the future, the people shrugged.

"What can we do?" they said. "The animals must eat today."

At last we reached the Tarai, the "breadbasket" of Nepal, which contains two-thirds of the country's cultivated land. In a grove of mango trees we sat beside a campfire and listened to the night sounds of the plains—the high-pitched squeak of fruit bats, the mournful yapping of jackals, the muted bells of mule caravans. A bullock cart creaked past on the moonlit trail, and it occurred to me that, aside from Buddhist prayer wheels and an occasional water mill, we had not seen a wheel for nearly a year on the highland paths.

Head Porter Counts on Liquid Assets

I found myself walking wide-eyed down the middle of a paved street in Nepalganj, absorbing the barrage of new sights, smells, and sounds. Brent was beside himself at the sight of automobiles and horse-drawn carts. Tara raced off with Danu to buy sweet, doughy pretzels piled on leaf plates. I watched the hill people swarm from shop to shop in the bazaar. Wary of fast-talking merchants, they clung together, buying their cotton cloth from the same dealer, then moving on to aluminum, ironware, spice, and jewelry stalls.

Fourteen of our porters purchased these conventional items, but Karma spent every rupee on distillery equipment. "I will make liquor," he reasoned, "and will earn so much money I can buy all the cloth in Jumla!"

Back in our base camp at Jumla, we pushed the research project to completion. We had witnessed the round of the seasons, and had watched man and nature mesh in the often inhospitable western Himalayas.

We had learned much in our 15 months of wandering afoot nearly 2,000 miles through western Nepal, and had gained a deep appreciation of its people.

Wedded to a soil that yields simple subsistence only grudgingly, this indomitable peasantfolk often must combine farming with other pursuits to survive. And the system works only through constant movement—cross-flows of people, animals, and goods over the formidable footpaths of the region.

Karnali May Yet Get a Road

Change is on the way. Indeed, some has already arrived—the panchayat system, which in turn has brought improvements in education, growing awareness of the outside world through the simple transistor radio, scattered government development programs.

But our study confirmed a need for a regional approach—a rounded program encompassing such things as feeder roads linking barely accessible hill country with its market centers, improved farm technology and higher-yielding grains, better livestock, reforestation, education in sound health and conservation practices.

A Karnali farmer, then, will discard his cumbersome wooden plow for one of metal, and a woman will no longer denude a hillside by stripping trees for fodder, and an apple crop will find its way to distant bazaars.

As we boarded the plane for our final departure from Jumla, we heard Karma and Bhim and Lagna Maya and many other friends amid the crowd shout "Namaste!" I earnestly hoped we would hear it from them again, for the word in Nepali does not mean only farewell—it is a greeting of welcome and reunion, too. □

Like a hungry locust, a woman lops the last leaves from a *sal* tree. Collected by a companion, the forage will feed sheep and goats, which have stripped the slope of everything they could reach. Soon the skeletonized forest will surrender the earth to erosion—a fate that has already claimed wide areas of Nepal.

For the rhythm, a jingling tambourine,
For the soul, a smile.
Soon feet take wing on a street turned stage.
The moment is Carnival in Trinidad.

CARNIVAL IN TRINIDAD

By HOWARD LA FAY

Photographs by

WINFIELD PARKS

BOTH NATIONAL GEOGRAPHIC STAFF

LIKE STRUTTING SUNBURSTS or birds of paradise, revelers sway to the beat of steel drums during Carnival in Port of Spain. Carnival! The cry signals an explosion of color, gaiety, and song in tropical Trinidad.

The intoxicating clamor of some 30 steel bands echoes through the capital. Each includes 100 to 150 "panmen"—musicians who ride huge wheeled racks and play as many as six drums apiece. In their wake marches a cavalcade of costumed merrymakers.

The people personify what the New World purports to be all about—for Trinidad is the ultimate melting pot. Its million citizens descend from West Africans brought here as slaves, indentured laborers from India and China, French planters, Spanish adventurers, English merchants—and even North Americans. Escaped Negro slaves who served with the British during the War of 1812 were resettled in Trinidad. The towns they founded bear the names of ghostly formations: Fourth Company, Fifth Company, Sixth Company.

Southernmost of the West Indies, Trinidad was discovered by Christopher Columbus in 1498. Coasting the island, he named it for the Holy Trinity, noting that it was "as green and lovely as the orchards of Valencia in March."

Green and lovely it remains, with the trade winds sweeping across incomparable beaches, verdant mountains, and fragrant, freshly cut fields of sugarcane. After three centuries as a Spanish dominion and 165 years under the Union Jack, Trinidad joined with its neighbor Tobago in 1962 to become an independent nation.

During Carnival, when an islander dances, he "jumps up"; when he dons a costume, he "plays mas'." Mas' stems from the French word *masque*. And in fact, Trinidad's Carnival traces its origins to European court dramas brought to their ultimate refinement in 18th-century Versailles.

Around the turn of the 19th century, troubles in Martinique, Haiti, and other Caribbean outposts of France brought French planters to Trinidad. The newcomers clung to the usages of the aristocratic past, and each year disguised themselves and marched in a candlelit parade. After emancipation, former slaves burlesqued their onetime masters. In the words of Trinidad artist Carlisle Chang, the first Carnivals were

"Versailles seen through tribal eyes."

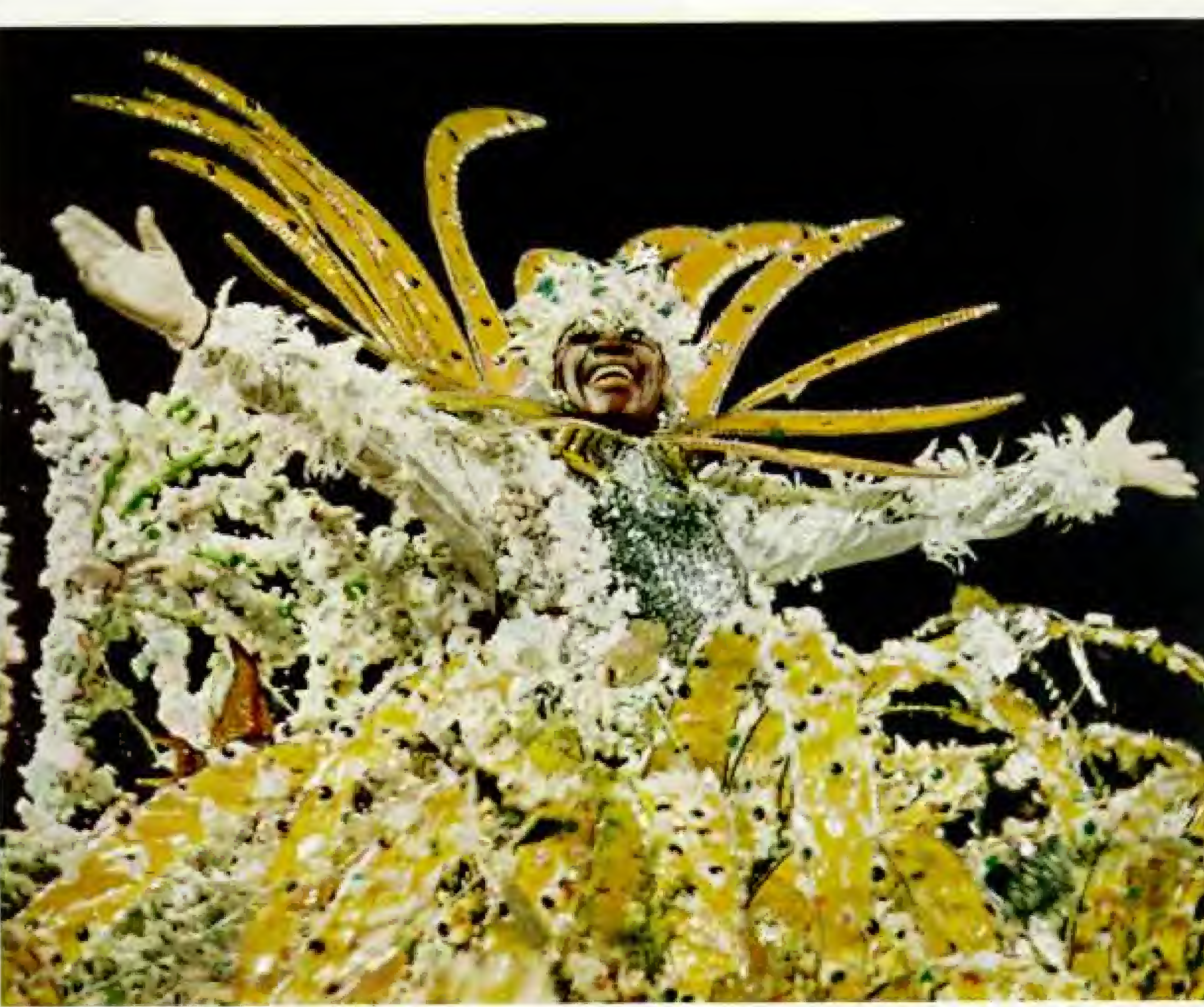
Nowadays each band chooses a theme and builds a spectacle around it. One man went to Paris to research "Vive la France"; much of the material for "The Glory That Was Greece" came from the National Geographic book *Greece and Rome*. In this year's Carnival, the Shell Invaders presented "The American Dream," complete with Mount Rushmore, Apollo rockets, and rioting students.

The average thousand-member troupe spends $17,000 each year for materials, and may contribute 60,000 man-hours to convert them into costumes. In the months preceding Lent, more than 8,000 seamstresses work around the clock. Just before Carnival, a 2 a.m. visit to a workshop found a dozen men—all with daytime jobs—laboring over costumes.

They had been doing this nightly for two months. Why? "You've got to understand, mon, this is a real art—our art. We gave it to the world from these streets."

Carnival begins at dawn on the Monday before Ash Wednesday. The revelers, who have been "jumping up" all night, flood into downtown Port of Spain as a parade—an eddying tide of man and music. Some wave green boughs, fertility symbols as old as mankind. Everyone dances to the dazzling rhythms of the steel bands.

And mon, those pans are sweet. Loud and clear they ring, and the masquers surge with the music—a mobile, living work of art. For 48 hours they weave their hopes into gay raiment, shape their dreams into melodies, and deride their own defeats in the mocking songs of calypso. They are exalted. They are sublime.



SPELLBOUND SPECTATORS watch troupe members propel a steel band through Port of Spain.

The United States played an unwitting role in the evolution of this unique musical style. Trinidadians discovered during World War II that discarded 44-gallon oil drums from the U. S. naval base at Chaguaramas Bay could be tuned and played. At war's end Carnival returned after a six-year suspension, and celebrators used their new instruments in its observance. Today they have so refined the drums that they can fashion tenor, cello, guitar, and "boom" pans covering a range of 56 notes.

Although expert instrumentalists, few panmen can read music. Nonetheless, they play Bach, Mozart, Chopin, and Dvořák, and have won critical plaudits throughout the world.

A COSTUME EXPLODES like a bursting star, but the weary face at its core reveals that brawn as well as beauty creates a Carnival king.

The most elaborate of such confections weigh as much as 150 pounds and have to be pushed along on wheels.

"I guess it's still an art," sighed one designer, "but more and more I think the art has become structural engineering."

DRUMS CAME TO TRINIDAD with each wave of immigrants. Africans brought intricate cadences polished by centuries of use. From India came the complex polyrhythms of the Hindus. Indian musician (**above, right**), tempering his skin drums before a fire prior to a holy day, still holds to ancient traditions.

Using a Melodica, a specialist (**above, left**) tunes a pan in a yard near St. Paul Street, in an impoverished section of Port of Spain where steel bands were born. Hammering the metal from below raises the pitch, a blow from above lowers it.

Panmen rehearse for long, weary months. In the contest for champion band, held on the Sunday before Carnival, each ensemble wheels its transcendent oil drums onto a stage for an eight-minute performance. Names of the bands are as vivid as their music and their garb—the Gay Flamingoes, the Renegades, Fonclaire, Starlift, Harmonites. The last two tied for top honors this year. Those eight minutes of contest, said one panman, culminate "ten months of trying to say with my hands what I have seen with my eyes and felt within my soul." □

EKTACHROMES © N.G.S.

BIG SMILE WILL FADE at midnight as a sudden silence marks the arrival of Ash Wednesday and the end of Carnival. The party that took a year to build is over and, as one celebrator sadly states, "all fall down." Phonograph records, such as this one produced by the National Geographic Society, lock memory in vibrant sound. In such echoes of the past will be born the Carnival of tomorrow. Second in the series of "Sounds of the World," the 12-inch stereo record features 16 selections. $4.95 postpaid from National Geographic Society, Washington, D. C. 20036

Imperiled Phantom of Asian Peaks

FIRST PHOTOGRAPHS OF SNOW LEOPARDS IN THE WILD

By GEORGE B. SCHALLER
NEW YORK ZOOLOGICAL SOCIETY

SUDDENLY I SAW the snow leopard. Wisps of cloud moved between us, and she became a ghost creature, appearing and disappearing as if in a dream. We were 120 feet apart on a rugged Pakistani cliff, neither of us moving—two beings bound to each other in a world of swirling snow (**right**). Thus, last December, I glimpsed one of the rarest and least known of the world's great cats.

I had traveled to a private hunting preserve in the Chitral district of northern West Pakistan to survey its wildlife—particularly the Kashmir markhor, a rare wild goat (pages 704-705). My associate, Zahid Beg Mirza of Punjab University, and I also hoped to advise His Highness the Mehtar of Chitral, who was turning his preserve into a sanctuary.

One day I saw leopard tracks in the snow at 11,000 feet. Determined to meet the elusive *Panthera uncia*, I began daily quests for fresh paw prints and "calling cards"—urine-splashed rocks or patches of gouged earth.

To entice the leopards I used live goats, but for two weeks the cats spurned my offerings. Then one morning the wheeling of vultures overhead told me a goat had been killed. Near the carcass I spied a female leopard on the crest of a spur. She stayed around for a week, consuming that goat and several more—and giving me the opportunity to make these unique photographs.

EKTACHROME © N.G.S.

CAMOUFLAGED behind a rocky parapet, the snow leopard (**right**) surveys her domain. The cats feed on musk deer, hares, wild sheep, and Kashmir markhors (**below**). Spiraling horns and white ruff characterize markhor rams, which often lead solitary lives except during the rutting season.

In winter markhors drop to lower slopes, where forage is more plentiful. There they climb evergreen oaks, teetering along their branches to browse on leathery leaves. The snow leopards also descend from the heights in search of prey. In the valleys the cats find domestic animals an easy mark. Here, too, they confront their only serious enemy—man.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

STALKING THE HEIGHTS, I found tracks (**left and lower**) of both the hind feet and the larger forepaws of the 80-pound cat. Chiefly nocturnal and solitary, snow leopards roam crags up to 18,000 feet in the Hindu Kush, the Himalayas, and other central Asian ranges (**map, below**).

The fluffy tail of this female (**right**), almost the length of her yard-long body, seemed to assume a life of its own when she moved. But her eyes were her most extraordinary feature. Pale, with a frosty glitter softened only by a tinge of amber, they were the eyes of a creature used to immense solitudes and snowy wastes.

A luxurious smoky-gray coat, sprinkled with black, both protects and imperils the snow leopard. It permits her to fade into rocky backgrounds, but its magnificence arouses man's greed. The International Fur Trade Federation recently recommended that its members halt all trade in snow-leopard pelts, but tourists in Pakistan and India often defy export bans and buy illegal skins for as much as $150 apiece.

Conservationists consider the species threatened, and much study is needed if it is to be saved. No one knows how many snow leopards exist; zoos house fewer than 100. My survey in Chitral, supported by grants from the New York Zoological Society and the National Geographic Society, provided a few facts, but many questions remain. With the realm of the snow leopard shrinking, its future looks bleak unless large sanctuaries can be created to safeguard this lovely cat. □

"Uganda is a fairy tale. You climb up a railway instead of a beanstalk, and at the top there is a wonderful new world." The land that evoked that image in young Winston Churchill today typifies many of the hopes and problems of Black Africa. Most of Uganda's people, like these dancing Karamojong herdsmen, still wrest a living from the earth. But a growing handful reorder their lives to follow the pulse of modern technology. Air filter and plastic face guard protect Kakwa tribesman James Lokosa (**left**) as he smelts copper in Jinja.

UGANDA

AFRICA'S UNEASY HEARTLAND

By HOWARD LA FAY

Photographs by

GEORGE F. MOBLEY

BOTH NATIONAL GEOGRAPHIC STAFF

IN THE REMOTE northeastern corner of Uganda lies the district called Karamoja, a land of arid plains and sudden, solitary mountains. So empty are the vistas and so clear the air that you can see a peak a hundred miles away. The people for whom the district is named, some 100,000 tall, slender Karamojong, drive their cattle across this sere domain in search of pasture. Formidable raiders, they pounce on the herds of their enemies, and no week passes without a cattle theft.

Driving south from Moroto, the district's biggest town, I came upon a party of young Karamojong warriors. They paused beside the road to let my vehicle pass. They were naked and wore black-and-white ostrich plumes on their heads. As I passed, they waved energetically and

Shawled by tropical green, Kampala rises on flat-topped hills. Equatorial sunshine burns away morning mist that creeps in from nearby Lake Victoria. Secluded but cosmopolitan, Uganda's capital welcomes safari-bound tourists; a modern hotel towers at center.

Wedding ritual of Islam awaits this bride at Kampala's Kibuli Mosque, although her people are the predominantly Christian Ganda, the nation's major ethnic group. For several hundred years, Ganda kings controlled a vast realm through a network of subchiefs and councils. Fine roads and neat gardens impressed the first British visitors in the 1860's. Under a British protectorate that lasted from 1894 to 1962, the Ganda dominated political life. The name Uganda—"land of the Ganda"—reflects their traditional role, challenged since independence by the country's other peoples.

EKTACHROMES BY JOSEPH J. SCHERSCHEL © N.G.S.

LAND IN TRANSITION Uganda strives to weld her varied people into nationhood as she moves from a colonial past to a stable future in modern Africa. Independent since 1962, she maintains membership in the British Commonwealth and has established an economic association with neighboring Kenya and Tanzania. Uganda's geography, as diverse as her people, ranges from the spectacular Ruwenzori Mountains in the southwest to arid savannas in the northeast.

AREA: 91,134 sq. mi. **POPULATION:** More than 9,500,000. **MAJOR CITIES:** Kampala, capital; Jinja, Entebbe. **LANGUAGES:** English, Swahili, other African tongues. **RELIGION:** Christianity, Islam. **CURRENCY:** One Uganda shilling equals approximately 14 cents. **ECONOMY:** Coffee and cotton, leading exports. Copper, tungsten, tin mined. Sugar, tobacco, textiles, fishing, major industries.

broke into big white grins. Then they continued cheerfully on their way. Each carried a pair of matched spears, and they were heading east toward the country of their traditional enemies, the Turkana, there to replenish their herds.

Farther down the road, I passed a small *emanikwor*, or cultivated plot. Behind a team of skinny oxen, a sinewy Karamojong struggled to guide a plow through the crusty earth. Sweat drenched his shirt. I felt a pang of sadness to see him thus—he who had been born to lead herds across the plains, to feel the wind of evening on his face, to stride tall and proud from horizon to horizon.

Tribes Sundered by Diplomats' Pens

But this contrast epitomized the changing conditions within Uganda, and indeed in most of Black Africa. Peoples steeped in the usages of a thousand years now struggle to adapt to the demands of a new age. Spurred by the economic needs of their newly independent governments, Africans are caught up in a drive to modernize, to industrialize, to produce. The rites of passage are always painful, and often tragic.

One trouble that racks Black Africa stems largely from its former colonial status. When explorers and traders swarmed through the continent in the 19th century, they made their territorial claims with scant regard for ethnic factors.

The men who created Uganda, for example, never saw it. In agreements concluded in 1886 and 1890, European diplomats divided East Africa into "spheres of influence." Territory above a line that angled inland from the Indian Ocean went to Britain; that below passed to Germany. The western sector of the British sphere was called Uganda, a name derived from its most powerful and populous tribe, the Ganda.

Of small moment to the statesmen that they had delivered half the Banyarwanda people to one nation, half to another; that the Uganda that became a British protectorate encompassed scores of tribes with little in common. As a legacy of that era, the present government of Uganda—and others throughout Africa—must seek to instill a sense of national identity in the disparate peoples within its borders.

The winds of freedom finally blew *uhuru*—independence—to Uganda in 1962. The new nation began life as a loose federation that included the old kingdoms of Buganda, Ankole, Toro, and Bunyoro. But under the leadership of Prime Minister A. Milton Obote, the central government abolished the kingdoms, and in 1967 declared Uganda a republic. When Obote was deposed by a military coup in January of 1971, Gen. Idi Amin assumed direction of the troubled nation's affairs.

Meanwhile Uganda's geographic setting abides in all its unique splendor. The country, technically a part of East Africa, is in fact close to the heart of Africa. Most of it lies at least 3,000 feet above sea level and it stretches from Lake Victoria—a body of fresh water second in size only to Lake Superior—northward to the Sudan (map, opposite). In the east, massive 14,178-foot Mount Elgon, an extinct volcano, hulks by the Kenya border; in the west, mists swirl about the snowy peaks of the Ruwenzori range, the fabled Mountains of the Moon.*

The Equator cuts through Uganda, as does the Nile in its majestic journey to the Mediterranean—the same Nile that long ago sired the pharaohs and their civilization.

To Judge a Wife, Listen as She Hoes

For a large number of Ugandans, life is bound up in the rhythm of the growing seasons. To savor it, I journeyed to a hamlet of the Gwere people in eastern Uganda, some 35 miles west of the town of Mbale. The cluster of seven huts huddled beside a trail that wound from a dirt road to the papyrus-choked shores of a small lake.

On all sides lay fields of cassava, peanuts, millet, and maize, punctuated by vivid green groves of banana trees. In much of Uganda, the banana is a staple. Mashed and steamed, it becomes *matoke*; raw, it is both snack and dessert; crushed and fermented, it produces beer. A few folds convert banana leaves into plates, and sometimes even into clothing.

The entire village professed Christianity, but only the headman, Eliphaz, practiced monogamy. The heads of the other households each had three wives. Generally, when a man greeted a woman, she would drop to her knees and avert her eyes, never presuming to look at him during the entire conversation. "One judges a wife," a male villager told me, "not by the clatter of her tongue, but by the clatter of her hoe."

In the village I visited, the groom had to provide five cows, six goats, and assorted small gifts—shirts, pots, dresses—to seal the

*Dr. Paul A. Zahl described this magnificent area in the March 1962 GEOGRAPHIC.

relationship with his bride's family. Occasionally a marriage would be arranged on the layaway plan—the prospective groom would pay a cow or a goat whenever he could until he had paid in full. He would then get the bride, though if she failed to become pregnant within a reasonable time, the husband could return her and negotiate a refund.

Life in the countryside, I learned, is mostly routine. The cocks crowed at 4 a.m., and, with first light, we all emerged from our huts. Tall *mvule* trees soared dark and green around the compound, and the air grew loud with the furious cheeps of gold-and-black weaverbirds in the palm trees.

By 6 a.m. most adults were at work in the fields. For five hours the villagers tilled the soil, then filed back to their huts to make a cold breakfast on the remains of last night's dinner—usually matoke or boiled millet. Even the well-to-do villager may taste meat only occasionally.

After breakfast the men either napped or tended their flocks while women prepared lunch, generally a pot of boiled millet served about 2:30. Thereafter, everyone rested for a few hours. At seven or eight o'clock, they ate the evening meal. Darkness falls swiftly at the Equator, and immediately after dinner everyone would retire.

Bugs Bite Men—and Vice Versa

Throughout the long night I would lie in a hut surrounded by the little noises of shifting bodies on the sleeping mats that crowded close on the earthen floor. Thieves roam the countryside, and every door and window had been bolted shut. So I lay there sweltering, listening to the strange, faintly sinister sounds of the African night. Termites attacked us with small, sharp bites; I got back a bit of my own one noontime when we lunched on them—fried. My ears resounded to the long, ascending whine of circling mosquitoes that always ended in sudden silence and a vicious sting. Some carried malaria, a disease that afflicted many of the villagers.

Though to Western eyes their days might seem dull, the villagers lead peculiarly rich social lives. In my hamlet, as in many, everyone belonged to the same clan. Blood relationships in the clan form what sociologists term "the extended family." A child regards his paternal uncles as fathers, coequal with his natural father, and his maternal aunts as mothers. His mother's family treats him with special indulgence. And the extended family is an endless source of love and security.

"How," asked a village youth, "could any of us possibly marry without our fathers' help? When the time comes for me to take a wife, each of my fathers—and I have four—will contribute a cow and a goat. If I fall ill, all my relatives will care for me; if I have no income, they will feed and house me. As long as I have them and they have me, none of us will ever want."

Later I discussed the extended family with a sophisticated African friend in Kampala. "Yes," he admitted, "this system cushions us against calamity. But it also robs us of any chance for prosperity. Jobs are scarce. So anybody who finds work ends up supporting a dozen or more kinsmen.

"As a result, we try to get as many relatives as possible on the payroll. Westerners criticize this as nepotism. They're dead wrong. Every family member with a job means one less to be supported."

Negotiation Brings a Return to Health

In rural life, death and disability are constant companions. One of every 100 Ugandans is a leper; many more have been crippled by polio; life expectancy is about 40 years. Many ascribe adversity to witchcraft.

"I fell ill a few months ago," a villager told me, "so I sent my son to the medicine man. You Westerners scoff at this, but without being told anything, the medicine man announced my symptoms and went on to say that I had been bewitched by one of my brothers. My son then went to that brother—he and I had been disputing the ownership of some land—and he admitted it. So we negotiated a settlement and I became well."

But Uganda has not abandoned medicine to such traditional healers. One hot morning I drove 31 dusty miles north of the capital, Kampala, to the village of Lutete, where stands a Church of Uganda maternity center. Like similar clinics, the one at Lutete is carrying out a program to eliminate one of East Africa's saddest scourges—infant malnutrition.

Staffed by midwives and attended by visiting gynecologists and pediatricians from Kampala's excellent Mulago Hospital, the center seeks to alter old customs relating to pregnancy, childbirth, and weaning. The physicians treat the women and children who flock to their weekly consultations. Midwife Gladys Musajjakawa shows them how to prepare balanced meals.

"Our problem," she told me, "is lack of

protein. An infant here is weaned abruptly. One day—generally when the mother realizes that she is again pregnant—he must join the rest of the family at the matoke bowl. Well, matoke is all carbohydrate and the child falls ill with a disease called kwashiorkor. Without treatment, he may die. My job is to show mothers simple sources of protein—peanuts, beans, or even fried termites—they can include in their menus."

Forceful and dynamic, Miss Musajjakawa harangued her audience as she cooked matoke with peanuts, with beans, with fish, and distributed samples of the finished products. The mothers sat impassive, the planes of their faces reflecting the light like so many Madonnas carved in ebony.

"The thing that breaks your heart," a volunteer nurse told me, "is the absolute patience, the total resignation of these women in their dealings with us. Each waits her turn with the doctor, no matter how sick her child may be. They never make a fuss. Even when a child is in convulsion and you know the mother is being emotionally destroyed, she waits."

Fish a Key to Better Nutrition

Protein deficiency may soon become a thing of the past through the heroic strides made by Uganda in increasing its food supply. Profiting from its extensive lakes and waterways, the nation has developed one of the most productive freshwater fisheries in Africa. Annually, nearly 150,000 tons of fish, caught by 27,000 fishermen, come to market. The Fisheries Training Institute at Entebbe plans to send modern trawlers out for long sojourns at the relatively untapped center of Lake Victoria. Ultimately, the yield may reach 220,000 tons a year.

Agriculture advances as well. A government official told me, "At the time of independence, we had only 39 tractors in the entire country; now we have more than 1,000. We've imported 30,000 purebred European cattle to crossbreed with our native stock. By 1973 Uganda will be self-sufficient in milk, and by 1975 in all dairy products."

Glowing like Vulcan's forge, molten copper moves in smoking caldrons through the Kilembe Mines smelter in Jinja. Mined in the Ruwenzori foothills, the nation's chief mineral export finds its way to Japan—despite the burden of high shipping costs from landlocked Uganda. KODACHROME © N.G.S.

KODACHROME © N.G.S.

Hewn from a single log, a dugout plies Lake Mulehe. Harvesting Uganda's waters, fishermen usually smoke or salt their catch. Aided by government credits, they increasingly buy outboard motors and nylon nets.

The Uganda economy rests firmly on agriculture, with coffee and cotton the leading exports. But, though farming occupies nine of every ten Ugandans, many younger people seek their fortunes in towns. Most are drawn to the burgeoning capital, Kampala (pages 710-11). The city is built on seven hills. In the center, on Nakasero Hill, new offices, apartments, and government edifices spring up so rapidly that virtually each month produces an alteration in Kampala's skyline.

"We now have a population of 360,000 in greater Kampala," one municipal official told me with pride. "This is one of Africa's fastest-growing cities."

For most of the newcomers, though, the capital brings disappointment. Housing is scarce and expensive, so on the outskirts they fashion squalid habitations of packing cases, corrugated metal, and bits of cardboard.

Nor do they fare better with jobs. Touring an industrial sector, I noticed on the gate of almost every enterprise the same sign in Swahili: *"Hakuna Kazi*—No Work." So the population grows, and so do its frustrations.

Capital Offers Cosmopolitan Dining

But the frustrations orchestrate themselves against the teeming, cosmopolitan color peculiar to East Africa. Arabs, Europeans, and Asians have all passed this way, and all have left their imprint. Consider only the culinary possibilities in Kampala. One may take tea—complete with scones—at the Grand Hotel, sample a searing curry at the Shahzan Restaurant, shark-fin soup at the Canton, a Greek pastry at Christos, or chateaubriand with a vintage Burgundy at Chez Joseph.

English, widely used throughout East Africa and the official language of Uganda, sometimes appears in curious and exuberant combinations. I passed a night in the Nile Happy Hotel, shopped in the Smile Fancy Store, examined fabrics in the Suitable Tailoring House, and pondered the intriguing Fourways Accommodation Bureau. But for stark utility, nothing equals a bar in Kampala: The City Drink House.

On the outskirts of Uganda's capital sprawls the campus of Makerere University, the first founded in East Africa and alma mater of

Many horns in the kraal bespeak the wealth of the southwest's Hima people, who rely on their Ankole longhorns for milk, meat, and status. Cattle ranching holds promise for Uganda's economy, but its success depends on improved strains, rotation of grazing lands, and prevention of disease.

KODACHROMES BY HOWARD LA FAY (BELOW) AND GEORGE F. MOBLEY © N.G.S.

The freshest leaves go into this picker's bag at Salama Tea Estate near Kampala (**above**). The government encourages farmers to plant a variety of cash crops to lessen the nation's dependence on the shifting fortunes of coffee and cotton.

Coffee-cup bonanza, grown near Mount Elgon, cures in this cooperative mill in Mbale (**right**). For more than half a century, here and around Lake Victoria, farmers have raised coffee with their food crops. The harvest makes Uganda the number-one coffee producer in the British Commonwealth.

From a calabash mug, a brewer near Mbale (**left**) samples beer fermented from bananas in a leaf-lined hole in the ground. The fruit provides food and drink in Uganda's southern half. Sorghum is the staple in the north.

BUGISU

intellectual and political leaders throughout Kenya, Uganda, and Tanzania. Makerere now numbers about 3,000 students and offers degrees in disciplines as varied as philosophy, law, surgery, and agriculture.

The spectacular growth of Makerere—before uhuru fewer than 500 Ugandans attended universities—reflects the national preoccupation with learning. In 1963 only 9,500 pupils attended public secondary schools; by 1969 the number had reached 33,300—more than 3½ times as many—while the total population had only doubled. And the government devotes 29 percent of its budget to education.

The capital's population includes some 45,000 "Asians"—Indians and Pakistanis whose grandparents immigrated at the turn of the century. Skilled businessmen, the Asians long dominated commerce throughout East Africa. In isolated villages, an Asian *duka*, or general store, was often the sole source of merchandise. Stocks ran a gamut from shoelaces to cognac, and residents and travelers depended heavily upon the dukas for survival. Yet the omnipresent Asian traders aroused bitter resentment.

British Passport Solves Few Problems

Uganda, Kenya, and Tanzania have acted to restrict Asian noncitizens in commerce and most other employment. Since at the time of independence most Asians opted to remain British rather than adopt Ugandan citizenship, they have been left in a cruel

quandary. They hold British passports, but Britain restricts their entry with a quota system. So most live bitterly and uncertainly, from day to day.

"Can you imagine what it's like to be one of us?" an Asian friend asked me. "To be subjected to this contempt? We trudge from embassy to embassy, hat in hand, begging for refuge. But everywhere we're unwelcome."

And so they wait through the blooming of the hibiscus and jacaranda; they watch the shrikes and cuckoos knife through the frangipani-scented air, and all the land is an ache of loveliness. I remember dusk in a garden, with chicken sizzling over charcoal and, in a sudden stillness, the piping voice of an Indian child. "But Mommy, isn't there some medicine that will turn our skins black? Then we could stay."

So the Africans and Asians contend with each other and with the future. When I visited Jinja, Uganda's second city, shuttered and forsaken shops of Asian traders dotted the streets like stigmata of the struggle.

Explorers Sought Elusive Fount

At Jinja, the slate waters of Lake Victoria surge through a narrow rock gap and flow northward as the Victoria Nile. For 75 years, until 1937, when an obscure German explorer, Dr. Burkhart Waldecker, traced the great river's southernmost beginning to a tiny spring in Burundi, this had been considered the source of the Nile.

To the ancient world, the grain-rich Delta of Egypt spelled life—the Old Testament recounts how the children of Israel fled there in time of famine—and the Nile spelled Egypt. Whence flowed this vital river? Herodotus, in the fifth century B.C., followed it as far as Aswân—600 miles from the delta—and abandoned the quest.

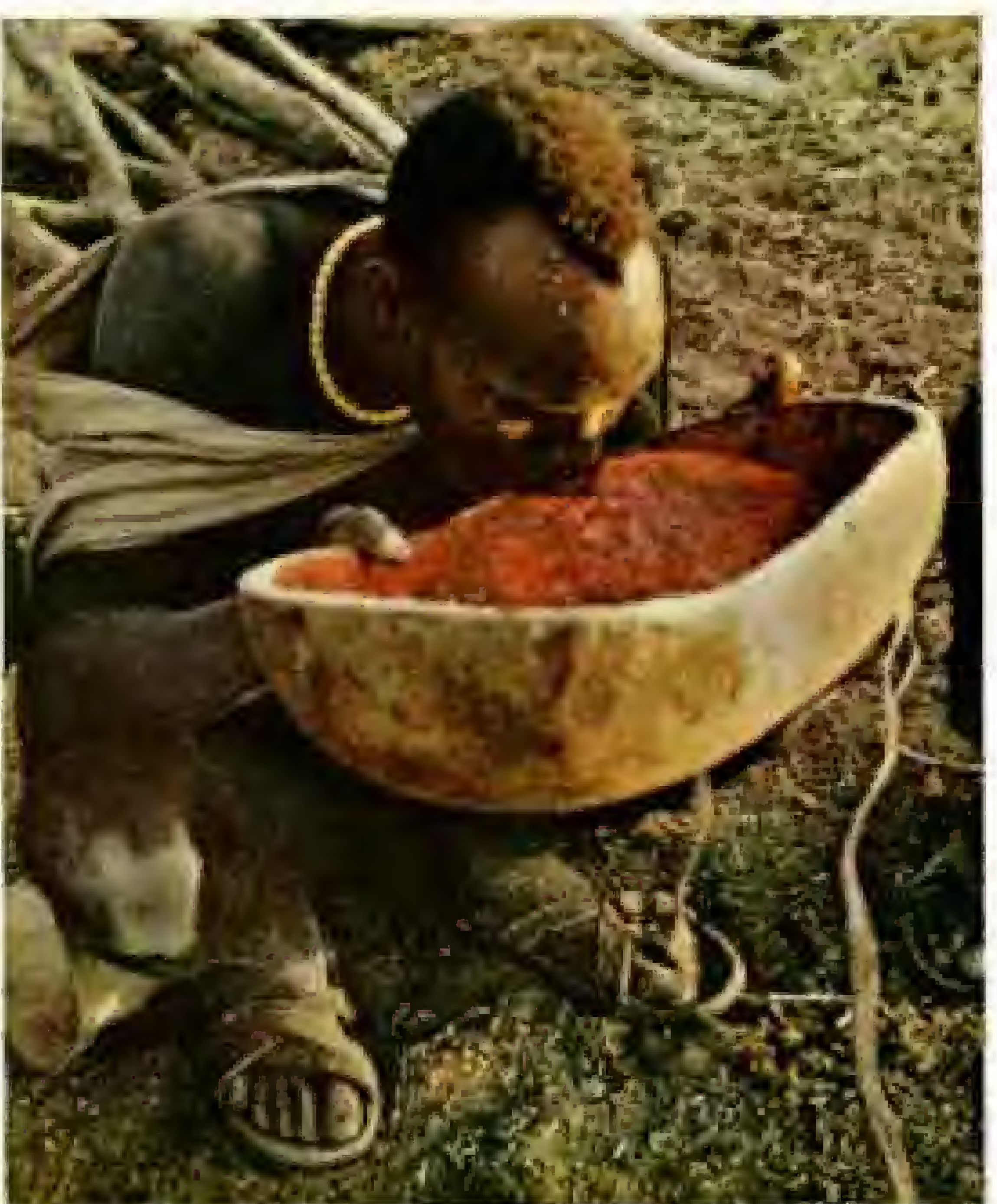
The 19th century saw the search for the "fountains of the Nile" swell to a crescendo. The list of explorers involved—Samuel Baker, Dr. David Livingstone, Henry Stanley, Richard Burton, John Hanning Speke—reads like a pantheon of African discovery. But only Speke, the least flamboyant of all those swashbucklers, succeeded in establishing the great river's connection with Lake Victoria.

In 1860 Speke began an expedition across East Africa which, after a year and a half, led him to the realm of Mutesa I, the *kabaka*, or king, of Buganda. Ganda civilization at that time was among the most advanced in Black Africa. Magnificently wrought conical cane-and-reed houses soared to 50 feet; canoes able to carry 150 men plowed Lake Victoria on missions of war and commerce. A dazzling variety of instruments—xylophones, flutes,

Home fires warm the morning in the cool uplands of Kigezi; sweet potatoes, peas, beans, and maize flourish on terraces of rich volcanic soil. Many Ugandans live on such family farms, where cooperation is a quality more admired than individual initiative. The people of Uganda have always owned their land; British administrators discouraged the white settlement that disrupted African life in the neighboring Kenya highlands.

KODACHROME © N.G.S.

Master of a harsh domain, a Karamojong elder tells of his search for pasture in the dry northeast, Uganda's least developed region. Though drought and theft may deplete his herd, raids, gifts, and trading can replenish it. He wears a knife on a finger ring; the three-legged stool keeps him off the thorn-littered ground. Uganda President Idi Amin hopes to turn the 100,000 Karamojong to commercial ranching. He urges them to send their children to school and to "dress properly."



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Drawing a ration of blood from a zebu calf (**top**), young Karamojong supplement their usual diet of milk. A herdsman drinks a bowl of the protein-rich mixture (**above**). Cattle are rarely butchered except on ceremonial occasions.

trumpets, and harps—provided the kabaka with sophisticated court music. Like his predecessors—and the dynasty reached back 32 generations—Mutesa possessed absolute power and a royal disregard for life.

Among the explorer's gifts to the kabaka were firearms. Speke tells how Mutesa, testing a carbine, gave it "full-cock to a page, [and] told him to go out and shoot a man in the outer court. . . ." To Speke's astonishment, the page did and "returned to announce his success, with a look of glee. . . ."

Nor was the incident unique. The last kabaka of Buganda, deposed in 1966, noted of his great-grandfather that on occasions "he would ask for a gun . . . and fire it into the crowd for amusement."

Discoverer Now Nearly Forgotten

From Mutesa's court, Speke advanced eastward, finally reaching the site of Jinja—which for so long would serve geographers as "the source of the Nile"—on July 28, 1862. Near the point of his discovery, ten turbines of the Owen Falls power station now convert the energy of the river into electricity as it drops sharply from Lake Victoria (page 728). From the power station—which produces virtually all Uganda's electricity and 40 percent of Kenya's—I followed the bank of the young river through a segment of Jinja's industrial complex.

Then I cut across country to Speke's monument—as neglected as the man himself. After a mile of hard going through hip-high grass, I clambered down a bank. The ground dropped sharply away and I came to Speke's memorial. It was a poor thing—a masonry wall enclosing a small terrace and a 35-foot-tall obelisk bearing a marble plaque at its base. After a while I picked my way down to the river's edge. The Victoria Nile flowed in from the south, swift and dark. Afternoon turned into twilight, and all was silent save for the cries of birds and the vast splashings of hippos.

But the scene would have astounded Speke. For across the river lay the manicured golf course of the Jinja Club, where a special rule permits you to move your ball from hippo tracks. I watched a foursome, attended by a small army of caddies, hurry along the fairways, racing dusk to the clubhouse.

In one respect, parts of Uganda have changed little since Speke's day. Its population of wild game—"herds of . . . hartebeest could be seen grazing, while the hippopotami

were snorting . . . and guineafowl rising at our feet"—remains spectacular. The animals, together with the wonders of Uganda's landscape, attract some 80,000 foreign visitors a year. For those with time and money, Uganda Wildlife Development Ltd.—a government agency—provides unequaled hunting and photographic safaris. I joined one headed by professional hunter Nicky Blunt.

In a four-wheel-drive Toyota Land Cruiser, our party headed toward remote northeastern Uganda; we drove through the lands of the Gisu, the Sebei, and the Teso. We skirted Mount Elgon, 50 miles broad at its base, and a jumble of bluffs lining the Kenya border. Here and there near the crests I could see high, secret waterfalls held immobile and silent by distance.

We pitched our first camp on a plain below 10,067-foot Mount Kadam. Like so many mountains in Uganda, it stands alone, elongate and craggy.

Each day found us lurching in the Toyota across the pocked plains, flushing ostrich, hartebeest, gazelle. Kites wheeled overhead; bishop birds, brightly scarlet, darted from bush to bush. Frequently we stalked on foot. You must start downwind of the animals, and approach gingerly in a low crouch, for any movement will instantly spook a herd. When disturbed, all African plains animals seem to follow an identical pattern of retreat. They dash swiftly for 50 to 75 yards, then stop, turn, and regard the interloper alertly. As the pursuer attempts to edge nearer, dash succeeds dash.

When we broke camp, we headed farther into Karamoja, home of the proud and resourceful Karamojong. Nomadic herdsmen, the Karamojong cherish their cattle above all else. They give each of them a name, train them to come when called, sing to them and of them. A man measures his wealth in cattle, and takes his sustenance by mixing their milk with their blood, which he taps by nicking the jugular vein (preceding page).

Spears Banned but Raids Go On

Karamojong men wear short togas or, as often, go about stark naked; women wear a goatskin apron and skirt and a kind of cloak. The Karamojong raid the herds of their neighbors both for fun and profit. To limit the forays, the Uganda Government has ordered the summary punishment of any Karamojong seen with a spear. But the men continue to raid and to skirmish with their cousins, the Turkana of Kenya.

We pitched our tents outside Moroto, near some cattle kraals. Late one afternoon we received a visit from a neighbor. He was an old man, exactly how old he could not tell,

Building her own hut and fences of thorn, a Karamojong wife rules the compound with a firm hand. No one may enter without her invitation, even her herdsman-husband.

To win a wife, a groom gives each of her relatives an animal; this bride-price earns him their lifelong support. His relatives present the bride with wire necklaces, symbols of matrimony. If rich in cattle, a man may seek more than one spouse to fetch his water, till his sorghum, and bear his children.

KODACHROME © N.G.S.

for Karamojong families record no birth dates. Some infection had claimed the sight of one eye, and scar tissue glistened on his torso. He wore a toga that fell far short of preserving modesty, an aluminum plug jutted from his lower lip, and earrings decorated the tops rather than the lobes of his ears.

He had three wives and ten children but was, as he sadly explained, a poor man. Once he had been affluent, but all his cattle had gone for his sons' brides. Now he had only five cows in his herd. In his prime he had seen the great world, crossing the border into Kenya, riding on a train, visiting Nakuru and Nairobi.

He led us down the hill to his camp. Dogs barked furiously at our approach. A thorn fence surrounded the camp, and we ducked inside through low entrances. Penned for the night, the precious cattle shuffled in their thorn enclosures. The huts were made of mud and wattle with thatch roofs.

Flies buzzed everywhere. They clung to pots, to animals, to eyes, to lips. They even clogged nostrils and ears. Two young goats quivered near the hot ashes of a fire; the heat repelled the onslaught of the flies.

Mournfully, the old man told of the Turkana forays that were decimating his people. Just the previous night, they had raided a neighboring camp, stealing 15 cattle and killing a pregnant woman. "It is they," he said, "who have made our lives so hard."

But, I asked, didn't the Karamojong also raid the Turkana?

"They force us to cluster together instead of following the green grasslands after a rain. Our cattle grow thin and few."

Didn't the Karamojong also harass the Turkana?

"Now the Turkana get guns from Ethiopia, while we are forbidden even to carry spears. It is unjust."

"But," I persisted, "have you yourself never raided the Turkana?"

"Of course!" he said irritably. "It is well known that they have excellent cattle."

But the old way of life—the swift assault by night, slow days of sunshine and the rich smell of kine—seems doomed. More and more, the Karamojong, their land overgrazed, are becoming tillers of the soil.

Volcanic Range Marks Southwest Border

In contrast to Uganda's flat and arid northeast, the southwest is green and mountainous. With not too much exaggeration, tourist brochures dub this area, called Kigezi, the "Switzerland of Africa." Like a truncated arrowhead, Kigezi intrudes between the Democratic Republic of the Congo and Rwanda—a region of clear lakes and densely wooded hills (map, page 712).

EKTACHROME © N.G.S.

His tears the only price, a child receives free medical care at a clinic in Namulonge. A British doctor, on government contract, treats patients with the aid of an interpreter.

Many children die of malnutrition or disease before their fifth year. Health education, immunization, and treatment campaigns move slowly for lack of funds and staff. But a growing number of Africans study medicine at Makerere University in Kampala; 90 doctors graduated in 1970.

"FEARLESS I STRIDE," *say courtly Tutsi, remembering their days of glory in a dance performed at Kisoro. The cattle-raising people, popularly known as Watutsi, ruled neighboring Rwanda until deposed by the Hutu majority a decade ago. Now aristocrats-turned-refugees, 72,000 Tutsi find a haven in Uganda.*

Torrents of the Nile flow through Owen Falls Dam near Lake Victoria. Electricity generated here satisfies the nation's needs of the moment and lures to Jinja industries that produce textiles, plywood, cement, copper, steel, and beer.

Pushing mounds of cotton, men at Kaliro feed raw fibers into seed-removing machines powered by Owen Falls electricity. Farmers themselves run such cotton-gin cooperatives to process their own crop, an export second only to coffee.

A series of huge volcanoes—the Mufumbiro—marks Uganda's borders with Rwanda and the Congo. The highest, Muhavura, cradles in its extinct crater an exquisite crystal lake fed by the rains; in the wet season, when it overflows, it streams down the face of the mountain like silver tears.

But not all the mountains sleep. On a clear night you can see distant peaks across the border in the Congo vomiting flame into the black-velvet sky. In Uganda the volcanoes have spewed their fiery debris far across the valleys of Kigezi, and huge chunks of lava scar the earth. Farmers till the rich volcanic soil and their produce is famed throughout Uganda.

Refugees Yearn for Life of Old

Kigezi shelters thousands of refugees. These are the Tutsi—known to the world as Watutsi—from nearby Rwanda. Four hundred years ago the tall, aristocratic Tutsi—herdsmen like the Karamojong—descended upon what is now Rwanda from the north, enslaving the more numerous Hutu people who inhabited the land.

But with the approach of independence to the Belgian-administered United Nations trusteeship, the Hutu deposed the Tutsi overlords, many of whom fled to Uganda, Tanzania, the Congo, and what is today Burundi. The Tutsi attempted to reinvade Rwanda in 1963, but were repelled in bitter fighting. More than 10,000 of them were killed.

In Uganda, like refugees everywhere, they have settled in bitter exile, longing for the old days, keeping their old ways. One afternoon, on a grassy field outside the village of Kisoro, I attended a ceremonial dance of Tutsi exiles. I knew some of the dancers. For them the present had no meaning; yesterday alone was real. I had seen them—Désiré, Joseph, Pierre, Antoine—dressed in tattered shorts, laboring in shop and field, and nightly easing their homesickness with beer.

They had come, for the space of a little hour, to recapture the sweet past, when as lords they had roamed amid the high green hills of Rwanda. Those same hills formed a magnificent backdrop for the dance.

To the measured cadence of a solitary drum, the ten dancers—attired in the traditional red-and-yellow skirts of warriors—advanced in single file across the field. Their sisal headdresses nodded to the rhythm of the stately tread. Each carried a spear. As they reached the center of the field, the beat quickened

and the dance began—a darting, stylized re-enactment of some long-ago battle (pages 726-7). As they leaped and pirouetted, the dancers chanted verses from the olden time.

Fearless I stride to the place of peril, to the lair of the lion, to the ambush of my enemy. . . .

Spear clashed against spear as the dancers charged and retreated with fluid grace, re-creating a glorious feat of their history that lives on now only in this dance, in this song.

He pillages what we have laid up, he stops the mouths of the people, he binds their limbs. Him do I despise! Him will I destroy. . . .

The dancers were transfigured. The world of labor among strangers disappeared; once more they were lords, proud and free, defending the home of their ancestors. Rage contorted their features. Feet stamped savagely. Spears flashed silver against the sky.

Swift and strong, I smash the shields of the warriors. I, like a god unto kings. . . .

They ended with an old song, a song of Rwanda, of upland pastures heavy with dew and of cattle beyond counting drifting across the meadows of the past. They sang in a minor key and their voices—sad and haunted—echoed lonely toward Rwanda.

Nile Roars Through a Narrow Barrier

I drove northward to Murchison Falls National Park. Uganda's three great parks—Queen Elizabeth, Murchison Falls, and Kidepo Valley—rank among the finest in East Africa, and the cataract in Murchison provides one of the most spectacular scenic backgrounds in the world. As the Nile approaches this 140-foot drop, its bed grows progressively narrower. At the top of the falls, the great river roars incredibly through a 20-foot channel to chute down in a white hydraulic explosion (page 734).

Although the parks of Uganda offer a superb glimpse of game in its natural habitat, the balance between man and nature remains delicate. Iain Ross, the brilliant and dedicated game warden of Kidepo Valley National Park, told me, "Poaching is at best a minor peril. We control it with armed patrols of rangers, and aerial surveillance.

"Hunting, intelligently regulated, can even be useful by cropping the herds. The one thing we cannot combat, the thing that in the end may doom the animals of Africa, is human encroachment. As the population grows, it reaches out for more land. And animals simply cannot compete with man."

I will never forget one early morning at Kidepo, looking across the broad savanna studded by squat acacias. Zebra grazed with antelope. Elephants regarded the horizon with seeming indifference, their great ears flapping quietly. Nowhere could I see a sign of man or his works. There was only the utter silence, the clear air, the pale-blue sky, the animals moving in the peace of Eden.

Night of Worry Follows Miring

At Queen Elizabeth, though, I experienced a more sinister brush with Eden. Alone in a rented car, I arrived at the park entrance in the late afternoon and decided to follow an 18-mile dirt track through the game area to the safari lodge. It was a mistake.

Although the day was warm and bright, a rainfall had turned the track into a rutted quagmire. I jounced and slid along, stopping to admire a herd of elephants and some antelope grazing almost within arm's reach. Suddenly, just as a large leopard bounded from behind a bush, the car slithered into two rain-filled ruts. To the accompaniment of an ominous grinding noise, the rear axle ran aground on the hump of the road, leaving both wheels spinning above the surface.

The rules of every game park in Africa forbid the visitor to leave his vehicle, except in carefully specified areas. So I composed myself to wait for the passing driver who would either nudge me free or carry news of my plight to park headquarters. An hour passed, and another. The leopard reappeared, stared at the car for a long moment, then melted into the brush.

As darkness spread, I settled back in the car, rolled up the windows, locked the doors, and glumly prepared for a miserable vigil. The worst time came between 10 p.m. and

Four-legged dining car: Cattle egrets tour Murchison Falls National Park atop an elephant and feed on the insects stirred up by their foraging mount. In the Rhode Island-size preserve, 8,500 elephants so overbrowse forest and grassland that they endanger their own survival. Wardens plan to cull 2,000 and sell the meat to villagers.

Tropical deep freeze: Elena Glacier (**left**) flows from Uganda's highest peak, 16,763-foot Mount Stanley. The river of ice sparkles in the heart of the Ruwenzori Mountains. The ramparts lie on the Uganda-Congo border only 30 miles north of the Equator, where the Western Rift Valley unfolds its dramatic panoramas.

Violent explosions centuries ago blasted volcanic craters that now lie in Queen Elizabeth National Park (**left, lower**) near the foot of the Ruwenzori. From a lodge on distant Lake Edward, visitors observe a rich array of wildlife.

Bright awnings of moss curtain heath trees in the Ruwenzori (**below**). The name means "rainmaker," and the constant moisture nurtures tree-size groundsels and lobelias. Three-foot-long, thumb-thick earthworms crawl in the damp earth. Rabbitlike rock hyraxes inhabit the slopes, and miniature "dragons"—three-horned chameleons—haunt the shadows. The geographer Ptolemy guessed at the existence of the Ruwenzori peaks some 1,900 years ago and called them Mountains of the Moon. Henry Stanley explored the range in the late 1880's. Now tourists on safari turn such scenic wealth into a cash-earning resource for Uganda.

midnight. By then I knew that no help could possibly come, and the long, uncertain hours of darkness stretched ahead.

Before midnight the darkness was alive with rustling, grunts, and the small cries of small creatures being done to death. The mind, when prey to solitude and unease, populates every shifting shadow with menace. Are those fireflies or the quick, golden glint of feline eyes? What made the grass rustle?

Once something huge, dark, and very quiet passed the right side of the car. Fear fed my imagination: A big cat, his curiosity piqued, might swat loose a door, or shatter a window with a blow of his massive paw. At one point, the leopard padded past like a ghost, causing my throat to tighten. So the night wore on, punctuated by growls and footfalls.

Dawn brought a soft, clammy drizzle, as well as release from the confines of the tiny, stifling car. I leaned against a fender, waiting for a vehicle to come my way.

Noontime found me—sleepless, hungry, ravaged by thirst—waiting still. The prospect of yet another night in the car was beyond all bearing. So, scorning the rules in the interest of survival, I armed myself with a jack handle and trudged to the top of a nearby knoll. I examined the terrain through binoculars. Several miles to the east I descried the glint of corrugated roofs.

Price of Escape: a Nerve-racking Trek

Jack handle at the ready, I struck out across the plain, fervent to provoke none of God's creatures, great or small, and determined, at the cost of any detour, not to pass between any wild mother and her offspring. My route teemed with game of every variety. Whenever possible, I veered from antelope herd to antelope herd, thinking that where they were, beasts of prey were not.

Just in front of me a warthog bolted out of the tall grass in a flurry that almost stopped my heart. Once I came upon the massive pawprints of a lion, fresh or not I could not tell. Carefully, carefully I picked my way through the waving grass.

After two nerve-racking hours, I topped a small rise in the plain and before me, perhaps half a mile away, loomed the village I had seen through the binoculars. Almost limp with relief, I quickened my pace.

Suddenly, about 20 yards to my right, four immense buffalo scrambled snorting out of an unseen wallow and formed a menacing rank. Their rheumy eyes regarded me with fear—or was it hatred? The adrenalin of terror flooded my body. Every instinct told me to turn and run, but again I remembered the counsel of a white hunter friend and stood my ground. After a long, harrowing moment, the four animals tossed their horns and trotted away.

Drained and wan, I reached the village of Katunguru. I am an ardent conservationist, but after my stroll through Queen Elizabeth Park, I could only thank God for those who had instilled fear of man in animals.

Ugandans Seek Their Own Path

My stay in Uganda brought a new appreciation of many things—of the variegated beauties of the African land, of the deteriorating balance between man and nature that haunts the continent, of the anguished struggle to pass, in the small space of a century, from the Iron Age to the Atomic Age. It brought the realization too that uhuru has worked no miracles; for every problem that it has solved, another has been raised.

I remember a conversation with a university student. In a voice barbed with mockery, he said, "We Ugandans are delighted with uhuru. Formerly we were oppressed by colonialists but now we have complete freedom—provided, of course, that we do not oppose our leaders in any way. And we rule ourselves, although there hasn't been a single election in the nine years of independence.

"Still," and his voice turned serious, "despite all the blunders and setbacks, I can't disapprove. All the countries of Black Africa are in transition toward something. Certainly not Western-style democracy: It just doesn't accord with our social system. Not dictatorship: We can't accept that after colonialism. We're groping now. But, in the end, we'll work out our destiny. And we'll do it our own way." □

Deafening roar announces the Victoria Nile's escape from the 20-foot-wide bottleneck of Murchison Falls. The river thunders and foams, then settles down for the 2,800-mile journey northward to the Mediterranean. Ugandans hope to build an underground power plant here to exploit the cataract's energy without spoiling its grandeur.

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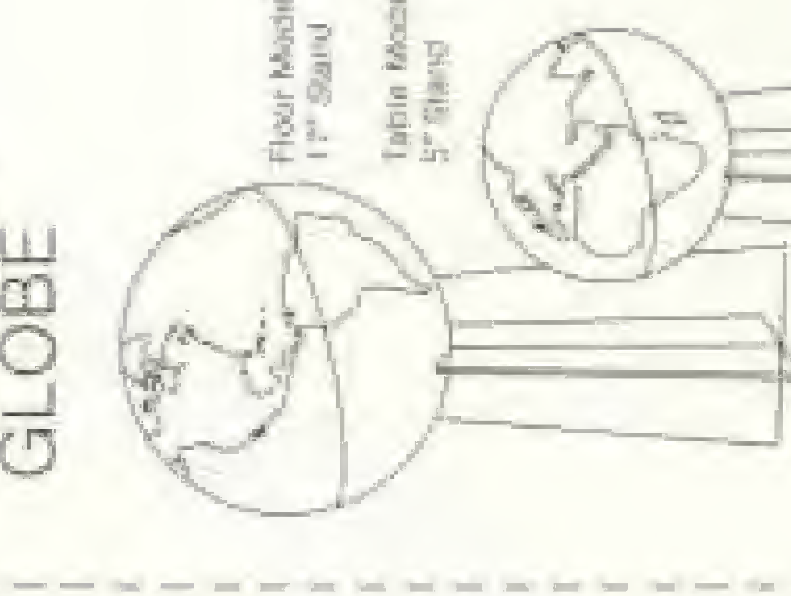

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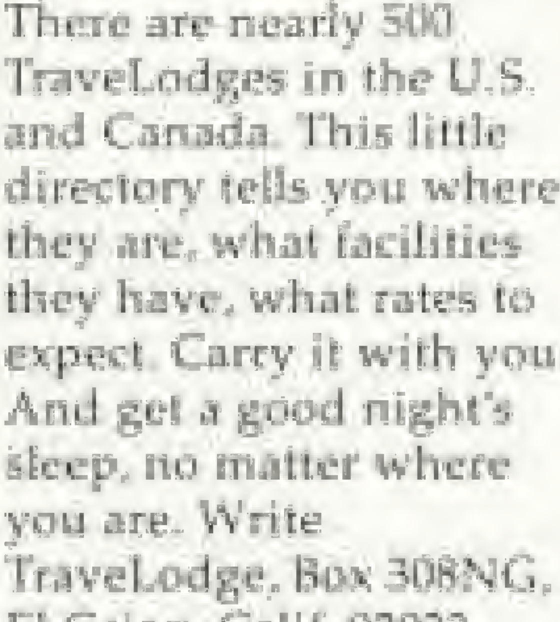

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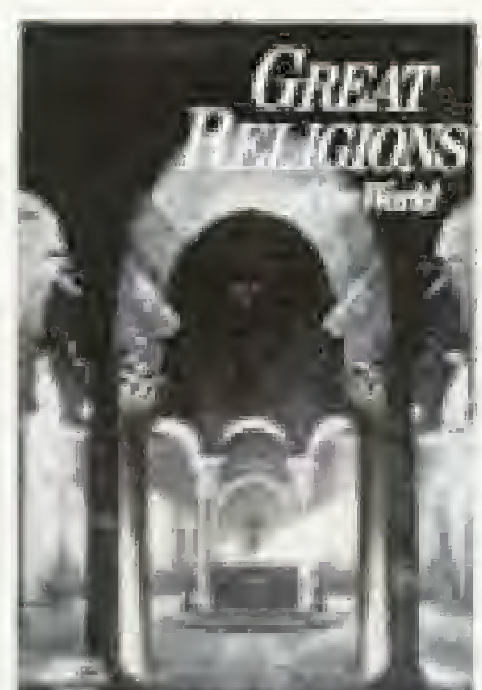

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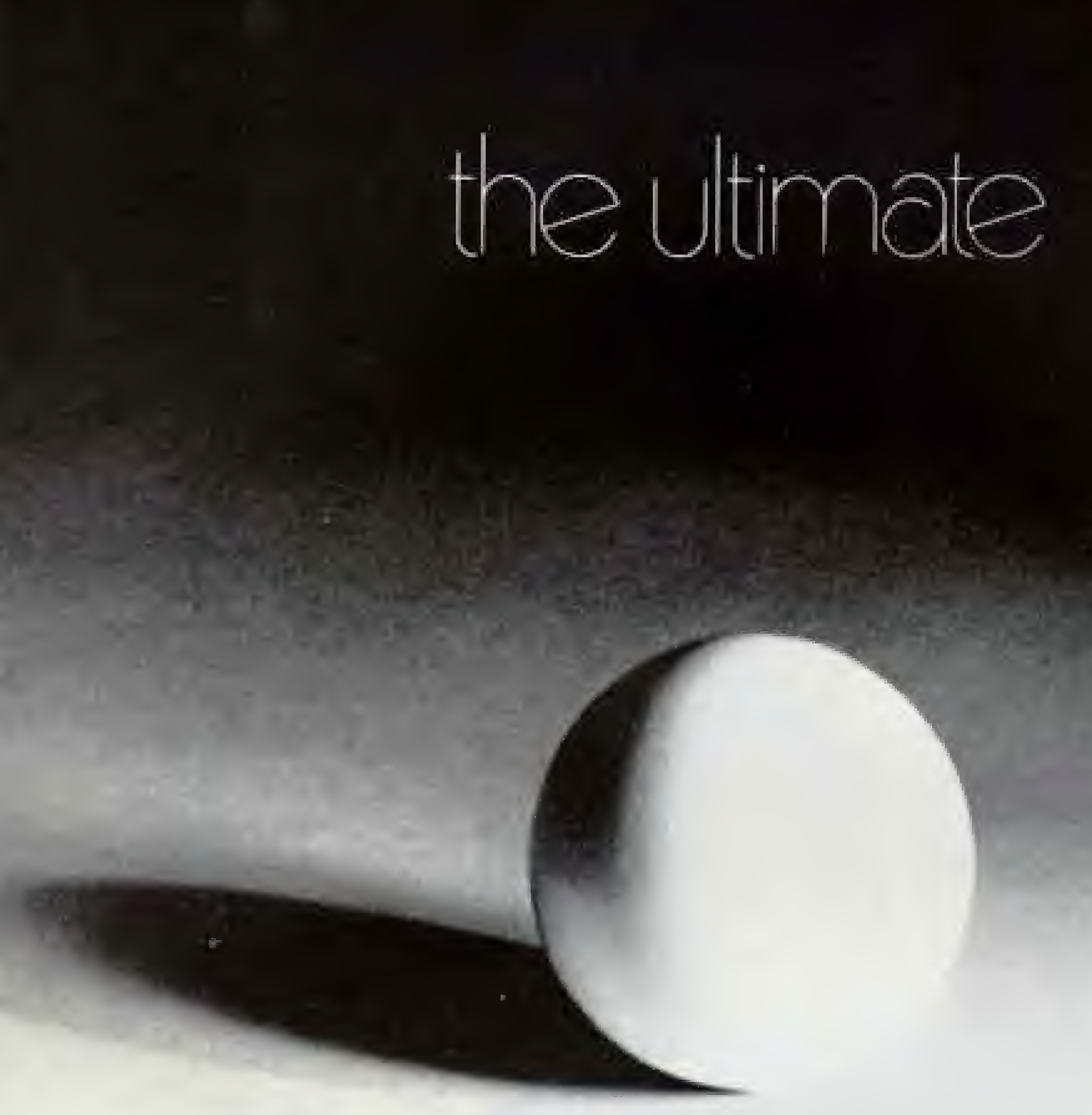

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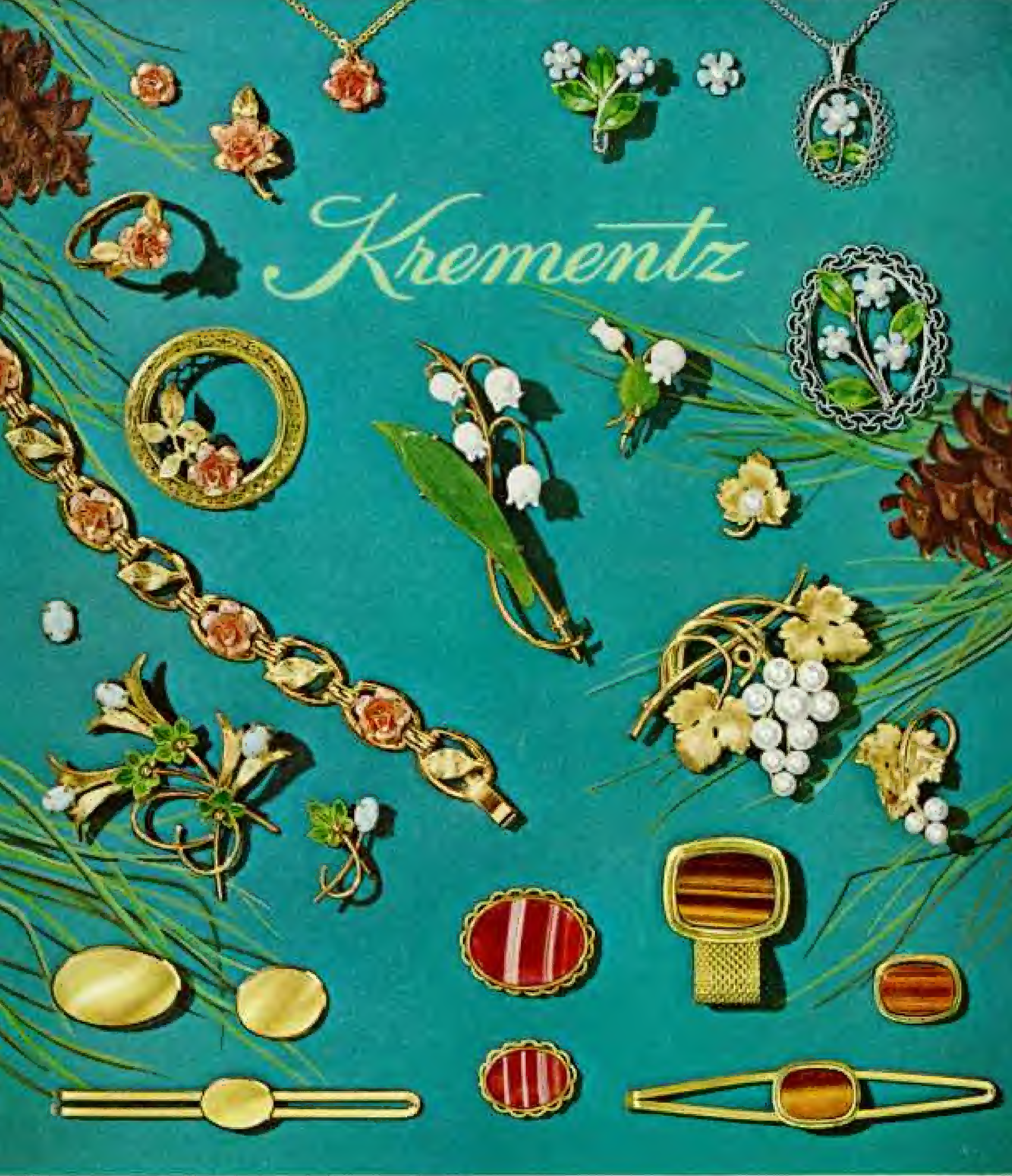

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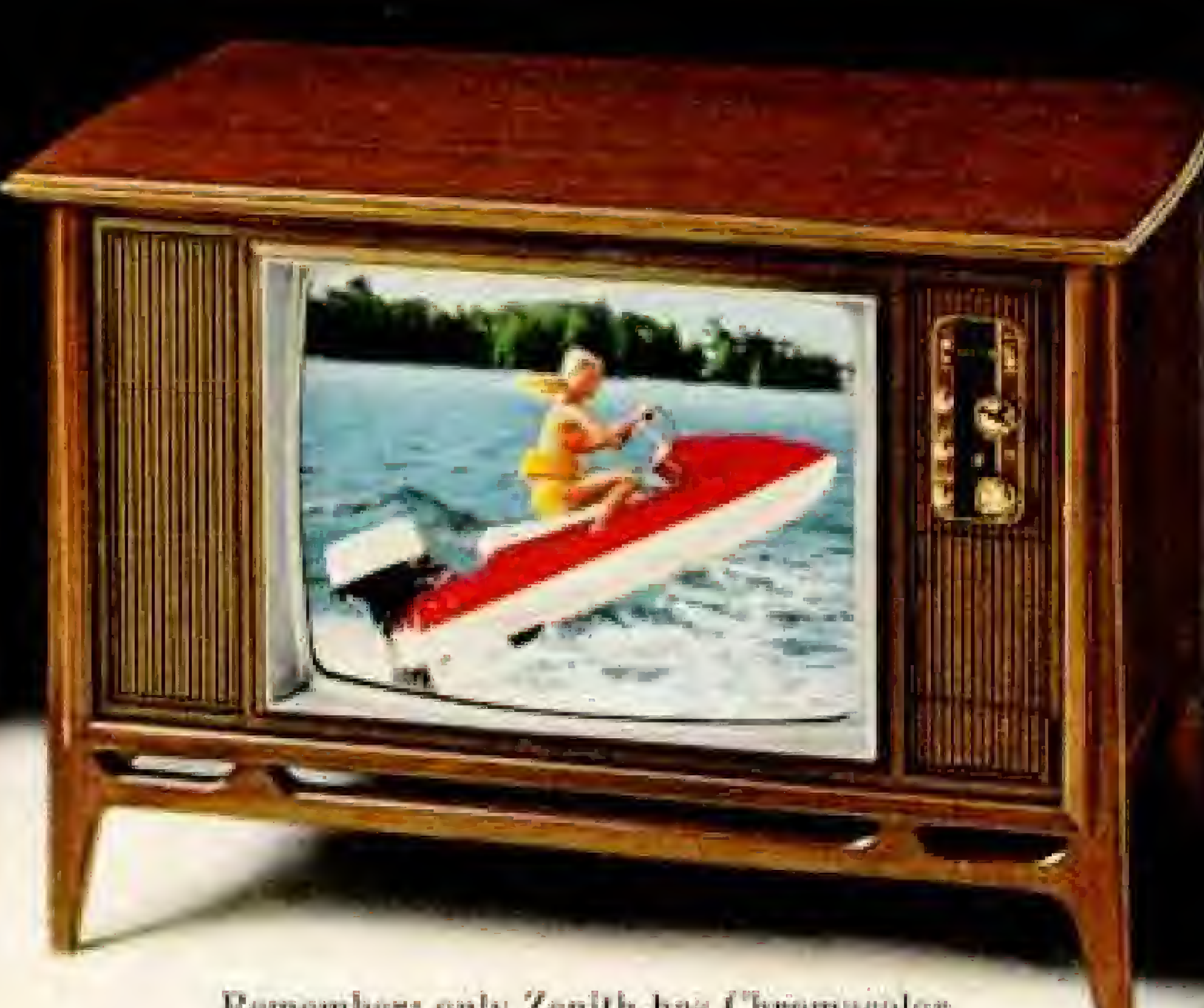

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