

VOL. 148, NO. 6

DECEMBER 1975

# NATIONAL GEOGRAPHIC

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SEE "THIS BRITAIN" TUESDAY, DECEMBER 9, ON PBS TV

**N**OW THE SKY of northern latitudes presents the glorious panoply of winter—Orion striding the night, the triangle of Taurus, the Great Square in Pegasus—as though the heavens were adorned for Christmas. Indeed, the Christian feast has an undeniable link with the winter sky; the New Testament is silent about the date of the Nativity, but the Roman festival of Saturnalia long celebrated that time in late December when the sun halted its journey to the south and began to climb higher and higher in the north each day, heralding the turn toward spring and renewed life.

Seeing the early Christians caught up in the spirit of the festival, Church fathers urged them to celebrate not the return of the sun but the birth of the Son, the Saviour. By the fourth century, December 25 had become firmly fixed as Christmas.

Almost every civilization has looked to the stars to pace off the seasons, the times to plant and harvest. Early religions developed rituals to fend off the death of winter and ensure the resurrection of spring, and their priesthoods were often based on astronomy.

Perhaps no other people, however, developed the calendar—the awareness of the steady, inexorable passage of time—to such a point as the ancient Maya of Middle America. We are presenting in this **GEOGRAPHIC** an extraordinarily detailed account of Maya civilization. We knew, even before we began the project two years ago, that there was much to be reported, and much contrary scholarly opinion about what was known. We have faced the situation before, as during our treatments of the Phoenicians and the Incas, and they are problems we love to have—problems of abundance and interpretation, of stunningly rich visuals and fascinating text.

We decided upon a popular, generalized treatment of the ancient Maya civilization, and what remains of it among the modern Maya-speaking peoples of Guatemala and Mexico. We also wanted to report on advances in deciphering the complex Maya hieroglyphs. And how could we turn down an opportunity to show you Tikal in all its classic glory? One of the leaders of this largest of all archeological excavations describes that 14-year effort, and an artist restores life to the ruins.

From the tower at the Palace in Palenque, Maya priests could watch as the sun reached its southernmost point at the moment of solstice; to their eyes, as it set that day, it appeared to vanish into a nearby pyramid tomb. It was the same event celebrated by the Romans, and by countless other sky-watchers throughout history—and, in a way, by you and me today. Think about that when you stand under the Yuletide sky.

*Silvestre Brown*

# NATIONAL GEOGRAPHIC

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December 1975

## THE MAYA

### I—Children of Time 729

*Staggering accomplishments in art, architecture, astronomy, and mathematics marked the ancient civilization of the Maya. The glory is gone, but ways of the past still guide their descendants' lives. By Howard LaFay, with photographs by David Alan Harvey.*

### II—Riddle of the Glyphs 768

*Deciphering Maya writing can mean a deadly race between scholars and art thieves. National Geographic archeologist George E. Stuart and photographer Otis Imboden report on progress in unlocking the mystery of Maya hieroglyphs.*

### III—Resurrecting the Grandeur of Tikal 792

*William R. Coe recounts the 14-year struggle of archeologists to lay bare a crumbled, jungle-shrouded metropolis in Guatemala.*

### IV—A Traveler's Tale of Ancient Tikal 799

*Artist Peter Spier re-creates the daily life of that long-abandoned Maya city, which in its day rivaled the splendor of Rome. Text by Alice J. Hall.*

### Can We Harness the Wind? 812

*In today's crucial search for more energy, engineers look again at power our forefathers used. By Roger Hamilton and Emory Kristof.*

### Rafting Down the Yukon 830

*Four young adventurers relive the Klondike gold rush in the course of a two-year, 1,850-mile river odyssey. Keith Tryck and Robert Clark tell the tale.*

### Iowa's Enduring Amana Colonies 863

*Descendants of a German religious sect succeed in clinging to the past while living comfortably in the present. By Laura Longley Babb, with photographs by Steve Raymer.*

**COVER:** Calendar symbols carved in limestone date an unknown event that occurred in Yaxchilán, Mexico, nearly 1,000 years before Columbus reached the New World. Photograph by Otis Imboden.



# The Maya, Children of Time

By HOWARD LA FAY

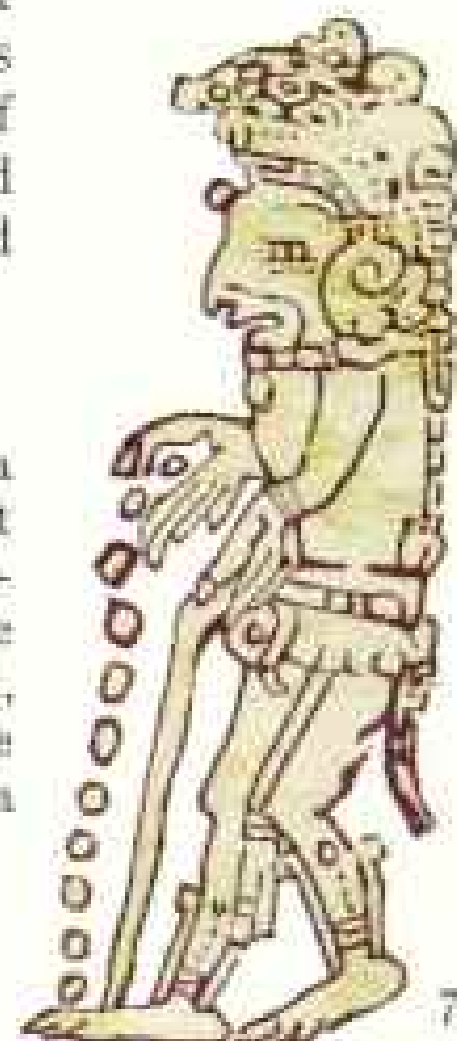
FOREIGN EDITORIAL STAFF

Photographs by  
DAVID ALAN HARVEY

**F**ROM THE DEEPS OF MYSTERY they came, and in mystery their unique culture fell. Scholars call them Maya, but they knew themselves by other names, and many are now lost. For some fifteen centuries they flourished in the grimly inhospitable reaches of Middle America, and between A.D. 250 and 900 they shaped a magnificent civilization of soaring pyramids and splendid palaces. This Classic Period ended in a sudden collapse. Cities were abandoned; the population declined drastically; jungle soon shrouded the mighty monuments.

During Europe's Dark Ages, the Maya practiced an astronomy so precise that their ancient calendar was as accurate as the one we employ today; they plotted the courses of celestial bodies and, to the awe of the faithful, their priests predicted both solar and lunar eclipses. They calculated the path of Venus—an elusive planet that is by turns morning and evening star—with an error of only 14 seconds a year. The Maya originated a complex system of writing and pioneered the mathematical concept of zero.

Still following ancient ways, a modern Maya harvests "sunbeams of the gods," the corn that provided the foundation for the brilliant civilization his forefathers built in Middle America. Come spring, he will plant anew with a digging stick, just as did the hooked-nosed deity (right) from the Madrid Codex (pages 777-780), one of four Maya books that survived the Spanish conquest.







Mute captives in stone (above) keep secret the mysteries they witnessed when religion and rule were one and the Palace of Palenque (left) towered above a dazzling city. Flourishing in the late seventh century under a ruler named Pacal, Palenque epitomizes the grandeur of Maya culture. In the first thousand years A.D. these Indians of Middle America developed a calendar as precise as our own, the most advanced writing system in the New World, and some of its greatest art and architecture.

In the Palace's eastern courtyard, nine-foot-tall figures (above) place hand to shoulder in submission. The man at right

has arms bound behind his back and scars that suggest self-mutilation, a rite believed pleasing to the gods. Nearby towns may have brought in the sculptures as tribute.

Above the courtyard, the Palace tower surveys the dense forest. From the tower at winter solstice, the setting sun appears to plunge into Pacal's nearby pyramid tomb (page 760) as if through the gateway to the underworld—a tribute to the king's divinity. Palenque became sacred as the westernmost city of the Maya, the place where the sun died. Nobles built hillside mausoleums, calling to mind Egypt's Valley of the Kings.

Yet, until recently, the brilliance of these achievements shone but fitfully through an encompassing gloom. Even the era of the Maya's greatest glory remained dim. Inscribed dates in their complex calendar loomed and disappeared . . . 7 Imix 14 Zec . . . 8 Ahau 13 Pop. So did the names of a few great personages: Bird Jaguar, who ruled in might at Yaxchilán; Pacal, whose pyramid tomb at Palenque rivals that of a pharaoh.

Now, however, the light of scholarship has begun to pierce the ancient shadows. City-states, dynasties, long-ago wars creep into clearer focus. Gone forever is the image of the Maya as peaceful, rather primitive farmers practicing esoteric religious rites in the quiet of their jungle fastness. What emerges is a portrait of a vivid, warlike race, numerous beyond any previous estimate, employing sophisticated agricultural techniques. And, like the Vikings half a world away, they traded and raided with zest.

**J**OURNEYING through the mountains and tropical forests and parched plains of Central America, I shared—at a long, pale remove—the sense of wonder experienced by 19th-century explorers when they first discovered the great Maya monuments. To fly down the steamy, green valley of the Río Usumacinta and suddenly descry the majestic white ruin of Yaxchilán off the left wing . . . to coast eastern Yucatán and find the temples of Tulum, timeless as dreams, towering above the savage surf . . . to round a bend in a road and confront the grandeur of Uxmal. Even now, after the discoveries have been made and registered, such experiences resound in the soul like an organ chord. And always with a haunting sense of tragedy. For the rise and fall of the Maya illuminate not only man's capacity for greatness, but also his terrible affinity for doom.

At the noontide of their power, Maya city-states stretched from Mexico into Belize and Honduras (map, pages 736-7). Copán, Tikal, Chichén Itzá, Palenque dominated busy trade routes where jade, salt, cacao, and pottery passed from center to center. Maya temples rose in the high, cool mountains of the south, in the torrid lowlands of Guatemala's Petén, and throughout the Yucatán Peninsula's sere plain. For almost seven centuries, Middle America knew the splendor of Maya culture.\*

Scholars employ several complementary

tools to re-create the Maya past. Archeology, with its unearthed buildings, stelae, and inscriptions, provides the bulk of practical information. Chronicles such as the Popol Vuh and the books of Chilam Balam present a post-conquest Maya version of history. Accounts of Spanish conquistadors and friars—unwitting anthropologists—record Maya practices in the last, lost days of the conquest that nearly obliterated them.

Finally there remain the Maya themselves. Their blood diluted, their past forgotten, they manage to survive in scattered villages. Some still observe the customs—speaking the old languages, serving the old gods, following the ancient calendar, living in the slow, soothing rhythm of their distant forebears.

**T**HE IDENTITY of the earliest such forebears poses a vexing question. Many scholars believe that Maya culture commenced in the lowlands of Guatemala's Petén region. Others speculate that the Maya had some significant relationship with the shadowy Olmec, who flourished to the west more than a millennium before Christ, and that they ultimately migrated into the lowland regions where their civilization reached its peak.

For clarification, I sought out an archeologist who has spent his career on the far frontiers of the Maya past. The 5,000-foot-high colonial city of Antigua, onetime capital of the captains general of Guatemala, floats among volcanoes and clouds. There Edwin Shook received me in a laboratory crammed with ancient artifacts.

He said: "We keep probing for the beginning of Maya civilization—that moment, easily identified archeologically, when a society settles down and develops agriculture and a modest architecture. So far we haven't found it. Do you know Kaminaljuyú?"

I did. I had visited this ancient site, now encompassed by the urban sprawl of Guatemala City. The spare, somber lines of its early

\*The lost greatness of Middle American peoples has commanded major attention from National Geographic-sponsored research expeditions for more than half a century, and the resulting discoveries have done much to dispel the mystery that once shrouded Maya glory. Since 1924 the Society has backed 68 projects ranging from excavating key ruins to deciphering the once-baffling glyphs. GEOGRAPHIC readers have followed the emerging story in more than three dozen articles, such as Sylvanus Griswold Morley's "Yucatán, Home of the Gifted Maya," in November 1936, and Eusebio Dávalos Hurtado's "Into the Well of Sacrifice," in October 1961.

structures had impressed me profoundly.

"I was with the Carnegie Institution when we began excavating it in 1936. It was the biggest Preclassic site ever tackled. Most archeologists thought we'd find traces of a simple, rather primitive culture. Instead, we found monumental architecture and glyphic writing. Incidentally, I'm almost certain that Maya hieroglyphs originated either in Kaminaljuyú or on the nearby Pacific coast.

"In 1948 workmen accidentally penetrated a Kaminaljuyú tomb dating from 300 B.C. It's probably the most important Preclassic burial ever found. There were some 450 pottery vessels, many imported from as far as Honduras and El Salvador. To me, this proves that 500 years before the Classic Period, Kaminaljuyú was both advanced and cosmopolitan. Of the earliest days, we know only this: By 800 B.C. a sophisticated culture was established here."

A few days later, in the Mexican state of Chiapas, I visited Dr. Gareth Lowe of the New World Archeological Foundation. Husky and soft-spoken, Dr. Lowe has spent almost twenty years studying Preclassic origins.

"We theorize that the Maya migrated into the lowlands of Petén and Yucatán about 900 B.C. Who they were, we simply don't know, but their pottery and language relate to this southern highland area. Here in Chiapas," he said, "we found the earliest dated monument, from 36 B.C. The first inscribed date at Tikal is 300 years later."

Before I left, Dr. Lowe showed me some pottery he had unearthed on the Pacific coast near Tapachula. Elegant in design and beautifully decorated, it dates from a daunting 1700 B.C.—almost a thousand years before the founding of Rome.

**ONE OF THE EARLY MAYA** ruins I visited was Becan, a recently excavated site clasped in the green embrace of the fecund forest of southern Yucatán. Dr. Joseph W. Ball of San Diego State University, a ceramist who had dug there, briefed me.

"A dry moat dating from the second or third century A.D. surrounds Becan. It reveals that the Maya—so long portrayed as a peaceful, devout people—were involved in warfare from very early times. Deposits of charred debris and bone material suggest that the population was attacked about A.D. 450."

For a long afternoon I explored Becan's moat—some 1.2 miles in circumference—beneath the dense canopy of tropical forest.

Few sunbeams penetrate the sweltering shade, and at ground level no breeze stirs. Sweat runs from your scalp to your heels in enervating rivulets; within minutes your clothes cling like clammy cerements. My notebook became a soggy clot, the sweat from my hand blurring words even as I wrote them.

Everywhere you inhale the rank smell of decay as fallen limbs and dead trees rot moistly underfoot. Snakes lurk in the shadows, ticks infest the vegetation, and drooping branches produce avalanches of stinging ants. Grasp a friendly tree for support and—should it be the innocuous-appearing *escoba* palm—surgically sharp thorns pincushion your hand. Dusk brings hordes of mosquitoes and, after a scorching, airless night, the prudent man checks his shoes for scorpions before putting them on.

The tropical forest struck me as a totally hostile environment. One of the many paradoxes of Maya history springs from the fact that in just such surroundings their civilization reached its zenith.

Until recently many scholars believed that the Maya were few in numbers and wholly dependent upon primitive slash-and-burn agriculture. Dig after dig, however, revealed evidence of densely settled centers and a large rural population as well. Dzibilchaltún in northern Yucatán, excavated by Dr. E. Wyllys Andrews IV of Tulane between 1956 and 1961, is unique in that the Maya occupied the site continuously from at least 500 B.C. to the time of the Spanish conquest—a period of 2,000 years. Professor Edward Kurjack of Western Illinois University has made an intensive study of aerial photographs and actual sites of the region. His conclusion: At its peak, Dzibilchaltún's population numbered some 40,000.

Meanwhile, proof appeared that the Maya, far from being the primitive farmers of theory, used sophisticated agricultural techniques. In southern Yucatán, Professor B. L. Turner II of the University of Oklahoma and others investigated the remains of large-scale terracing on hillsides. Dr. Turner also made a study of "raised fields"—artificial platforms of soil that enabled the Maya to grow crops in seasonally flooded lowlands.

"These features," he told me, "indicate that the Maya practiced permanent and intensive agriculture capable of supporting a large population. If you could have flown over the Petén at the height of the Classic Period, you







would have found something akin to central Ohio today.”

An older generation spoke of a “Maya Empire,” but today scholars doubt that such an entity ever existed. The Maya language early fragmented into numerous variants. Architecture and art followed diverse paths. Warfare raged, alliances shifted, dynasties rose and toppled.

Yet communication was swift and precise. When the astronomers of Copán standardized the lunar calendar toward the end of the seventh century A.D., it was quickly adopted throughout the Maya world.

At an elevation of 2,000 feet, Copán in Honduras was a center of Maya astronomy. It also possesses elegance of architecture, and, rare among the Maya, Copán’s artists approached sculpture in the round. Yet Copán struck me as a disturbing place. On the famed stelae you find visages that are vaguely Chinese (page 759), poses that are vaguely Egyptian. Many stone faces exhibit no obvious Indian characteristics; many more seem like caricatures. Stone demons posture everywhere; an evil jaguar leers from a wall; simian heads surmount sculpted human bodies. Copán is sinister. Even the gods depicted here resemble devils.

**R**ECURRING STRIFE characterized the Classic Age, and artists memorialized it in striking murals at Bonampak. To Mayanists, that name rings down the ages like a clash of arms. The remains of the ceremonial center lie innocently enough on a series of limestone terraces in the hot lowlands near the Rio Usumacinta. Discovered in 1946, a three-chambered temple revealed walls covered with frescoes unrivaled in the Maya world. In rich reds, yellows, and blues, artists portrayed life among the Maya elite of the late eighth century A.D. One series of paintings depicts a raid against another Maya community, from the battle to the final ritual sacrifice of prisoners.

A later battle account, preserved in a monastery, captures the excitement of Maya warfare. One must picture the warriors of both sides, vivid in spotted pelts and blazing feathers, the hooked-nosed war chiefs directing tactics.

Declares the chronicle: “They came over the hill with the first rays of the rising sun, filling the air with their shouts and war cries, displaying their banners. . . . It was terrible, this descent of the Quiché. They advanced rapidly in columns down the hill to the edge of the river. The clash was horrible, the screams and shouts. A din of flutes, drums, and

**Purification by fire:** Men of Chamula in Mexico’s southern highlands race across a flaming plaza in Carnival rites that mix Christian and Maya beliefs. During the five-day festival, villagers called Passions impersonate the Christ, who is also Lord Sun. Others, in conical, beribboned hats of fur, are evil Monkeys—Christ’s persecutors and the Sun’s enemies—who harass feasting townspeople with obscene and sacrilegious jokes. On the fourth day, the Monkeys and the Passions purge themselves in the flames, as did the 16th-century Maya. Those earlier people esteemed fire walking as a “remedy for their calamities . . . very pleasing to their gods.”



# THE MAYA

- Archaeological site or ruin
  - Populated place of archaeological importance
  - Other site or place of interest
  - ✚ Place with scheduled air service
- P.A.H. denotes Pan American Highway System  
Elevations in feet.

MAP PRINTED BY PETER L. SMITH  
CORPORATION, 4000 PLAZA  
NATIONAL GEOGRAPHIC SOCIETY

## Gulf of Mexico

**LOWLAND MAYA CIVILIZATION** reached its height during the Classic Period on a vast stage extending from the Yucatan Peninsula to the base of the Guatemalan mountains. Individual centers developed distinctive personalities, but all shared a complex calendar, hieroglyphic writing, astronomical concepts, and sophisticated artistic styles.

**MAYA TODAY**, some two million strong, live throughout the area and speak one of the two dozen distinct languages of the Maya family.



Archaeologists use three terms in dating Middle American sites and artifacts  
**PRECLASSIC**: 2000 B.C. to A.D. 250  
**CLASSIC**: A.D. 250 to 900, the peak period of Maya civilization  
**POSTCLASSIC**: A.D. 900 until the Spanish conquest

## Caribbean



**PRONUNCIATION GUIDE**  
 Vowels in Maya place names usually take the sounds ah, ay, ee, uh, and oo, while a corresponds to English "ah." Words are generally accented on the final syllable.

- Uhmaj = oosh MAHJ
- Kaminajuyü = kah mee nahj hoo YOO
- Dzibichaltün = tseeb eel chahj TOON
- Xcobenhaltün = shkoh beet nahj TOON
- Yachilan = yahsh chee LAHJ

**HIGHLAND CULTURES**  
 flourished in southern Guatemala and Chiapas in Mexico during the late Pre-classic, when peoples here used an elaborate calendar as well as writing system that was later more fully developed by the Classic Maya civilization in the lowlands. Early in the Classic Period, however, the highlands came under strong influence from Central Mexico.

conch-shell trumpets resounded as the Quiché chiefs vainly sought to save themselves by divine magic. Soon they were hurled back, and many died. . . . A great number were taken prisoner, together with their chiefs. . . ."

When I flew into Bonampak on a charter aircraft—there is no other practicable means of reaching this remote site—I found that mineral deposits now shroud virtually all the frescoes. Mercifully, however, experts copied them soon after their discovery, and the National Museum of Anthropology in Mexico City displays the reproductions.

Descending the broad stone stairway at the base of the Bonampak temple, I reflected that the fate of these murals typifies a tragic theme of Maya archeology—discovery and loss. Consider the glyphs that have long baffled scholars, and today baffle computers. Some Spanish friars understood the glyphs, but the knowledge has disappeared. In the 18th century Avendaño, who had lived among the Yucatec, wrote dictionaries and a grammar of the language. Now, no known copies exist. Time has blotted the murals of Bonampak; at Tancah, near Tulum, yet another painting showing a procession of gods was discovered and almost immediately defaced by looters (page 787). Every increase in Maya knowledge seems matched by a commensurate loss.

**A**T LEAST ONE ELEMENT during the Classic Age lent unity to the Maya world—religion. From earliest times the Maya displayed a preoccupation with divine forces. Their great ceremonial centers such as Tikal and Palenque were—for a people who had to cut every stone without the benefit of metal tools—monumental acts of faith.

Maya religion fathered Maya science. The late Sir Eric Thompson, greatest of Mayanists, told me, "Their skill with numbers developed because accurate calculations were important to divination. They developed astronomical observation to support astrology—a basic element in their religious beliefs."

Above all, time obsessed the Maya. They envisioned it in terms we can never understand. To them, past and future were indistinguishable. In the Maya language one word, *kin*, serves for sun, day, and time.

The Maya pantheon included innumerable gods, in varied manifestations. Possibly the greatest was Itzamná, the Lord of Life, generally portrayed as an elderly sage. Ah Kin,

the Sun God, presided over the day, and Ah Puch reigned in the Land of the Dead. Chac, God of Rain, rose to pre-eminence each springtime; if the rains came late, crops failed and famine stalked the land. Later, Kukulcan—the Maya manifestation of the central Mexican deity, Quetzalcóatl—gained a kind of primacy in the form of a feathered serpent.

To function benevolently, the gods required human blood. The Maya sacrificed accordingly. Prisoners of war, perhaps individuals levied from the peasantry, or even some devout volunteers sated the divine appetites. Climaxing an elaborate ceremony, a priest ripped open the victim's breast with an obsidian knife and tore out the still-beating heart.

In addition, priests and pious individuals cut holes in their tongues and drew rope festooned with thorns through the wound to collect blood offerings. Priests pierced their earlobes with stingray spines for the same purpose, and drew blood from their genitals.

Bernal Diaz del Castillo, historian of the Spanish conquest of Mexico, recorded his disgust at the pagan priests "clad in long white cotton cloaks, reaching to their feet, and with their long hair reeking with blood, and so matted together, that it could never be parted or even combed out again. . . ."

Human sacrifice outraged the Spaniards, and they smashed idols, burned sacred books, tore down pyramids, and used the stones to erect churches. Caught between torch and sword, the Indians converted. But after four centuries of imposed Christianity, the Maya have not forsaken the ancient deities.

**I**N THE SPRING of this year the rains did not arrive on schedule. While corn withered, villagers grew apprehensive. Finally, they turned—as they often do—to the long-nosed God of Rain, Chac. Everywhere, secret ceremonies invoked his aid.

With the aid of Pedro Gullotti of Mérida, I was permitted to attend such a ritual in the village of Xcobenhaltun (Shkoh-ben-hahl-TOON). Numbering perhaps a hundred souls, the village lies beside a dirt track that winds through the Puuc hills of central Yucatán.

When we arrived early on Sunday morning, Yum Kin, Lord of the Sun, awaited us before his altar. Yum Kin, of course, bore an earthly name—Susano Santos. He is a Maya priest, or *k-men*, who serves the old gods. One of the villagers, Heraclio Uuc—who farms 22 acres—had commissioned the ceremony.

The forty or so men in attendance were his guests, and he was bearing the considerable expense.

The Yum Kin was a small, frail man with coal-black hair and remote eyes. He did not know his age, and regarded the question with indifference. The villagers knew that he was at least 80. When he spoke, he looked directly at you, but his eyes seemed to focus on something far away. He is an *ah-pulyaah*, a practitioner of black magic, as well as a priest, and the villagers treated him with gingerly respect.

"I was called by the gods before I was born," he told me. "While my mother was carrying me, my father did an evil thing to her, and from the womb I struck him dead."

**S**USANO'S ALTAR was a plain wooden table with a cross mounted on the rear edge. Before the cross were 13 bowls—one for each Lord of the Day—filled with *zacá*, cornmeal stirred into water and sweetened with honey.

As Susano made his final preparations before the altar, the men in attendance killed a dozen or so chickens, plucked them, cleaned them, and plunged them into buckets of water to simmer over fires. Nearby they had previously dug a huge ditch, covered the top with logs, and piled stones atop the logs.

At a given moment, Susano passed the bowls of *zacá* among the congregation. He favored me with one, and I sipped the sweet, watery liquid. Meanwhile, women—who are barred from the ceremony—were in their huts making thousands of tortillas. These were piled 13 high—each pile representing a cloud—cemented with dough, and wrapped in broad green leaves of the *bob* tree. Called *tutiwah*, they would eventually be baked in the pit.

In the manner of the ancient priests, Susano had fasted for two days and would eat nothing until the ceremony ended. He did, however, drink copious draughts of *balché*—a liquor made of fermented honey and the bark of a certain tree—that has long and ancient religious associations for the Maya.

I asked him about his priestly activities. "I go where I am needed," he said. "In another village there was dissension, strife, and murder. They summoned me to bring them peace, and when I arrived I called down a thunderstorm. I told them to shelter in their huts because the final lightning bolt would bring fire to the village. It did; several bushes began

to burn. The people were so awed that they have lived harmoniously ever since."

Heraclio Uuc, wearing a baseball cap, lit the logs above the pit. As they burned through and crumbled, the intensely hot stones above cascaded down. Then the men placed the leaf-wrapped *tutiwah* upon the stones and filled in the pit with earth. The village still speaks with wonder of the h-men who, several years before, had downed a long draught of liquor, removed his shoes, and calmly walked across the fiery stones without injury—a practice of the ancient Maya. "He was," declared one villager decisively, "the devil."

The *tutiwah* baked for slightly more than an hour. Then the men excavated the loaves—done to a crisp—and Susano piled almost half of them on the altar. He topped them with the chickens that had been boiled earlier. From a purse he took a clear glass ball and dipped it in a bowl of *balché*. Such a ball, called a *zastún*, meaning clear stone, possesses high ceremonial significance.

The Yum Kin now addressed the altar—always staring through the *zastún*—from the four points of the compass. "O Clouds," he chanted, "I implore you to come now and bring life to Xcobenhaltun . . . I give to you now, O Lord, this bread and this meat . . . What I ask of you is life for these farmers. Let the rain fall where they have worked and life will begin for them again . . . Therefore, Clouds, when I tell you to give rain, follow my order. Because I have the power, as a priest, a Lord of the Sun, to command the rain . . . With my power, O Clouds, I ask you to bring only good to humanity."

After the ceremony, the congregation wolfed down the food—the gods had already consumed the all-important spirit of the sacrifice. Susano lay exhausted, his remote eyes staring at nothing—or at everything.

Within less than a week the sky darkened. Lightning bolts—the spears of Chac—flashed and crackled through the leaden air. Finally the heavens opened to pour life-giving rain on the parched fields of Yucatán.

**M**Y STAY IN XCOBENHALTUN introduced me to the rhythm of life in an isolated Maya village. Given the innate conservatism of farming societies—and of the Maya, above all—there is little reason to believe that rural life today differs radically from that of the distant past.

The families of Xcobenhaltun live in houses





NATIONAL GEOGRAPHIC PHOTOGRAPHER OTIS IRWIDEN (ABOVE)

"City of dawn" to the ancient Maya, Tulum glows as the sun's first rays strike the east coast of Yucatán. In the 15th century Tulum overlooked a vivid parade of commerce. Traders glided past in huge canoes laden with jade and feathers from Honduras, honey, wax, cotton, and salt from other parts of Yucatán. After the Spanish landed in 1517, they marveled at this and other great cities with their plazas, markets, temples, orchards, and maize plantations. But the invaders proved so destructive that in fifty years Tulum was all but abandoned.

Even so, echoes of glory yet sound at the site. The sculptures and murals of the limestone temples sing praises to deities repeatedly reborn out of the sea—the moon and the planet Venus. Another patron of renewal, the Corn God (above) carries the Maya glyph, or sign, for corn atop his head. Dr. Arthur G. Miller discovered the wall painting at nearby Tancah.





similar to those of their ancestors. The sides, sticks lashed together, permit air to circulate; the high, thatched roofs provide insulation against the oppressive heat. Furnishings are sparse—usually a large drum for water, a grinding mill for corn, a small, low table, and a few low benches. Hammocks slung from the beams furnish sleeping accommodations. Having spent a few nights in Maya hammocks, I can attest that they are cooler and more comfortable than any bed.

The Maya begin work early and eat frequently. At ten in the morning, I joined Santos Teodoro Uuc Chi—one of the few

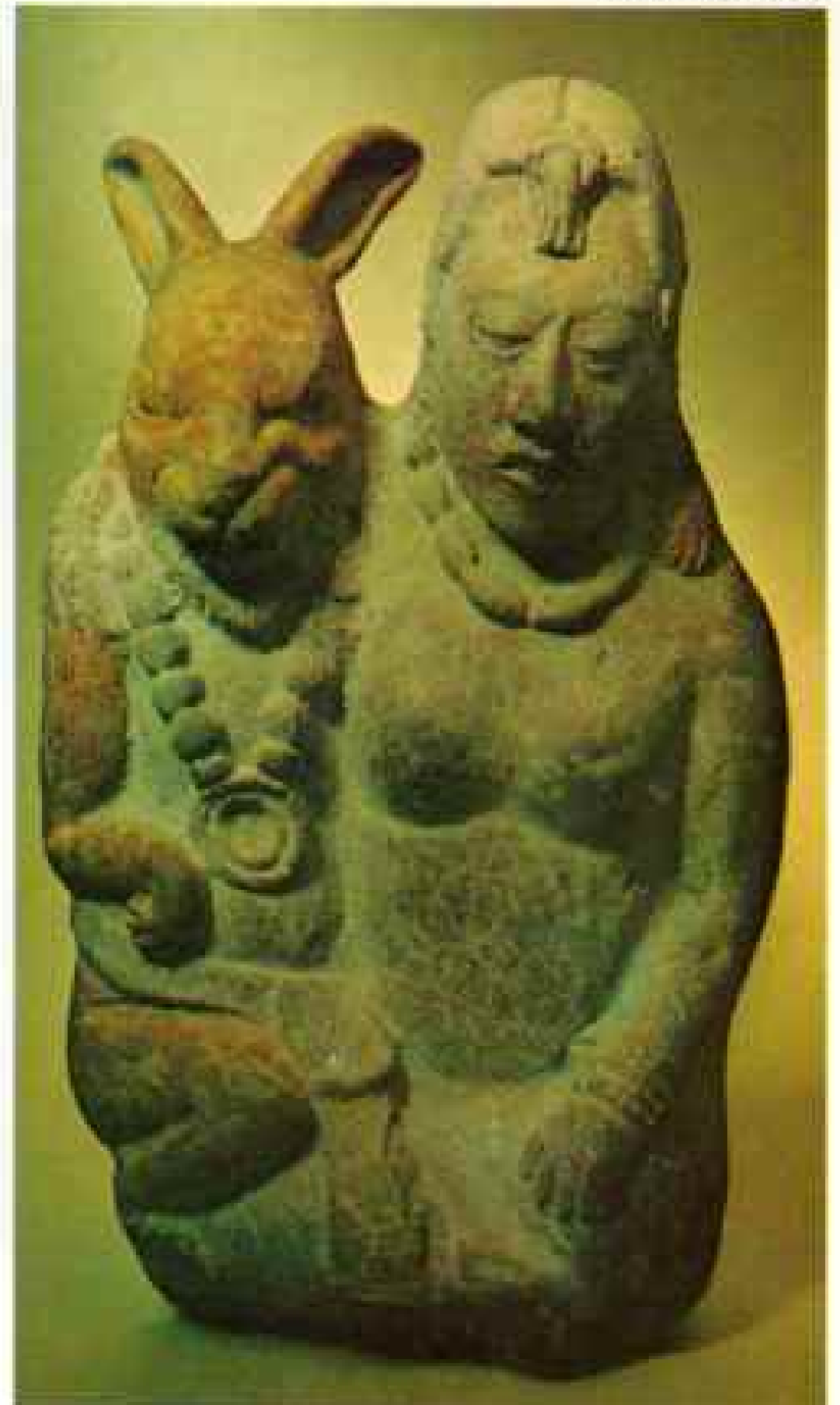
villagers who spoke Spanish—for a repast. We crouched on benches six inches high while his wife Feliciano presided at the fire. She shaped tortillas by hand from cornmeal dough and cooked them on a steel sheet above the flame. We dipped the hot, delicious tortillas in a bowl of thick bean soup.

Pigs, chickens, and turkeys roam among the huts. In the center of the village stands a rack of beehives. The Maya here make these in the ancient manner by hollowing a section of log, sealing the ends with mud, and punching a hole in the side to permit bees to fly in and out.



Mirror image of a sister in clay created some 1,200 years ago (below), a hardworking Yucatec wife is up before dawn to grind corn and cook tortillas. Maya women of old sought solace from the Maya moon goddess, Ixchel, patroness of fertility, weaving, and medicine. Wife of the sun, she consorted with other gods, just as the moon crosses paths with stars and planets. In this 4 $\frac{3}{4}$ -inch figurine from Jaina Island, off Yucatán, the moon goddess takes a grinning rabbit for her partner.

OTTO WOODEN (BELOW)



**A** SENSE OF COMMUNITY, of mutual interdependence, suffuses every aspect of life in Xcobenhaltun. I detected a feeling of kinship, perhaps even of love, among the members of the village. When I arrived, a group of men were trying to saw planks from a thick log. Someone needed a new door for his hut. They took turns with a handsaw, and there was much advice, many jokes, and easy laughter.

Because corn is soaked in water and lime, making it easier to grind into meal, that mineral ranks as a staple of Maya life. Together the villagers heat chunks of limestone

to pulverize them. At the edge of Xcobenhaltun—like a blinding snowdrift in the parched forest—a great mound of lime stands available to all comers.

Still, most modern Maya exist on the ragged edge of want. In the Guatemalan town of Huehuetenango, I met a U. S. Maryknoll missionary, Brother Felix Fournier, who recounted a poignant story. Brother Felix works in isolated villages of the Maya highlands—villages much like Xcobenhaltun. He told me: “These people lack medical attention, and the average annual cash income of a family is less than \$300. Of course, they grow



MERCHANT GOD MAKING FIRE. MADRID CODES

Forefathers' know-how guides a farmer near Lake Atitlán in highland Guatemala as he waters his bean field from an irrigation ditch. Long ago, Maya agriculturists perfected sophisticated techniques with only hand labor and stone tools. They built raised fields above swampland, constructed terraces, and dammed waterways.

On a dry April day in Yucatán's lowlands, Mario Antonio Raigosa has set a match to brush near Maní to clear land by the ancient slash-and-burn method. Ancestors laboriously created fire with a wooden drill (left).

Religion still coincides with wise agronomy; if weeds are allowed to grow, Maya believe, the souls of the corn plants will move to cleaner fields.



much of their own food, but protein is always scarce. Maybe once a week a family will buy a few ounces of meat and cook it in a soup so that everyone can obtain some benefit."

A few days earlier, Brother Felix had been in a village, and an Indian asked, "Why is it that you Americans are so much bigger and stronger than we, and you never get sick?"

"But we do get sick," said Brother Felix. "Look at me now. I have a brutal cold."

"What is a cold? No American ever gets seriously ill. No American ever dies."

"Of course we do!"

"I've seen many Americans. Some live here. But not one has ever died."

"I will die. My father is dead already."

The Indian smiled with a sad wisdom. "No," he said, shaking his head, "it is well known that Americans do not die."

**I**N THE GREAT EPOCH of Maya civilization, tillers of the soil—the peasant population—supported the entire superstructure of society. To gain some insight into the Maya social order, I called upon Professor Alfredo Barrera Vásquez of the Yucatán Institute of Anthropology and History.

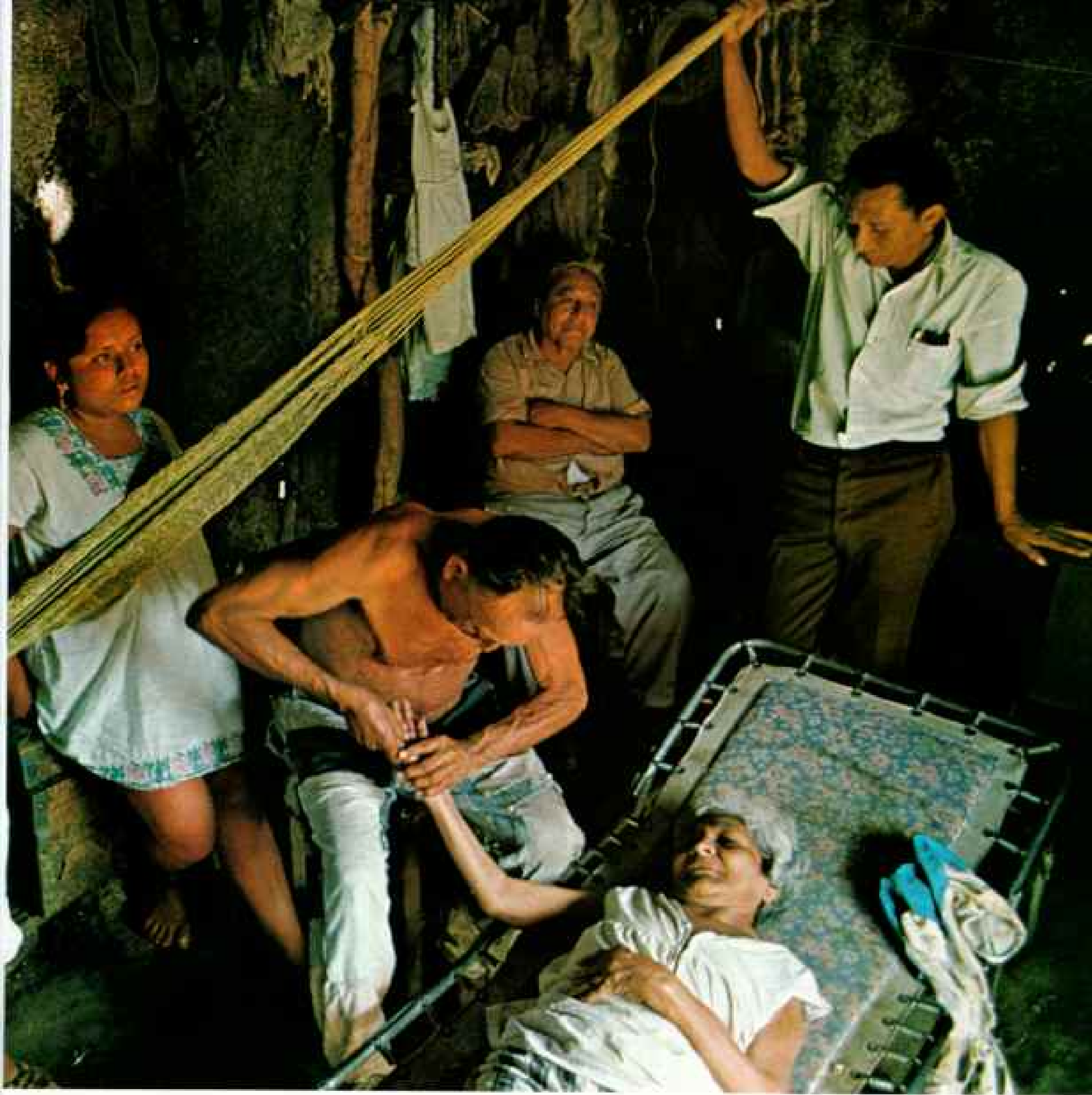
A white-haired man with a swift smile, Professor Barrera received me at a desk in the Biblioteca Central—a huge, high-ceilinged room lined with old books. The library opened, through great double doors, directly onto the street in downtown Mérida.

"Among the ancient Maya," Professor Barrera said, "there was a profound cultural dichotomy. On the one hand, you found the elite—a small group of priests and chiefs charged with preserving knowledge. They understood astronomy, architecture, engineering, art. They alone knew how to plan the building of the great monuments. They alone knew the meaning of everything in the temples. They could predict eclipses and cast horoscopes. They could decipher the history carved on the stelae and add to it. In return, they led splendid lives.

"Luxury items like jade, feathers, and jaguar pelts were reserved for their exclusive use. It was the function of the rest of the population to provide these luxuries for the lords, as well as to meet all their everyday needs. So the commoners farmed, cut wood, hunted, and then bore the fruits of their labors to the ceremonial centers. When the elite traveled, it was even the duty of the people to carry them in litters on their shoulders.



Doing battle with pain, folk healer Juventino Pérez of Maní, Yucatán, treats a victim of rheumatism with massage and secret chants. Among the ancient Maya, healers belonged to a hierarchy of priests and astrologers. Of the old elite, only the healer remains, still respected, still sought after. This woman came 85 miles from Campeche to see Pérez, whose son, standing, is an apprentice. Other patients wait. His *santún*, a glass sphere, assists the healer in diagnosing a young woman's problems (right). Has she offended the gods? A relative? Violated a taboo? He will prescribe herbs or exorcise evil spirits.





"When a baby was born, the parents took the child to a priest who, with the aid of star charts and books, would predict its future. Each day, each moment was governed by a different god; depending upon the exact time of birth, a child would owe a lifetime of devotion to the ascendant deity.

"In his lifetime a Maya bore three names. Say he was born on the date 7 Ahau of the Maya calendar. His name until puberty would be simply Seven Ahau. When he was initiated into manhood, he would assume a new name that reflected some personal feature. Say he was short. Then he would be known as Tzap, or Short One. Not until he married did he assume his formal name. Supposing his mother came of the Poot family and his father was an Uuc, his adult name would be Na-Poot Uuc, literally an Uuc born of a mother [Na] named Poot.

"An ultimate refinement was also possible. The name of a man's profession, or some noteworthy characteristic, might replace his mother's name. If our hypothetical child had proved very courageous in battle, he might have been known as Ah Dzik Uuc, or the Uuc Brave One."

Professor Barrera now directs a staff of 12 in preparing a definitive dictionary of the Maya language. This work, which includes collating all entries from all previously published dictionaries plus adding modern vocabulary, will consume almost two years.

"I myself," the professor said, "have been bilingual since early childhood. I had a Maya nurse, you see."

"If you could go back to a Maya city of the Classic Period," I asked, "would you understand them and could they understand you?"

"All languages change," he said. "I think present-day Maya relates clearly to the language spoken at the time of the conquest. If you study the modern language scientifically, you can deduce the older forms. But I repeat, languages change. In our new Maya dictionary you will even find words like 'strike' and 'ball.' Baseball is a passion in Yucatán, and the American vocabulary of the game has passed into Maya."

**T**HE YUCATEC OBSESSION with baseball merely echoes an ancient enthusiasm. Virtually every Middle American ruin contains at least one court where teams played a ball game that is still not perfectly understood. In the Mexican



PRINCETON ART MUSEUM, 6 1/4 INCHES HIGH

Man disguised as a god? Perhaps. Priests often portrayed deities they revered. Here large round ears, snaggle-toothed smile, and shield suggest the aged jaguar god, a lord of the night and god of the underworld.

Noble ballplayer, wearing hip padding for safety (facing page), takes an everlasting time-out from the fast-moving Middle American game (pages 810-11). Prominent nose represents the Maya ideal of beauty in the eighth century, when thousands of these charming painted pottery figures were placed in graves on Jaina Island, off Yucatán. Vividly portraying costumes, customs, and even personalities, they rank among the finest works of New World art.

BURTON-WILLIAMS-PROCTOR INSTITUTE, UTICA, NEW YORK; 6 1/8 INCHES. BOTH PHOTOGRAPHS BY OTIS JOHNSON



version, two stone rings protrude from opposite walls and, apparently, the teams scored by putting a rubber ball through one of the rings. This must have been a fiendish enterprise: paintings on vases imply that the players could hit the heavy ball only with hips and buttocks (painting, page 810). Possibly, penalty points also resulted when the ball touched the ground.

In any case, the ball game was a serious matter with deep religious connotations—so deep that losers were often sacrificed. Its antiquity is attested by the fact that archeologists have discovered three ball courts in Chiapas that date from the sixth century B.C.

Human sacrifice, as we know, constituted a vital element of Maya ritual. Through the centuries, a cenote at Chichén Itzá has grown fabled as the site where, presumably, harsh-faced priests cast lovely virgins into the deep waters to appease the gods.

**H**ALF A CENTURY AGO, a journey from Mérida to Chichén Itzá involved a slow train, a tedious ride on mules, and ended with a hammock slung among the ruins. Now you drive there in two hours, and luxury hotels compete for your patronage.

Chichén Itzá is a kind of dual ruin. Maya buildings of great beauty crumble quietly on one side of the highway; on the other stands the gray architecture of the Toltecs—a warlike people from Mexico—who ruled in Chichén Itzá after the Maya collapse.

On a fiercely hot day, I walked the length of a 325-yard causeway leading from the Toltec sector to the most famous of Yucatán's cenotes. These sinkholes in the limestone that underlies the entire peninsula provided the ancient Yucatec Maya with virtually their sole source of water.

By two o'clock in the afternoon the last of the clamorous tour groups has adjourned for lunch. A sunny tranquillity enfolds the Well of Sacrifice. Swallows and butterflies dart and

flutter above the opaque green water. Small blind fish from the underground streams that feed the cenote wriggle just below the surface. A majestic egret suns himself on a clump of floating twigs. Halfway up the side two gorgeous birds—blue-green motmots—do territorial battle for a limestone ledge.

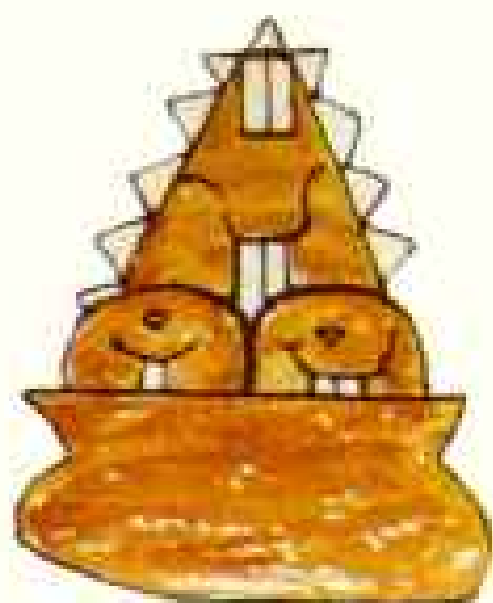
Silence. Serenity. I stand on the ruins of a small temple on the south edge of the cenote and regard, 70 feet below, the murky jade of this well sacred to Chac.

**T**HE ROMANTIC FICTION of sacrificed virgins is just that. People did die here, but—except for children—not necessarily as offerings. Rather, in the early morning they were thrown into the cenote. If one survived until noon, he was rescued. Since he had visited the god, he was expected to prophesy about rainfall in the impending year.

In 1904 Edward H. Thompson, U.S. Consul in Mérida, began to dredge the cenote. Through several years, he brought up thousands of artifacts and a jumble of skeletons.

Later, Dr. Earnest Hooton of Harvard reported on these human remains: "Three of the eight ladies who fell or were pushed into the cenote had received, at some previous time, good bangs on various parts of the head, as evinced by old, healed and depressed circular lesions; and one female had suffered a fracture of the nose. One woman also had platybasia, a condition in which the skull base is pushed up into the cranial cavity. Two of the men had received head wounds which left depressed lesions. Altogether, it is suggested that the adult denizens of the Sacred Cenote may not have been generally beloved in their presacrificial careers."

Once, at this cenote, a bystander rose to kingship. A Maya chronicle testifies that in a certain year all those thrown into the cenote drowned. But a nobody named Hunac Ceel Cauich dived into the well and emerged "to declare the  
(Continued on page 755)



**Giving thanks in the old-time way**, women dedicate a part of the corn harvest to the Christian God, as they once did to Maya deities. But times have changed, as in this Protestant service in Mexico's southern highlands. Women attend, though seated apart from men; in pre-Columbian days they were generally banned from religious rites. These Protestant converts reject the old gods and the drinking that still accompanies Maya festivals.

During colonial times, there were brutal confrontations between Christian and Maya beliefs. Spaniards smashed idols, burned sacred books. But after four centuries of Christianity, Indians still cling to ancestral traditions.

BOWL FILLED WITH BERN GUPPWE, MADRID-CODER, SWISS BRILL, PACIFIC PINE



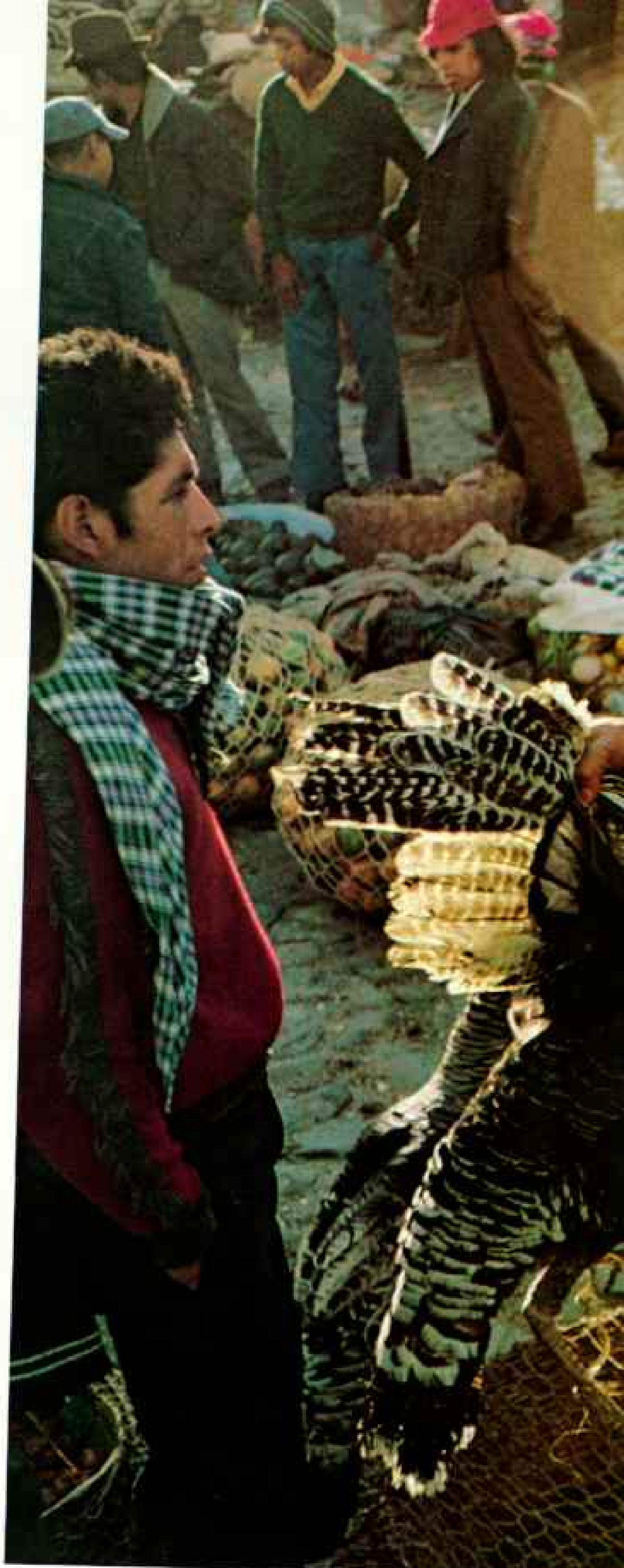
Lively hub of a trade network preserved since antiquity, the Friday market at Sololá, in Guatemala, draws Indians from remote hamlets of highlands and lowlands. Farmers-become-merchants, they trudge with traditional net bags swinging from tumplines around their foreheads. Many travel at night in order to be open for business at dawn. Within the packs ride products that have gone to market since pre-Columbian times: tomatoes, avocados, sweet potatoes, high-backed sandals, and small turkeys.

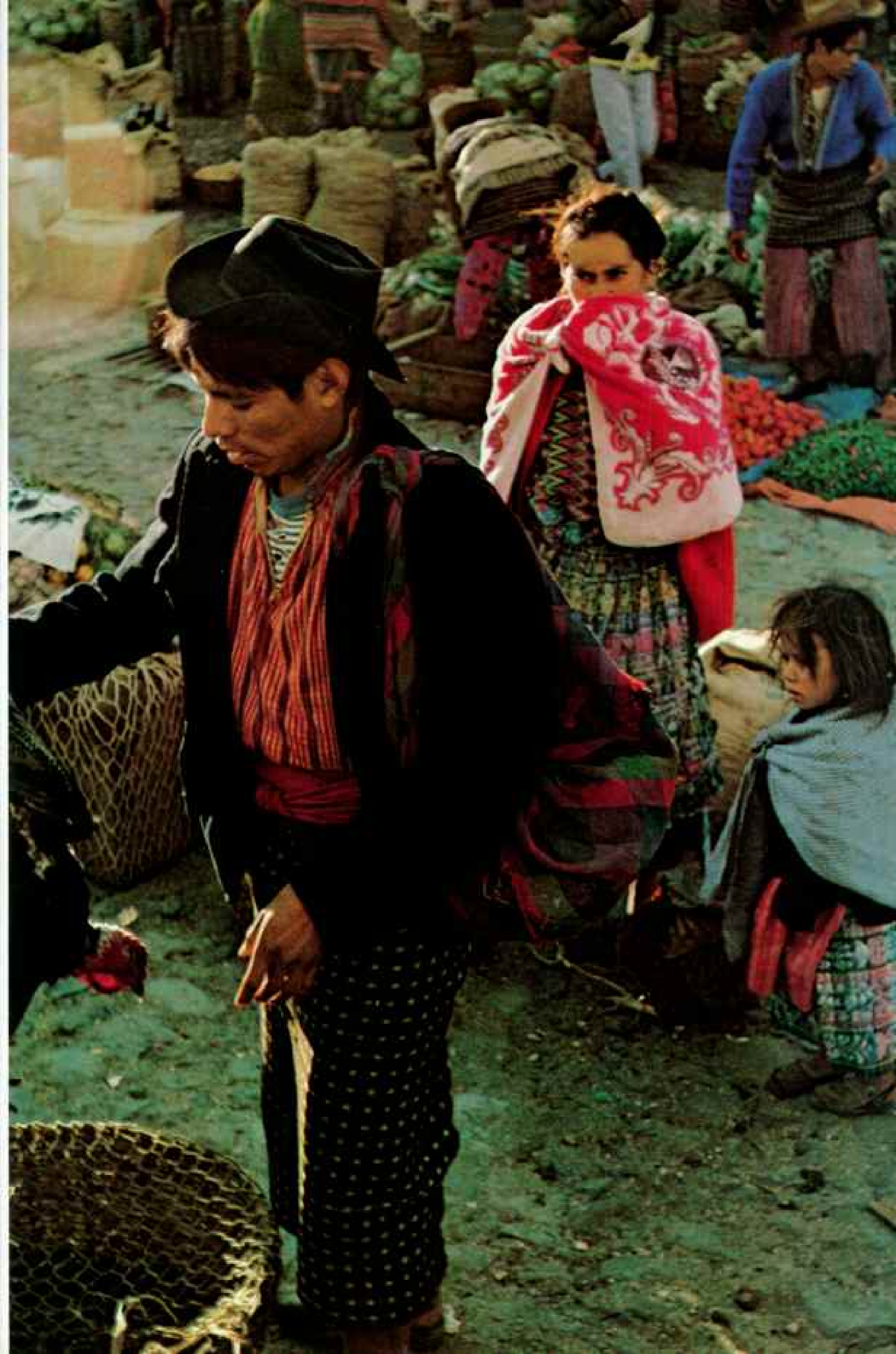
Shoppers bargain for goods that may have come fifty miles and have a hundred yet to go. Vendors from other large towns buy in bulk for resale at home.

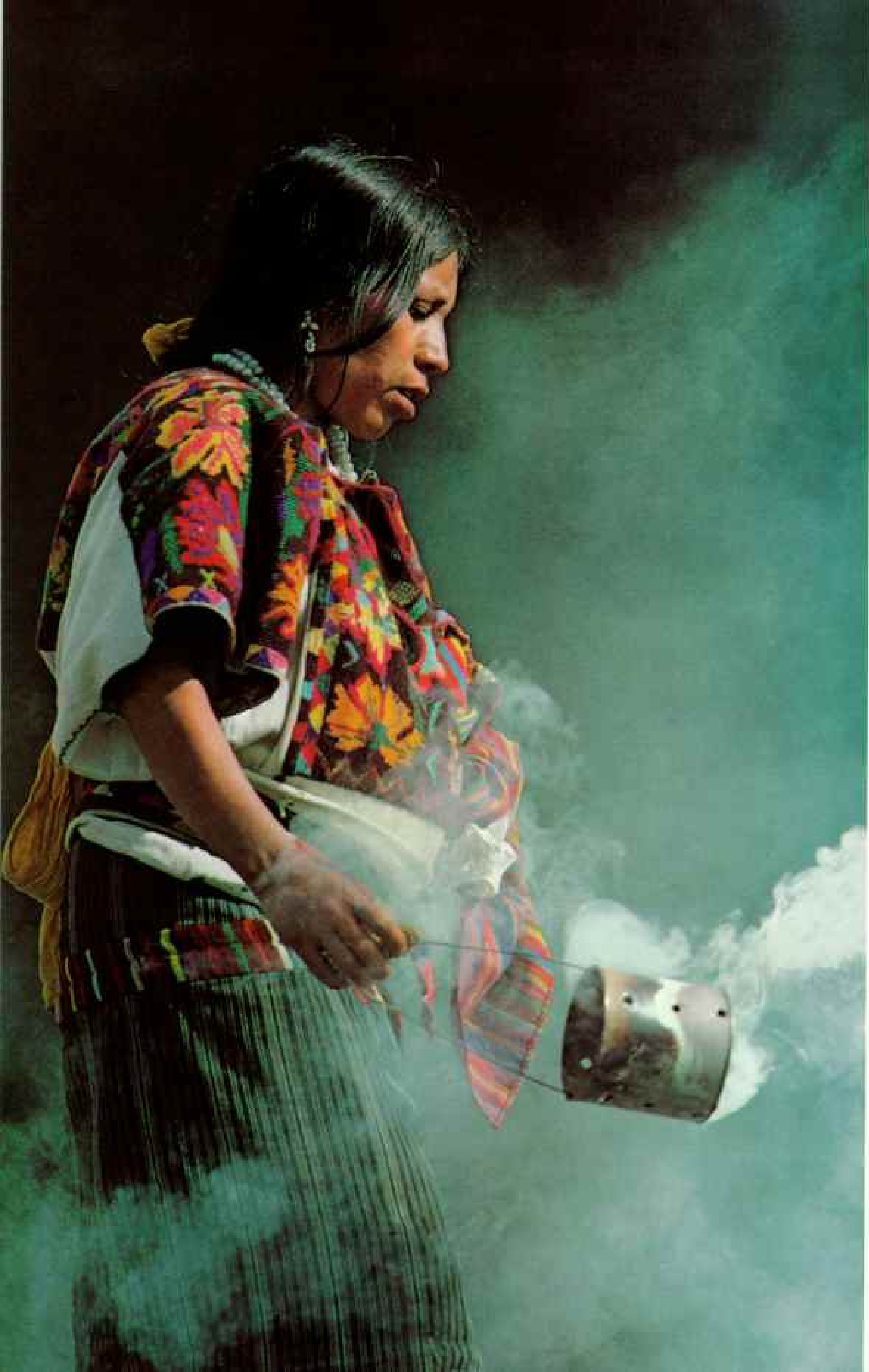
Some farmers have formed cooperatives to purchase trucks and speed produce day and night to different markets along the Pan American Highway, the new trade route of the highland Maya.



DCELLAND TURKEY, LEFT, AND FIRE VULTURE MAY REPRESENT TWO TRIBES LOCKED IN COMBAT, MADRID CODES







(Continued from page 750) prophecy. . . . Then he was set in the seat of the rulers."

This event occurred in the tormented, decadent centuries following the Classic Maya collapse. Hunac Ceel Cauich ruled in Mayapán, a walled, shoddy city built after the fall of Toltec Chichén Itzá. Mayapán survived until about 1450. In this Postclassic age the burgeoning civilizations of central Mexico strongly influenced the remaining Maya—yet their flickering culture persisted. When the Spaniards arrived early in the 16th century, they found Maya cities such as Tulum flourishing on Yucatán's eastern coast.

**I**N THE WOODED HILLS of the Mexican state of Chiapas, once the westernmost march of the Maya, brood the haunting ruins of Palenque. Archeologists have freed perhaps two dozen structures from the green grasp of the forest, but this represents a scant beginning (pages 730-31); Palenque's temples and pyramids stretch for seven miles along a wooded ridge. What secrets do the trees shield, the earth cradle? No one can guess, and archeologists can only dream. But the tiny segment of Palenque excavated to date has already revealed art treasures unequaled in Middle America.

At Palenque I met Merle Greene Robertson. White-haired, incredibly energetic, Mrs. Robertson has spent 13 years copying and recording Maya art. She has made rubbings of 600 monuments at 50 sites for Tulane University. She worked at Tikal, and is now in her third year of recording the stucco images at Palenque. I asked Mrs. Robertson, steeped as she is in Maya art, what she regards as its salient characteristics.

"Well, first, it reflects its environment. The Maya lived in the jungle, and in their art you find an endless variety of plants and animals. Not long ago a herpetologist was looking at some stuccos, and he identified several species of snakes, each accurately portrayed.

"Then the buildings of Palenque—with their large openings—bring the outside in. The Maya were the summation of their environment.

"As far as technique is concerned, they

were fantastic. For example, stucco figures were put on naked, and then clothing was added layer upon layer. Now stucco is simply plaster, and it dries rapidly. But the Maya added a bark extract and other substances to it that kept it malleable for a long period of time, permitting them to fashion incredible detail. But the secret is lost. No modern artist could duplicate these Maya works of art."

**M**OST VISITORS who come to Palenque do so to visit the somber, awesome tomb of Pacal, who ruled the city-state from A.D. 615 to 683. On a bright June morning I followed their example and arrived among the ruins at 6:30 a.m. At that hour the air soothes with the accumulated coolness of the night, shadows stretch across the grassy plazas, and the heightening sun warms the buildings as it has for almost a millennium and a half—an old friend, indeed an old god, paying his daily visit.

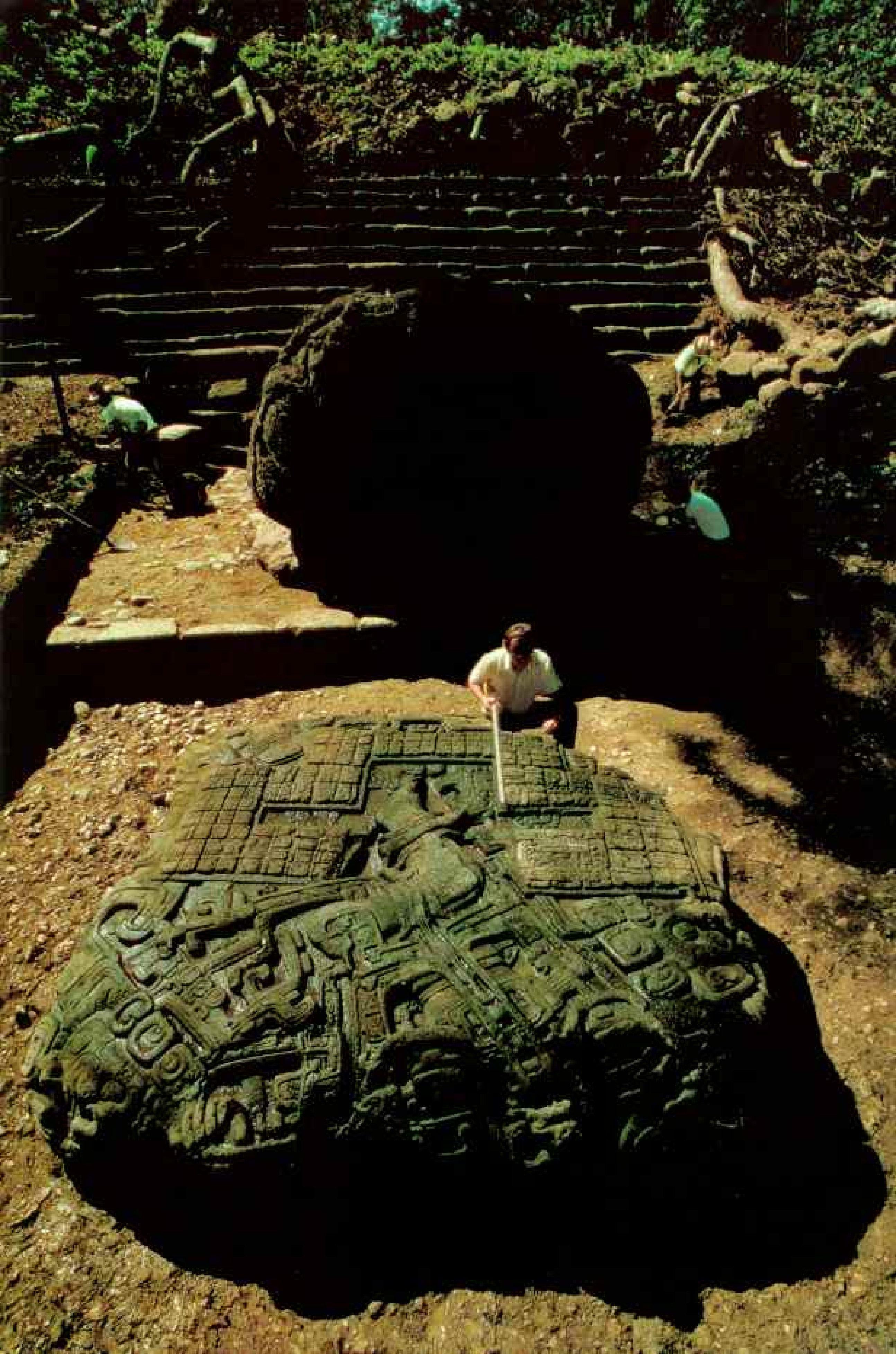
You clamber up steep steps of the Temple of the Inscriptions—Pacal's tomb—feeling the flood of sunshine on your back. At the top, high above the plaza, you pause for breath and gaze out across the green countryside; to ancient eyes, that broad vista might have seemed a world. Turning away and entering the temple proper, you pass a glyph-covered wall—no one can fully read its messages.

At this very spot, in 1949, Dr. Alberto Ruz Lhuillier—then in charge of the excavations at Palenque—noticed round holes in a slab set into the floor. Raising it, he found that it led to a secret passage clogged with rubble and earth. Four years were required to clear the passage, which descended into the heart of the pyramid. At the bottom Dr. Ruz found a chamber with five skeletons. Removing a triangular slab from a side wall, the archeologist shone his flashlight into a large vault. Shadowy stucco figures with elaborate feather headdresses stood solemnly along the walls and, almost filling the center, he saw a huge sarcophagus. Dr. Ruz had discovered the most elaborate pyramid tomb in the New World.

With Merle Greene Robertson and Professor David Kelley, an expert on glyphs from Canada's

(Continued on page 760)

**When the world was young, the Maya burned precious incense to nourish the gods of creation. "Food for the gods," a bittersweet resin called copal is still served to divinity, this time by a Quiché Maya who swings her censer as she enters the Church of Santo Tomás at Chichicastenango in the Guatemala highlands.**



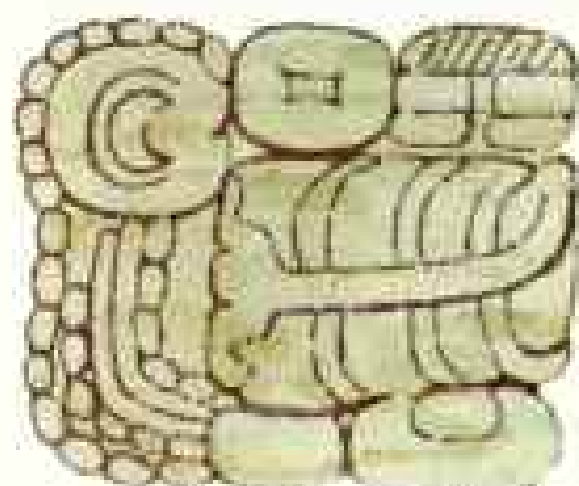
## Quiriguá's sculptures: sermons in stone

**O**NE-MAN RULE... marriages of convenience... struggles with usurpers... self-aggrandizement. Faces and inscriptions record the power politics of eighth-century Guatemala. According to recent interpretations of hieroglyphs here, a newcomer from nearby Copán named Two-Armed Sky assumed power, probably married into a local dynasty, and erected huge carved stones to his own glory. His name comes from a literal reading of his personal identification glyph.

The 42-year-old ruler stares serenely from a 20-foot sandstone stela raised in 766 (right). Ann Coe, wife of University of Pennsylvania archeologist William R. Coe, cleans moss from the carved feathers of a towering headdress of god masks.

The successor of Two-Armed Sky immortalized himself with a huge boulder (left). Below the panel of glyphs, an abstract dancer holds writhing serpents in "one of the most complicated sculptures in the Maya world," according to Dr. Coe. He is restoring the site in a five-year program sponsored by the University Museum, the National Geographic Society, and the Guatemalan Government.

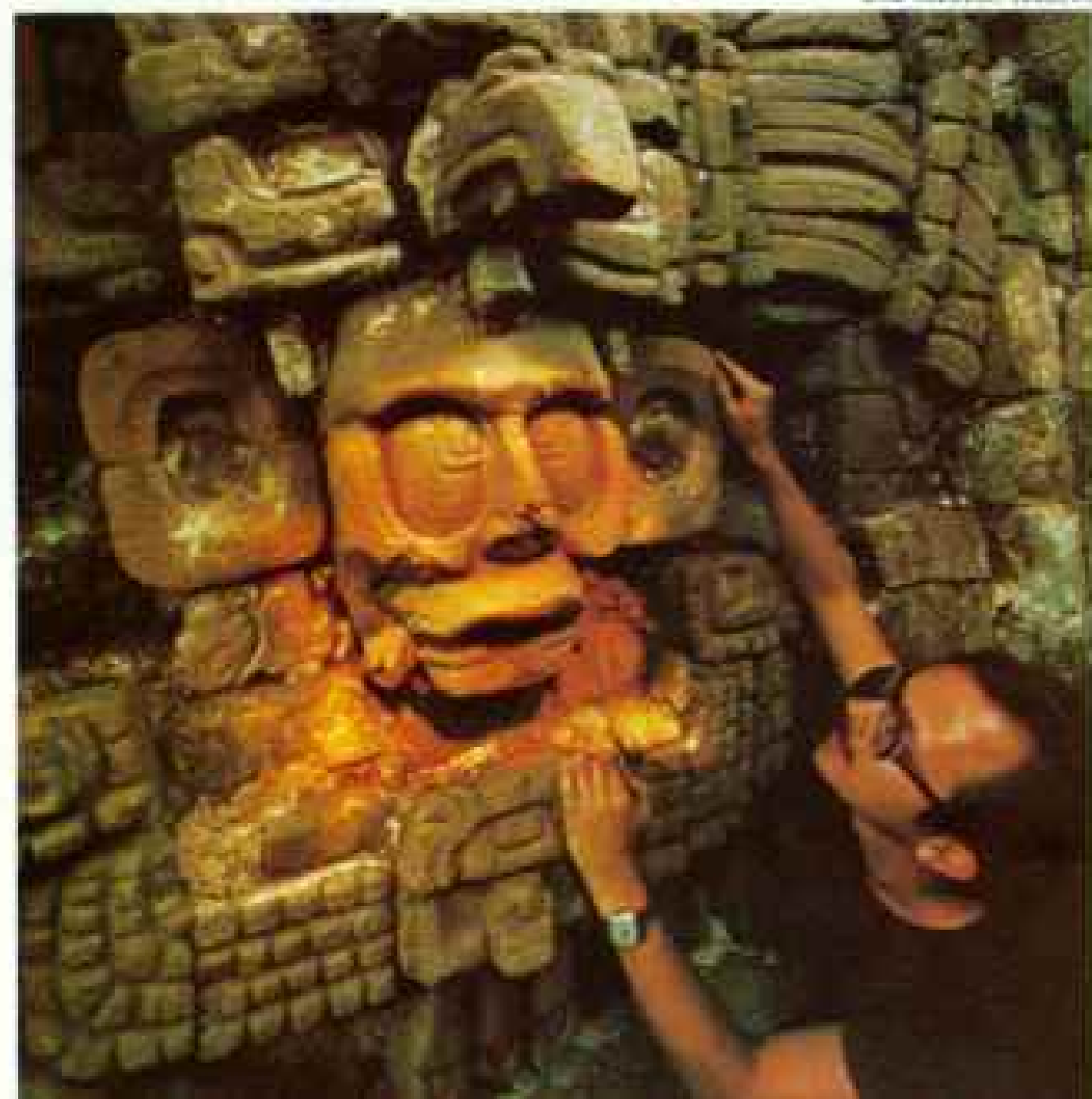
Crossed eyes (right) identify a sun-god found by Dr. Coe. Archeologist David Sedat checks giant earplugs and necklace.



CROSSED EYES GLYPH FOR QUIRIGUÁ



OTTO LINDBERGH (CROSSLING)







Living face and countenance of stone share the strength of a common heritage. The Oriental cast of their features bespeaks the Asian forebears of all American Indians. At Copán in Honduras, a bearded ruler (right) still flushes red with paint that once covered his stela, erected in 782. Leaders

may have held the allegiance of their people by granting prestigious ceremonial tasks. A system of rotating religious duties prevails today in the highlands, home of this straw-hatted Guatemalan elder of San Juan Atitán (above). Men win honor by doing voluntary service.



(Continued from page 755) Calgary University, I descended the stairway found by Ruz. The limestone passage glistened moistly. You go down, steeply and deeply, through a series of brilliantly engineered corbeled vaults. The awesome passage drops away before you like the nave of a cathedral plunging into the depths.

Ordinarily, the tomb of Pacal is barred. But this day I was accompanying Mrs. Robertson and Professor Kelley as they studied the rectangular slab above the sarcophagus (facing page). The complexities of the inscription enthralled them for hours, permitting me to stand quietly and contemplate this wonder of pre-Columbian art.

**W**HAT IMPRESSES YOU when you enter the tomb of mighty Pacal? The silence. The void that comes when time, too, dies. For 1,300 years Pacal had reposed here in absolute silence, in total darkness. He lies here still. And though the world has found him, the vault—lost to sunlight and starlight, to solstice or equinox—seals this dead king into a bleak eternity.

We crawled under the great slab and Mrs. Robertson loosened stone pegs in the coffin lid. While she shone a flashlight through one hole, I peered through the other. The interior glowed red with cinnabar—color of the east, where the sun is reborn each day, and where man too can hope for rebirth—and I could discern fragments of a dark skeletal foot.

Mrs. Robertson and Dr. Kelley mounted the great carved slab in their stocking feet to examine the glyphs and the various portraits

under a strong light. The central figure, of course, is Pacal himself. One interpretation holds that the slab depicts his assumption among the gods after his illustrious earthly career. He lies in a curious posture and his right foot is clubbed. As the two scholars concentrated on his other foot, they noted a slip of the artist's chisel on the big toe. After close study, Dr. Kelley cried, "No, it's not a mistake! That's a split toe, a congenital defect. I have it myself."

He peeled off a sock and, comparing his toe with Pacal's, verified that indeed they suffered from the identical split. The sculptor had not erred—a towering testimony to the verisimilitude of Maya art.

From evidence in the tomb, portraits of other rulers of Palenque, and inscriptions, scholars are fashioning a genealogy of the dynasty that produced Pacal and raised the city to greatness. The period ranges from A.D. 501 to 783, and offers several surprises. Unlike other Middle American peoples, the Maya accorded importance to women. Two queens had ruled in Palenque: the Lady Kan Ik, who reigned from 583 to 604, and the Lady Zac Kuk, probably the mother of Pacal, who occupied the throne from 612 to 615.

Two portraits of Pacal depict him with a club foot. And Merle Robertson's study of the stucco images convinces her that the dynasty suffered from an unusual incidence of deformities. She suspects that this resulted from repeated inbreeding within the royal family. Pacal, at least, seems to have married his sister, Lady Ahpo Hel. Similar practices prevailed among the Mixtecs of southern Mexico

760



Frozen in a perpetual fall, Pacal, the great ruler of Palenque, drops at the instant of death into the jaws of an underworld monster, just as the sun sinks each day in the west. This interpretation holds that, again like the sun, he will ascend into the heavens, thus fulfilling a cosmic cycle. This exquisite bas-relief is carved on a 12-foot sarcophagus lid of limestone. The cross behind the ruler represents the sacred *ceiba* tree with roots in hell, trunk in life, and branches in the heavens, where a celestial bird perches.

Pacal died in A.D. 683. The five-ton lid remained hidden until 1952, when a Mexican archeologist reached the crypt under the Temple of the Inscriptions (left).

DRAWING BY RICHARD SCALCH  
PHOTOGRAPH BY MERLE GREENE ROBERTSON AND LEE HOCKER





Striding through a cloud-haunted sky, Lord Sun illuminates Uxmal before dropping into the underworld of night. Ancient planners apparently positioned buildings with the

and also, curiously enough, among the dynasties of Egypt.

Bluntly, in the Temple of the Inscriptions, one cannot avoid an implicit comparison to the crypts of the Egyptian pharaohs. The similarities between the tomb of Pacal and of those who ruled earlier beside the Nile are striking. In each instance pyramids rise above the burial sites and the builders took elaborate precautions to conceal the entries; inside the tombs grave goods accompanied the corpse into the afterlife; the sarcophagus top bore the likeness of the dead king.

Yet, Egyptian pyramid tombs—with their detailed reliefs depicting virtually every phase of daily life—remain exquisitely decorated passageways to eternity. In contrast, the burial vault of Pacal seems at once more austere and more barbarous. Five youthful victims had been slaughtered outside his door to serve him in the hereafter. His pyramid speaks of savage grandeur.

**A**LL ITS SPLENDOR could not save the city of Palenque. It died abruptly at the outset of the ninth century A.D. The same fate soon overtook the other city-states in the center of the Maya world. The

convulsion began on the frontiers and traveled inward. Within a few generations, Classic Maya civilization lay supine. Peasants were building cooking fires in abandoned temples; once-great ceremonial centers lay empty and desolate.

Most Mayanists advance uncertain theories for the sudden collapse of the Classic culture. A failure of trade, overtaxing of agricultural means, earthquakes, hurricanes, invasion are cited. So is disease, and medical evidence indicates that as the Classic Age waned, the Maya shrank in stature as they fell prey to malnutrition.

Sir Eric Thompson has written that peasant revolt played a key role in the collapse. Professor Alfredo Barrera Vásquez agrees.

"The Maya collapse," he said, "is a clear-cut matter for me. That cultural dichotomy of the Maya—the gap between the elite and the peasantry—grew wider with the passage of time.

"At a certain point the ever-increasing demands of the aristocracy became unbearable. The people rebelled. Their only weapon was their overwhelming numbers. They probably strangled most of the overlords with their bare hands. Some of the rulers, of course,



help of astronomy and heavenly powers. The Pyramid of the Magician, right, and the Nunnery Quadrangle, center, align with the sun's path at setting on the summer solstice.

escaped. These may have returned with new allies, the Toltecs, a few years later to reconquer parts of their former domains."

The Classic Period ended in chaos, but its final years saw a certain sunset glory. Nowhere is it more manifest than at Uxmal, 45 miles southwest of Mérida. The name in Maya means "thrice built," and implies that Uxmal survived more than one catastrophe. A chronicle reports that "during the Katun 2 Ahau [probably A.D. 987 to 1007] Ah Zuytok Tutul Xiu took up residence at Uxmal." The Xiu family, of Mexican origin, soon became completely Mayanized and ruled in the city from approximately A.D. 1000 until the eve of the Spanish conquest.

The architecture of Uxmal, with its facades of golden limestone, represents the full, glowing splendor of Maya artistic achievement (above). One 320-foot-long building, called by the conquering Spaniards the Governor's Palace, has been hailed as the most beautiful edifice in pre-Columbian America. After spending a long afternoon watching the play of light and shadow on its frieze, composed of 20,000 intricately decorated blocks carved with implements of stone, I see no reason to retain the modifier "pre-Columbian."

In February of this year, Elizabeth II, Queen of England, paid a state visit to Yucatán. One event in the royal schedule excited much comment. More than a thousand notables gathered for a gala outdoor reception among the ruins of Uxmal on the night of February 27. The local authorities offered a program of Mexican folkloric songs and dances for the royal delectation. Among the presentations was an ancient invocation to the Maya rain god, Chac. Although rain is all but unknown in Yucatán in the month of February, Chac obliged by dousing the assemblage with a generous downpour.

**A**T THE QUEEN'S TABLE that evening sat a retired schoolmaster named José Xiu. He is descended from Ah Zuytok Tutul Xiu, and once his ancestors ruled at Uxmal.

José Xiu lives on a street without a name in the town of Oxkutzcab. I found him in his house, an old man with white hair and a face that could have come from a Maya stela. He said, "The last Maya ruler of this area was my ancestor, Tutul Xiu. The priests had foretold that soon white men with beards would arrive from the ocean and become new

Memory has fled for many families in the Mexican highlands, who know no allegiance to Maya life or lore after centuries of buffeting by outside influence. When the handful of conquistadors won the highlands by playing on hatreds among Maya tribes, land and people were divided among the victors. Thereafter, many Indians adopted the Europeans' clothing, religion, and language. Those who moved into towns became Ladinos. Today Indians still remaining on ancestral lands are regaining ownership under a Mexican Government program.

The pet of this rural family speaks to us of the Maya past, when dogs were raised as sacrificial offerings and ceremonial food.



SINGING GOD PLAYS A GOURD DRUM AT A NEW YEAR'S RITE.  
MACHO CODES, DAVID BRILL, RIGHT



gods. So when the Spaniards arrived, Tutul Xiu offered no resistance. Because they believed the prophecies of the priests, the Maya of this region willingly accepted the conquest. In fact, when Tutul Xiu was baptized, the conquistador of the Yucatán, Francisco de Montejo, was his godfather."

Does José Xiu visit Uxmal often? "Yes," he nodded gravely, "and the other ruins as well. When I see them, I am very proud to be a Maya. I am continually surprised to see what my people did—achievements that even modern technology cannot match.

"But we Maya do not look only to the past. Education is changing our lives. Today we

are chemists, physicists, artists. We will be as great in the future as we were in the past."

When I left, Señor Xiu returned to his work—a peculiarly Maya undertaking. He was preparing an article for the newspaper, *Diario de Yucatán*, on the names of stars.

**A**MONG THE MAYA, even the memory of greatness died with the Spanish conquest. Some, like the Xiu, capitulated without a struggle. Others fought doggedly and well. In at least one case, a Spanish renegade guided the Maya to key victories over his former compatriots, and apparently he did it for love of a woman.



Along with a number of other Spaniards, Gonzalo Guerrero and Gerónimo de Aguilar fell into the hands of the Maya in Yucatán in 1511. All but these two died or fell victim to the sacrificial knife. Both men survived as slaves, and they soon managed to attain positions of prominence and trust. In 1519 the conqueror of Mexico, Hernán Cortés, landed at Cozumel Island off the east coast of Yucatán, and sent a message to his two captive countrymen.

Only Aguilar responded. When he reached Cortés, he reported that his erstwhile companion, Guerrero, "was with the cacique of Chetumal and married an important lady of

that land by whom he has children. He is captain for a cacique named Nachancam and on account of having won many victories against the enemies of his lords he is greatly beloved and esteemed. . . . He did not come . . . because he has his nostrils, lips, and ears pierced and his face painted and his hands tattooed according to the custom of that country. . . . Indeed, I believe he failed to come on account of the vice he had committed with the woman and his love for his children."

Chroniclers later reported that Guerrero masterminded many a Maya victory. According to a Spanish official report, he died in action in 1536: "During the combat which





had taken place... a Christian Spaniard named Gonzalo... had been killed... He is the one who lived among the Indians of the province of Yucatán for 20 years or more, and in addition is the one whom they say brought to ruin the Adelantado Montejo... he came with a fleet of 50 canoes... to destroy those of us who were here... This Spaniard who was killed was nude, his body decorated, and he wore Indian dress..."

But not all the gallantry of Gonzalo and the Maya remnant could stem the tide of history. The banner of Spain rose everywhere in Middle America; friars razed the ancient temples, smashed the idols, burned the books.

**N**OW, ONLY THE RUINS REMAIN. But they possess a power of their own—an immortality compounded of stone, silence, and solitude. On June 21, the date of the summer solstice, I went to the Caracol at Chichén Itzá, an astronomical observatory (left), just before sunset.

Night comes softly in Yucatán at that time of year. A pastel sunset briefly splashes the western horizon. In the darkening sky appears the evening star, Venus—a votive lamp to the dead sun. So highly did the ancient Maya priest-astronomers regard Venus that they made it a god.

Night brings a merciful quiet to the highway that bisects Chichén Itzá. In the east the moon rises, a round radiance of platinum. Somewhere a hidden bird, the tapacamino, sounds his anguished call. In the lambent moonlight the deserted ruins loom pale and lovely and sad.

How many nights did the priest-astronomers pass here in the high, lonely silence? How many nights illumined only by the heavenly bodies whose passage governed their own fate and that of their people? How many nights observing, recording, computing?

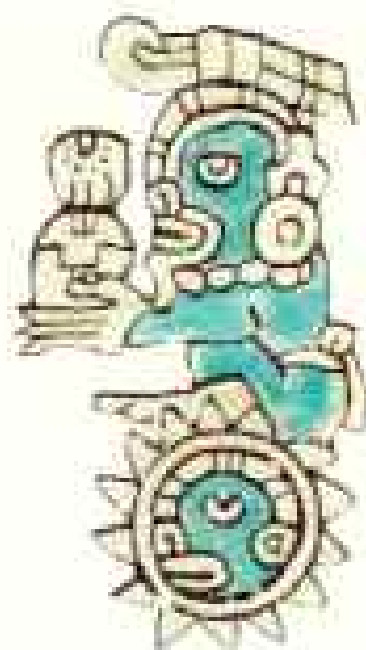
All gone now. Overhead the constellations still wheel in their changeless patterns. But new men in new countries with new instruments now track their progress. Chichén Itzá lies empty in the silver moonlight; the jaguar's roar resounds through the deserted temples of Tikal and Yaxchilán; the demons of Copán direct their sculptured shrieks at history, but history has discarded them.

The Maya, Children of Time, knew this too would happen. Long ago one of their prophets wrote: "All moons, all years, all days, all winds, take their course and pass away."

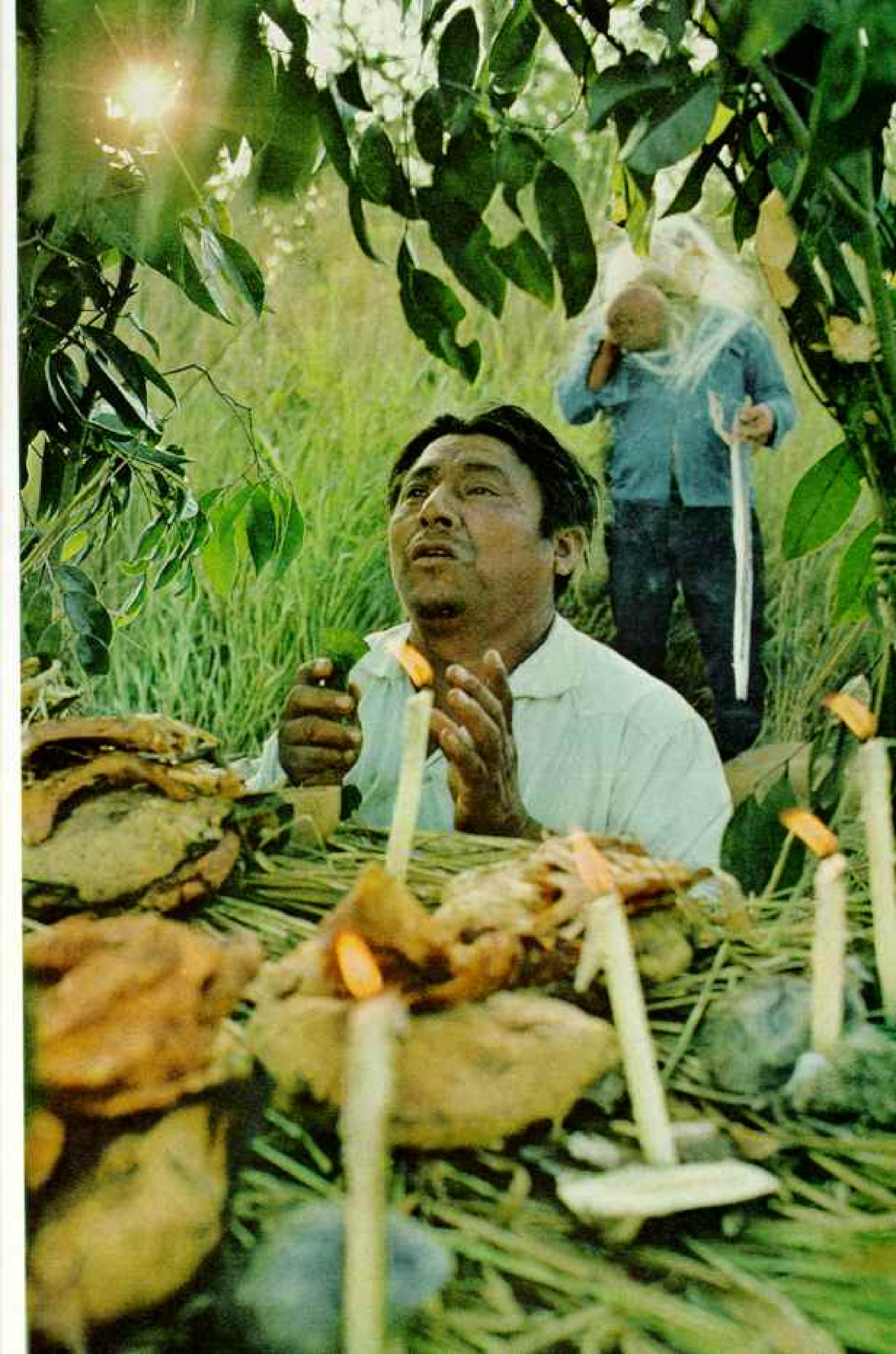


Sky-watchers of antiquity charted the heavens from this observatory at Chichén Itzá. With the data, priests selected auspicious days for planting and harvest, warned of eclipses, and directed sacrifices. During a recent dry spell, a folk healer conducted a rite to the

Chacs, or rain gods, at Chichén Itzá (facing page). Domingo Cen Balam, whose last name means "jaguar," places food offerings on an altar. Wiggled in sisal, a friend blowing on a gourd portrays a rain god. The men share the chicken, bread, and drink after the deities have feasted on the spirit of the sacrifice.



NORTH STAR NOW HOLDS A CORN ELSA AND ANOTHER THAT TOGETHER INDICATE EQUINOXES, WAGNER COOK





## THE MAYA *Riddle of*

By GEORGE E. STUART, Ph.D. STAFF ARCHEOLOGIST

**M**URDER and Maya hieroglyphs make an unlikely combination, but the two came together one evening several years ago, deep in the rain forest of northern Guatemala. It happened at La Naya, soon after Scotsman Ian Graham and his party had arrived to draw and photograph inscriptions that had been reported at the remote ruin. They found much more than they bargained for.

"I never thought Maya archeology would

be that dangerous," Ian told me when I visited him at Harvard University's Peabody Museum of Archaeology and Ethnology, "but I sometimes feel fortunate to be alive. The looters are quite serious about their business."

At La Naya, Ian and his group had unwittingly interrupted a gang of men engaged in cutting apart an ancient stone monument. Later, as the archeologists were setting up camp, shots rang out and Pedro Arturo Sierra, one of Ian's assistants, fell dying.



Seeking keys to the past, Ian Graham plays lights across eroded details of a stela at Yaxchilán, Mexico (left). The Scottish scholar from Harvard University has undertaken the task of photographing and drawing all known Maya inscriptions. His work will provide an invaluable resource for interpreting the mysterious writing, a complex system of both realistic and abstract pictures. Another aid, a computer, analyzes glyphs for Professor Leonardo Manrique and Cristina Álvarez Lemeli (above) of Mexico's National Institute of Anthropology and History.

# the Glyphs

Photographs by OTIS IMBODEN NATIONAL GEOGRAPHIC PHOTOGRAPHER

The shooting was an isolated incident. But looting still occurs frequently enough to deprive us of priceless knowledge of the fascinating ancient Maya civilization.

At Naranjo, a site near the Guatemala-Belize border, half the 40 known monuments have been attacked. Some of the finest examples of ancient American sculpture lie scattered in meaningless fragments over the forest floor. In their efforts to slice beautiful stone carvings into portable, marketable

segments, looters have totally destroyed many precious hieroglyphic inscriptions.

Such depredation—wreaked with tools as crude as sledgehammers—is doubly deplorable now. Researchers need every inscription that men like Ian Graham can record, for in the past two decades Mayanists have made significant progress in deciphering them.

Until recently it was thought that these intricate glyphs dealt only with the calendar and the gods. Now, however, scholars have

unraveled the names of rulers and fragments of history that indicate the ancient Maya sought an immortality of sorts in stone.

The brilliant civilization that rose in the lowland jungle of the Yucatán Peninsula endured at places like Palenque, Tikal, and Copán until about A.D. 900, when a complicated series of circumstances wrecked the delicate equilibrium of what archeologists call the Classic Period. Not the least of Maya achievements was the most complex writing system ever devised in the Western Hemisphere.

### Learning to Read Messages in Stone

Maya writing appears strange to us, for we see it across a wide gulf of time and culture. Its elements usually appear in what Maya epigraphers—specialists in the writing—call “glyph blocks.” These are the square or rectangular elements that make up the separate units of an inscription.

Glyph blocks may be arranged in a horizontal row to be read left to right, or in vertical columns to be read from top to bottom. In long inscriptions, such as the exquisite Tablet of the 96 Glyphs from Palenque, two columns are to be read at a time, top to bottom.

Individual glyph blocks hold the actual elements of the writing. In all, 800 or more glyphic elements are known. Authorities do not agree on how many of these have been deciphered accurately; estimates range from 5 to 30 percent.

Usually each glyph contains a dominant “main sign” that occupies most of the block. To this are attached any necessary affixes, or smaller elements. Main signs often have two forms. One is abstract and geometric; the other is the head of a human, animal, or bird that presumably represents a god or mythical being. Even the numbers, most often shown with combinations of bars (representing fives), dots (representing ones), and shells (zeroes), have different head forms. The numbers almost always refer to calendar matters.

To the Maya priest, time and its endless passage of days inspired great awe. Anyone

who has beheld the brilliant night sky from a dugout canoe on the Rio Usumacinta, or from the pinnacle of a ruined pyramid on the plains of northwestern Yucatán, can perhaps approach some understanding of this Maya obsession—the effort to bring the moving universe into harmony with the seasons, and the regular passage of days into coherent unity with the errant moon.

In order to perpetuate their unique affinity with the cadence of time—and to meet the year-to-year needs of the farmers who sustained them—the Maya employed the complicated calendar system developed by unknown Middle American forebears.

Only the priests and rulers possessed complete knowledge of the calendar and hieroglyphic symbols. These were recorded by sculptors—with rarely an error—on stone, or painted by scribes in incredibly delicate rows of glyph blocks we find on pottery, walls, or the pages of surviving Maya books.

Our increasing ability to decipher this writing has come about largely in the past century, and is an epic of both arduous exploration and meticulous scholarship.

### Early Bishop Left Keys to the Puzzle

We would have been much the poorer without the account of the Maya written in the 1560's by Diego de Landa, third bishop of Yucatán. Although the original was lost, an indefatigable French antiquary, the Abbé Brasseur de Bourbourg, found an abstract of the famous Landa text in a Madrid library in 1863. It contained, in addition to an amazingly complete account of Maya ways at the beginning of the colonial period, a description of some of the workings of the calendar, accompanied by recognizable pictures of glyphs for *kin*, or day, and the names used for various days and months.

Beginning in 1880, it took Ernst Förstermann, head librarian of the Royal Library at Dresden, 14 years of spare-time study to figure out the fundamental workings of the Maya calendar. He found a wealth of raw

**Magnificent obsession of the Maya**, time reached its most elaborate expression in glyphs such as these on a limestone lintel from Yaxchilán. Combining head forms and full figures, they portray a single date. Here animals represent blocks of time; the profiles of gods are numbers. The monkey, right, second from top, signals “day”; in his hand a god's head, gazing skyward, means six; the skull below the hand, facing left, is 10. Thus, this glyph stands for 16 days. The sum of the days in all these glyphs is added to a starting point in 3114 B.C. to equal February 11, A.D. 526, in our calendar.

PHOTOGRAPHIC WORK PERMISSION BY THE NATIONAL MUSEUM OF ANTHROPOLOGY, MEXICO CITY, 1/4 ACTUAL SIZE.





material in Landa's account, as well as in the excellent drawings of monuments that Frederick Catherwood had made during his journeys with John L. Stephens between 1839 and 1842, and the yet-unmatched photographs of Englishman Alfred P. Maudslay that were just beginning to appear in print.

Förstemann possessed one item of prime importance that no one had yet utilized: the Postclassic Dresden Codex, which had reposed since 1740 in his library. The manuscript had been purchased in Vienna; most authorities think it may have been part of the shipment of New World curiosities that Cortés himself sent to his sovereign, Emperor Charles V, who resided in Vienna in 1519.

The Dresden Codex is painted on fig-bark paper sized with a thin layer of white plaster, folded screenlike into 78 pages. It is one of only four major Maya writings to survive, including works in Paris and Madrid, and a book in Mexico City whose authenticity is doubted by some authorities.

Today, "to all intents and purposes, the contents of the Dresden Codex are known," noted the late Sir Eric Thompson, dean of all Maya scholars. His definitive study of the document shows it was a book of divination.

Among its thousands of glyphs, delicately drafted figures, and rows of numerical notation lie sacred almanacs of good- and bad-luck days, tables charting the orbitings of Venus and predicting solar eclipses, and even warnings of divinely bestowed diseases.

#### Each Day a God to the Maya

Förstemann started from scratch in trying to decipher the Dresden manuscript. It is a tribute to his genius that he not only managed to grasp the repeating sequences that paced Maya eternity, but was also able to calculate backward in time—and in Maya terms—the base date of the calendar used from the Early Classic Period onward.

There were two main cycles; one of 260 days, the other 365. These sequences meshed like gear wheels (graph, page 783). Each day was named in terms of both the 260- and 365-day cycles, and the full name of any single day could repeat only every 18,980 days—once every 52 years.

To the Maya users of this calendar, the very days were gods, as were numbers. These moved in relentless procession through the eternity that priests of Quiriguá, Guatemala, must have glimpsed in A.D. 766, when they



BASE FROM ZOMBARTEIN VASE COLLECTION, PHOTOGRAPHED BY DEEJ IMBODEN AND ENOKI KASUYO

produced the calculation on Stela D that reaches a day 400 million years in the past!

How did the priests handle such stupendous calculations? Simply by a method of positional notation such as we use when we write "1975." In our case, the four positions of numbers represent, from left to right, 1000's, 100's, 10's, and 1's. The Classic Period Maya customarily used *five* positions and a modified "base-20" arithmetical system to record dates.

Archeologists call such inscriptions "Long Count" dates, and can correlate them with our own calendar. Still there remains a tantalizing mystery: Long Count dates record the number of days that had elapsed since the beginning of the Maya calendar, a date that most Mayanists agree corresponds to our own August 11, 3114 B.C. What, one can only wonder, was the high significance of that day, long before Maya history began?

We found just such a Long Count date last year while I was helping to map the site of Cobá in collaboration with Mexico's National Institute of Anthropology and History, and with support from the National Geographic Society.

Domingo Falcón, the custodian of Cobá, and his brother, *(Continued on page 785)*

You are there, in a Maya throne room of the eighth century, transported by a realistic painting on a tomb vase (above). The seated ruler, right, stares into an obsidian mirror. Does he ponder his past, represented by the virile youth at left? Is he "the mirror in which the people see themselves," as lowland Maya once said, using a word—*nen*—to express the triple meaning of ruler, to contemplate, and mirror? Faded glyphs perhaps record a funeral chant; one may stand for Yaxchilán.

To make this "roll-out" photograph, NATIONAL GEOGRAPHIC technicians built a special strip-camera setup. A rotating turntable holding the pot is synchronized with a motorized 35-millimeter camera. The speed of the moving film and the width of the slit in the shutterless camera determine the exposure.

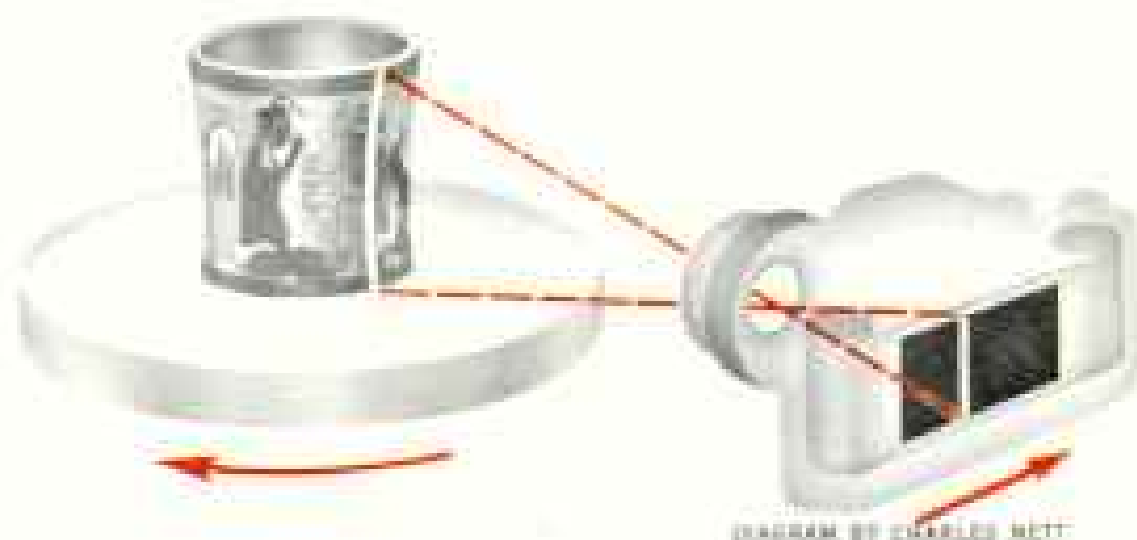


DIAGRAM BY CHARLES BERT





Ceremony of self-sacrifice unfolds on an exquisite Maya vase, buried with a young woman at Altar de Sacrificios, Guatemala. Jade inlays in her teeth identified her as an aristocrat; she evidently died to accompany an older noblewoman, buried below her.

OTTE JONSSON, COURTESY MUSEUM OF ARCHÉOLOGIE AND ETHNOLOGIE, GUYANA 1111

The vase bears glyphs that date the suicide to April 21, 754, and identify the participants. The male dancer, in jaguar-skin headdress, mittens, and trousers to impersonate the god of the underworld, is the renowned ruler of Yaxchilán, Bird Jaguar. The snake



above the dancer at right symbolizes a completed life cycle. At lower left, the white-faced victim takes her life with a leaf-shaped flint, resembling a blade found in her grave. A leader from Tikal, upper left, holds a jar of blood offerings. Red-speckled areas on other costumes pinpoint spots often chosen for ritual bloodletting to win divine favor.

Farmer's almanac of bygone centuries, the Madrid Codex (far right and foldout pages) once guided Maya priests performing divination rites relating to hunting, weaving, planting, beekeeping, and rainmaking. A scribe painted the codex on a folded 22-foot length of paper made of the fig tree's inner bark that had been pounded

and coated with fine white lime plaster. It was read left to right on both sides. Here, in Madrid's Museo de América, GEOGRAPHIC photographer Victor Boswell uses a guide to assure accurate color in the four-page reproduction that follows.



FOLLOWING PAGES FOLD OUT



**WATCHED OVER** by good and evil gods, orderly rows of glyphs name the 20 days of the Maya "month," over and over, marching through a

260-day cycle that was essential for forecasting. To use this calendar, a priest probably counted a random pile of corn kernels while reading

the days from left to right across the pages. The day reached when the grains ran out determined the prediction. For example, the glyph for



Day 1, or Imix — resembling a baseball fielder's glove — was always auspicious, a good time to plant maize, a portent of plenty.

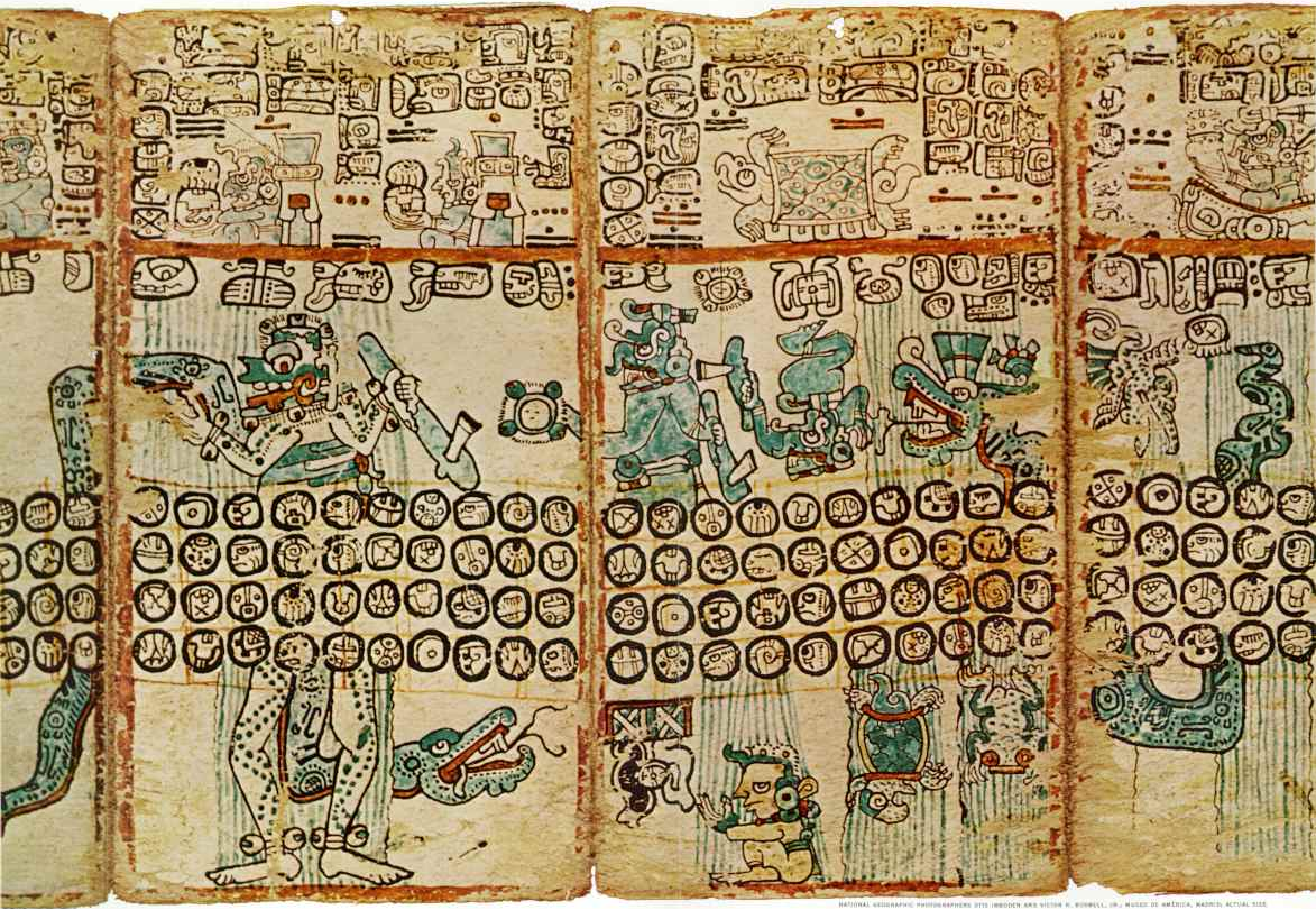
**UNDULATING** sky serpents send rain; their voice is the thunder. Two are rattlesnakes. The circles of crosshatching on the serpents' skins are the

same as that in the glyph for the fifth day, Chicchan, which is therefore a proper time for rain ceremonies.



**MERCHANT GOD** Ek-Chuah grasps a copper ax and carries his pack on a tumpline. Above his head, the glyph

with black background names him; its design resembles his own eye.



NATIONAL GEOGRAPHIC PHOTOGRAPHERS BY: IRRODOR AND VICTOR H. BOBBLE, JR., MUSEO DE AMÉRICA, MEXICO, ACTUAL SIZE

**GOD OF DEATH** stands upright, adorned with "death eyes," bells jingling on his head, neck, wrists, and ankles. Glyph over his head shows the

clipped eye of a dead person, also a sign of the sixth day, Cimi. A divination landing there portends serious illness or death.

**MAIZE GOD**, with a vertical line through his face, sits on the red line directly above. Here he holds the imix glyph of

abundance and the Kan sign for corn, also the fourth day.

**TWO CHACS**, or rain gods — one upside down — wield battle axes.

Yucatán Maya today still say of wet weather, "Chac is falling."

**IT'S RAINING** frogs and turtles! These animals also appear in the Maya zodiac. Swimming turtle with boxlike shell, at top,

shares his hook-nosed profile with four name glyphs nearby.



## The past was more than prologue to the Maya

A SON PRESENTS himself as even greater than his father in this magnificent bas-relief from Palenque. With the death of the ruler Pacal, left, his son and successor Chan-Bahlum, right, celebrated his ascension by building three beautiful temples and placing stone tablets in their inner recesses.

In this scene on the so-called Tablet of the Sun, Chan-Bahlum receives from his father his dynastic rights, represented by hand-held idols. Knotted burial clothes and other symbols on Pacal indicate that he is acting after death and is, in fact, deified. Both men have the high, flat forehead formed in infancy when boards were bound around the skull to give this much-admired deformity.

The shield at center, covering crossed spears of war, portrays the Sun God in his aspect as the Jaguar God of the underworld. Two other gods of that domain crouch below.

Once such scenes were believed to show only gods and priests. Then in 1959 an exciting breakthrough occurred when Tatiana Proskouriakoff, now of Harvard's Peabody Museum, correlated such scenes with newly interpreted glyphs to show they recorded historical events.

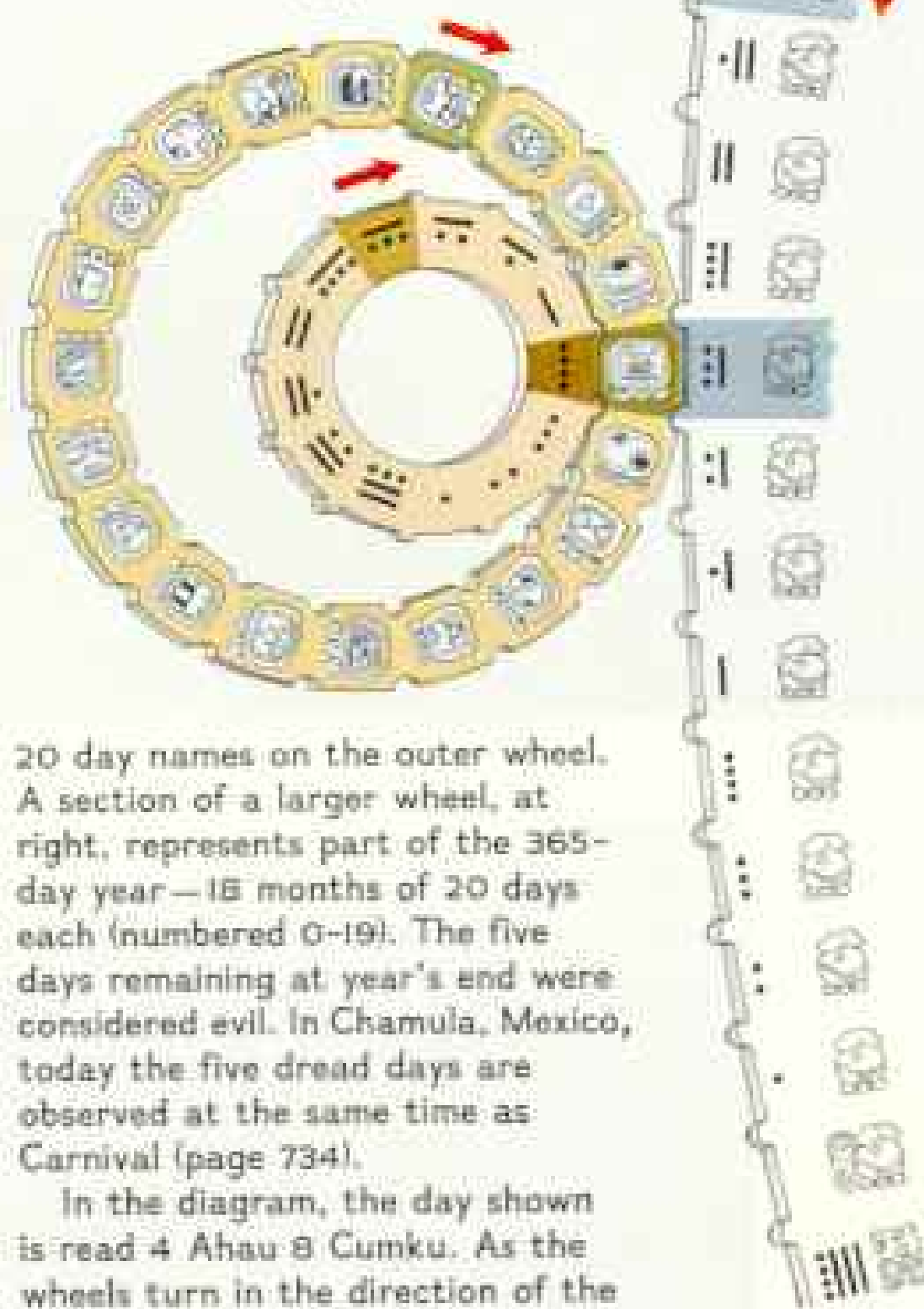
Glyphs above the shield tell of Chan-Bahlum's ascension in 684 and name his father and his mother, Lady Ahpo Hel, who also held power. The inscription includes the fact that Pacal lived into his fifth *katun* (80-100 years) and ends with an emblem glyph referring to Palenque.

Inscriptions around the edges, still not fully understood, refer to a day in 2360 B.C., probably important in Palenque mythology. Others refer to Chan-Bahlum and a distant ancestor when each was 6 years old, perhaps the age an heir apparent was designated. Clearly the inscriptions seek to relate the mythical past to the reign of living men, thus supporting their political power.

Only at Palenque are narratives told on such large tablets; elsewhere sculptors usually carved briefer texts on tall upright stones called stelae (page 791).

THE WHEELS OF TIME ground exceeding fine for the Maya. To be able to predict the seasons for farmers and astronomical events for religious rites, they utilized a calendar of two meshing, repeating cycles. Maya mathematicians could project this calendar millions of years into the past and the future; time had no beginning, no end.

The Maya recorded numbers with a system of bars and dots. A dot equals one, a bar stands for five. The smaller wheels, at left, together represent the 260-day Sacred Round; the inner wheel, with the numbers one to thirteen, meshes with the glyphs for the



20 day names on the outer wheel. A section of a larger wheel, at right, represents part of the 365-day year—18 months of 20 days each (numbered 0-19). The five days remaining at year's end were considered evil. In Chamula, Mexico, today the five dread days are observed at the same time as Carnival (page 734).

In the diagram, the day shown is read 4 Ahau 8 Cumku. As the wheels turn in the direction of the arrows, in four days it will read 8 Kan 12 Cumku. Any day calculated on these cycles would not repeat for 18,980 days—52 years.

DAVID ALAN HARVEY (TRACING PAGE)  
ARTWORK BY CHARLES HEIT





JOHN W. REYNOLDS, N.D. (ABOVE); OTIS IMBODEN



(Continued from page 773) Leonardo, were clearing brush from a mound when they uncovered part of a carved stone, all but buried by rubble. We carefully scraped away the dirt and rocks and roots, forgetting the mosquitoes and stifling heat as row after row of glyph blocks came to light. I recognized the characteristic calendar glyphs, with their bar-and-dot numbers. The piece obviously had broken from an upright monument, across the headdress of a large figure.

#### Glyphs Pinpoint a Day Long Ago

The exposed stone quickly dried to a uniform whiteness that obscured the badly eroded glyphs in the brilliant sunlight. Draping a heavy tarpaulin over me to form a darkened tent, I set to work with graph paper, tape, pencil, and flashlight, playing the beam over different glyph blocks at varying angles to bring finer points into view.

It took me several hours—emerging occasionally for a gasp of air—to complete a scale drawing of the inscription.

At last I began to count: First, the *baktun*, or 144,000-day periods—there were nine of these. Next, the *katun*, signifying 7,200 days; 17 of these. Then, ten 360-day periods called *tun*. The next two glyphs—the 20-day *uinal* and the bearded sun sign for *kin*, or one day—were accompanied by symbols for zero.

Arithmetic brought the day count out of the dim reaches of the fourth millennium B.C.: The inscription signified 1,422,000 days after that mystical August 11, 3114 B.C. The sculptor had carved the date—in our terms—of November 30. (Continued on page 788)

Crest of a ruin—perhaps the most massive in the Maya world—protrudes from a lofty forest canopy and hints at the majesty of Guatemala's isolated and mysterious El Mirador. A helicopter delivered NATIONAL GEOGRAPHIC photographer Otis Imboden to the top of this crumbling pyramid (above). In preliminary surveys, archeologist Ian Graham measured the remains of more than 200 buildings and a dozen great pyramids—one, he feels, surpassing the largest at Tikal, 40 miles away.

A causeway linking El Mirador and Tintal, 12 miles to the south, cuts arrow straight across a dry lakebed (left). Light and dark areas may be ancient canals and raised fields, indicating intensive agriculture.





## What price looting?

**S**NATCHING MAYA ART from its setting, thieves feed a voracious black market for stolen antiquities. Would-be crooks discovered a treasure—these unusual stucco masks of the Sun God on a pyramid at Kohunlich, Mexico (left). In a switch on the usual pattern, an informer alerted government authorities in time to prevent the looting. Now archeologist Victor Segovia excavates the guarded site.

STYLING: S. STUART

Sacrificed to greed, Chac, the Rain God, lost his head in Tancab sometime before 1971, when Dr. Arthur G. Miller, studying murals under a National Geographic Society grant, found only this gaping hole (right). The entire mural seemed hopelessly lost under 700 years of limestone accretions. Artist Felipe Dávalos-Gonzalez, working with Dr. Miller, traced line and color to reconstruct Chac holding an ax and offering (upper right). He filled in the head based on a kneeling Chac alongside.

A shattered stela at Tikal (right) tells a sorry tale of loss to Washington, D. C., surgeon John Keshishian, center, who had admired it earlier at Agua-teca, 70 miles to the southwest. Looters broke the heavy monument apart for easier transport and wrecked major glyphs. Police captured the men, but not before they had sold part of the loot. Miguel Orrego Corzo, Tikal National Park archeologist, right, and a guard discuss the impossible task of trying to safeguard countless Middle American sites.



ARTHUR G. MILLER



STAN JEROME



W. E. SARTRETT, NATIONAL GEOGRAPHIC STAFF



GEORGE E. STUART

Glorifying military conquest, this scene with inscriptions on a lintel from Yaxchilan shows actual historical events. Bird Jaguar, successor to Shield Jaguar, brandishes a spear and grasps a fallen captive, called Jeweled Skull. Bird Jaguar's subordinate grasps another prisoner's hair, the most demeaning of gestures. Glyphs on the conquered men's legs may be their names or those of their peoples. Such evidence points to city-states ruled by military might in the Maya world of the eighth century.

A.D. 780. Whatever his intent, he had added nearly a century to the known Classic Period occupation of Cobá.

Since dates or recordings of time spans pervaded Maya texts, scholars had long thought that the inscriptions dealt exclusively with the mechanism and mythology of time. But in the 1950's some Mayanists began to feel that this could not be so.

For one thing, too many noncalendrical glyph blocks had come to light; some short inscriptions contained no calendar material. The whole concept of what the Maya had been recording began to change rapidly.

Epigrapher Heinrich Berlin, who has devoted years to interpreting the panels that

grace the serene temples of Palenque, noted an interesting repetition: Among the inscriptions of Palenque and those of other Classic centers across the southern lowlands—among them Tikal, Naranjo, Yaxchilán, and Copán—there occurred strikingly similar glyph blocks. They contained the same kinds of prefixes, but different main signs, and they appeared in similar context from site to site.

The change in the main sign appeared to be dictated by the site where the glyph occurred. Berlin cautiously dubbed them "emblem glyphs," for each was generally found only at a specific site. He reasoned that such glyphs probably functioned either as place-names of the centers or, possibly, as names or symbols of their ruling lineages.

Emblem glyphs give us a fascinating glimpse of relationships among the Maya centers. An intriguing link between Copán, Tikal, and Palenque, for example, is hinted at by the occurrence of both the Tikal and Palenque emblem glyphs in the inscription on Stela A at Copán. Were the places tied politically? Were their ruling families perhaps related? We should know someday.

#### New Meanings Begin to Emerge

The greatest breakthrough of all came in 1959, when Mayanist Tatiana Proskouriakoff, then with the Carnegie Institution of Washington, D. C., found patterns in dates at Piedras Negras, Guatemala, that suggested a record of milestones in the lives of individuals.

On Stela 14 at Piedras Negras, a young man in Classic Maya regalia sits cross-legged in a large niche. A carved ladderlike band marked with footprints rises toward the niche, and a woman stands gazing upward at the seated figure. The monument, even by Maya standards, is unusual, but others bearing the same general motif occur at Piedras Negras—and each is the earliest in a group of monuments set up in front of a building.

"My first thought," recalled Miss Proskouriakoff, "was that the 'niche' motif represented the dedication of a new temple, and that the footsteps symbolized the rise to the sky of the victim of sacrifice. I thought I might find the glyphic evidence for human sacrifice. What I found instead started an entirely new train of thought and led to surprising conclusions."

Delving into the complex series of dates, Miss Proskouriakoff began to see intriguing patterns. For instance, an important event

appeared to be symbolized by what Sir Eric Thompson called the "toothache" glyph, a solemn bird head or other form bound by a knotted cloth. Another significant event was marked by the picture of an upended frog head. The time intervals associated with these events proved the most fascinating of all.

The total time span recorded for each set of monuments ranged from 56 to 64 years. Human life spans? In these same groups, the upended-frog event preceded the toothache event by from 12 to 31 years. One might reasonably infer that the frog represented birth, or birthday; and the toothache, some milestone in a person's life—perhaps accession to power. The latter might be symbolized as well by the ascending footprints.

Analysis of all the monuments, their date combinations, and the portraits of women, children, and young lords only reinforced Miss Proskouriakoff's startling contribution—our first glimpse of Maya political dynasties of the seventh and eighth centuries.

Miss Proskouriakoff's interpretation of the Piedras Negras monuments opened a whole new world. David Kelley, now with the University of Calgary, found comparable data among the inscriptions of Quiriguá, one of the main centers of ancient Maya astronomy. Tatiana Proskouriakoff herself turned her attention to Yaxchilán, a major site upstream and across the Rio Usumacinta from Piedras Negras. Again, the intellectual quest paid off.

The ruins of Yaxchilán are arranged in a great crescent that parallels the biggest meander loop of the Usumacinta. The terrain rises from the river in vast jungle-covered heaps, and the rich, dark drapery of green perfectly complements the ancient buildings and moss-covered carvings that lie about.

This was the setting for inscriptions that highlighted the lives and reigns of two of the most illustrious rulers of American antiquity—Shield Jaguar and Bird Jaguar, so-called simply from the pictures that make up their name glyphs.

#### A Tale of Rulers and a Usurper

Among more than a hundred scenes and texts on the lintels, stelae, and stairways of Yaxchilán, Miss Proskouriakoff found that the earliest recognizable ruler in the inscriptions, Shield Jaguar, was probably born around A.D. 650. Since there is no apparent record of his accession, she speculates, Shield Jaguar may have been a usurper. Also, since

some dates associated with him reflect a distinctive one-day "error," he may have been a "foreigner" from northern Yucatán, where such a calendar anomaly often occurs.

Whatever his origins, Shield Jaguar appears to have lived to be more than 90 years old. Events of his military career are depicted in scenes of conquest. The lintels of one building suggest a combined obituary for the ruler and three other persons; their name glyphs are preceded by the distinctive prefix that signifies "female."

Mexican archeologist Roberto García Moll, who is excavating at the site, may someday find—if Miss Proskouriakoff's reading of the inscriptions accurately reflects the events of 1,200 years ago—a tomb containing remains of an old man and three women.

More is known of Shield Jaguar's successor, Bird Jaguar. Near the riverbank where it now rests, I saw Stela 11, the underside of which shows Bird Jaguar around A.D. 750, just before he ascended to rulership. Elegantly garbed and wearing a mask of the Sun God, he stands before three kneeling figures, surely captives. A panel above memorializes the dead Shield Jaguar and his wife.

#### Fun With Puns Compounds the Problem

What did Bird Jaguar's subjects actually call him? The question underscores the most difficult task involved in glyphic research—to discover the true phonetic translation, as opposed to the meaning, of the various pictures and symbols in Maya inscriptions.

With surviving colonial Maya-Spanish dictionaries, and grammars of modern Maya dialects, such translation would seem easy. After all, Michael Ventris cracked Minoan Linear B, an ancient script, by using code-breaking techniques—without even knowing what language it was in!

But Maya texts are filled with obscure allusions and metaphors, and—worse, for the epigrapher—their authors loved plays on words, or puns. We constantly find homonyms, words of identical sound with different meaning. This devastates, in advance, any cryptographic analysis of the glyphs.

As one example, small pictures of fish sometimes flank the large glyphs that lead off Long Count dates. Thompson has shown that one Maya word for a certain large fish was *xoc*, and *xoc* is also the root of the words for "count" or "read." Thus, in the date-introductory glyph, the fish almost certainly



STEVE BRIDGER

signifies "count." Another element in that introductory glyph is the *tun*, or the 360-day period. Thus the ancients might have read the whole glyph as, ["What follows is] the count [of the] tuns."

Some experts disagree even on the basic principles of translating Maya glyphs. The Russian scholar Yuri Knorozov believes that, in addition to the inventory of word signs, there are a number of glyphic elements that represent not ideas but single syllables. Linked together, these syllables can "sound out" meaningful words and phrases.

#### Pieces Seem to Fit Together

Thompson disagreed. "Maya writing is not syllabic or alphabetic in part or in whole," he wrote. Each glyphic element has an intrinsic meaning, he concluded.

Nevertheless, some of Knorozov's readings work beautifully: His signs for *chu*, *ca*, and *ha*, for example—the very elements shown in the "capture" glyph in a scene with Bird Jaguar (page 788)—yield, by Knorozov's system, the word *chucuh*. One of its meanings, according to the old dictionaries: to seize.

By employing similar phonetic principles, David Kelley and Yale University linguist Floyd Lounsbury have been able to read the name of the man found in the magnificent tomb beneath the Temple of the Inscriptions at Palenque as "Pacal," or "Shield." Sometimes the name is shown simply as the picture of a shield. In other instances it is written as three glyph elements that by phonetic interpretation read *pa-ca-la*.

In their careful work with the inscriptions and accompanying motifs, Lounsbury and



GEORGE C. STUART  
AND DAVID S. STUART

With fear and wonder, eyes of the multitudes once fixed on the temple atop this man-made pyramid (left), towering some 12 stories at Cobá in Yucatán. Priests led processions up the great stairs to conduct rites on the heights.

In the plaza below, an eight-foot carved stela again stands sentinel (above, drawing). English scholar Sir Eric Thompson found the broken lower part in 1930. Last year Mexicans working with the author located the missing upper corner. The stela portrays a ruler, ceremonial bar in hand, standing on kneeling prisoners. The date: November 30, 780.

colleagues Linda Schele of the University of South Alabama and Peter Mathews of Calgary are reconstructing the list of Palenque's rulers through the Late Classic Period. So far they have identified at least 15. They have made other discoveries as well. Lounsbury, for example, has isolated what appears to be another event glyph—that for "burial." Thus he has completed, in a sense, the set that Miss Proskouriakoff began with the upended frog, or "birth."

Obviously, the small dedicated group who seek the content of the Maya inscriptions, from John Graham of the University of California at Berkeley to Thomas Barthel of the University of Tübingen, West Germany, can't work in isolation. The task of decipherment comes only in bits and pieces that build slowly on the work of others.

As one of my colleagues put it, "There can be no single key to this sort of thing because there's no single lock. I doubt that we'll ever have anything like the Rosetta stone. What we really need are good copies of *all* the inscriptions."

This task is underway. Undaunted by the shooting at La Naya, Ian Graham continues to comb the lowlands for new texts. He and his colleague, Eric von Euw, have together added 55 new monuments to the known inventory in six years. But the race between scholarship and thievery continues.

Not long ago I visited an art museum in Texas. Mounted on one wall was a beautiful Maya stela bearing a huge figure in full regalia flanked by glyph panels. Its looters had "thinned" the monument to a sheet of stone only an inch and a half thick, then sawed the sheet into smaller squares, damaging parts of the sculpture. Where had it stood? Only its looters knew.

Large carvings are not the only pawns in this illicit trade. The famed Maya polychrome cylinder vases of the Classic Period, things of indescribable beauty, show up in art shops from San Diego to Geneva, then vanish into private collections.

This is a tragedy for mankind, really, for each is, in effect, a new codex, replete with scenes of action—ball games, royal courts, ceremonies, and processions—most often with texts that explain them. One such vessel that was exhibited in New York City bore the pictures of 31 small figures, beings of the Maya pantheon, or mythology, hitherto unknown to archeology. One can only wonder what else the looter found in the tomb that would have added to our knowledge of the Maya and the ways of the Maya mind.

#### Time Works Toward Dispelling Mystery

I recently returned to Cobá with Sir Eric Thompson, only a few months before he died. The dated fragment we had helped uncover last year was now reunited—after more than a thousand years—with three other pieces of the same stela (left) that Eric had found when he was last at the site, on his honeymoon, in 1930.

As we stood in the brilliant sunlight before the whole magnificent carving, I reflected on such discoveries, and how they so often transcend the lifetimes of many scholars as they move toward complete knowledge of the Maya and their civilization. The old priests, with their fascination with time and its attendant good fortune, would have liked the idea. □

# THE MAYA

# Resurrecting

By WILLIAM R. COE, Ph.D. DIRECTOR OF RESEARCH, TIKAL PROJECT

**I**T WAS LYING in 174 incoherent pieces—this magnificent jade mosaic mask (facing page)—when archeologists in 1963 opened a rock-cut tomb in Tikal, the supreme Maya center. Locked in the grip of Guatemala's jungle for 1,000 years, the onetime metropolis was yielding its secrets during the most extensive archeological excavation ever undertaken in the New World.

Midway through the 14-year-long project, sponsored by the University of Pennsylvania Museum, we dug into one of dozens of temple-pyramids and found the burial crypt. Its roof had partly collapsed, scattering rock over the skeleton of a 45- to 50-year-old man and smashing his mask. Two other skeletons, youths with broken backs, lay in positions of extreme agony, suggesting last-minute sacrifices before the crypt was sealed.

Opening ancient tombs has always captured the public imagination, but now Mayanists have greater cause for excitement. We are linking such burials and their treasures to hieroglyphic inscriptions and discovering the names of rulers and facts about their reigns.

A date painted on the wall of this crypt, for example, matched that on a fragment of a stela found on an adjoining plaza. The stela apparently commemorates the son-in-law of an illustrious fifth-century ruler named Kan-Boar. Perhaps then the tomb belongs to a high-ranking member of the royal family.

## Jungle Shrouds Sprawling Ruins

For generations, Tikal had been the dream of Mayanists who assumed that the biggest had to be the best. And we knew it was big, even though it was shrouded in a nearly impenetrable tangle of vines, mahogany, cedar, sapodilla, and palm. Maps and descriptions by archeologist-explorers hinted at its magnitude. Anyone flying over could see five stone roof combs protruding high above the 100-foot forest, forming the tallest group of temple-pyramids in the New World.

We assumed that Tikal was a ceremonial center where ruling priests periodically performed rituals for the benefit of local farmers. We visualized simple peasants dispersed uniformly and thinly in the hinterland, tending their corn patches. Finally, peasant revolt against priestly overlords would account for the death of the center, or so we surmised.

Yet why, we wondered, would the Maya develop their largest center in the seemingly remote interior of what is today northern Guatemala? We needed to know more, and we believed archeological data, logically collected and processed, would yield answers.

## Uncovering the Heart of a Metropolis

Flying to an airstrip hacked from the jungle, DC-3's began to ferry in supplies and scholars in 1956. Over the years we invited more than a hundred specialists to study everything from architecture to soil type. From the first, camp life meant hammocks and palm-thatched huts, axes and machetes, beans and tortillas, and brackish drinking water from an earthen reservoir, designed by the ancients and now inhabited by a lone crocodile. Workmen started the task of clearing. At last, the breathtaking heart of Tikal, its Great Plaza, came into view (pages 796-8).

Mapping was our initial task, and it could be accomplished only by walking the area and recording with camera and pencil all visible remains: dozens of temple-pyramids; carved and plain stelae and altars; chultuns, those peculiar underground chambers cut into bedrock; freeway-size causeways; and thousands of small, rectangular elevations that we later learned were house mounds. We even recorded the graffiti scratched in the plaster of surviving buildings.

Our early map, covering six square miles, gave us a pair of eyes into the jungle, suggesting where to clear and what to dig.

A trench 35 feet wide and at times 100 feet deep was cut through the two-acre religious

# the Grandeur of Tikal

AND PROFESSOR OF ANTHROPOLOGY, UNIVERSITY OF PENNSYLVANIA

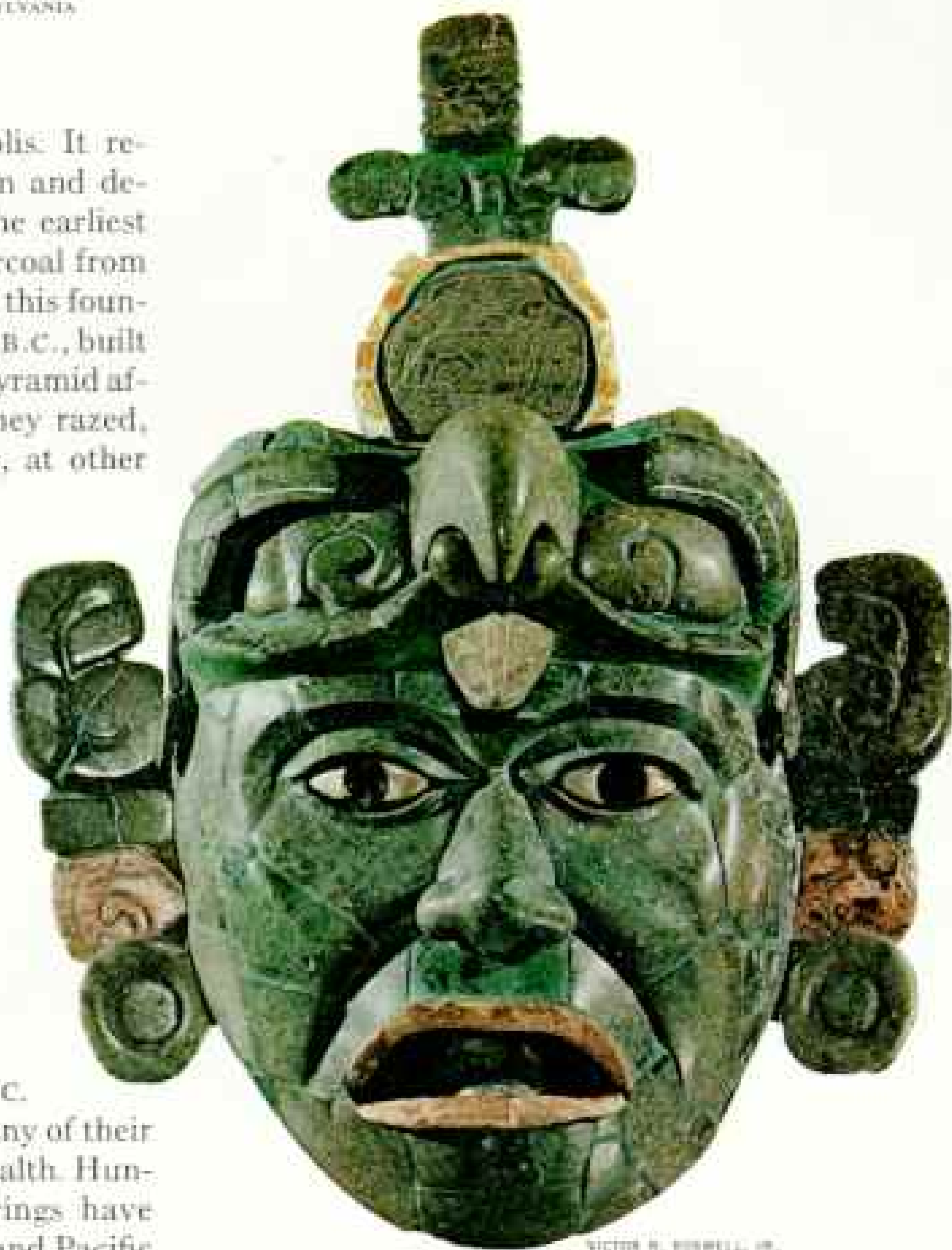
complex called the North Acropolis. It revealed a fantastic story of creation and destruction. At bedrock we found the earliest evidence of human settlement, charcoal from fires that burned in 600 B.C. Above this foundation, the Maya, beginning in 300 B.C., built one limestone-and-plaster temple-pyramid after another. Before they added, they razed, sometimes ripping off roof combs, at other times demolishing entire shrines down to the plaster foundation. On such platforms I have traced the original scribe line scratched with a flint blade by an ancient architect.

Yet the Maya constantly recycled materials. Demolished buildings were used and reused as fill. We found a small carved limestone fragment in the debris of the roof comb of Temple II, which was built in A.D. 700. Later a perfectly matched second fragment turned up in a floor of the North Acropolis, laid in 100 B.C.

The Maya not only destroyed many of their buildings but also buried much wealth. Hundreds of graves and cached offerings have yielded seashells from the Atlantic and Pacific coasts, green obsidian from Mexico, jade and other precious minerals from the highlands.

## Empty City Again Draws Throughs

Elsewhere in central Tikal we cut hundreds of trenches and pits deep into ball courts, a covered marketplace, causeways, a residential complex dubbed the Central Acropolis, a sweathouse, and more than 120 elevated house mounds. These turned out to be family compounds of three or four houses built on a single plastered platform. To the east of the residences was found a building—apparently a family shrine—that contained burned copal, cached offerings, and graves of elderly men, no doubt family patriarchs.



VICTOR H. BISHOP, JR.

Like a voice from the grave, a life-size mosaic funeral mask of jade, pyrite, and shell bespeaks the wealth of a noble buried about A.D. 527 at Tikal in what is now Guatemala. Heavy-lidded eyes and protruding mouth suggest the style of distant Teotihuacán, rival city of central Mexico, and hint of intensive trade and cultural interchange. Compiling such clues, archeologists now piece together the story of Tikal, greatest of all Maya centers.





Architect of genius, who brought Tikal to its finest hour, achieves immortality with this jade mosaic portrait jar, buried with him about A.D. 730. Found in his vaulted tomb under the Temple of the Giant Jaguar, the jar bears glyphs that reveal his identity: Double-Comb, ruler of Tikal, who died in his fourth *katun*—60 to 80 years of age. Another vessel, below, came from a tomb dated 758 that resembles Double-Comb's, suggesting the occupant was a son.

To fashion the treasures, Maya lapidaries drilled a hole in each of the polished plaques—900 in all—applied resin glue and pegged them to wooden cylinders. A tiny jade plug covered each wooden nail.

VICTOR H. BOSWELL, JR.  
ACTUAL SIZE, LEFT



1/2 ACTUAL SIZE

Elsewhere in the compounds we discovered signs of various occupations—maker of flint tools, potter, sculptor—clear proof of a flourishing middle class.

Such exciting discoveries encouraged the Guatemalan Government to contribute more than \$500,000 to fill up our trenches, repair crumbling temples, and prepare the site for tourists. Guatemalan workmen quarried local limestone, burned it for plaster in the time-honored fashion, and remade a city that had been built over so many times in the past. Now Tikal National Park welcomes 40,000 visitors a year.

### Final Map Proves a Surprise

When excavation ended in central Tikal in 1965, we were still curious about how people lived in the countryside. Guatemalan engineers had already cut four trails extending from the Great Plaza for seven miles in each direction. Archeologists surveyed 250 yards on each side of these trails, calling out every feature: house mounds, chultuns, vegetation. Then with posthole diggers they looked in selected mounds for pottery sherds that would aid in dating. Where mounds became less frequent, we drew the boundary line for eighth-century Tikal.

The final map was astonishing. The so-called countryside was heavily populated over an area of 50 square miles. Rarely were family compounds more than 500 yards apart; nowhere was there enough space for the slash-and-burn practices of Maya corn growers.

The people must have been backyard horticulturists. Breadnut—the fruit of the ramon tree—and root crops were probably staples. Most likely, subsistence was based on highly productive kitchen gardens; fresh produce could be carried to the central market and surpluses stored in those subterranean chultuns. Utilizing their environment to the fullest, Tikal people perhaps built up low-lying areas, or *bajos*, into raised fields.

After 14 years of investigation, with tons of stored artifacts from pearls to potsherds, with 500 buildings excavated, and more than 60,000 photographs, how do we now picture ancient Tikal?

From dim origins some six centuries before Christ, Tikal grew rapidly over the low, well-drained limestone hill underlying its center. Huge plazas and majestic architectural complexes, in existence by the second century B.C., became the foundation of future development,

a slow, steady growth involving the destruction and immolation of thousands of buildings and platforms. Nothing was made to last forever. Had Tikal persisted, the edifices we see today would almost surely have been sealed beneath something even grander.

At its height in the eighth century, Tikal was populated by perhaps 40,000 people, a figure that might be halved or doubled in view of the uncertainties in such calculations. With few resources beyond flint and farmland, the city depended on a complicated trade network that reached from ocean to ocean and from central Mexico to Costa Rica. The city's jungle location began to make sense, for it lay on a plausible portage route between two great river systems, one leading to the Gulf of Mexico and the other to the Caribbean (map, pages 736-7).

This was no priest-plus-peasant society, but a vastly complex, stratified, cosmopolitan culture. At its head, dynasties of strong men prevailed, although women were often prominent. Noble families resided in elaborate compounds, such as the Central Acropolis, and used nearby temples as personal family shrines. Most exciting of all, a succession of three rulers, starting with a man named Double-Comb, has been positively identified.

### Seeking Clues to a Time of Doom

Then, suddenly, Tikal died. Its last stela, set in the Great Plaza in A.D. 889, was an exclamation mark on a cultural system that had endured for 1,000 years. Squatters moved in, living amid their garbage, while buildings crumbled and the jungle crept closer.

What had happened? Military raids in distant river valleys may have snapped critical trade routes. Population increase likely warped the delicately balanced agricultural base. A rigid bureaucracy and political usurpations—all are possibilities.

Now we have enough data to permit lively speculation by my colleagues about the daily life of Tikal at its zenith (portfolio of paintings, pages 799-811). Only years of analysis can verify the details. Today, from Tucson to Zurich, the excavators of Tikal are preparing the millions of units of information they have collected for publication.

When that monumental task is completed, many of us are ready to shoulder our pickaxes and head back to look for even more information still concealed by this enigmatic, ever fascinating metropolis. □





## Life returns to a dead metropolis

**F**REED from strangling jungle, Tikal bares its heart: the Great Plaza, surrounded by temples and palaces. Beneath the surrounding forest still lie the ruins of an immense city that covered 50 square miles in the eighth century A.D.

Tikal seems at one with the universe, which the Maya visualized as four-sided and many-storied, with a deity ruling every aspect. Its ritual center for eight centuries was the North Acropolis, at lower left. Archeologists have located more than fifty temples underlying those visible today.

By the end of the seventh century, the religious focus had shifted to the Great Plaza, its 2½-acre plaster surface now blanketed with grass. After Double-Comb ascended to power in 682, he built a pyramid-temple to the west, far right, realm of the setting sun. Apparently it honored his wife, whose portrait appears on a wooden lintel above an interior door.

The ruler reserved the opposite site, where the sun rose, for his own stunning monument—the Temple of the Giant Jaguar. Tunneling into the pyramid, archeologists in 1962 penetrated a room-size crypt; in it they found a jade portrait jar (page 794); pearls, and well-worn hair tweezers inscribed with Double-Comb's glyph. And among his possessions lay the skeleton of the old man himself. W. C. BARRETT



# A Traveler's Tale of Ancient Tikal

A PORTFOLIO OF PAINTINGS BY PETER SPIER  
WITH TEXT BY ALICE J. HALL NATIONAL GEOGRAPHIC STAFF

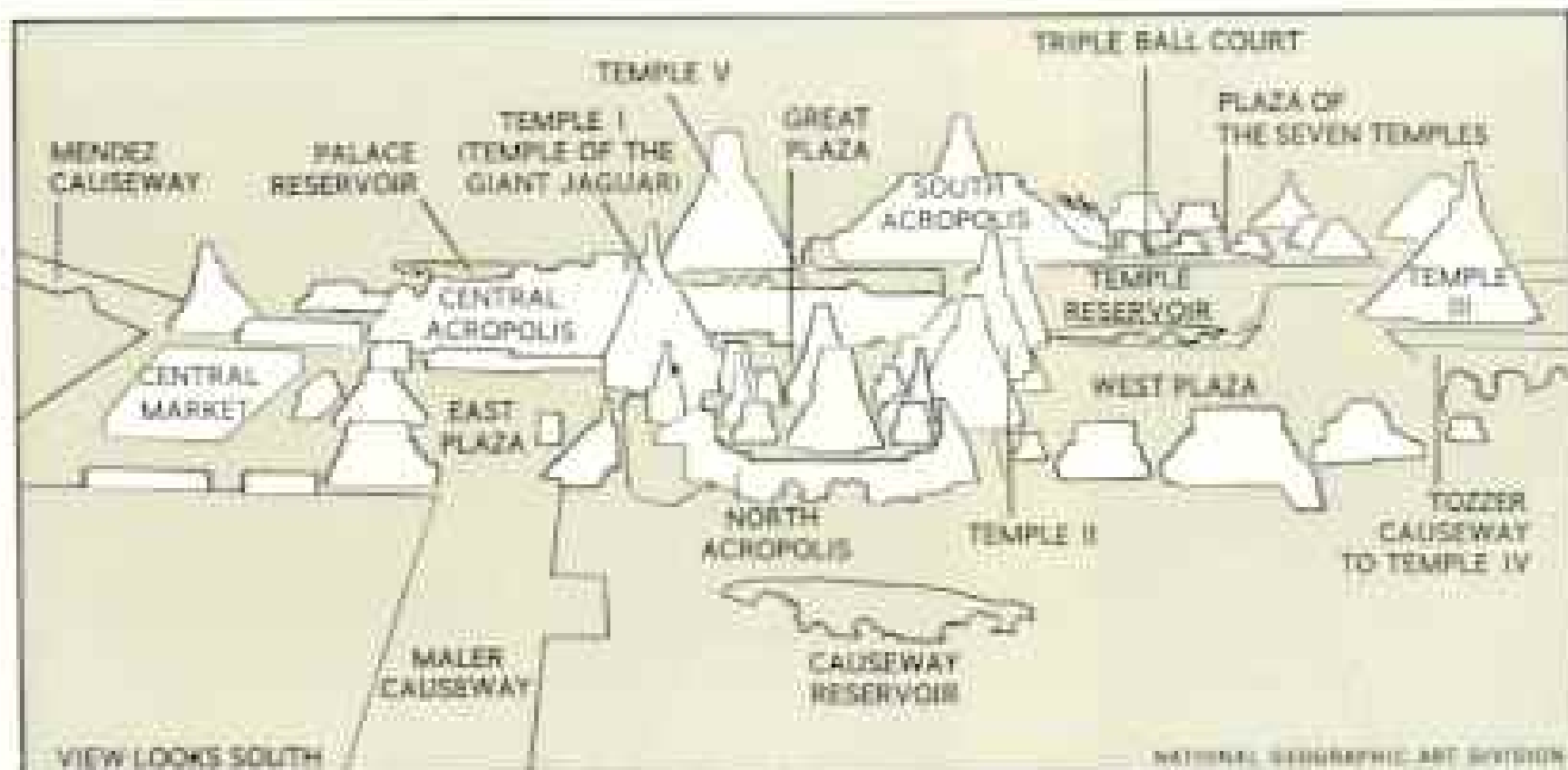
**T**HE MAYA GODS must have smiled upon such a city, with its temple-crowned pyramids, its great homes for the nobility, its pulsating market, and its tiered courts for games of high skill and deadly risk.

Would just looking at Tikal stop the heart? So the young stranger—let us call him Chan and fancy that he comes from an obscure hamlet—wonders as he nears the city, splendid crown of Maya civilization.

A wall protects it, he learns, as he passes immense earthworks, two and a half miles out on the north road. There he pays a tax on the heavy

bundle of *zapote* firewood he carries on this first journey to the great market of Tikal; his father has promised that half his profit will be used to help buy him a bride. A mile out, Chan skirts a gateway shrine reserved for the elite. Then he steps up onto a paved causeway, 80 feet wide, lower left. Soon he spies one of the reservoirs that provide water during the dry season.

Now Chan reaches the broad East Plaza. Ahead lies the Central Acropolis, with its religious schools and dormitories, government offices and palaces. Climbing, exploring, Chan sees sunshine chase shadow in the infinitely varied cityscape.



Consultant: Dr. Peter D. Harrison, veteran of 48 months at the Tikal excavation and research associate of the Royal Ontario Museum, helped prepare this lively re-creation of Tikal as it may have looked around A.D. 800. Speculation is based on archeological data, Spanish chronicles, and the customs of modern Maya "to give quickening color to the dead past," in the words of the late Sir Eric Thompson, who adapted this technique to Maya scholarship.

## Mighty rulers raise new temples atop the old

**A** SWARM OF WORKMEN on the North Acropolis construct a new temple to the rain gods in a scene Chan would have witnessed had he arrived a century earlier. A ruler has died and been interred in an older temple on this spot, and now his tomb has been engulfed by an even grander monument. Thus ancestors are so closely associated with divinity that they become as gods.

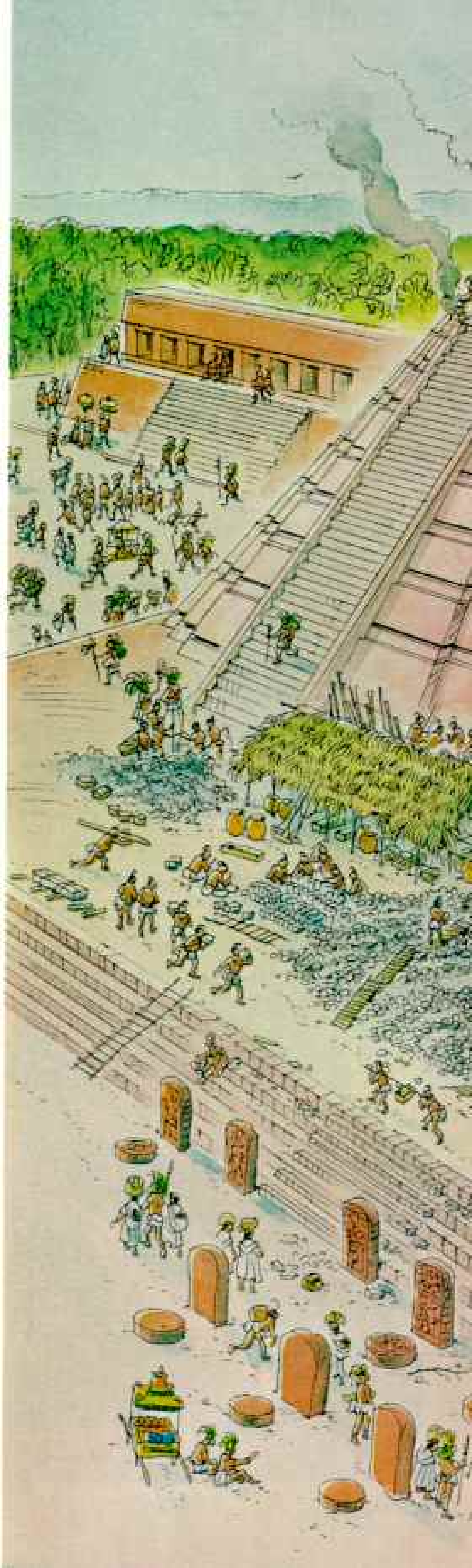
Construction techniques are truly marvelous. Laborers cement together rough-stone walls, filling the space between with rubble, mortar, and trash. Then they level them over with plaster and build another tier.

Simultaneously, masons face exterior walls with fine-cut limestone. Men carry the blocks on slings, for there are no beasts of burden or wheeled vehicles. Workers heat stone for powdered lime to mix with water and make mortar, stucco, and plaster. The plasterers spread a fine surface on the first and second levels. After the pyramid reaches about seventy feet, its top will be leveled to hold a two-room high-walled temple with a crest of stuccoed relief showing rulers who would be gods.

This imposing Chac temple will serve as the northern pivot for ceremonies on the Great Plaza, with its stelae and altars.

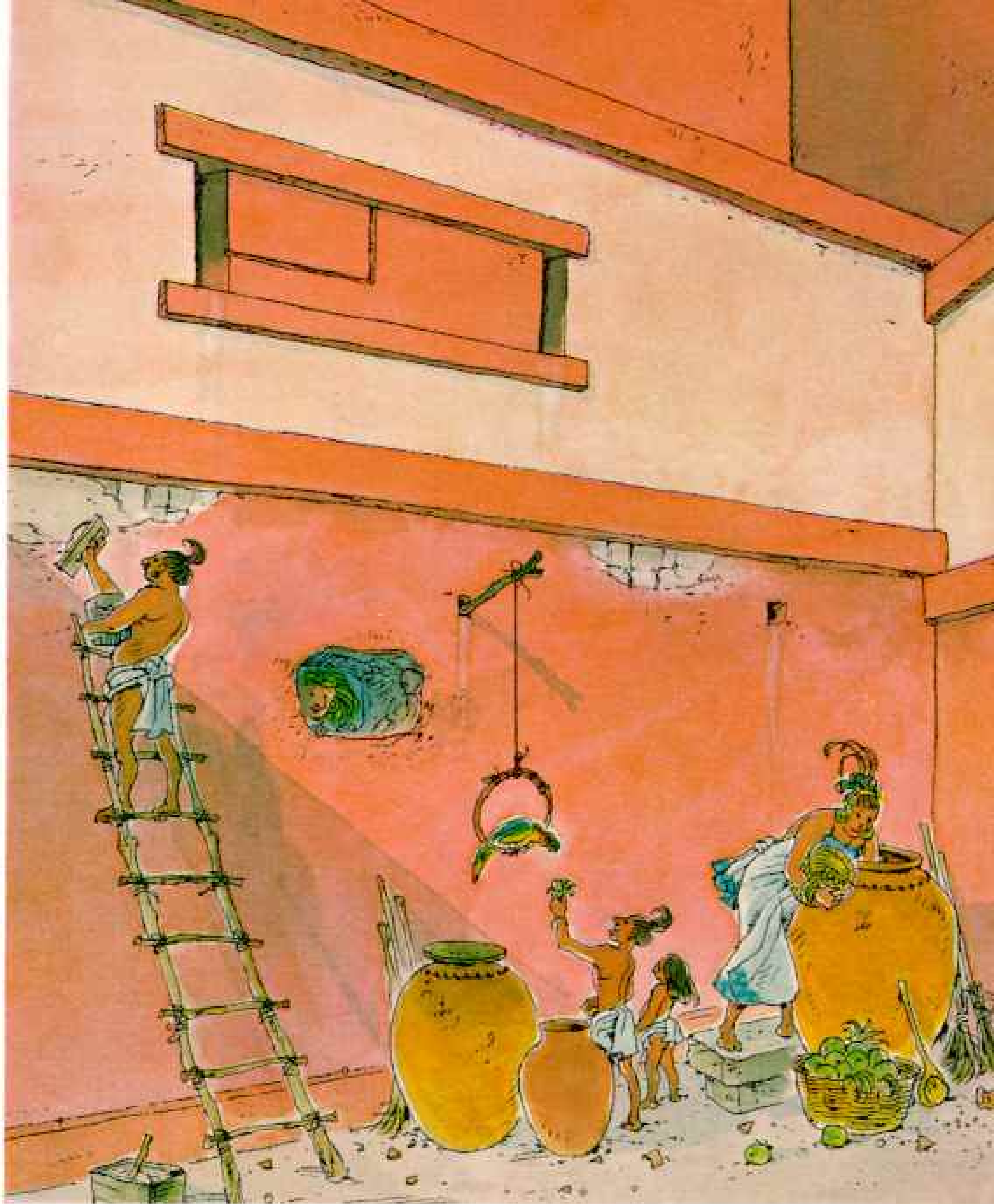
Sculptors (below) put the finishing touches on a new stela that portrays a ruler and the cycle of his days.

802





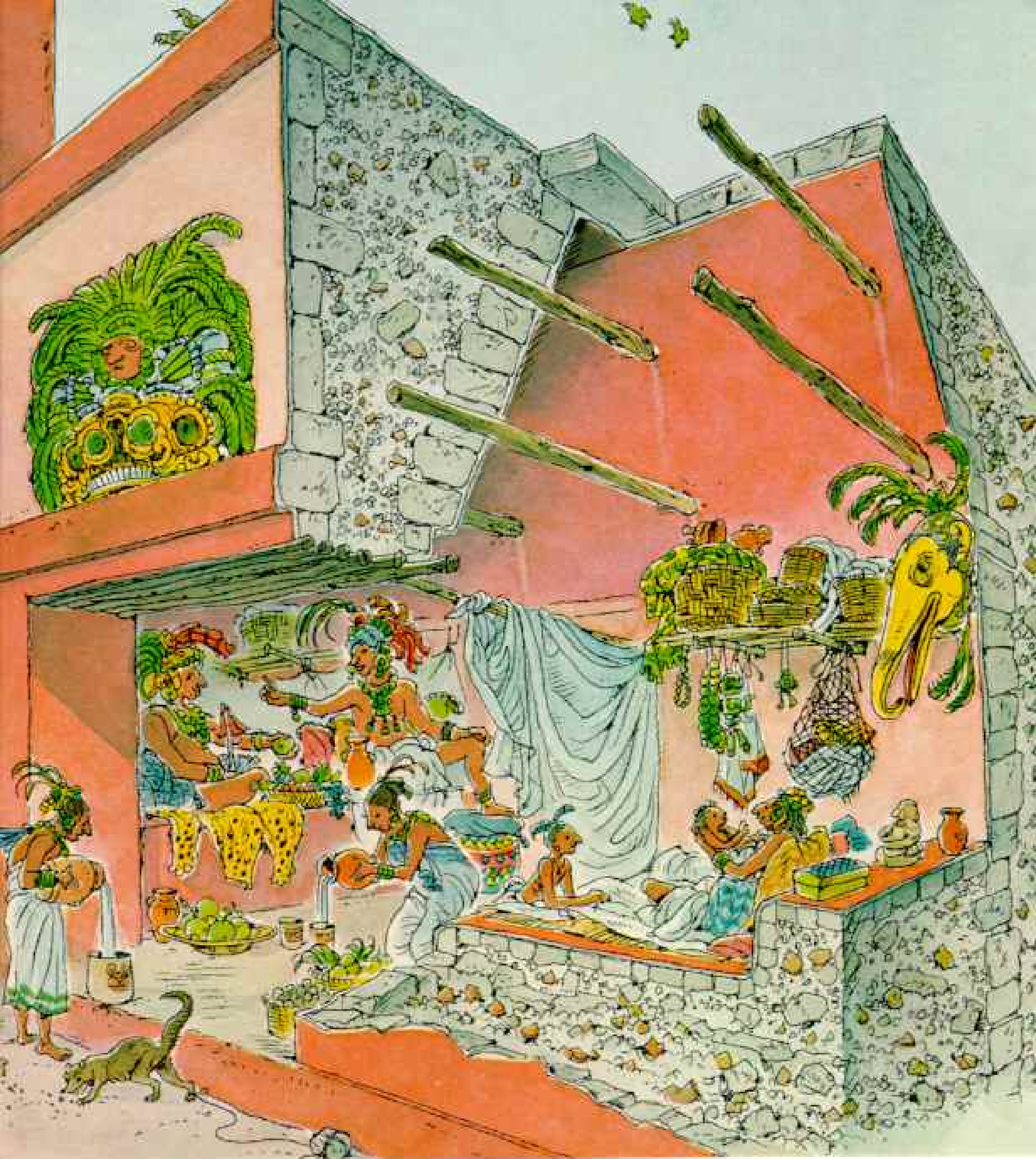




## Palace homes offer nobility a life of ease

**S**URROUNDED BY TRAPPINGS OF RANK, the family of a nobleman relaxes before the noonday meal. These aristocrats live in one wing of a two-story palace in Tikal's Central Acropolis. Above the doorway a stucco head of the jaguar god proclaims divine protection for members of the royal jaguar dynasty.

The young nobleman, seated on jaguar skins and laden with jade, offers fruit to his brother as they confer about affairs of state. Behind a half-



raised cotton drape his wife cuddles the baby on a hard bench-bed made comfortable with cushions and cotton sheets. A huge bird mask of lightweight papier-mâché and feathers, far right, hangs ready for the next city-wide ceremony. Other possessions rest on shelves or hang in net bags.

In the sunny patio a workman patches rain-damaged plaster, a never-ending task. Other servants pour drinking water and scoop maize to make gruel. A raccoonlike coati on a tether seeks

scraps amid trash that will pile up until moved to the community dump, source of construction fill, as seen in these cutaway walls. The home is built as sturdily as a temple. Walls made of facing stones and fill are slanted toward each other until the gap is closed with capstones, forming a corbeled vault, a hallmark of the Classic Maya. As the population grows, residents remodel, constantly seeking privacy by sealing doorways and adding wings with private patios such as this.



## The people who feed Tikal

**O**FF ON A COUNTRY RAMBLE, Chan meets a farm family that reminds him of his own. Tied to the cycle of their crops, they raise vegetables to sell in Tikal. Around a courtyard, a father and his married sons have built cool pole-and-stucco homes with thatched roofs. Kneeling over her



metate, a mother grinds breadnuts, picked from ramon trees; she will bake loaves with a flavor like chestnuts. Using a hip loom, a daughter weaves intricately designed cotton cloth. Wild animals trapped in the forest, spider monkeys and a coati, have become pampered pets for the

children; a young deer and turkeys face slaughter for feasts on special occasions. On small terraces built to trap soil, men tend an array of crops: corn, beans, squash, chilies, tomatoes, pumpkins, and gourds. Orchards of papaya and protein-rich avocado flourish nearby.

## Market day at Tikal: showplace of tropical bounty

**I**N RAINBOW PROFUSION, local and imported goods vie for Chan's attention at the Central Market. He bargained hard before selling his firewood and now carries in his pouch the currency of Tikal, 20 shiny brown cacao beans. He must resist the temptation to spend as he strolls the long galleries. Here a hunter offers cured skins and the carcasses of rabbit, turkey, deer, armadillo, and iguana. There a merchant displays fine textiles. Tikal's own workshops provide other products: everyday pottery, gourd containers, flint tools, beeswax candles, woven baskets.

From distant mountains and shores have come obsidian blades, tobacco, salt, dried fish fillets, metates of abrasive volcanic stone. And on the steps at right, a woman ladles out a stew that bubbles over a charcoal fire.

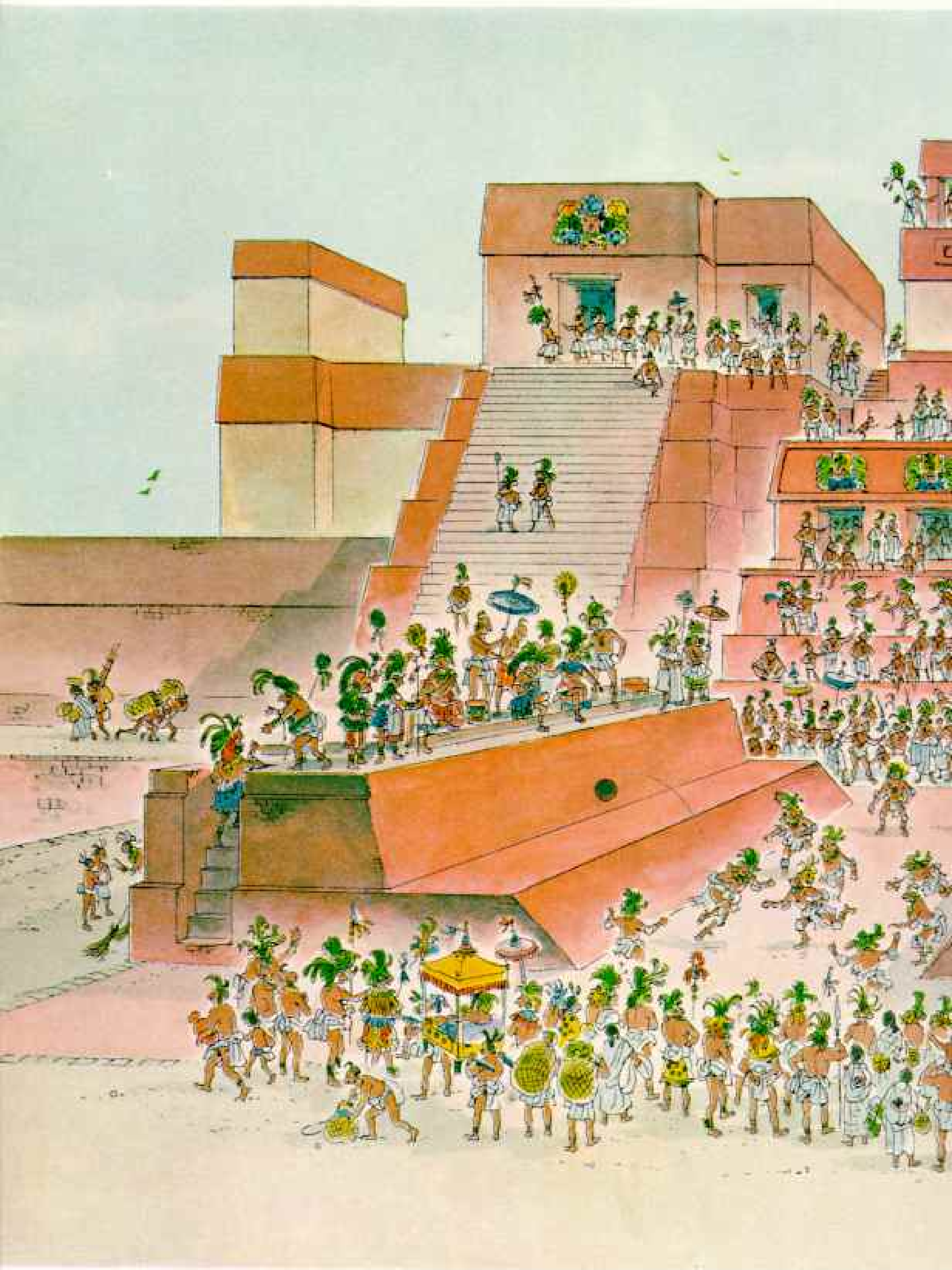
Behind the cook a man bent under his net bag enters the inner court, where sacred paraphernalia and luxuries are sold: masks, medicinal herbs, incense burners, whistle figurines, bundles of quetzal feathers, staffs with oddly shaped flint blades, stingray spines used in bloodletting. Hidden from view is precious jade from the highlands, for ornaments and offerings.

As in the village markets Chan knows well, market administrators set maximum prices. Contracts, never written, become valid when both parties drink together in public. Many people spend shiny cacao beans like Chan's, but the rich conspicuously consume their money, Chan hears, by drinking it as chocolate; sometimes clever counterfeiters remove the bean skins and fill them with clay.

Everywhere Chan looks—prosperity. No shadows hint that a century hence, by A.D. 900, Tikal will be virtually deserted. Overland trade will disappear, replaced by oceangoing canoes ferrying riches between Mexico and Panama around the Yucatán Peninsula. Yet even when the Spanish arrive in the 16th century, the Maya will still be Maya. As Bishop Landa will report: "The occupation to which they are most inclined is trading."







## Ceremony and sport: the Maya ball game

**S**HOUTS of the spectators, the smack of a hard rubber ball against masonry, the thud of bodies in collision—the sounds of a Maya ball game lure Chan to this scene.

Padded players, forbidden to use their hands, strike the ball with the hip, sending it ricocheting around the court. If the ball drops to the paved floor, it is “dead,” and so too may be the team at fault. Losing players sometimes become sacrifices, so serious is this game. Varying versions developed across Middle America, including a central Mexican contest using stone rings on court walls as goals.

In this game at Tikal, privileged nobles cheer the action from atop the walls, while ordinary spectators line end zones and the platforms and galleries of the towering Central Acropolis.

The teams had practiced hard, purified themselves in the ritual sweathouse, and uttered incantations over their equipment. A priest blessed the court, and play began. Now agile players leap to make a block or circle to return a volley.

Chan sees spectators make bets. He hears that some men gamble heavily on the game, wagering homes, jewelry, children, and even themselves as slave laborers.

The fast, violent game upsets and confuses Chan, and he turns toward his rural home with his little horde of cacao-bean currency intact. Had he but known, his Tikal visit had shown him one of the world's leading cities of his day, rivaling Rome, Alexandria, and the great centers of China. □





# Can We Harness The Wind?

By ROGER HAMILTON

Photographs by

EMORY KRISTOF

NATIONAL GEOGRAPHIC PHOTOGRAPHER

THE WINDMILL'S great arms of latticed wood swept past me with a mighty "whoosh." The heavy planks under my feet trembled and shuddered.

This was "The Seeker," a cooking-oil mill made of wood and powered by the wind. Without smoke, without the roar of engines, it took the same breeze that ruffled the leaves of a nearby tree, and transformed it into brute force.

At my side stood the miller, stocky, taciturn Jacob Kaal. He smiled proudly, and told me of the old days.

"This..." he drew a powerful arm across the flat horizon of the Netherlands' Zaan River region, "was once one of the world's great industrial centers. And the wind made it all go."

I squinted and imagined the scene of two centuries past. A thousand of these wind-powered Dutch factories sawed timber, fulled wool, ground spices and dyewoods. Nearly every industrial process then in existence ran on wind power. Whenever the wind blew, the great sails turned, day and night, many even on Sundays.

And today? The old industrial windmills that have managed to survive struggle for attention among the modern factories pressing in on every side. Kaal spoke philosophically about the change.

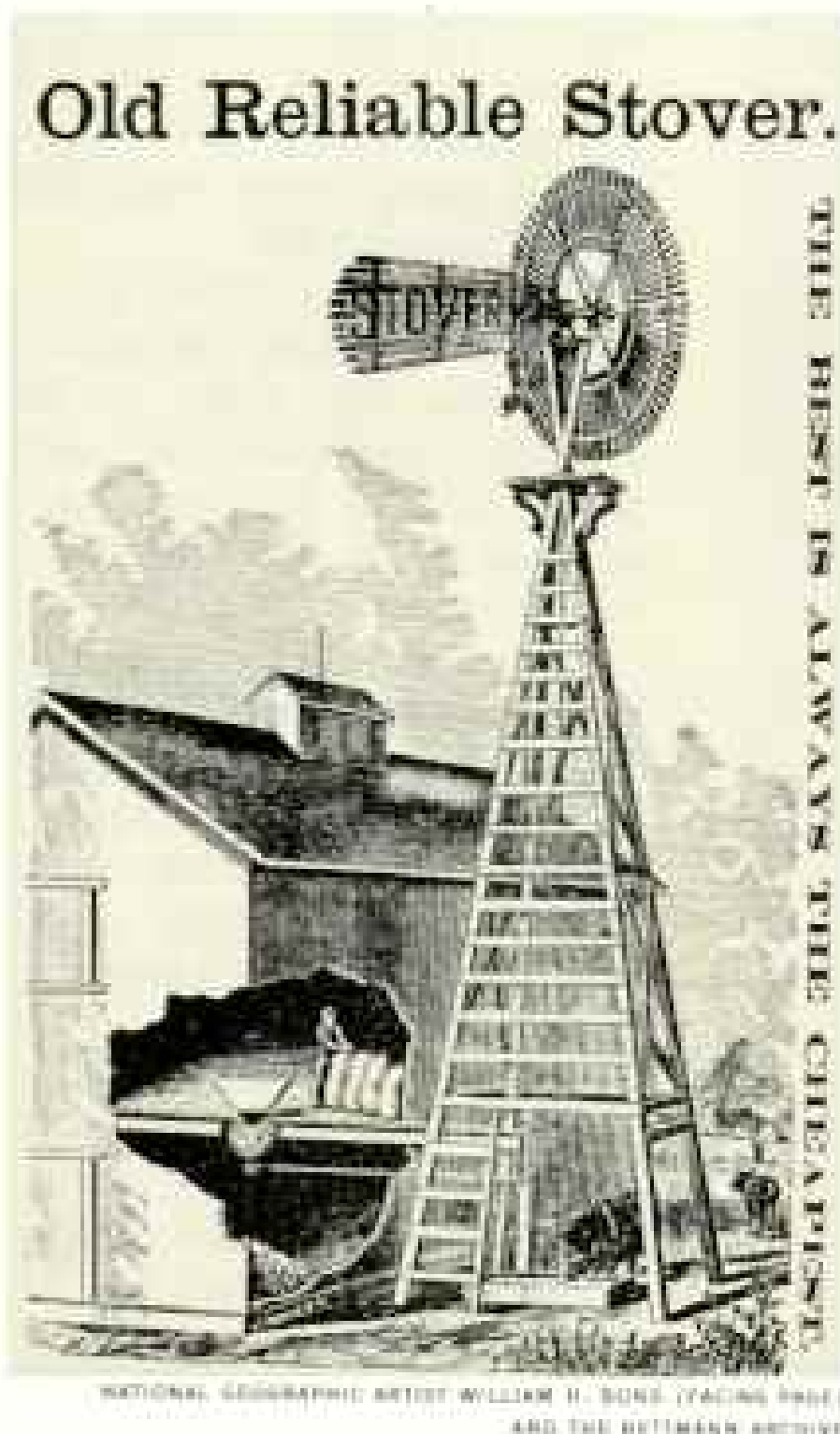
"Those big factories are the windmills' children. Almost every one of them has a windmill ancestor."

In the 19th and 20th centuries the old windmills couldn't compete with cheap oil and the concentrated might of steam and internal-combustion engines. Across the Netherlands and around the world people razed windmills, or converted them to other uses. The Seeker survives thanks to generous subsidies from its modern factory neighbors.

Miller Kaal returned to work. The mighty wooden gears creaked and groaned as they locked their teeth into one another, sending the wind's power down to the work floor below. I felt the rumble of the great millstones as they crushed the peanuts shoveled into their path. I heard the sharp crack... crack... crack... as the pressing rams forced the meal to yield its oil.

The Seeker filled me with thoughts not only of the past, but also of the future. Petroleum prices have recently quadrupled, and then some. The supply of oil is uncertain, subject to politics of the oil-exporting countries. Homeowners and industrialists in many parts of the world face the threat of increasingly serious energy shortages.

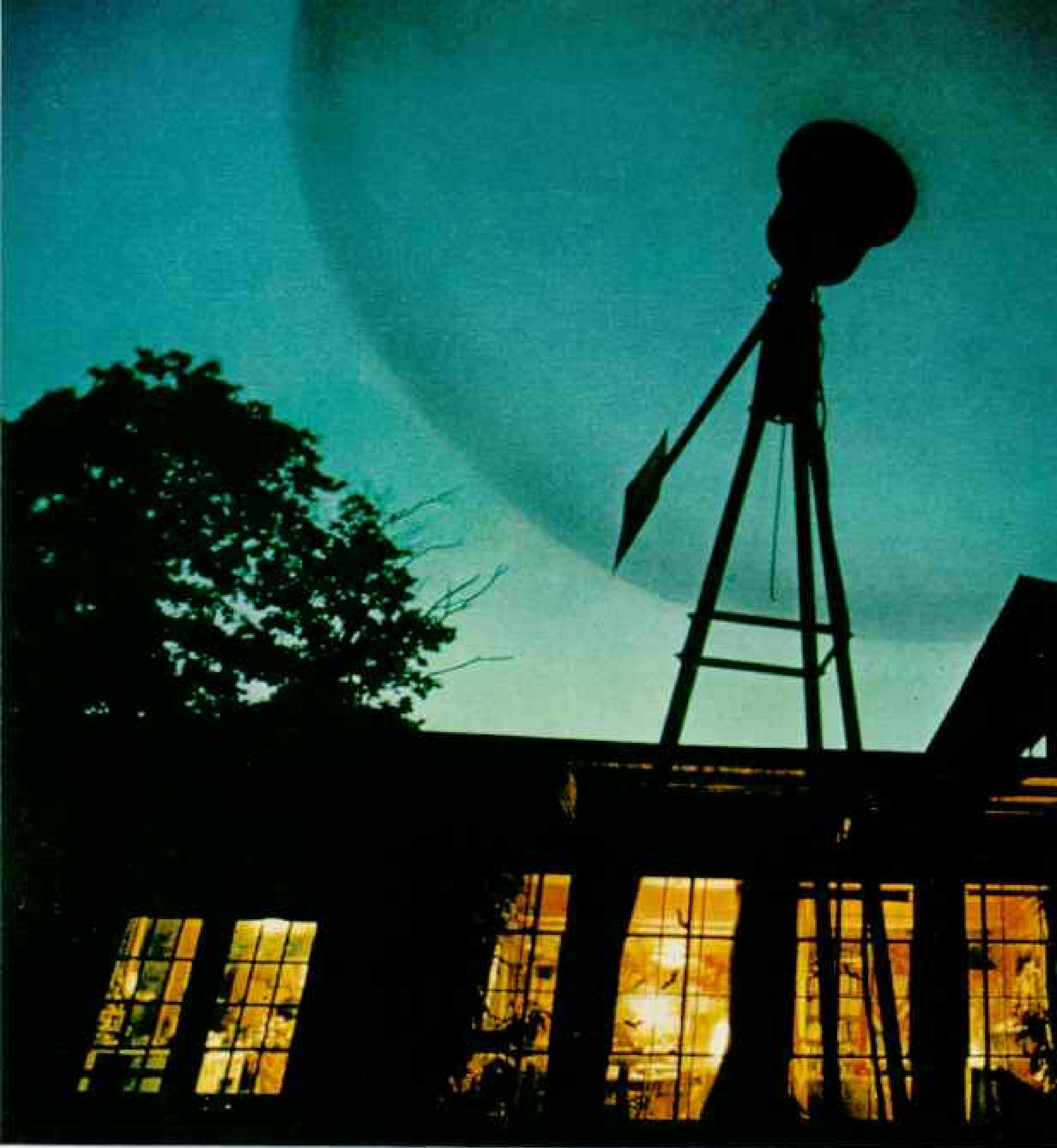
In the United States the Energy Research and Development Administration (ERDA) is eagerly seeking possible alternative sources of power, from the sun, from ocean currents, from heat beneath the earth—and from the wind.



NATIONAL GEOGRAPHIC ARTIST WILLIAM H. BONE (FACING PAGE) AND THE BETTMANN ARCHIVE

Skyscraping wind machines, 70 stories high, turn offshore winds into electricity even as repairmen service a 60-foot propeller (facing page); four towers could electrify a town of 10,000. Thus do this and other proposed variants of the traditional windmill (above) spin hopes for bolstering the energy supply.





The government's keen new interest is seen in the sharp spurt of federal financing for wind-power research—up from a token \$200,000 just three years ago to 12 million dollars in fiscal year 1976. Nearly fifty wind-power projects are now supported by federal funds.

People are beginning to take the psychological step backward that wind power seems to represent, and then two steps into the future. For example, the prestigious California

Institute of Technology at Pasadena introduced a course in windmill engineering. Responding to rancher demand, New Mexico State University in Las Cruces has scheduled a course on how to repair old windmills. Some 150,000 of them still operate across the United States, chiefly to pump water. Perhaps another 50,000 could be repaired and used again, according to estimates.

I found that books on the subject are scarce, and getting scarcer because of high



When Henry Clews moved his family to a Maine hilltop in 1973, the power company wanted \$3,000 to hook him up. Instead, Clews set up two wind-driven generators; 20 six-volt batteries and 60 two-volt batteries store power for periods of calm, and a gasoline-fed generator serves as backup. A third windmill (left) tests blade and gear-box designs. Clews can produce 250 kilowatt hours a month—more than enough to run his 12 lights, television, phonograph, vacuum cleaner, typewriter, water pump, and well-equipped toolroom (below).



public interest. "We just can't seem to hang on to them," one librarian told me sadly.

#### New Designs for an Old Idea

In research centers and universities I have seen prototypes and blueprints of a new generation of windmills, or, to be more precise, wind-driven generators. Some, towering higher than the Washington Monument's 555 feet, may in time form great networks; others, much smaller, will power individual

homes. All promise clean, inexhaustible electrical power—if the research pays off.

Meanwhile, one Iowa corn farmer is outdoing anything I have seen in a laboratory or on a test site: He gave me a preview of life with wind power.

"John Lorenzen? Sure, you can't miss his place," said a Woodward, Iowa, postman. "He's got windmills and everything else."

This lean gentleman did, indeed. Overhead his wind generator hummed and vibrated,

swinging to meet the sharp winter wind head on. Not so many years ago thousands like Mr. Lorenzen generated their own power. Then, during the 1930's and 1940's, the Rural Electrification Administration crisscrossed the nation's farmlands with power lines; the West became a windmill graveyard.

But not on John Lorenzen's farm. He pointed down his driveway, where overhead lines bypass his cluster of tidy buildings:

"They tried to get me to hook up, all right," he said, laughing. "But I wouldn't. There was nothing wrong with wind machines that I could see."

And sure enough, no matter what electrical gadgetry came along—vacuum cleaner, dishwasher, TV—his wind generator powered it. When the wind does slacken, generally during August, he's ready with banks of storage batteries.

#### Wind Tamer Shows His Prizes

If I was impressed by all of this, I was flabbergasted when I followed Mr. Lorenzen into the barn. There I discovered what the postman had meant by "everything else."

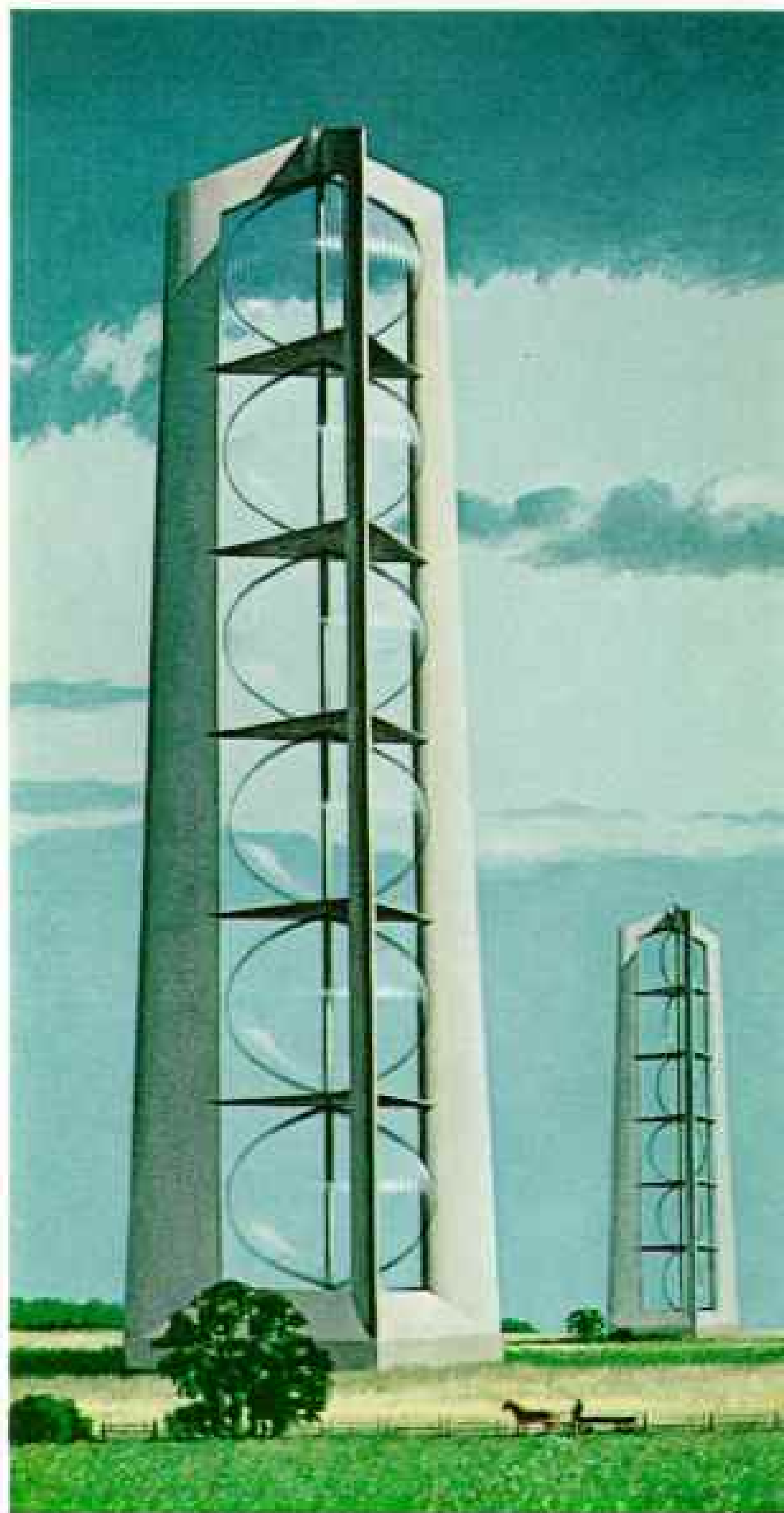
"Here's my power hacksaw. I made it myself," he announced, flicking a switch that set in robot motion an iron arm ending in a saw blade. "I made this drill from an old automobile generator," he continued.

For an afternoon this self-taught electrical wizard showed me his air compressor, welder, electric forge, lathe, presses, grinders, saws, even a little device for charging old flashlight batteries. Like a maestro, he threw switches and plugged plugs. Wheels spun, machinery hummed, lights lit, coils glowed. I felt like applauding.

I thought back to the Netherlands' Zaan region, and what human ingenuity and the power of the wind had produced there. Mr. Lorenzen seemed to have done as much.

Wind power works, there's no doubting that. It can turn The Seeker's massive millstones, and run Mr. Lorenzen's bewildering menagerie of machines. But is it economical? For the answer to this key question I traveled to a hilltop in Maine, where Henry Clews lives with his wife, two children, and his sleek new wind generators (preceding pages).

"People paying \$150 a month in power bills are naturally very much interested in windmills," this bearded young engineer told me. As a wind-generator dealer, he receives a thousand inquiries. (Continued on page 820)

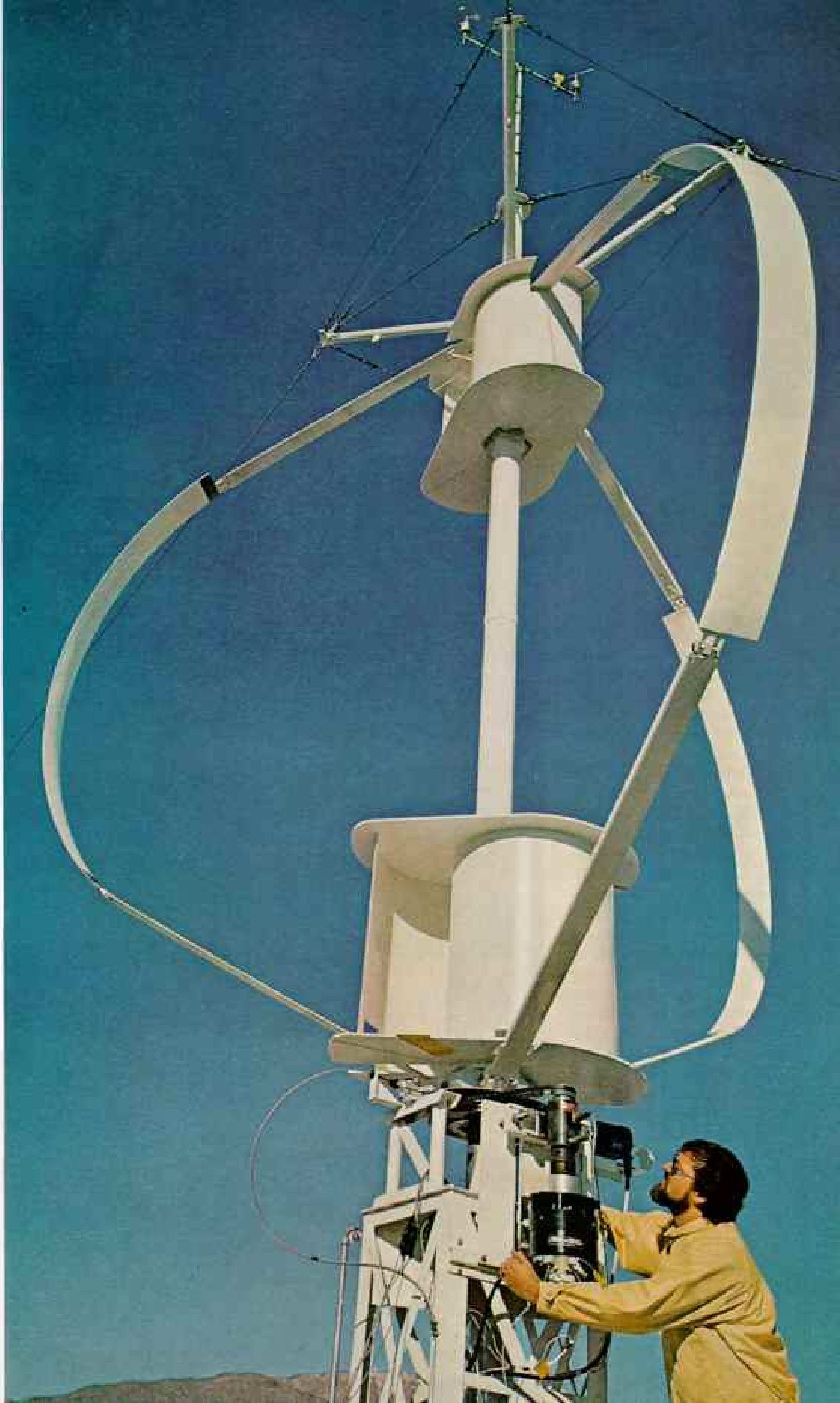


NATIONAL GEOGRAPHIC ARTIST WILLIAM H. BONE (ABOVE) AND BRUCE LABORATORY

Nothing in the books says a windmill has to look like a windmill—but that it must have a set of blades, something to kick them into action, and a hub to transmit the energy.

Developed from 50-year-old French and Finnish designs, this 15-foot-diameter vertical-axis wind turbine in Albuquerque, New Mexico (right), is now undergoing tests. Because it is vertical, wind coming from any direction will strike its blades properly; rotors at top and bottom set the turbine in motion even at low wind speeds.

The vertical-axis designs, including futuristic six-rotor towers (above), may someday transform the rural landscape.





Stark rigs scratch the sky on a ranch near Harrison, Nebraska. Four face the setting sun, spinning in the western wind that sweeps the Great Plains. Three stand "furled," with the long tail that swings the blades into the wind set parallel with the wheel.

"Without the windmill, we could raise hardly a fourth of the cattle we do," says Dick Herren, proprietor of Herren Bros. feed and ranch-supply store in Harrison. "The number of cattle you can put on your ranch depends in part on how far they must walk to water. Ranchers can use electric pumps where there are power lines, but the lines are placed far apart. The wind blows everywhere."

Part of Herren Bros.' business is keeping the area's windmills turning. In the brown grazing land a crew works over a venerable Aermotor (right).





"The wind is awake," wrote poet John Cheney, and indeed it is; nearly always, nearly everywhere. But wind power—the amount of energy available in the breezes—depends not so much on the average wind speeds as on the hourly distribution of winds, on terrain and obstacles, and on altitude. As the darkest tints indicate, the New England coast, the western

Great Plains, and the Pacific Northwest offer the contiguous United States' greatest wind-energy potential, largely because of powerful winds that occur part of the time. That's important, for wind power increases as the cube of wind velocity. In other words, a little more wind means a lot more power.

An example: Assume that the wind in Chicago blows con-

stantly at its average speed of 11.2 miles per hour, but that the average for Minneapolis, also 11.2 mph, comes from winds that blow 8.2 mph for half of each day and 14.2 mph for the other half. Because of the cube factor, the city of Minneapolis would have available during its windier *half* day as much energy as Chicago would have during the *whole* day.



a month at his trailer office in tiny East Holden. But few materialize into actual sales.

"People think, 'Well, I'd be glad to spend a thousand dollars and be done with it.' But today they would have to spend closer to \$10,000," says Mr. Clews. The price of wind generators is rising. Most come from Australia or Europe. Only recently have American manufacturers again put on the market machines capable of powering a home.

Even so, the Clews family's original \$2,800 wind machine was a good buy. The alternative

would have been to pay \$3,000 just to string a power line to the isolated homestead. Wind power, even in its present state, is already the answer in such special cases.

#### Wind Can Even Aid Oil Quest

Gulf Coast oilmen are installing small three- to seven-foot wind turbines to supply electrical power for offshore platforms. In remote places like Hawaii or the Aleutian Islands, where oil must be imported but where the wind blows freely, wind generators



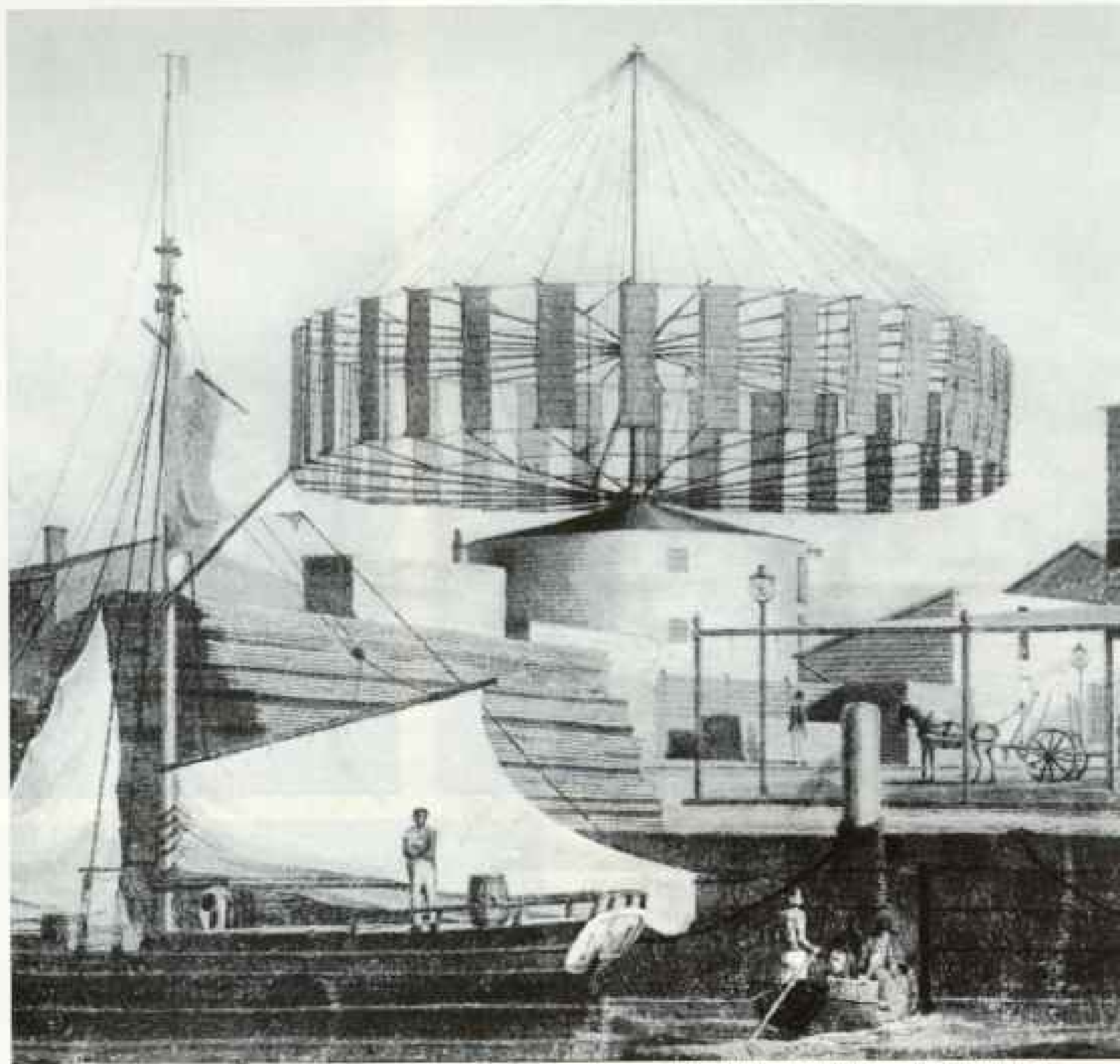
have important potential. But every wind-power researcher I met agreed that wind generators will come into general use only when costs come down.

The National Aeronautics and Space Administration has taken on important energy projects in addition to its space program. At Lewis Research Center in Cleveland, Ohio, I talked to Ronald L. Thomas, who heads the center's drive to bring wind power into the 20th century.

"Right now the major barrier to the use of

wind turbines is their high cost," Thomas told me. "The wind may be free, but not the machinery to harness it. Today's increasing petroleum prices are swinging the pendulum toward wind power. Modern technology can provide that extra push."

Amid acres of starkly functional laboratories, the wind-power program struck me as modest. But NASA is dead serious. The agency estimates that by the year 2000 wind generators might supply as much as 5 to 10 percent of the nation's electricity.

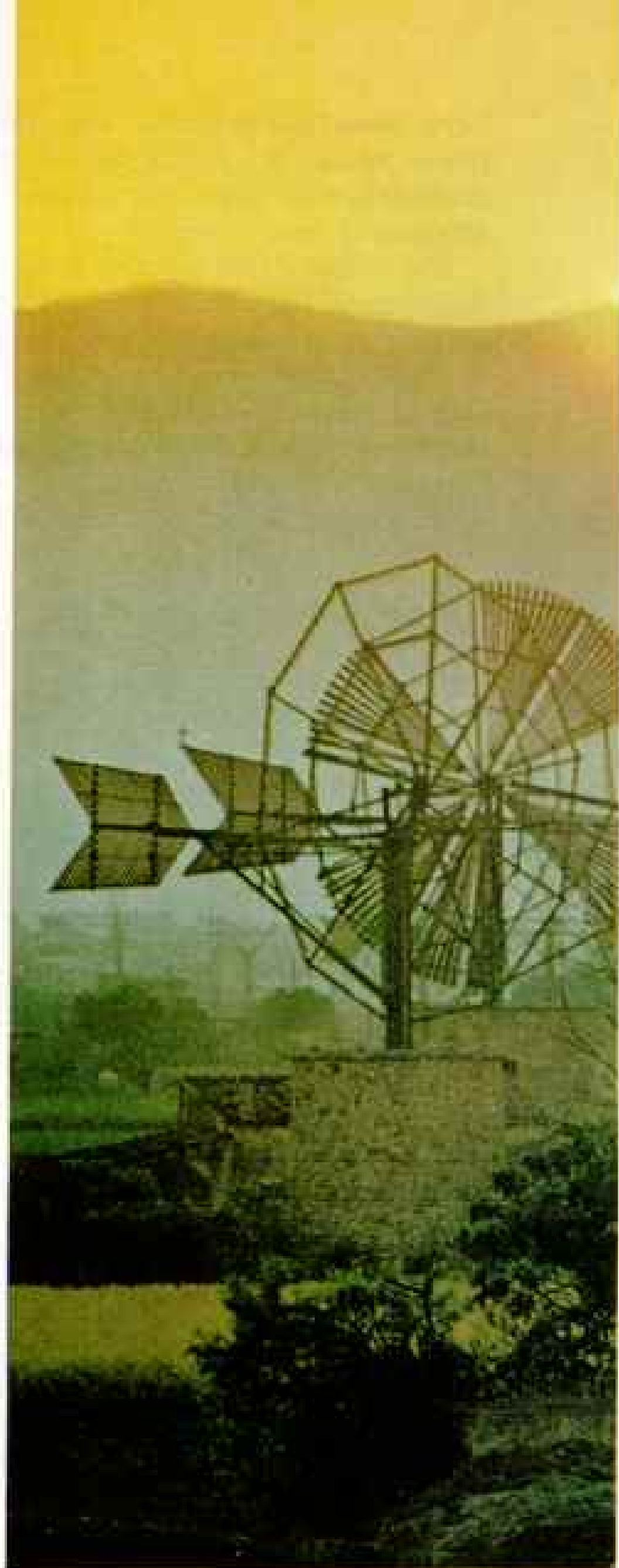


COURTESY THE OAKLAND MUSEUM (LEFT); THE BETTMANN ARCHIVE

Wind catchers of the past helped engineer the continent's expansion. Sails of a carousel-like vertical-axis wind wheel (above) powered machinery of a New York State lumberyard in the early 19th century. The Union Pacific Railroad used 25-foot-diameter mills (left) to squeeze water

from Wyoming's sun-baked acres in the 1870's.

Scientists puzzle over how to store wind-generated energy. Shelves of batteries present one approach. A newer approach is to use the electricity to break water down to its components: oxygen and flammable, clean-burning hydrogen.



**Different spokes for different folks.** In a Portuguese hamlet (above), plow-shaped extensions help boost the power of a windmill. Giant arrows of Majorca (above right) mark old windmills made obsolete by the advent of a public water system. A new design, called the Super Speed Turbine, uses aerodynamically shaped blades (right) to whirl power from the air at Oklahoma State University. Generators require a high rate of spin to produce electricity, usually accomplished by gears attached to the central hub of the windmill. The SST instead runs a belt around the faster-moving outer rim directly to the generator—at a considerable saving in cost and complexity.





NATIONAL GEOGRAPHIC PHOTOGRAPHER BRUCE DALL (FACING PAGE, TOP) AND JAMES H. SMITH (RIGHT)

NASA's prototype for the future is the 100kW Experimental Wind-Turbine Generator at the Plum Brook test area in Ohio. Its two slender blades span 125 feet, and turn a 100-kilowatt generator (page 829). Perhaps 30 homes could depend on it for power.

Although it dwarfs John Lorenzen's wind generators, the 100kW doesn't set a record for size. Dr. Joseph M. Savino, a founder of NASA's wind program, waved to shelves of yellowed books and papers, and told me of wind power's largely forgotten history in the Soviet Union, Denmark, France, England, and Germany.

In the United States, during the war years of 1941 to 1945, the biggest wind machine in history towered over Grandpa's Knob, a mountain near Rutland, Vermont. Its two eight-ton blades stretched 175 feet from tip to tip (page 828). Off and on its 1,250-kilowatt generator pumped into the local grid enough power for a modern village of perhaps 200 homes. But it came to an untimely end when a blade tore loose. The great machine was scrapped as too costly. And fuel was cheap, so why bother perfecting wind power?

Today that harsh master, cost, oversees most details of wind-generator construction.

This quest for economy has spawned a wild variety of windmill designs. One, under study at NASA's Langley Research Center in Hampton, Virginia, resembles the oval blade of an upright eggbeater. Engineers on the West German island of Sylt have tested a horizontal-axis machine with two sets of blades rotating in opposite directions.

An aeronautical engineer, John F. Strickler, Jr., told me about a house he is building near

Seattle, Washington, in which two wind generators will provide electricity. If mass produced, he said, the equipment would cost no more than a large color TV.

On Long Island, engineers at Grumman Aerospace Corporation demonstrated the "Sailwing." Its yellow-and-white blades, made of Dacron, spun merrily, like an expensive pinwheel for an overgrown child.

At Princeton University in New Jersey, the Sailwing's inventor, Dr. Thomas E. Sweeney, showed me a design like a giant spatula doing a pirouette. Another resembled a wingless, slender aircraft balanced on a pole.

What design holds the most promise? Nobody can say. Wind-power researchers at Oklahoma State University are betting on the SST (Super Speed Turbine) that looks like an overgrown version of the bicycle wheel that inspired it (page 822). The aluminum blades, snapped onto wire spokes, respond nimbly to changes in the wind.

"Wind power is still a field where people can innovate things in a garage workshop," comments Dr. William L. Hughes, head of the Oklahoma State team.

The SST's aluminum blades give it a weight advantage over most conventional-prop models. Team member Dr. R. Ramakumar and I easily lifted the 15-foot wheel. Another advantage is the absence of a gearbox—a very expensive item. The SST works somewhat like a spinning wheel, driving its generator with a belt encircling the wheel's rim.

#### What About the Windless Times?

Dr. Hughes's team still faces one of the most nagging problems: how to store the wind's power for use during a calm.

"Economical energy storage is still a long way off," Dr. Hughes conceded. He listed some of the potential methods: conventional batteries, giant flywheels, compressing air into underground caverns, manufacturing hydrogen for use as fuel. "When these come, fine. But we don't have to wait for them before we begin utilizing wind energy."

Instead, he suggested, wind-generated electricity could be pumped directly into utility lines to save fuel. When the wind dies, existing conventional power plants would take up the slack.

The Oklahoma State team believes that within a few years, with the necessary funding, windmill "farms" without storage could provide 5 to 10 percent of the electricity used



NATIONAL GEOGRAPHIC PHOTOGRAPHER STEVE BAYNER

Getting a "tankful" of clean energy, a driver in the 1975 Alternative Vehicle Regatta plugs his electric motorcycle into a wind generator on New Hampshire's Mount Washington. The idea is not new; Adm. Richard E. Byrd took a larger generator to Antarctica in 1933. Its spruce wood propellers were still spinning when the explorer inspected the base at Little America 14 years later. Cost of maintenance: nothing.

by Stillwater, Oklahoma—a city of about 36,000 people.

Once explained, wind power without storage sounds obvious. But the Oklahoma State team had to solve one more problem. A wind generator, explained Dr. Hughes, cannot pump just any kind of power into the transmission lines. It must be alternating current pulsing at an unvarying 60 cycles per second. The usual method of keeping frequency constant is to feather the blades; thus they turn at the same rate no matter how strong the wind blows. It works, but it's complicated and expensive—and it spills valuable wind.

So the Oklahoma State team concentrated on the generators rather than the blades, and came up with a generating system that maintains the 60-cycle output regardless of blade speed. Their method extracts 10 to 40 percent more energy from the wind.

#### From Wind, to Hydrogen, to Methane

For a glimpse of the more-distant future, team member Dr. H. Jack Allison took me to his "boom room" to talk about hydrogen storage. "Don't worry," he joked. "We haven't had an explosion here for eight years."

He showed me the well-known classroom experiment in electrolysis: attaching two wires to the poles of a dry-cell battery and dipping the free ends into water. Two streams of tiny bubbles—oxygen from one wire, hydrogen from the other—rose to the surface. In the same way, he explained, wind-generated electricity could break down water molecules into oxygen and hydrogen.

A versatile gas, hydrogen can be burned to produce steam to turn electrical generators and to heat buildings. It can also be combined with organic materials to make fuels such as methane, which can power automobiles.

"In the past we've used hydrocarbon fuels to make electricity," he said. "In the future electricity will make hydrocarbon fuels."

A major obstacle facing hydrogen storage is psychological: mention hydrogen, and people think of the fiery finale of the dirigible *Hindenburg*. But gasoline, too, is flammable, Dr. Allison reminded me. Yet the millions who drive the highways seldom worry that they sit astride potential firebombs. Someday technology will make hydrogen as safe.

It's easy to respect the power of the wind in Oklahoma. Open the car door, and the wind tries to wrench it from its hinges. Tumbleweed skitters across the dusty ground. "It's a

wind you can lean on," drawls Dr. Hughes.

It's the kind of wind that has sparked the imagination of a professor of civil engineering at the University of Massachusetts. Professor William E. Heronemus wants to harness such winds at sea, with hundreds of thousands of lofty wind towers.

This scheme would unite wind machines with the age of sailing ships. Professor Heronemus showed me a drawing of gigantic wind towers rearing out of a calm ocean, each of them equipped with three 200-foot-diameter wind generators. Thirteen thousand of these wind towers, he suggested, could be strung off the New England coast to catch the prevailing westerlies that sped the old seafarers home from the New World. Some towers would rest offshore on the bottom; others would float, rising and falling with the swells. The wind-generated electricity would be fed to undersea electrolyzer plants to produce hydrogen. Pipes laid on the seabed would carry the hydrogen to shore.

Professor Heronemus estimates that his offshore system could supply 2½ times the amount of electricity consumed by the New England states last year, and that the cost would be 45 percent less than the cost of building nuclear plants with the same capacity.

#### A Little More Wind, a Lot More Power

Common to all of Professor Heronemus's schemes is the great height of the supporting towers. "If we're not willing to put the turbines up where the winds are, we might as well forget about wind power," he asserted.

Go thirty feet above the earth, he said, and the wind blows 15 to 25 percent stronger than at the three-foot level. That's important, since even a small difference in wind strength makes a big difference in power. Power increases as the cube of the wind velocity, thus the power in a 20-mile-an-hour wind is eight times that in a 10-mile-an-hour wind.

But could we tolerate the sight of thousands of such gigantic towers if they were inland? A spokesman for the same Vermont power company that used the Grandpa's Knob windmill told me, "If you're talking about putting wind machines all over the Green Mountains, we couldn't live with it."

Aesthetic considerations also concern Dr. E. Wendell Hewson, who has been evaluating inland and coastal wind-power sites in Oregon. A professor of atmospheric sciences at Oregon State University, Dr. Hewson told me



"I just wanted to make something for the young people to see," muses 91-year-old Emil Gehrke of his colorful assortment of whirligigs and windmills. Some 300—give or take a stray chamber pot or waffle iron—pepper his yard in Grand Coulee, Washington.



NATIONAL GEOGRAPHIC PHOTOGRAPHER JAMES P. BEAIE

But whimsy slips away when serious wind-power advocates discuss their subject. Exclaims one convert concerned about dwindling resources, "Let's use the sun, the wind, the rain, the tides, the natural heat of the earth—but let's not use anything up!"



On the wing of a giant, project workers inspect a mammoth blade of Grandpa's Knob generating station in Vermont. From time to time during the 1940's, the experimental turbine, rated at 1,250 kilowatts, fed electricity into local power lines; the project was abandoned in 1945, when one of the eight-ton blades tore loose. A measure of the revived interest in wind power is the 100-kilowatt experimental generator (right) being tested by NASA in Ohio as a possible prototype for practical commercial machines.



CARL A. WILCOX ASSOCIATES (ABOVE) AND DAN J. DYE

he had been attracted to wind power after years of studying air pollution. He will not now be an accomplice to visual pollution.

I drove up the coast and felt precisely the same concern. Here was drama in the frothy surf, in the monolithic boulders, in the conifers teetering on the edges of cliffs.

But Dr. Hewson is optimistic. His research has convinced him that there are many sites in the Northwest suitable for wind-power projects—sites so remote that the towers would offend hardly anyone.

#### Scientists Ponder Side Effects

Wind-power advocates are also giving careful thought to other possible problems that large-scale wind power might present.

Could thousands of enormous towers slow the wind enough to affect the weather? It seems unlikely, the experts say, when one

considers that a single 20-story building disrupts the wind more than 20 wind machines the size of NASA's 100kW model (right).

At the University of Oklahoma Professor Karl H. Bergey, a wind-power expert and a bird-watcher, voiced another concern: Could large wind-power farms cause havoc with migratory flocks? "The flyways are generally well known," the professor told me. "We must not choose these routes for the towers."

As I talked to engineers and scientists, wind power's problems sounded to me like manageable problems. Wind generators, no matter how big or how many, cause no radioactive wastes, no strip-mine scars, no depletion of scarce resources. We know what to expect from wind power. For centuries it has proven itself man's loyal friend, ready to serve whenever needed. In the view of many, it will serve again. □



# RAFTING DOWN THE

By KEITH TRYCK      Photographs by



# YUKON

ROBERT CLARK



I BRACED MYSELF for the crash. Wallowing in the grip of a powerful cross-current, our raft veered from the middle of the river and headed toward the canyon wall. "We're going to..." someone yelled, but the warning was drowned in the thunder of splintering logs and the rasp of wood against stone. Cartwheeling along the canyon wall, the raft threatened to spin us overboard into the millrace or to crush us against the sheer face of the cliff.

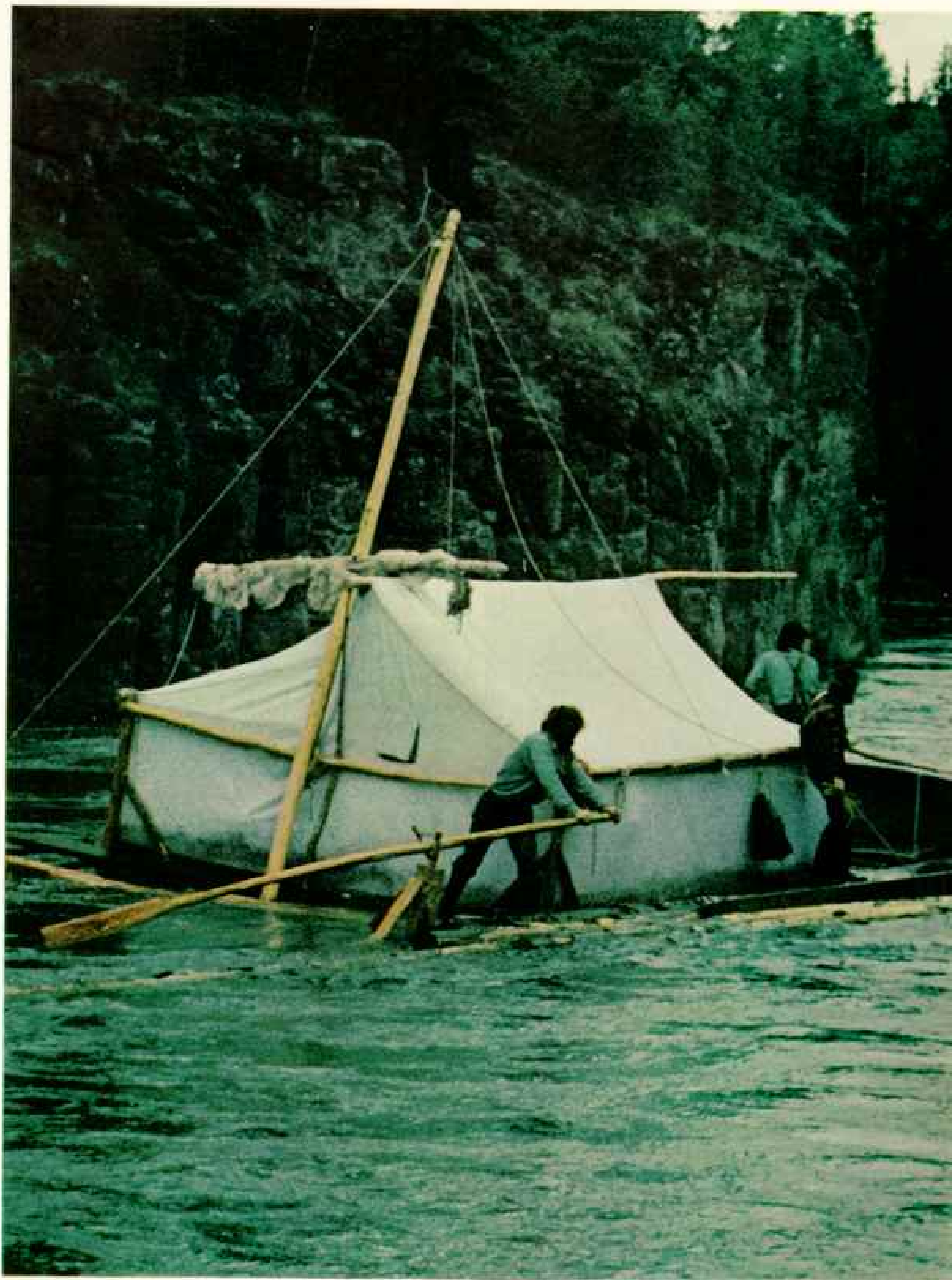
Caroming off at last, we swept back into midchannel (following pages) and regained control with our sweep oars, emerging from the canyon into smooth water. Somehow the raft had survived with only minor damage: a sheared corner, a broken sweep mount, and a toppled mast—all repairable. We had weathered our first encounter with swift water and had met the challenge well for beginners. We're learning, I thought.

It was the first of many lessons the Yukon was to teach us during our 1,850-mile odyssey from Bennett Lake, a source of the river near the Canadian-Alaskan border, to its mouth on the Bering Sea (map, pages 836-7). Journeying first by raft and later over the river's frozen surface on skis, we spent two summers and part of one winter exploring Alaska's best known waterway. In the process we made close friends among the varied people—Indians, whites, and Eskimos—who share the beauties and the hardships of life along the river.

We were four men, all in our twenties, with a common goal: to see the Yukon as others had seen it more than three-quarters of a century before. Our predecessors were the thousands of fortune seekers who made up the great Klondike gold stampede in the late 1890's. By following the route and techniques of the early "stampedeers," we hoped to explore the remains of one of Alaska's wildest and most colorful eras and to experience some of the adventures and challenges of that era.

The four of us were not strangers to the

**Pinochle-faced foursome** while away an evening on their hand-built raft. A year earlier Paul Crews, Jr., from left, Jerry Wallace, Bob Clark, and Keith Tryck had set out to relive the epic journey of the miners who swarmed to the Klondike in 1898, then on down the Yukon River to the Bering Sea, following cries of "Gold!"



"Waters that hissed disaster," wrote Robert Service, the "Bard of the Yukon," of Miles Canyon, where at least 150 boats were lost in the summer of '98. A dam now slows the



SIMON BELL

river's rush, but the gorge can still be dangerous. This photograph was taken seconds after the raft struck a wall, spinning the vessel and shattering a corner of the log craft.

northern wilderness. Paul Crews, a native Alaskan like myself, is a superb mountaineer, a former member of the U. S. Ski Team, and a professional racing skier. Jerry Wallace, a third-generation professional logger from Oregon, had spent five summers in Alaskan timber camps. Bob Clark, our expedition photographer, and I had both spent several seasons as land surveyors in the bush.

For me the trip was a personal crusade. My grandfather had done much the same thing in 1899. Following the wave of stampedes of the previous year, he and his brother had built their own scow and journeyed from Bennett Lake down the Yukon into Canada's Klondike and later continued along the river into Alaska, where they settled.

"If they could do it," Paul echoed my view, "so can we."

We chose my grandfather's route, beginning at the long-abandoned port of Dyea on Alaska's southeastern coast and climbing northward afoot across famed Chilkoot Pass to Bennett Lake. At Bennett Lake we planned to build a raft with simple hand tools such as the pioneers had used, and voyage downriver as far as the first summer allowed. There we

would disassemble the raft and store it for the next season's voyage.

At the end of the second summer we hoped to convert the raft logs into a cabin ashore, then wait till the Yukon froze over and ski the remaining miles to the Bering Sea.

#### Raft Had to Meet Special Needs

Hiking the Chilkoot in early July, we reached Bennett Lake within three days and faced the first challenge—the building of a "seaworthy" raft. We had already discussed the major requirements. "Endurance and maneuverability first," Jerry declared. "And comfort," Bob added. "We've got to live on the thing for months."

For the first part of our voyage, across Bennett and Tagish Lakes, our raft must be sturdy enough to withstand the sudden storms that had once sent full-size lake steamers scurrying for shelter. Lake navigation also required a mast and sail designed for running both across and before the wind.

In the river itself maneuverability was everything. We would run a gantlet of canyons and rapids that could spell serious trouble for our raft—a fact brought home to us



by our brush with the canyon wall during our third week under way. We decided on sweep oars at both bow and stern, giving us maximum steerage in tight quarters.

Once again the swish of handsaws and the thud of axes echoed through the forest beside Bennett Lake. Spruce and pine trees were felled, limbed, and moved by block and tackle to the water, then floated to camp.

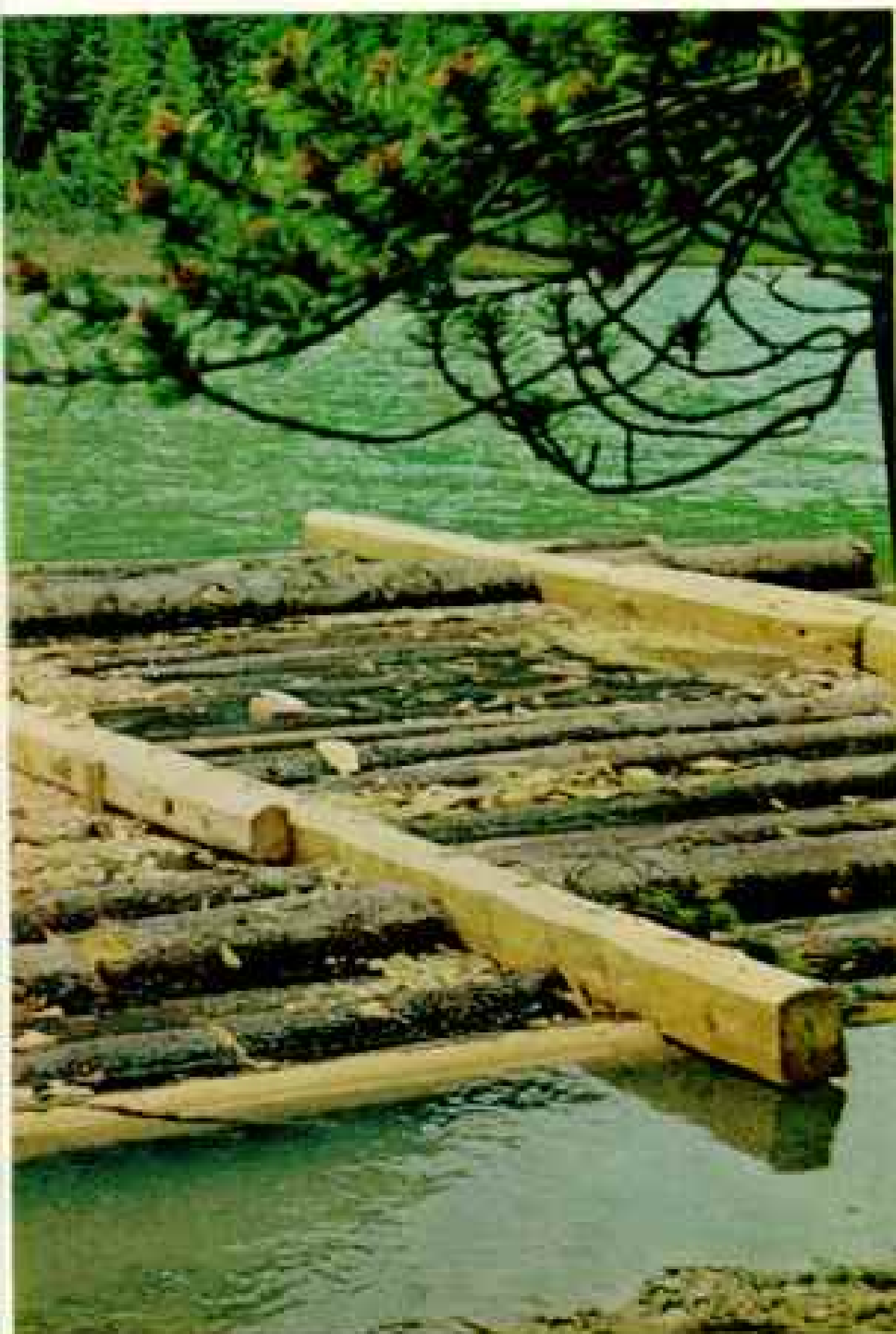
Within three weeks the raft was finished, a 37-by-22-foot platform of rough logs joined together with hand-hewn timbers set crosswise and fastened by almost 200 stout wooden pegs (below). We added two huge sweeps, each fashioned from a single tree trunk, a 36-foot mast with a surplus parachute for a sail, and a four-man tent on deck. Loading aboard our supplies and fishing gear, we pushed off on July 24.

As maiden voyages go, ours was a great success. Crossing 25-mile-long Bennett Lake, we weathered our first storm, with 20- to 25-knot winds and three-foot waves. Our estimated top speed was roughly two knots—with a strong following breeze!

"If it's this easy we could sail this bucket around the world," (Continued on page 840)

"We called it the torture crank," remembers author Tryck, who watches Jerry bore holes for pegs with a  $1\frac{7}{8}$ -inch hand auger (left) on the nearly completed raft at Bennett Lake. "Each of us drilled only every fourth hole, but it was the hardest work we did in all our time on the river." Three weeks earlier the team had trekked over grueling Chilkoot Pass to begin construction of the 37-by-22-foot raft. Jerry, a third-generation logger, directed the felling of spruce and pine trees and handled most of the ax work. He hewed timbers for crossbeams and shaped a total of 184 2-by-18-inch wooden pins, each requiring 250 strokes of his ax! Pounded into augered holes, the pins swelled in the water to make supertight fastenings. Deck planking, bow and stern steering oars, and a 36-foot mast completed the vessel. The author patches a sail (below), a surplus parachute needed for the 75 miles of lake navigation before reaching the river proper.

835



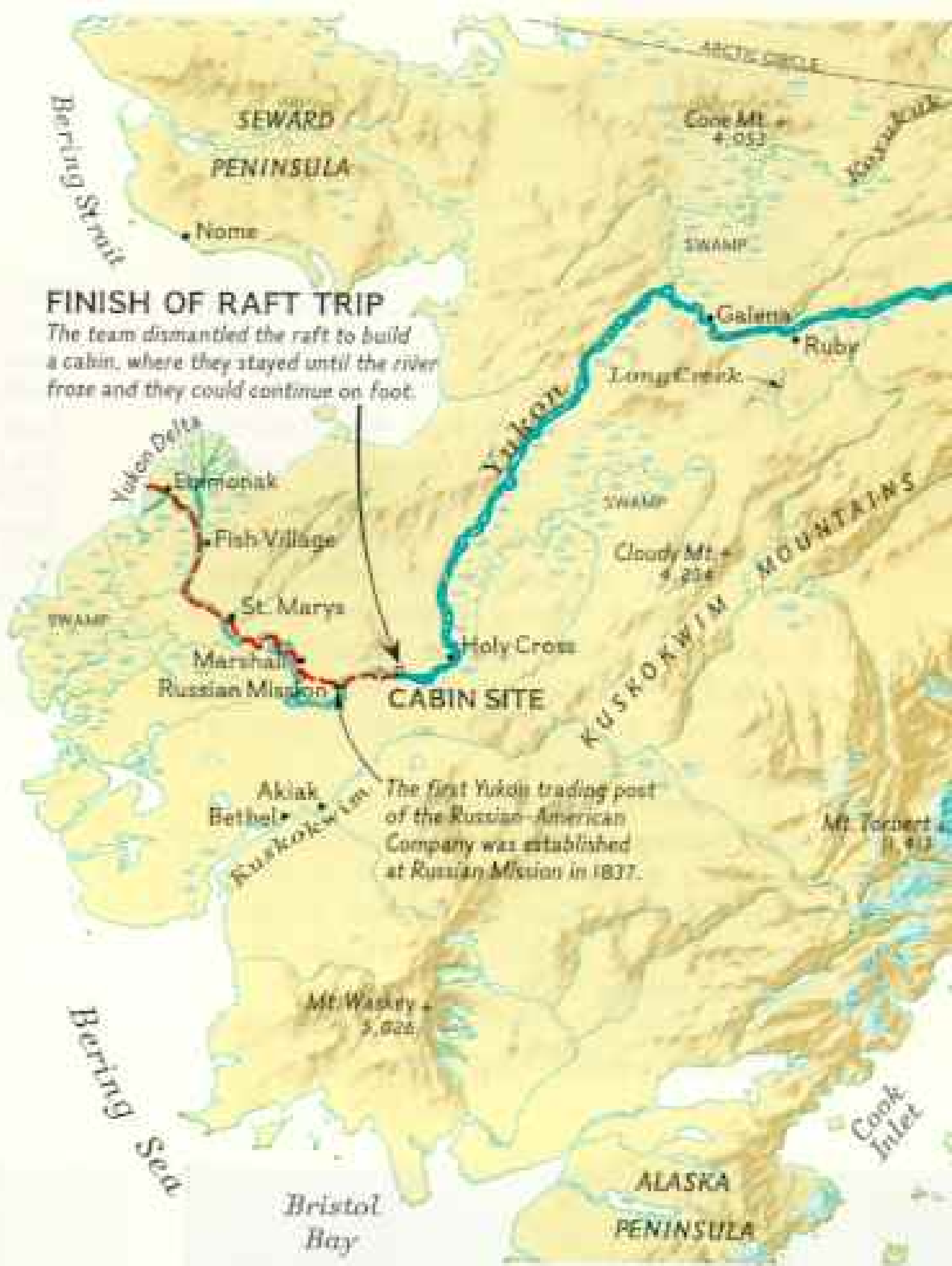


# RIVER OF GOLD

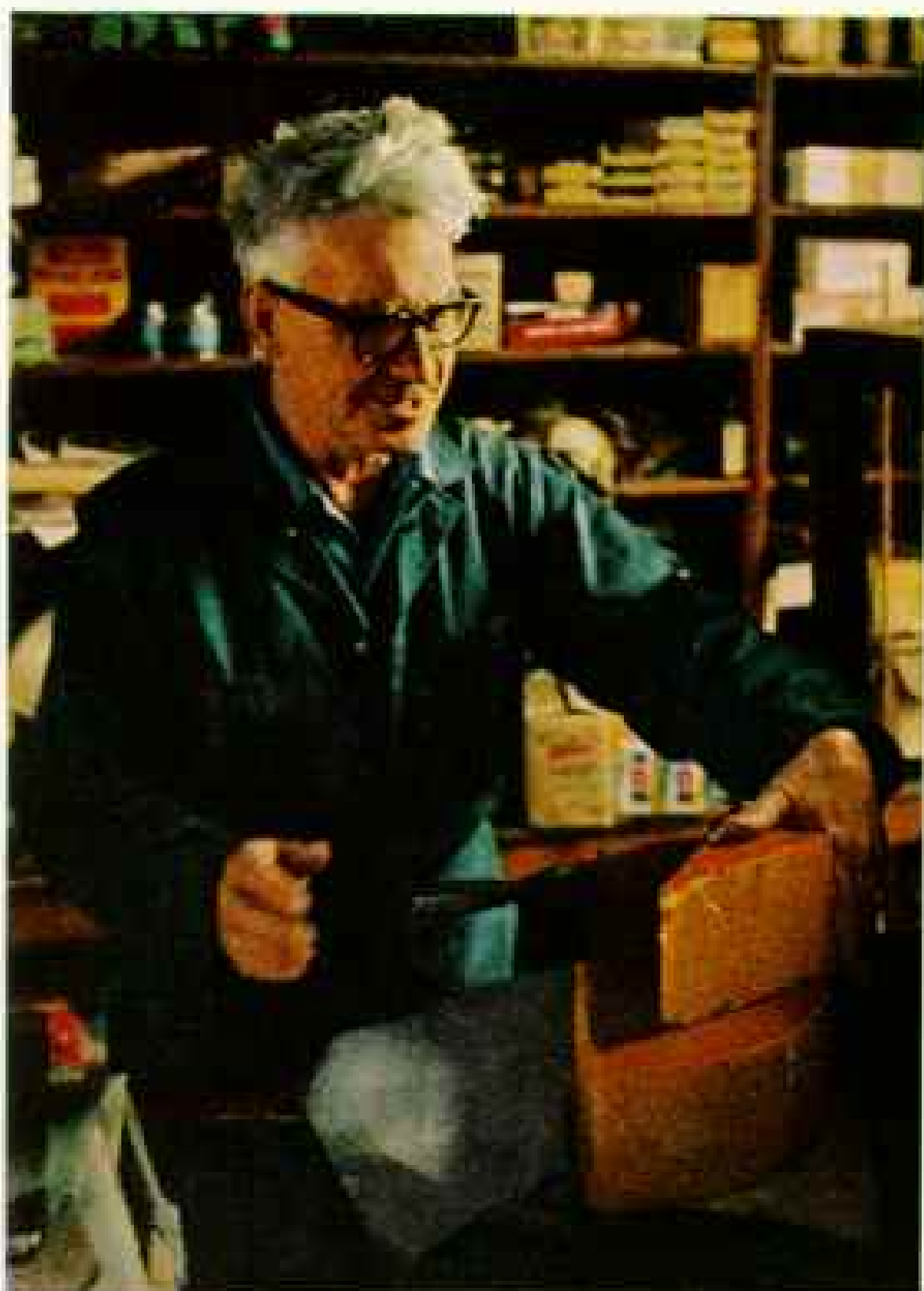


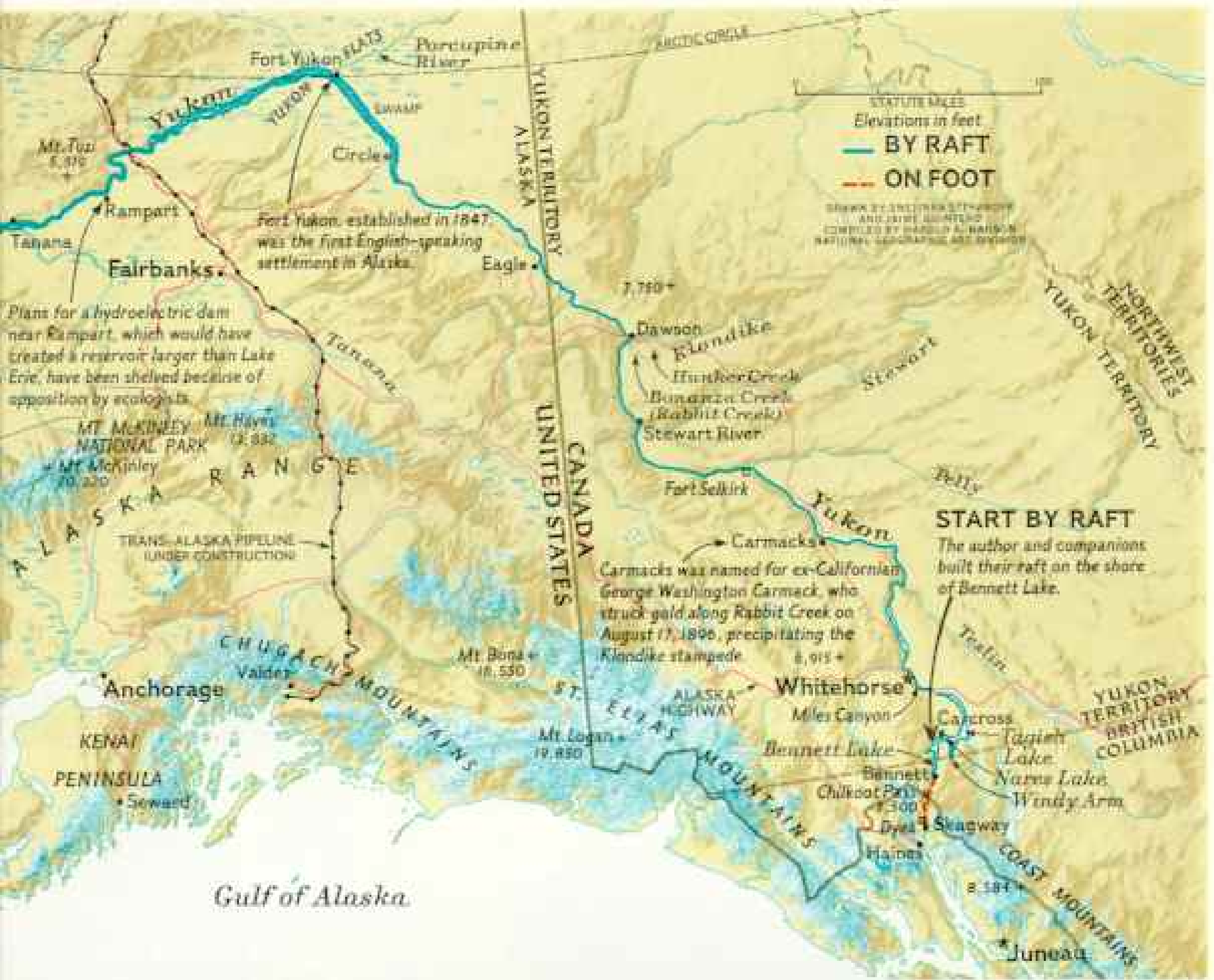
**L**AST MAJOR WATERCOURSE discovered in North America, the Yukon winds nearly 2,000 miles through some of earth's wildest country. Indians called it *Yukonna*—Great River. It flows northwesterly to touch the Arctic Circle, then sweeps southwest to the Bering Sea.

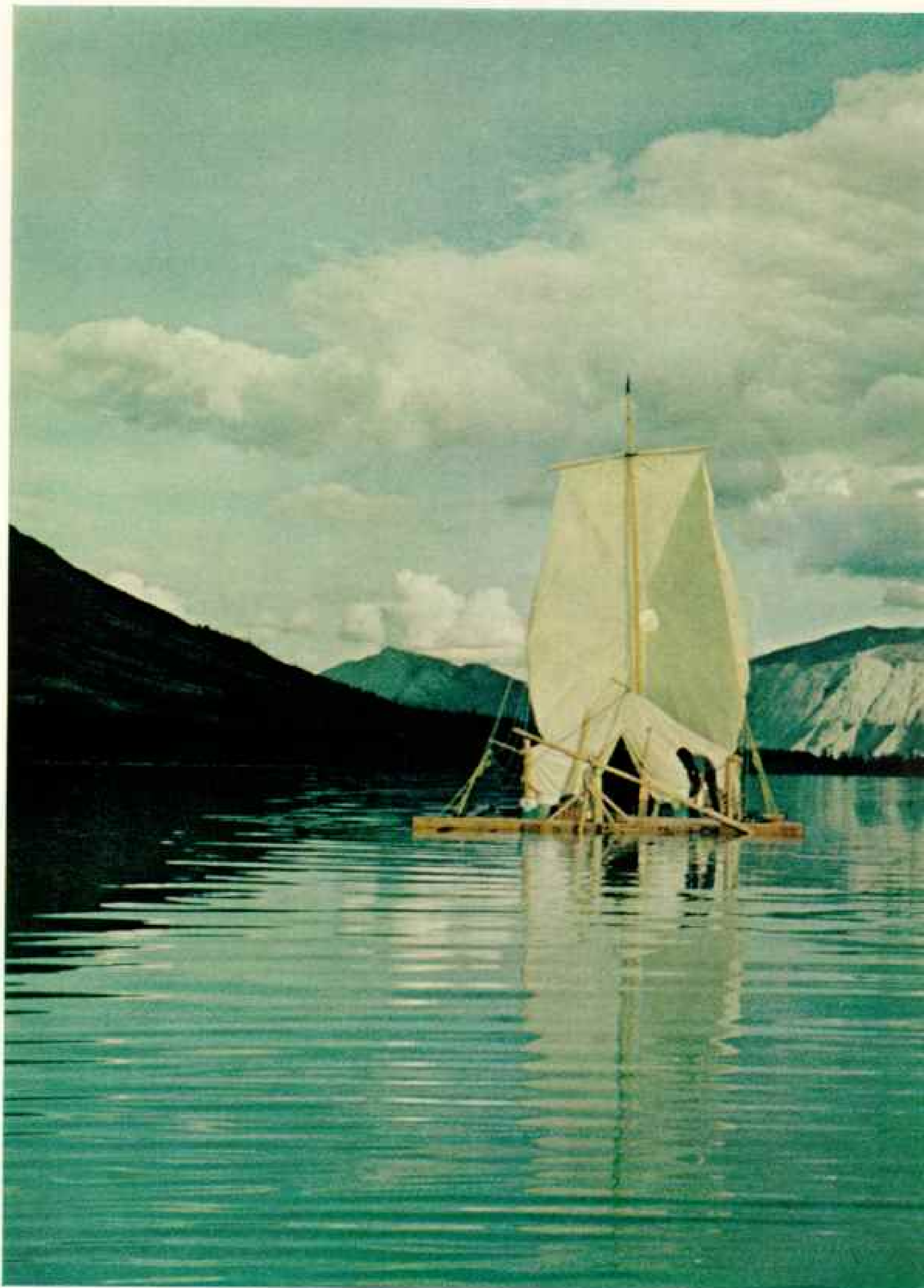
In the rush for gold, thousands climbed over the Chilkoot Pass, built crude boats, and headed downriver. At the foot of Bennett Lake a caribou crossing became Carcross, where today Bobby Watson (below) runs his general store. In Whitehorse, a modern "dance-hall girl"—a member of a Korean rock group—entertains (center). Fourth-of-July fun prevails in Eagle, first town across the Alaskan border, where fishing is duck soup for small fry (right).



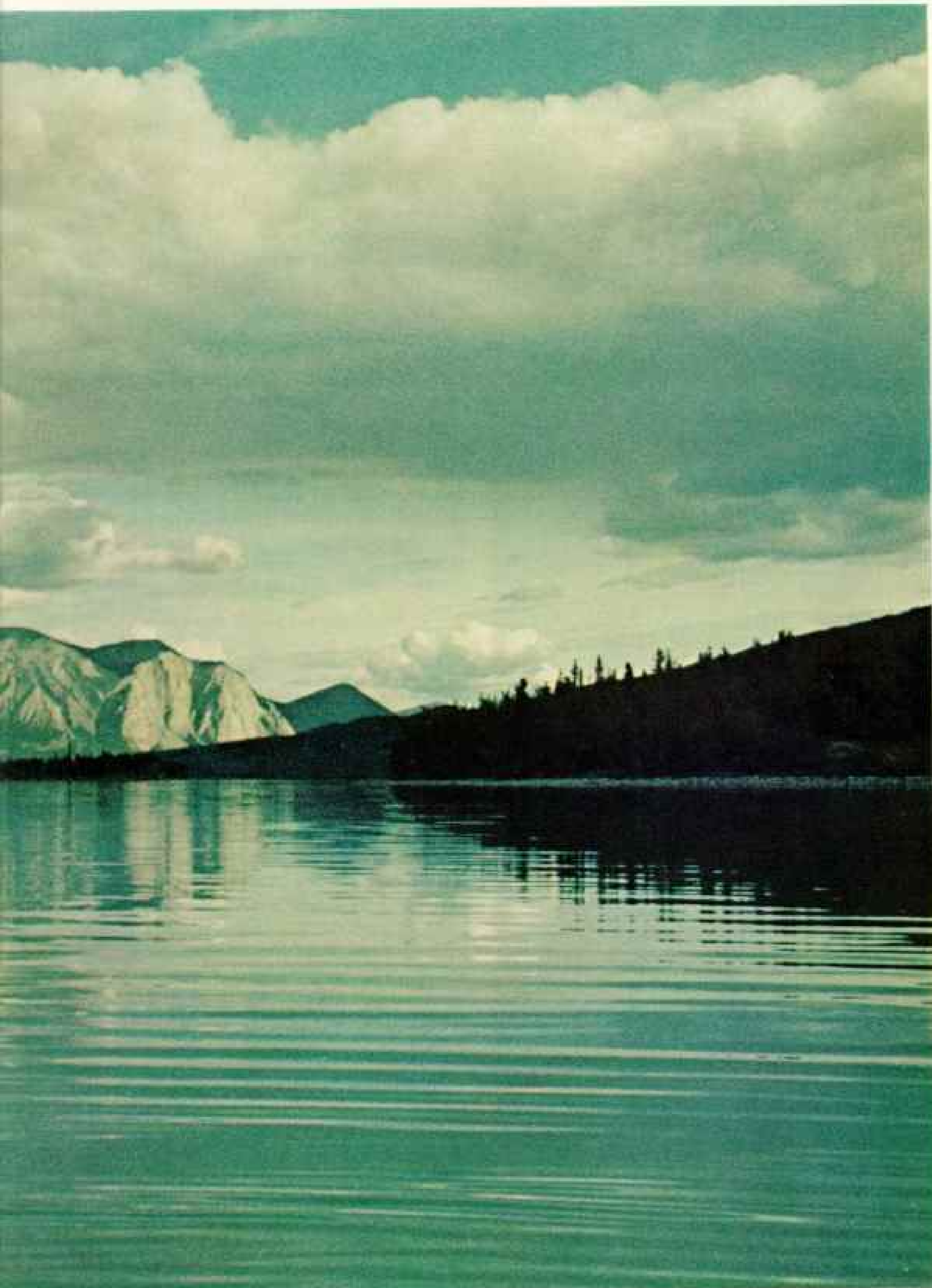
836







*"I am the land that listens, I am the land that broods," wrote Robert Service of his*



—BETH DYER

*Yukon home. As though adrift in a dream, the raft ghosts serenely across Nares Lake.*

(Continued from page 835) Paul remarked as we made our first port of call, the village of Carcross on Bennett Lake's north shore.

Having trudged over Chilkoot Pass from Alaska to reach Bennett Lake, we now had to clear Canadian customs and persuade the Royal Canadian Mounted Police that they wouldn't have to come looking for us in every turn and rapid along the Yukon.

"You seem to know what you're doing," the police constable acknowledged. "I'm just not sure I'd want to do it with you."

Leaving Carcross for blustery Tagish Lake, I recalled the lines from Robert Service's

graphic poem about the Klondike stampede, "The Trail of Ninety-Eight":

*Thuswise we voyaged Lake Bennett,  
Tagish, then Windy Arm,  
Sinister, savage and baleful, boding us  
hate and harm.*

*Many a scow was shattered there on that  
iron shore;*

*Many a heart was broken straining at  
sweep and oar.\**

We suffered no broken hearts, but we certainly "strained at sweep and oar" to avoid occasional islands as we crossed the lakes toward the river itself. Our first grounding introduced us to a backbreaking routine we came to know grimly as "P and P"—poling and pulling. When our ten-ton craft would budge no farther, those aboard would apply stout poles to the shallow bottom, while the unfortunate "puller" jumped overboard to haul away on a long towline (pages 846-7). When at last we entered the river, we heaved a sigh of relief, only to find other hazards.

#### Whitehorse: Hub of the Yukon

It was just above the city of Whitehorse that we had our encounter with the canyon wall, in the narrow gorge leading to the man-made lake above Whitehorse hydroelectric dam. A volunteer army of residents cheerfully turned out to help us detour the barrier.

A local construction company provided a crane, a trucking firm loaned us a flatbed trailer, and seemingly all of Whitehorse offered advice. Within hours we were below the dam, repairing the raft and being besieged by invitations to dinner ashore.

From a wilderness intersection of steamboat and rail lines, Whitehorse has become the Yukon Territory's premier city (pages 844-5). It is the seat of territorial government, a transportation and commercial center, and home for some 12,000 people—more than half the territory's population.

As Whitehorse prospered, other river settlements declined. "When the last steamboat was retired on the Yukon in 1955," resident Allan Innes-Taylor told us, "it marked the end of the small river communities."

Mr. Innes-Taylor is a former member of the Royal Canadian Mounted Police. On a map

\*These lines and others by Service in this article are from *Collected Poems of Robert Service*, published by Dodd, Mead & Company, New York, McClelland and Stewart, Toronto, and Ernest Benn Ltd., London.



Low clearance: Jerry Wallace struggles to push the raft beneath a railroad bridge at Carcross. The allowance is 36 inches, and even with the mast lowered the vessel is too high. At this and five other bridges, the crew had to modify the raft to get through.

of the upper Yukon he pinpointed major obstacles ahead of us—rapids, hidden shoals, and treacherous currents.

"You won't find much company between here and Dawson," he warned. "Time was when there were plenty of people along that stretch of river—woodcutters, trappers, miners, telegraph operators—but they're gone now, along with the steamboats. Except for the people at Carmacks, practically the only year-round residents you'll meet in the next 400 miles are the Burian family at the junction of the Yukon and the Stewart River. Be sure and give Rudy and Yvonne my best."

#### Approaching Autumn Brings a Warning

September was almost on us, and we set off downriver, hoping to make the best of the Yukon's brief autumn. We had come more than a hundred miles and had four times that distance to go if we were to reach Dawson before winter barricaded the river.

The transition from lake to river navigation is pronounced. To maintain control in the tight grip of the current, we had to man the sweeps continually and keep a sharp eye ahead. We had to be quick, too, in evaluating situations, committing ourselves to a course of action far in advance.

While we had sailed the lakes confidently around the clock, running the river at night was unthinkable. Before sunset we tied up, sometimes in a historic spot that would keep us moored several days. One of the most colorful places was the ghost town of Fort Selkirk, the Hudson's Bay Company's first post on the Canadian Yukon and a potential national historic site. Established in 1848, half a century before the gold stampede, Fort Selkirk grew to hold a schoolhouse, church, trading post, and log homes. Today all stand empty. To the irreverent stampeders, the Hudson's Bay Company's stencil "HBC" came to mean "Here Before Christ."

Our exploring trips often served as foraging expeditions. We gathered wild raspberries, currants, and cranberries, to be eaten as a special treat with sugar and condensed milk. Now and then we even made jam that would have done credit to our mothers.

Autumn slipped slowly south along the Yukon to meet us. At each cleft in the mountains the river's solitude enfolded us more closely. We spent hours in silence, watching the endless panorama of fall sifting down the slopes in infinitely varied patterns.

At the junction of the Yukon and Stewart Rivers, Rudy and Yvonne Burian welcomed us to their comfortable house on a small island. Yvonne had grown up in the town of Stewart River, where her father had been the steamboat agent. She married Rudy when he came there to work, first at odd jobs, later for the Inland Water Survey of Canada.

"There were two taverns here at Stewart when I was a kid," Yvonne told us. "We had a telegraph office and police quarters, though the Mounties came up from Dawson only in the summer. There were lots of people living along the creeks, and Stewart was a thriving community."

As with many another river settlement, Stewart was bypassed by the eventual road between Whitehorse and Dawson. "Steamboats couldn't compete with the trucks," Rudy explained, "and people began drifting away. The gold miners' expenses went up so high they couldn't make it any more."

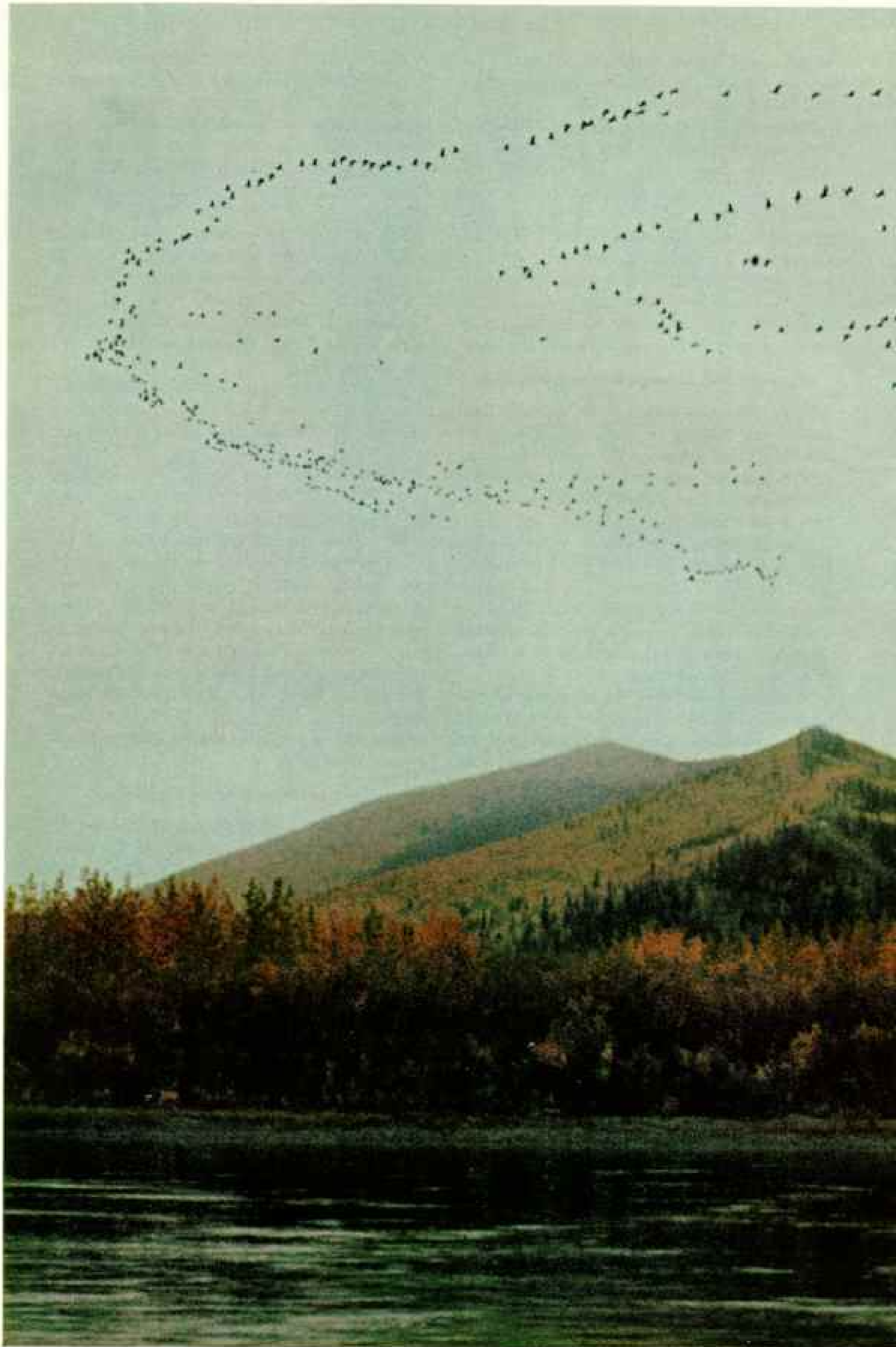
How long the Burians themselves will remain in Stewart depends on the vagaries of the Yukon. Several years ago the river changed course and is now washing their island away. "We've had to move the house once already," Yvonne said. "We put it on rollers and dragged it along with our tractor. But I don't know what we'll do if the river keeps coming. The house can't take another move, and in any case there's only so much island remaining!"

#### Tour of Dawson Waits for Spring

We left the island and on September 19 reached Dawson, at the mouth of the Klondike River. We were well ahead of freeze-up, with about 500 miles behind us and 1,350 still to go. The raft was dismantled and stored half a mile above town. Dawson was buttoning up for winter, and we decided to postpone exploring it fully until spring.

Hitchhiking southwest to Anchorage in Alaska, the four of us split up, agreeing to rendezvous early in June. Paul joined the professional ski-racing circuit, Jerry headed for a logging camp in the Pacific Northwest, and Bob and I worked at odd jobs in Anchorage over the winter.

The following June found us with our raft reassembled and moored beside Dawson's waterfront. We celebrated the event with an evening stroll down Dawson's raised boardwalks, edged with false-fronted buildings, some leaning precariously, others freshly





painted and open for business. The flavor of the past and of Dawson's rough-and-tumble reign as "Queen of the Klondike" are still memorialized in the names of cafés and emporiums: Flora Dora, Black Mike's, The Palace Grand, and Diamond Tooth Gertie's.

In 1898 a human tidal wave struck Dawson following the famous discovery along Rabbit (now Bonanza) Creek. The news flashed around the world: "Klondike . . . a ton of gold." And the race was on.

For all her glitter, Dawson's reign was brief. Within a year or so, strikes at Nome and Fairbanks drew the tide of fortune hunters west, and dredges eventually replaced the prospectors' picks and shovels along the Yukon. In time even the dredges ground to a halt in the face of rising costs and the low ceiling price of gold.

#### Old Town Takes a New Lease on Life

Today's sky-high price for gold has brought a fresh wave of prospectors to Dawson to join the few old-timers who have stuck it out. In the Midnight Sun Restaurant we met Pete Brady, who at 83 runs a small placer mine on nearby Hunker Creek. Using sluice boxes he washes gold-bearing gravel dug from the creek bed; the heavy metal collects in "riffles," or barriers, in the bottom of the box.

"Came here in 1908 from old Ireland, I came," Pete recalled, with a touch of brogue after all these years. "Me brother and me, we mined the creeks and had the bear by the tail quite a few times." He shook his head sadly. "But the bear got away, aye, got away—too hard to hold."

I asked if he had ever made it down into Alaska. "Aye," Pete answered. "Met up with two prospectors here, 1915 it was. Tim and Mike Buckley, their names were. We rowed all the way down the river to Ruby, close on 800 miles. There was gold in Ruby, too, don't you see." I mentioned that Ruby was where my grandfather and his brother had mined, at a place called Long Creek.

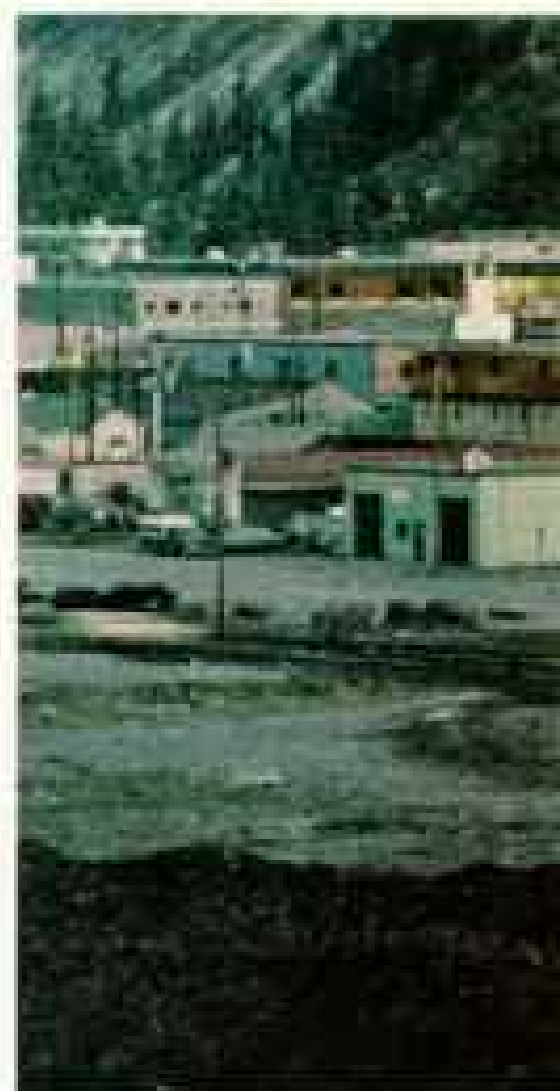
"Long Creek!" Pete exclaimed. "I was there for two years meself. And what would their names be?"

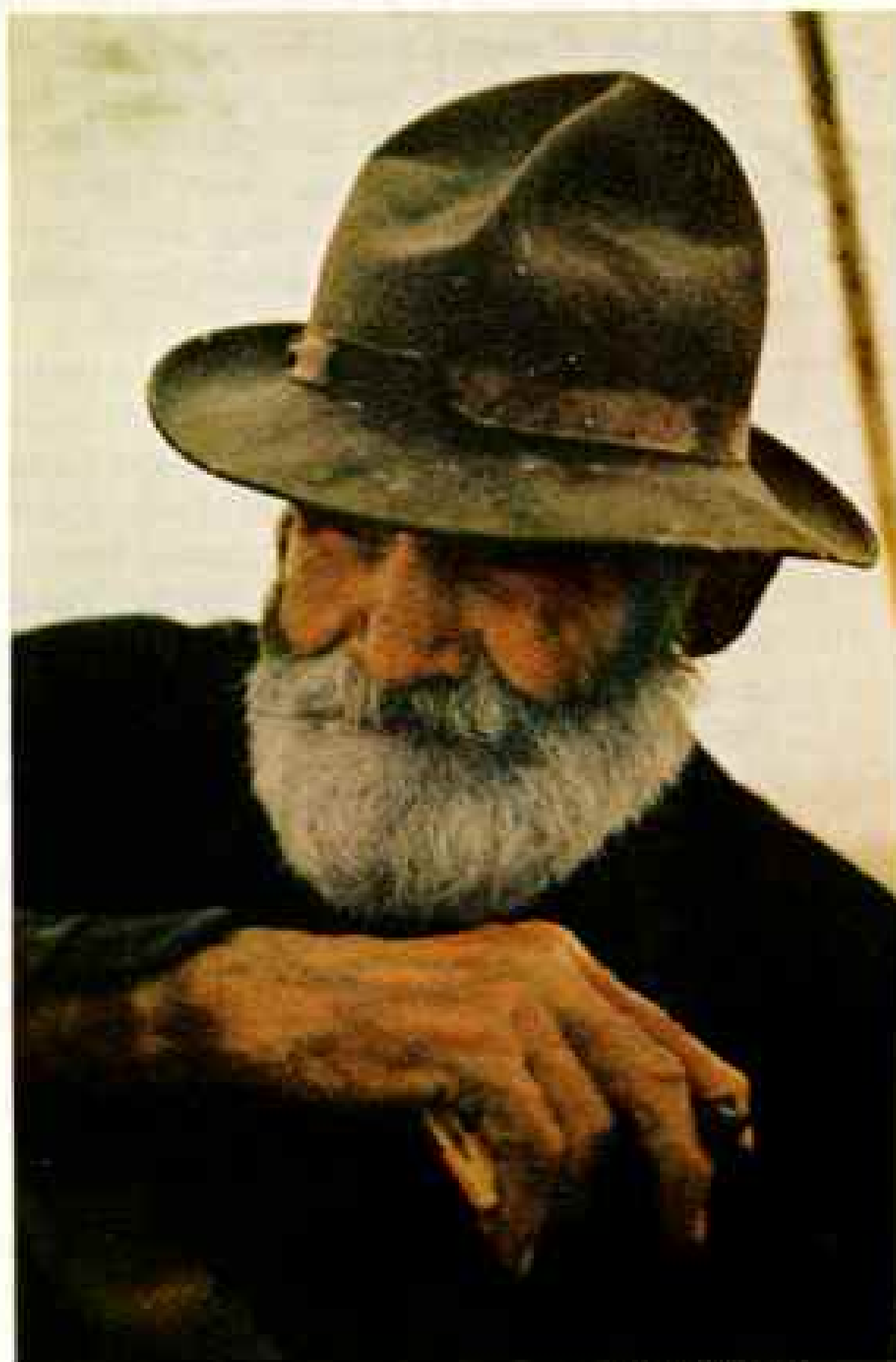
Autumn unfolds near Fort Selkirk as skeins of geese migrate south. Hudson's Bay Company explorer Robert Campbell established the Canadian Yukon's first outpost here in 1848. Four years later, Chilkat Indian raiders burned it to the ground.



Gleaming rivulet of coarse gold streams from a weighing pan (below) at a bank in Dawson, center of the Klondike stampede. The town newspaper once philosophized that "There is no music like the tinkle of nuggets falling upon a gold scale." That song faded in the Klondike after the strike that produced an estimated five million ounces of the precious metal. But high gold prices now are luring

prospectors back to Dawson, amid growing numbers of tourists. They come by car and camper overland from Whitehorse, bustling capital of the Yukon, where old stern-wheelers molder on the riverbank (right). An all-weather road completed in 1952 put an end to steamboat service between the two cities.





ARTHUR BRUCE (TOP)

He came with the gold rush but stayed for love of the land. "Black Mike" Winage (above) claims to be 105, and has lived in Dawson since 1900. The rush left many men rich, but many more bitter. Those with the Midas touch went out in style; the rest—except a few like Mike—headed downriver to new strikes or slunk home in despair.

Oscar and Charlie Tryck, I replied.

"Ha!" said Pete. "A couple of Swedes. I knew of 'em, I did. Fine lads, people said, and done quite well. As for me, I had six hundred dollars going into Ruby and come out two years later with one ounce of gold. One ounce. Sixteen dollars!"

#### Off Again After a Nine-month Hiatus

With 1,350 miles still to go—more than two-thirds the length of the Yukon—we left Dawson and set off downriver.

In the northern latitudes summer days are long; nights are a blend of sunset, twilight, and sunrise. We lengthened our shifts to four hours each, running around the clock. On July 4, a year almost to the hour from our entry into Canada over Chilkoot Pass, we drifted across the U. S.-Canadian border and back into Alaska. I scribbled in my log:

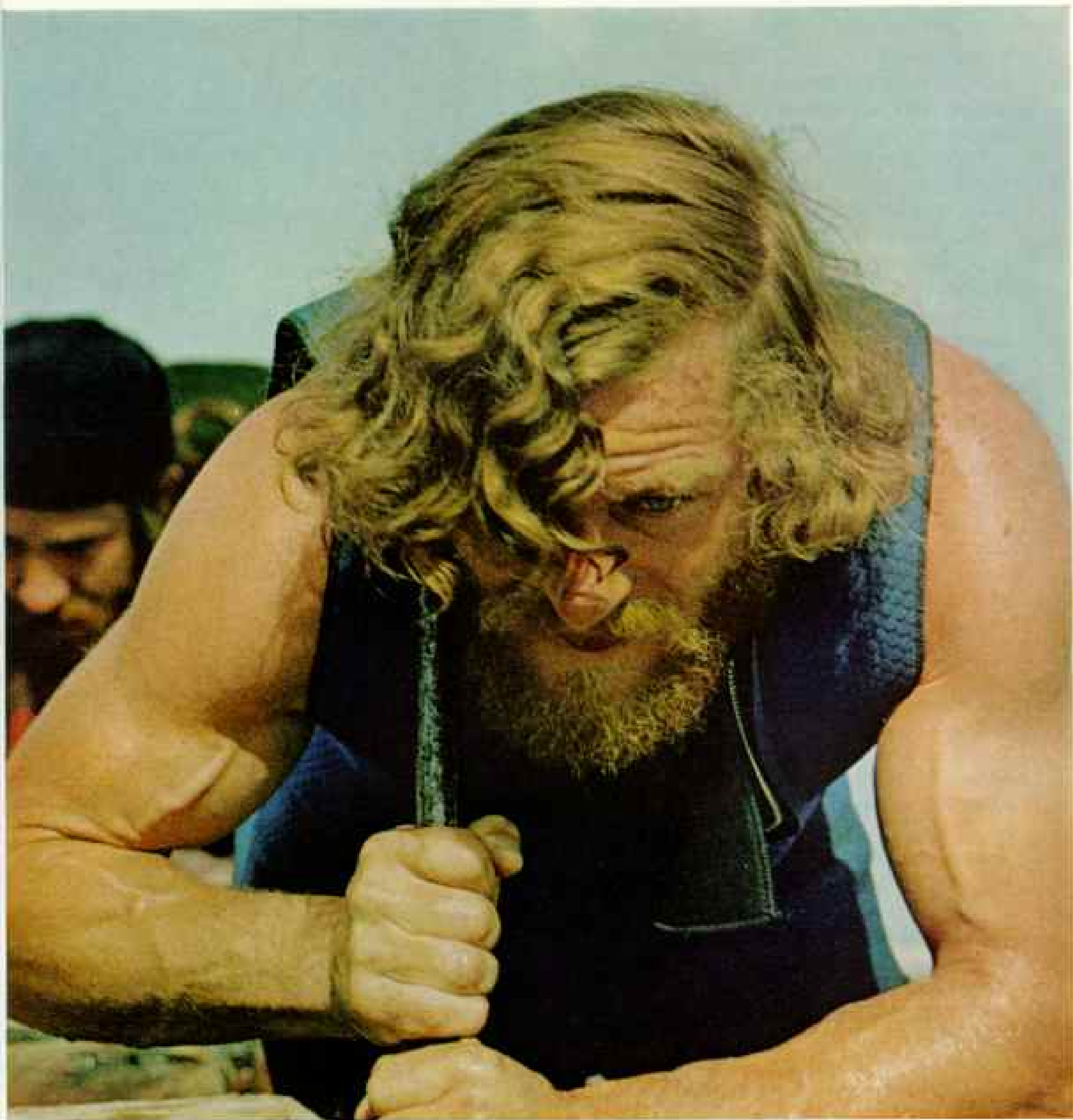
"Crossing U. S.-Canada boundary, 5:26 a.m., July 4. The border is simply a clearing, stretching over the hills on either side of us. Same trees on both sides, same water under us. The Yukon has grown a lot in its roaming through Canada, and so have we. . ."

Beyond the border the Yukon would undergo a drastic change. Through Canada it had wound among mountains—subtle and forest-clad, or rugged and craggy, but always mountains. In Alaska the Yukon spreads across a vast and level plain known as the Yukon Flats. Here, as though freed at last, the river gives way to caprice, carving a thousand different channels and depositing millions of tons of silt in the form of constantly changing islands and bars.

At the town of Eagle a riverman warned us about the Yukon Flats. "You can't see the sandbars, and that's bad. You fellows are sittin' down low and it's hard to see from there." He pointed to the observation platform we had recently built atop the mast with

"Ready . . . *heave!*" Muscles strain as Keith, Jerry, and Paul (above) pry their tenton craft off a sandbar—a scene repeated 26 times during the trip. "We were in pretty fair physical condition," the author understated. After leaving their raft near Dawson for the winter, the team went on, crossing into Alaska to flatlands where the Yukon becomes wide and unpredictable. Wind often hampered efforts to stay in deep water. Harnessed to the raft, Jerry (right) battles a breeze while the others help push.





this in mind. "You'll be needing that crow's nest for sure." Once in the flats, we would see no natural landmarks; the next chain of mountains lay 200 miles downriver.

Heading into the flats, we saw the town of Circle slip by, on another arm of the river. We'd had to choose between two channels.

"Never mind, we're still in the main channel," Jerry reassured us from the crow's nest. "I think Circle made the wrong choice!"

Presently a new enemy appeared—wind, sweeping across the flats. We tied up when it grew too strong, sometimes waiting for days. We used a simple but accurate gauge for wind velocity. If it was too windy for mosquitoes to attack us, it was too windy to be under way. When the mosquitoes showed up, it was time to head for the middle of the river!

Toward the end of the flats, when we entered the mountains with plenty of calm, deep water on either side, we relaxed, feeling like specks of sand that had been squeezed through a giant sponge.

#### Oil to Flow Over Untroubled Waters

Two enormous projects involve the Yukon below the flats, one of them under way and the other abandoned, perhaps forever, owing to its cost and potential effect on the wilderness. The project under way, of course, is the trans-Alaska pipeline, which will cross the Yukon on a high steel-and-concrete bridge 25 miles below the flats. Supporting the 48-inch transmission pipe and its utility road, the bridge will form a vital link in the 800-mile stretch between Prudhoe Bay on the Arctic Ocean and Valdez beside the Gulf of Alaska.

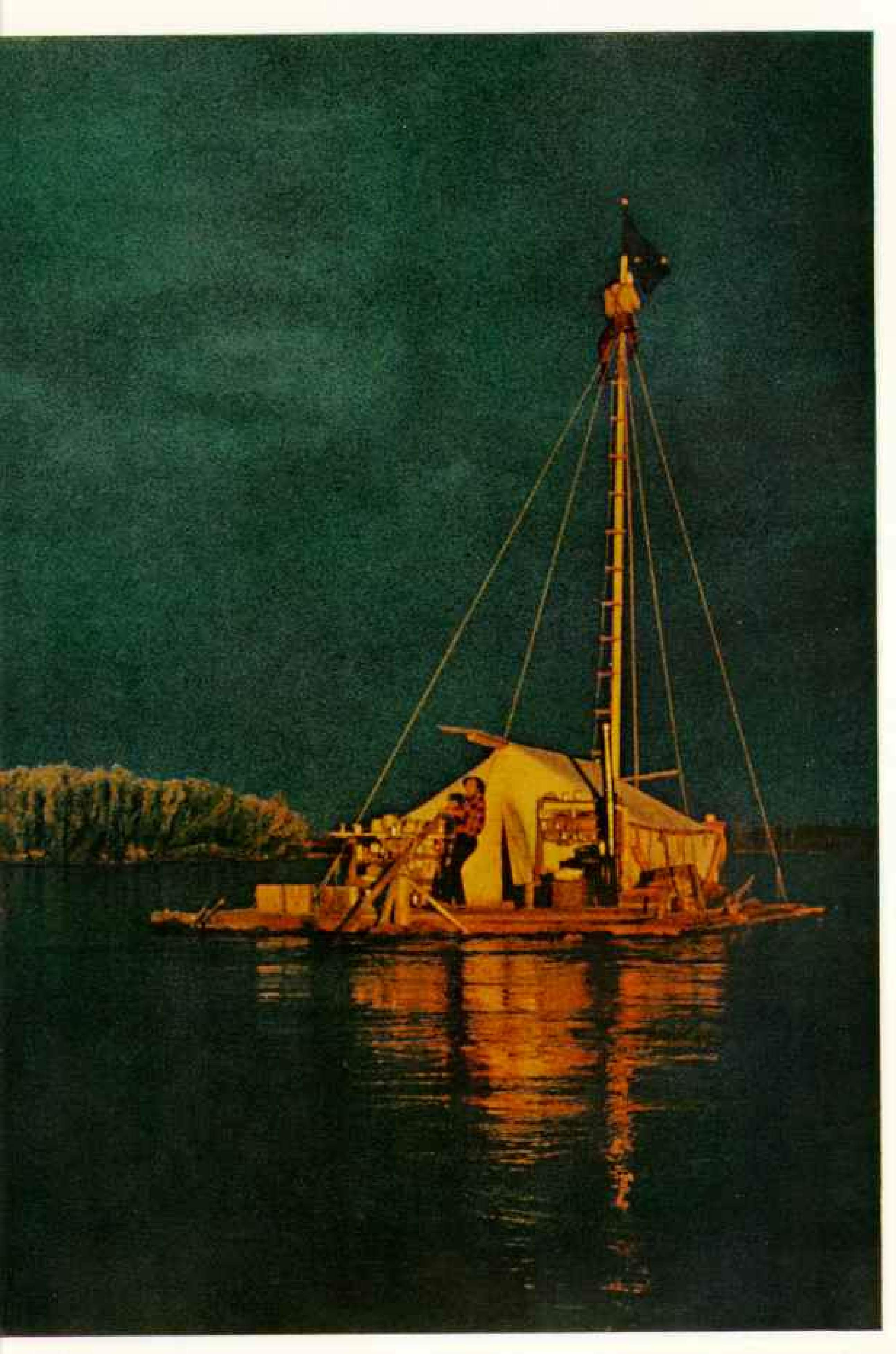
The abandoned project, 85 miles downriver from the pipeline crossing, near the settlement of Rampart, envisioned a huge flood-control and hydroelectric dam. It would have backed the Yukon up almost to the Canadian border, drowning most of the Yukon Flats and thousands of square miles of superb breeding ground for waterfowl. Happily, for the waterfowl at least, plans for the Rampart Dam have been shelved.

While still in historic gold country, Bob Clark and I decided to get our hands dirty with a day's panning under the tutelage of

*Vagrant beam of sunlight gilds the raft in the Yukon Flats. Paul mans the stern sweep while Jerry keeps watch from the crow's nest.*

ESTHER TRICE







Harry Havrilack. At the age of 65 Harry runs a small placer mine along a creek not far from Rampart, using a bulldozer to scoop up pay dirt for his sluice box.

"Mostly dirt and not much pay," Harry said with a shrug. "If you were to work this claim with a pick and shovel at \$1,000 an ounce, you'd go broke."

I could almost hear my grandfather talking. When I was ten, I had offered to scare up the gold pans and shovels if he would finance our joint mining venture.

"While you're at it," my grandfather had said, "don't forget food for a year, horses, oats, a steam boiler, dynamite, the other tools, tent, and . . ." Our partnership died a-borning.

### Bird Sings a Hopeless Tune

Harry kindly offered us a few tips on panning, and we set to work while he discussed the life of a solitary miner.

"Nobody wants to live alone," he said, "but it's hard enough to support yourself, not to mention a family. A partner? What would I want one of them for? One fellow's got one idea, the other's got a different one, and before they know it, they're at each other's throats." He eyed Bob. "Bring that pan here, boy, let's see what you've got."

The results were disappointing—a few flecks, or "colors," as Harry called them. After a time we said good-bye. As we walked back toward the river, a familiar note sounded in the branches overhead.

"Hear that call, Bob?" I said. "My granddad used to tell me that was a finch saying, 'No gold here, no gold here. . . .'"

However dim the prospects for panners, each summer still brings bounty to Alaskans along the Yukon. That's when the salmon return from the Pacific to spawn. Downriver from Rampart we encountered growing numbers of gillnets set close inshore and fish wheels anchored on rafts.

Fish wheels are ingenious contraptions featuring two mesh baskets connected to a pair

of wooden paddles. Driven by the current, the paddles lift the baskets in and out of the water so that they scoop up salmon and dump them into a large hopper.

We stopped above Ruby to visit John Honea, an Athapaskan Indian, at his smokehouse by the river. We found John, his wife, Lorraine, and a young daughter, Valerie, filleting the huge fish and hanging them in a three-story smokehouse.

Amid the flash of knives in bright sunlight John described the different kinds of salmon and the ways his people prepare them. "There's 'dogfish' for dog food," he said of a less appetizing variety. "Then just plain eating fish, salmon bellies, smoked strips, eggs, and 'stinkfish'—stuff that's left to rot for baiting animal traps."

Inside the dark smokehouse a cottonwood log smoldered like a giant cigar. Beneath long rows of amber fillets I noted large numbers of fish tied in bales.

"Those are the dogfish," John explained.



Patience rewarded, Valerie Honea (left) pulls in a whitefish at her family's camp near Ruby; salmon fillets dry behind her. Each summer Pacific salmon head up the Yukon to spawn, providing vital income for people along the river. A prized king salmon (right) is bagged for the journey to market, where it may bring \$5.00 a pound.



"In days when they carried mail along the Yukon by dogsled, every camp and station had tons and tons of them on hand. Nowadays there's commercial dog food, but our dogs like this better, so we keep some around."

I noticed a string of tiny fish hung up to dry, each no bigger than my little finger. John caught my glance and laughed. "Those are my youngest daughter's fish," he said. "She plans to feed them to her kitty this winter!"

At the village of Ruby I came across an elderly Finnish-American, Albert Yrjana, whose wife, Dolly, had known my grandfather and his brother when they had stayed in Ruby during World War I. In former days Albert worked for the Bureau of Public Roads, or BPR, known facetiously among longtime Alaskans as the "Bureau of Parallel Ruts."

"They were well liked, your grandfather and his brother," Dolly Yrjana said when I paid a brief call. "They never leaned on anybody or drank too much, and whatever they wanted they paid cash for. You couldn't say that of everyone."

During his stay in Ruby, my grandfather had left only once, traveling "Outside" in 1913 by boat to Seattle and then overland to Michigan to marry his childhood sweetheart, Blanche Tipping. Returning with my grandmother the same year, he traveled across Alaska by dogsled, carrying crates of fresh eggs, with both grandmother and the eggs wrapped in bearskin robes. He covered 400 wintry miles without freezing or breaking an egg—or his bride, for that matter!

In Fairbanks, then besieged by winter and lacking fresh food, the eggs sold instantly for \$1 apiece, enough to pay for the return trip.

#### Team Prepares for a Long Winter

By late August we were within 300 miles of the Bering Sea. Nights had already grown long and cool and the hillsides were once again stained gold and crimson. At the hamlet of Holy Cross we decided to provision for the coming freeze and to burrow in ashore a few miles downriver.

Our delight at being so near our goal was mixed with gloom over the departure of Paul Crews. After 1,600 miles together on the Yukon, we hated to lose him, but he could not afford to miss the professional ski-racing season. Carrying an ax and only a dozen nails in his 80-pound pack, Paul hiked 50 miles from Holy Cross to the Kuskokwim River, where he built a one-man raft (right). Floating a

hundred miles down the Kuskokwim to the village of Akiak, he traded the raft for a boat ticket to the town of Bethel, then flew to Anchorage.

At Holy Cross's general store we spent two days laying in provisions—slab bacon, flour, sugar, dried beans, a canned ham for Thanksgiving—then set off downriver in search of a winter cabin site. It was the final voyage of our faithful raft, for as soon as we found a likely spot it would come ashore log by log to be rebuilt into a cabin. On the afternoon of September 9 we spied a grassy knoll above the river with a grove of birch trees that rustled in the light breeze. I looked at Bob and Jerry and they nodded. Soon afterward our raft slid into final port.

Next morning a small mountain of equipment and supplies began to grow on the riverbank, including our indispensable cook stove, which hardly missed a puff in the transfer.

Passage out for one: Paul rests on the oars of the do-it-yourself raft that will carry him



We found the cabin even slower to build than the raft (following pages), but by early October we were snugly installed. A roof-pole framework layered over with thick sod extended above our "Yukon porch." Inside, bunks, shelves, a desk, and a bookcase had been built to fit.

### Eerie Silence Interrupts Slumber

Slowly ice began to form in the river, and at night we could hear the muffled crack of floes grinding together. By early November the sound was almost continuous; any day the river might ice over completely.

There came a morning when I woke with an uneasy feeling; something was not quite right. Then Jerry's voice came excitedly from the porch: "Hey, it's stopped—the river's frozen solid!" I suddenly realized that what had wakened me was total silence. Bob and I joined Jerry outside and found the river

a vast sheet of white. The thermometer stood at minus 20 degrees.

In less than a week the ice was strong enough to be crossed on foot, and soon afterward by sledge. It was then that we met Charlie Fitka, Jr., an Eskimo trapper from Marshall who seemingly knows every resident and square inch of land along the lower Yukon. Pulling up to our door one morning on his dogsled, he invited us to a Christmas celebration at Marshall, 60 miles to the west.

"You've got plenty of time to make it," Charlie said. "Many of our people are Russian Orthodox, and we celebrate Christmas by the Julian calendar—January 7 in your book."

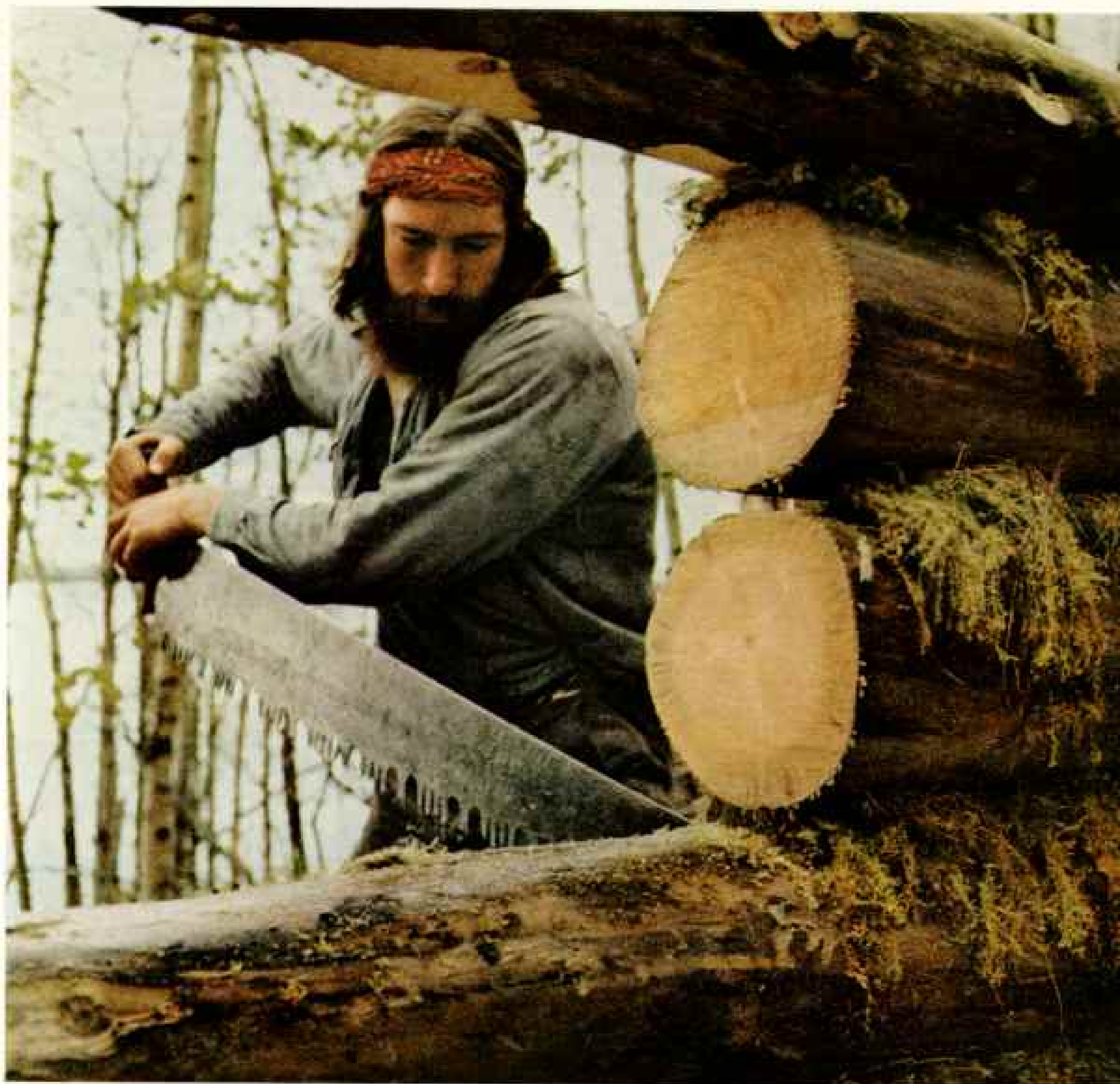
We left the cabin December 15, heading downriver on skis with 80-pound packs containing our food supply, portable gas stove, a tent, and extra winter clothes. We left a small supply of food for our camp-robbing friends, two northern jays we had named

100 miles down the Kuskokwim River toward an airport at Bethel. With regret, he elected to leave the team in August to join the professional skiing circuit.

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(PAUL CHERRY, JR.)







Deck turns to floor and galley becomes kitchen as the crew, now minus Paul, transform their raft into a cabin where they will wait for the river to freeze. Logs are hauled by block and tackle into position for the building's foundation (above right). As walls rose, the team notched corners together, fitting and refitting until each log sat solidly on the one below. "We built it to last, and last it will," says Jerry with pride, cutting a hole for the door (above). The author chinks moss into cracks (right) and finishes sodding the roof just as the season's first snow arrives (left). The metamorphosis from raft to winter home took four weeks.



Shorty and Jethro. Old-timers along the Yukon maintain that the sociable jays are ghosts of long-ago miners.

In three days we reached the village of Russian Mission, having spent the first night in our tent and the second with Charlie Fitka's brother, Nick, in a trapper's cabin.

"The weather is kind to us," I wrote during the 30-mile trek. "Close to zero during the day, and dropping to minus 20 degrees at night. Luckily, we have no wind."

On December 25 we observed our own Christmas Day with Larry and Jackie Smith, who teach at the small school in Russian Mission. Four days later we shoved off for Marshall in 35-degree weather, and promptly ran into trouble. The gray sky opened, drenching us with rain and slowing us to only a few miles a day. Wet snow clung to our skis and bindings; it was all we could do to force our way through, one leg at a time. Nights in the tent were a sodden agony, and by the third morning we were still nearly 20 miles from Marshall. Around noon we heard the sound of a snowmobile.

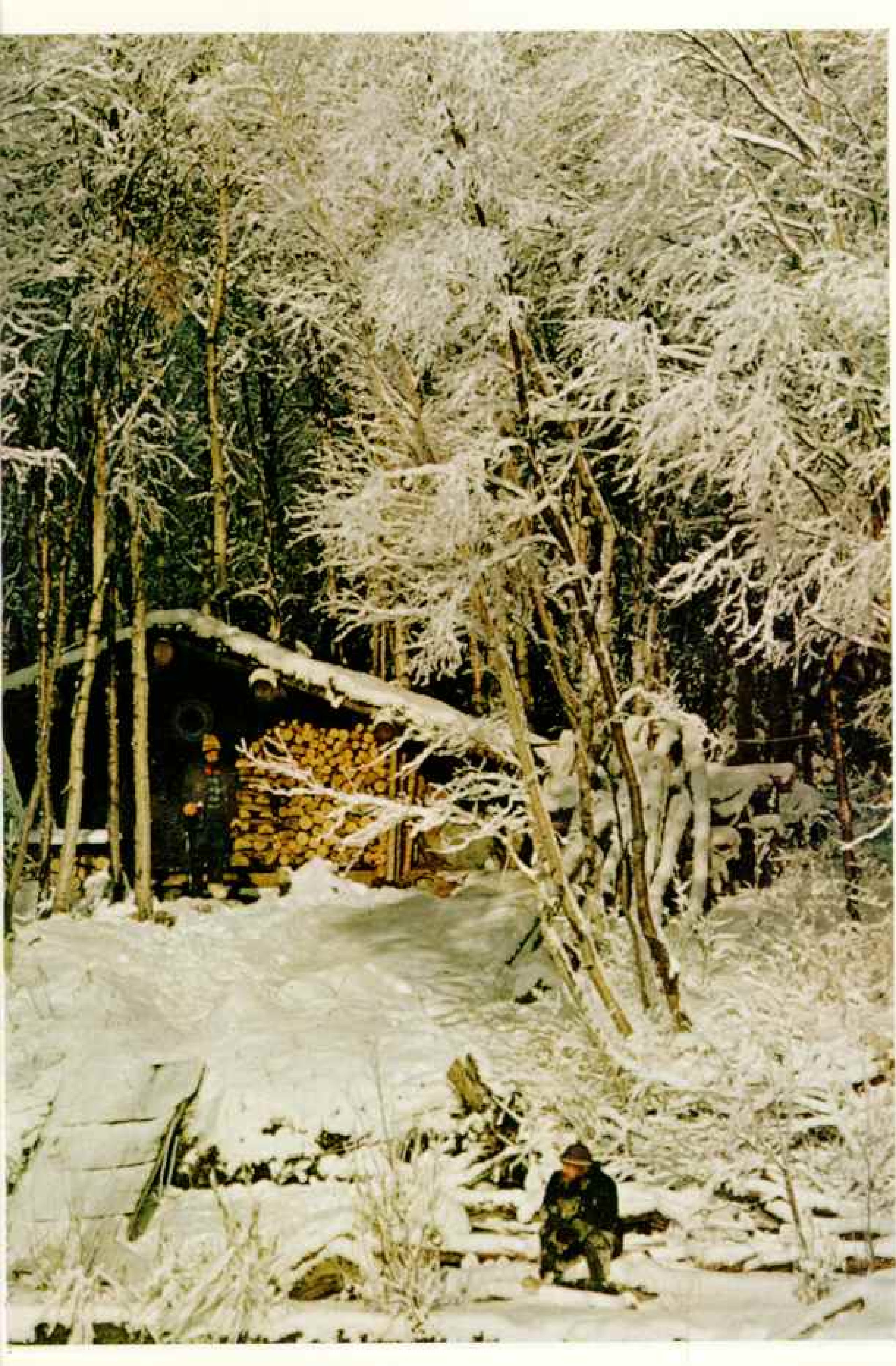
"It's got to be Charlie Fitka—who else?"

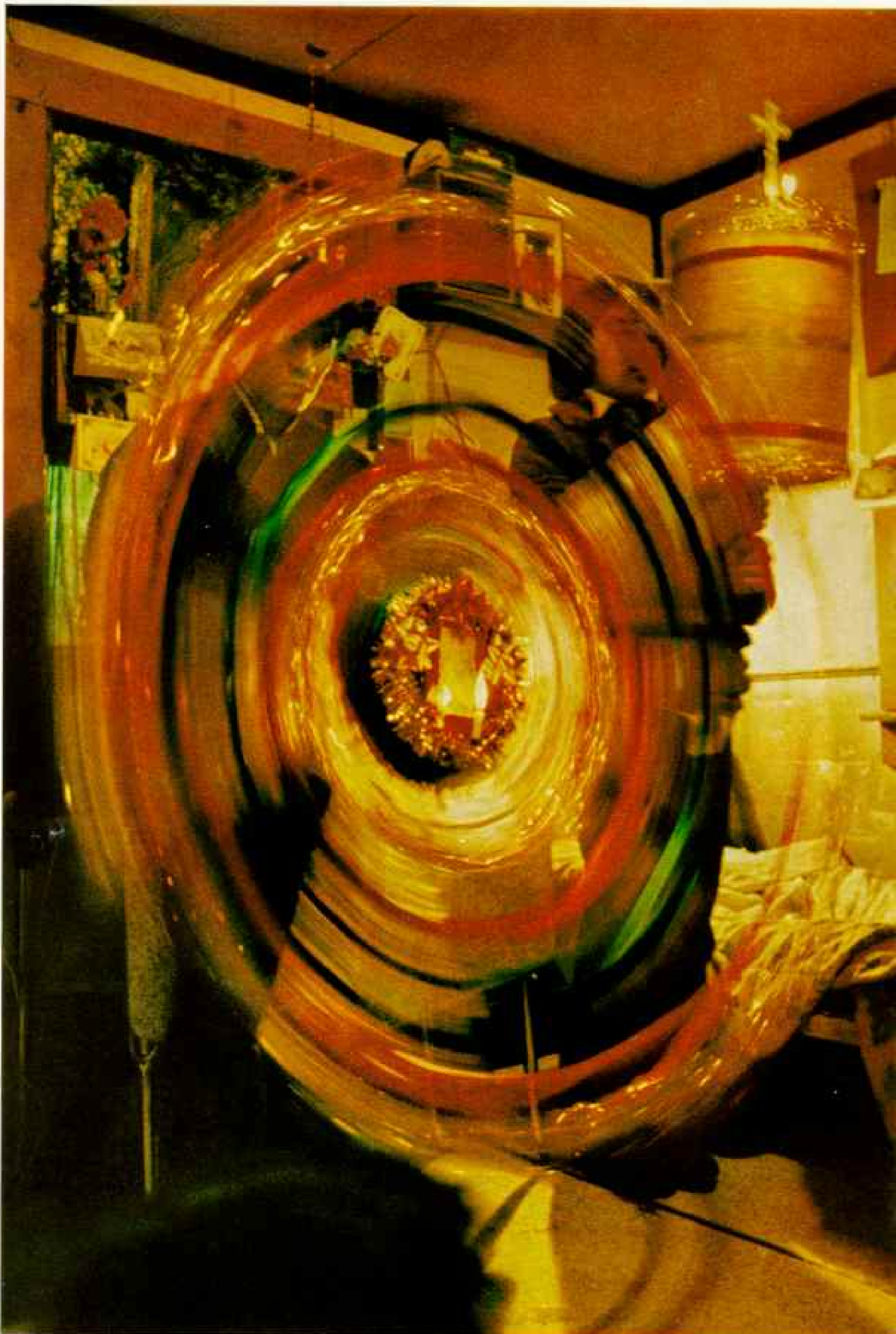


BEITH TRICK (ABOVE) AND JERRY WALLACE

Frosty filigree enfolds the cabin (right), stacked to the eaves with firewood. During their three-month stay the team rotated housework, with one man handling all the chores for a three-day period. A lantern's warm glow lights a cribbage game (above) between Bob, at right, and Charlie Fitka, Jr., an Eskimo trapper who later invited the three to come to his village for Christmas.







Bob said, and sure enough, it was. He was returning to Marshall with a sled hitched behind his "iron dog." We eyed the sled longingly but knew none of us would accept a ride.

Charlie read our feelings and came up with a compromise: "I'll take your packs for you." Without a word we loaded them aboard and fairly sailed over the snow in Charlie's track, making it to Marshall by late evening.

Charlie's mother, Exenia, met us at the front door with a welcoming smile and a single word, "Hungry?" We were famished. Within minutes we were seated before an enormous moose roast, which disappeared with the help of Charlie's father and a large family gathered for the holidays.

Next morning we explored Marshall with Charlie, meeting a good many of the riverside village's 175 residents. The community of two-score frame or log houses has three "roads"—two dirt tracks that parallel the Yukon, and the frozen river itself, which becomes a freeway for snowmobiles in winter.

"Meet my *gussuk* friends!" was Charlie's standard introduction for us. *Gussuk*, the Eskimo word for "white man," is a corruption of "cossack." For 126 years the Russian czars ruled much of Alaska, until the United States purchased the vast territory in 1867. The first white men that many Alaskan natives saw were the Russian fur traders and missionaries who crossed the Bering Strait and eventually pushed as far south as California. Their legacy survives among Alaska's natives in the Russian Orthodox faith and in various names and customs.

#### Christmas Feast Lasts a Week

By the time we arrived, Marshall was gearing up for Christmas. The men were all home from hunting and trapping or tending fishnets stretched beneath the Yukon ice. There was an air of expectancy at every village gathering point—the two general stores, the community center, a pool hall, the health clinic, and post office.

The Slavic feast of Christmas—known simply as "Slavi" in Marshall—continues for a week. A feature of the celebration is the "star" (left), an enormous decoration made of wood and gilt paper carried in procession from house to house, accompanied by carols, prayers, and feasting in each.

"We follow the star just as the Three Wise Men followed it to Bethlehem," Charlie explained, "and in each house we proclaim the

coming of Jesus. You are our friends and you are welcome to join us."

Join them we did, and in a week's time Marshall virtually became our second home. We listened to carols and prayers in Eskimo, feasted on moose and salmon till we could barely walk, and shared the many joys of a different but moving Christmas.

At Marshall we prepared for the final assault on the Yukon. With 150 miles still to go to the Bering Sea, we faced the toughest stretch of all. Along the lower reaches of the river, January and February can bring temperatures in the minus 40's; add the chill



OPPOSITE PAGE (FACING PAGE)

Steppin' lightly, the mukluk-shod author (above) joins the merrymaking at Marshall during its "Slavi"—the Russian Orthodox Christmas. In the week-long festival, villagers move from house to house following a whirling "star" (opposite), a reenactment of the Wise Men's journey. Many of Alaska's native people retain the faith brought them by Russian explorers.



factor of arctic winds, and temperatures can reach the equivalent of 100 below zero.

With typical generosity, Charlie insisted on accompanying us by dogsled to the village of St. Marys, 60 miles downriver. There we set off for our last stopping point, the hamlet of Emmonak in the Yukon Delta. But we had not counted on the wind. It came out of the north like a knife blade, probing at the seams of our arctic gear and tearing at our protective face masks. Skiing over the glare ice challenged our skill and endurance, for the wind had exposed scattered sandbars, strewing sand over the frozen surface.

One afternoon the wind rose to gale force, and our tent would no longer serve. We had to build a snowhouse or risk freezing to death. In three hours of remaining light we carved blocks of snow from a large drift with hatchets and knives and built a refuge from the minus 100° F. chill effect.

#### Heady Present for a Special Occasion

It was the last major crisis. Next day, when the wind abated, we pushed on to Emmonak, where a local schoolteacher, Byron Ryono, put us up for two nights. On the third morning as we were preparing to leave, he tucked something beneath Jerry's parka.

"Champagne," he said with a grin. "I was saving it for a very special occasion. Seems to me this is it. Good luck!"

On a calm and sunny February afternoon we skied out at last onto the Bering Sea, savoring the long-awaited triumph. We had come 1,850 miles in two summers and part of a winter. Bennett Lake lay two years and a world behind us.

The Bering Sea had been our goal, but in terms of experience and new friendships, our true summits were scattered all along the Yukon. As for our memories, Robert Service had said it all in "The Spell of the Yukon":

*There's a land where the mountains are  
nameless;*

*And the rivers all run God knows  
where;*

*There are lives that are erring and  
aimless,*

*And deaths that just hang by a hair;*

*There are hardships that nobody reckons;*

*There are valleys unpeopled and still;*

*There's a land—oh, it beckons and  
beckons,*

*And I want to go back—and I will.* □

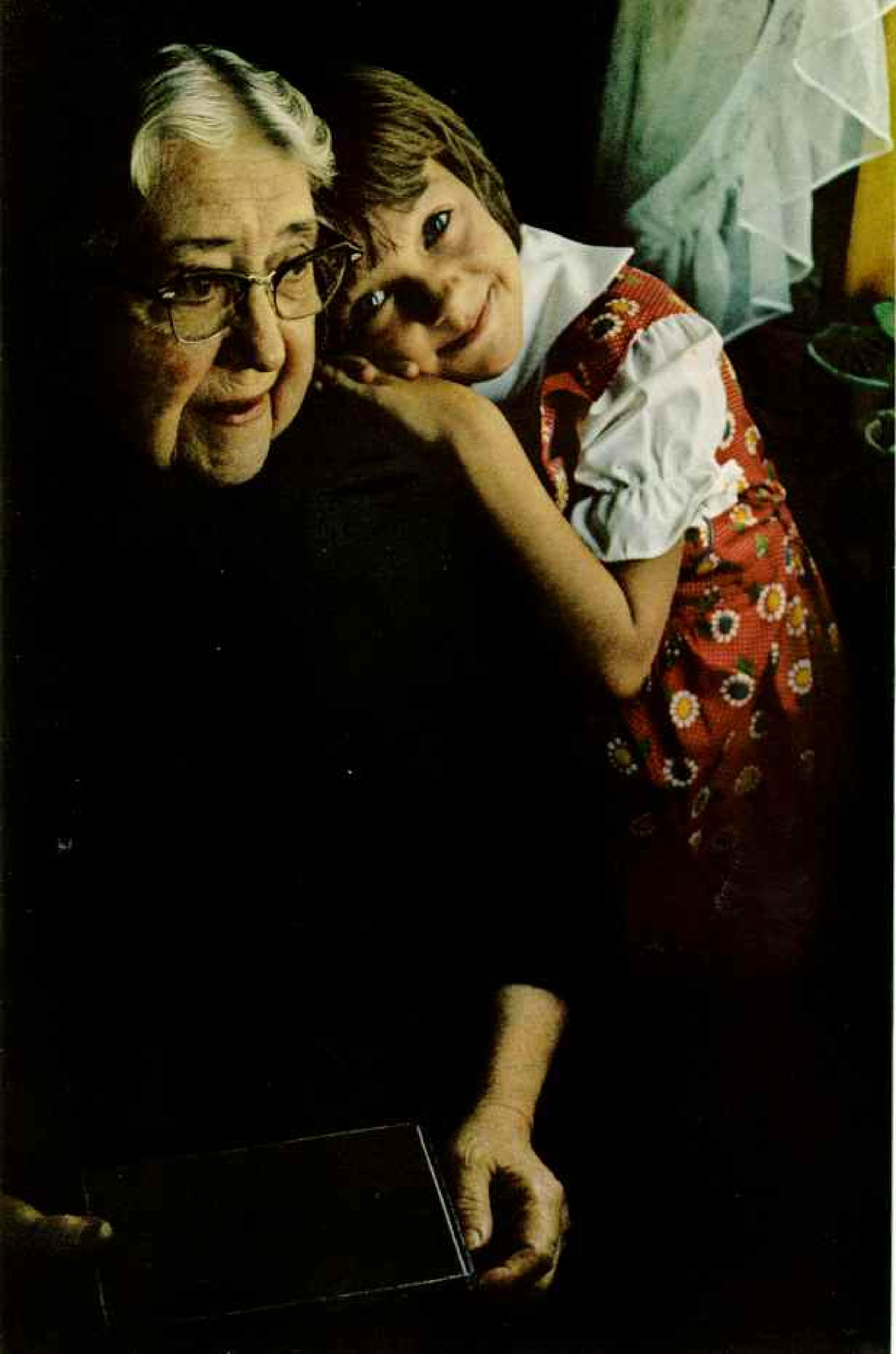


"The white silence" of the North, so named by Jack London, engulfs the trio (above) as they ski out onto the Bering Sea where a plane will pick them up. During their trek from Marshall the team braved the wind-chilled equivalent of -100° F., icing their ski masks (right). "Reaching the sea turned out to be an anticlimax," mused the author. "We all wanted to keep going!"



WYNNE WRIGHT (ABOVE)





# Iowa's Enduring Amana Colonies

By LAURA LONGLEY BABB

Photographs by STEVE RAYMER

NATIONAL GEOGRAPHIC PHOTOGRAPHER

**A**LL MORNING the rain drizzled gray and cold on the seven small villages of German heritage that are the Amana Colonies of Iowa. Many visitors huddled inside their cars on the main road of Middle Amana; others took cover in the old general store. A few of us, drenched and perhaps a bit daft, waited in the rain.

*Boom ta boom!* The lead drummer moved around the bend from the village of Amana two miles away. We had waited all year and, *ja*, it looked as if it would rain on our parade.

*Ta boom ta BOOM!* And the sky opened up, showering us with sunlight! For Oktoberfest the Amanas would sparkle!

Up past the Amana refrigerator factory chugged a massive tractor towing the old West Amana fire wagon. Then came the Gemeinde Brau brewery's castle, its joyriders tossing bags of Korn Kurls to hungry bystanders. Trucks, twirlers, floats, and the Oktoberfest Players—in dirndls and lederhosen for the afternoon stage show—followed.

The parade rolled on to the park, where the Conklin German Band was already "rolling out the barrel." In the park I strolled through the crafts tent, where, in one corner, Carrie Shoup and her South Amana quilting group

busily picked away with needles on a bright red quilt. And in the refreshment-ticket booth, Don Shoup was beaming at the weather's cooperation. He hollered at me.

"Remember how I told you that every year it has rained on Oktoberfest? I think you brought us good luck this year!"

I'd like to think so, if only in return for the way the Amanaites welcomed me as a member of their unique family. Yet when I first came to this quaint community of 1,650 people, I knew only that these Amanaites had once lived under a communal system and had changed to cooperative capitalism in 1932; that their religion—the Community of True Inspiration—had roots in Europe's Mysticism and Pietist movements of the 16th and 17th centuries; that the name of their society was the same as a familiar refrigerator; and that many still spoke German.

I really didn't know what to expect as I drove west from Iowa City on my first trip to the Amana settlements. But as I neared the village of Homestead, I noticed a subtle change in the countryside. Commercial buildings and barns no longer dotted the highways and hillsides. The land seemed stretched to infinity, broken only by streams and fences

**Memories and dreams:** Mrs. Emma Setzer and her granddaughter Caroline reflect the dual nature of the Amana Colonies, formed by a German religious sect in the mid-19th century. Fleeing persecution in Europe, early members established a string of self-sufficient villages that practiced simple piety in communal solitude. Today's Amanaites, attuned to modern fashions and opportunities, still keep the faith but welcome outsiders who leave tourist dollars or offer skills to local industry. © 1997 C. 1997

and clusters of rooftops a few miles apart. Evidently these were the Amana villages. But where, I wondered, were the horse-drawn buggies? And the stern, bearded patriarchs?

As I walked toward the modern 400-pupil school at Middle Amana, I was puzzled: The children were dressed like children in any ordinary American school.

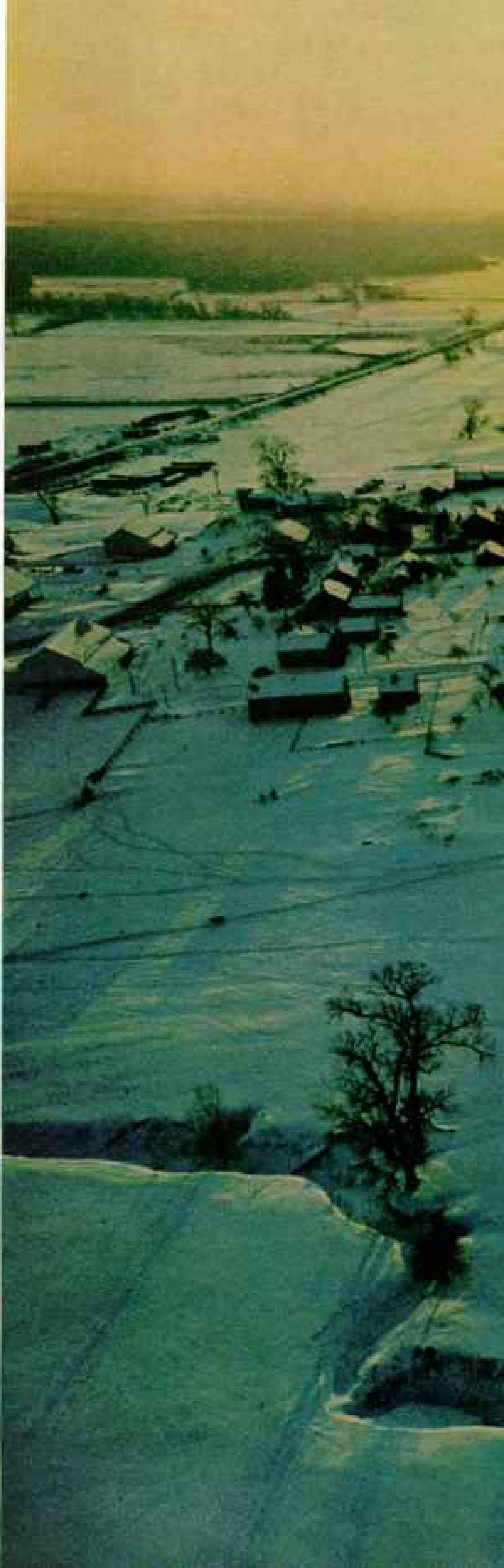
Superintendent Charles L. Selzer set me straight: "People often confuse us with other religious groups that live apart from the modern world. They think we don't follow federal or state laws with regard to education and taxes, even though we always have. We have a public school and licensed teachers, and we don't teach religion in the classroom."

### Farms Laid Out as in the Old Country

In Amana, at the history museum, I got a further education in what the Amanaites actually are. I picked up a map showing the location of the seven towns. It looked like a connect-the-dots drawing of a dipper. At the end of the handle was East Amana; at the joint, Amana; left along the rim were Middle, High, and West Amana; South Amana and Homestead marked the bottom corners.

"You ask why there are seven villages instead of just one?" said Henry Schiff, the museum's wizened curator. "Because that was our European way of farming—a matter of distance. It was easier to farm all the land with the people and the animals scattered

Yesterday's island on the prairie still appears remote. An ocean of snow surrounds South Amana, one of the seven Amana villages scattered on 26,000 acres in eastern Iowa. Founders clustered their homes and barns, then farmed the uncluttered countryside.





around in several small villages. So when we came out here in 1855, we started laying out the villages the same way. But Homestead was already here. We bought it in 1861."

Wandering through the cozy museum, I learned that the history of this community began in 18th-century Europe when a group of God-fearing, free-thinking people—German, Swiss, and French—banded together and founded a religion based on belief in divine revelation through *Werkzeuge*—inspired prophets. Thus the denominational name: Community of True Inspiration.

### Sect Joined the Westward Movement

In 1842, confronted with increasing political and religious persecution, some 800 hardy Inspirationists immigrated to the United States and established the Ebenezer Society community near Buffalo, New York. But within a dozen years Buffalo began encroaching. The Inspirationists went west, to 26,000 acres in the verdant Iowa River Valley.

They lived a self-contained communal life for 77 years in the seven villages they founded, each virtually self-supporting, with its own bakery, slaughterhouse, icehouse, general store, farm department, church, an eight-grade school, and various factories and workshops. Property was held in common and living quarters were allocated by church elders according to need. Communal meals were prepared in large kitchen houses.

The elders determined members' annual credit allowance "according to justice and equity." Clothing, household linens, and the like could then be charged at the society's general stores.

Spartan though the communal life was, older Amanaites recall it with nostalgia. But the young people began drifting away in search of jobs and a livelier life in the cities. Then, around 1930, the community, like the rest of the country, began falling on hard times. The Amanaites, \$400,000 in debt, voted for a radical reorganization; it took effect on June 1, 1932.

With this "Great Change," church and state were divided. The Amana Church Society

was formed to attend to divine matters, and the Amana Society—a closed joint-stock corporation—to manage man's affairs. Every member received one free share of Class A common stock, valued at \$80.79. Today those shares are worth more than \$20,000 each. Each member also received shares of less valuable prior distributive stock, the number determined by the years he or she had spent laboring for the society.

Land and shops were organized under a worker-owned corporation, which replaced red ink with black in the first year, sold off communal homes, and paid wages for work in society enterprises.

"Just about everyone immediately turned part of the stock back to the society as payment on his house," museum curator Schiff explained. "So, in reality, some of us started the new life almost penniless."

### Fewer Services—and Less Wine

Still, the spirit of working for the common weal remains among the Amanaites, and the church remains a strong and unifying force.

"In many ways the church is still the same as it was when I was a small boy," said Rudolph Pitz. Now nearly 80, Mr. Pitz grew up under the communal system and is one of the twenty-five or so church elders.

"Only a few things have changed," he said. "We used to have almost seventy elders, and services eleven times a week. Now, with services only once a week, we don't need so many elders. Years ago we held Communion—*Liebesmahl*—services every two years, and they lasted seven hours. We still have them every two years, but now they last less than two hours. There's just one thing I miss," and he grinned devilishly. "In the old days for *Liebesmahl*, two people shared one large glass of wine. Now we get only a thimbleful."

I was welcomed to a regular Sunday service by Marvin (Benny) Bendorf, a middle-aged elder who is also sales manager for the Amana Society furniture shop. "Come to Middle Amana at 10:30 this Sunday," he had invited when I stopped in the shop. "That service is in English instead of German. I'm

**Boyhood's eternal triangles** poise over the Amana canal, which powered woolen and cereal mills in the early communal days. The "Great Change" of 1932 turned the Amana Society into a profit-making corporation. Members who once shared property, services, and income became stockholders in the community's business and farm operations, making possible private enterprise and home ownership.







giving the sermon, and my wife, Emaline, will be glad to accompany you."

So the next Sunday morning I donned my darkest dress, hoping I wouldn't feel too out of place among the women in their traditional black silk aprons, shawls, and caps. Emaline met me at a side door and we followed the other women into the church's whitewashed community room. From a door on the right, the men and boys—dressed in browns and grays and dark blues—entered one by one. The plain wooden benches filled quickly, youngsters in front, older members in back. Seven elders took their places on a low bench facing the congregation.

The service was simple: a few hymns *a cappella*, a brief sermon, and several prayers and readings from the writings of Christian Metz, gifted leader of the church for 50 years.

More than the churches, the cemeteries reflect the singular religious heritage of the Amanaites. Their graves, in precise rows, are marked only by identical white headstones, each bearing the name, date of death, and length of life (page 877). Members are buried in order of death, not in family groups. One Amanaites told me, "In death, as in life, we are like a family; we are all equal."

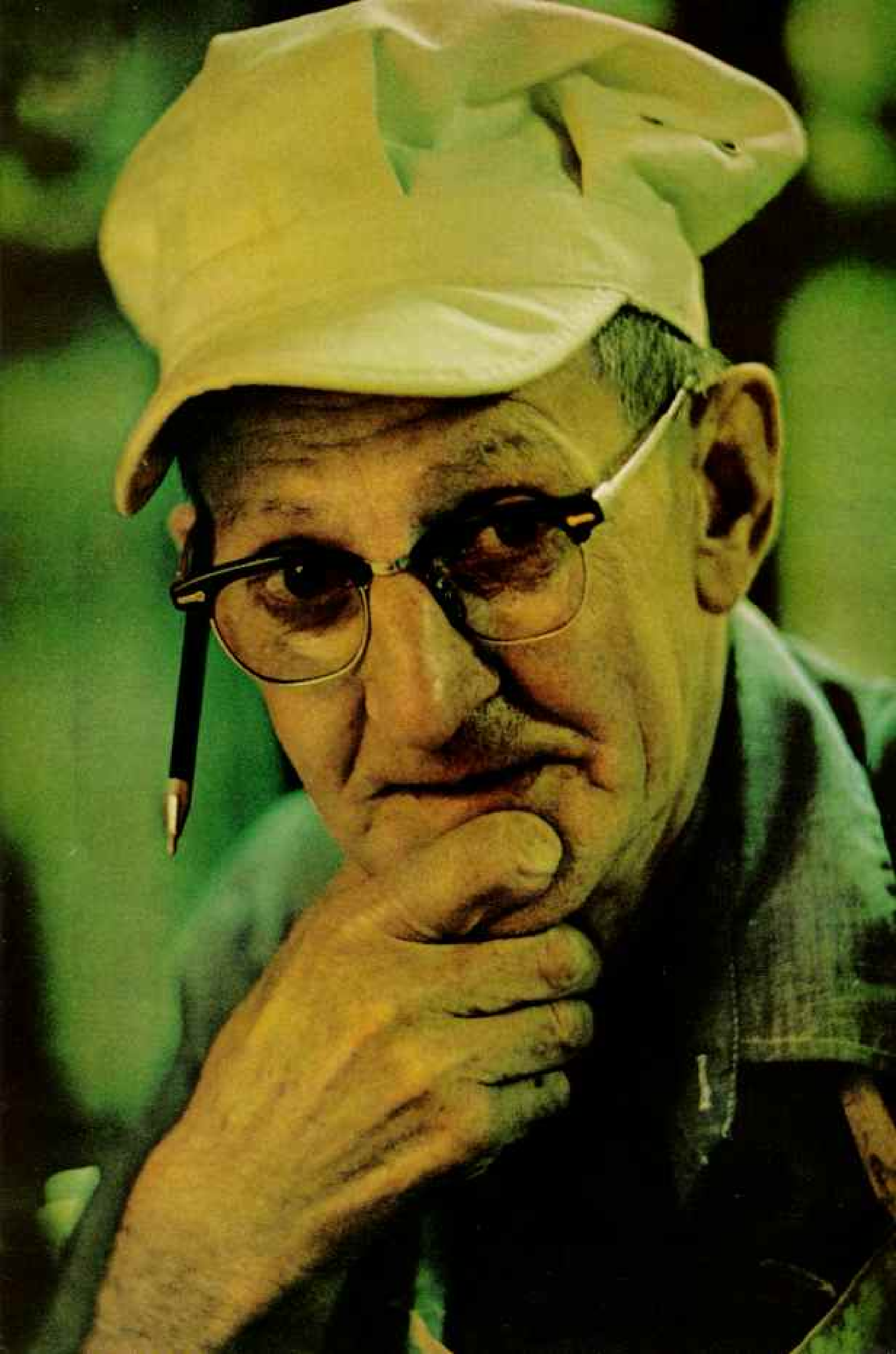
#### Little-used Church Still Cared For

Of all the community's churches, I remember best the old High Amana church tended by 86-year-old Minnie Setzer. I met this wisp of a woman one clear April morning on a walk through tiny High Amana. When she saw me admiring a lone lavender crocus, she said with a smile, "Ja, spring is coming at last." And she invited me in.



"It takes folks back to their childhood," says Mrs. William Jeck, explaining the success of this vintage general store (left) in High Amana. Built in 1858, three years after establishment of the first Amana village, the store remains well stocked with early-American atmosphere.

Crock-cured pickles with a whimsical label (above) tempt customers at the meat shop in Amana, largest of the villages. In Middle Amana, where his father baked bread for the communal kitchen, Jack Hahn sweeps a loaf from the wood-fired open hearth (upper left), preserving a time-honored technique.



As we sat on a front bench, I glanced at Mrs. Setzer's small wrinkled hands, folded over her Bible. Mrs. Setzer, a widow for 26 years, had worked hard in her life.

"I was a cook in the kitchens for 13 years," she told me. "Then I was a vegetable woman, and for three years I was working in South Amana's general store. But when my husband died, I came back to my hometown."

Now she cares for the church, even though it is seldom used (pages 876-7). "Our elder died in 1972, so we go to Middle now for church. But when someone dies in High, we have the funeral here." Her soft voice dropped to a reverent whisper: "It is the Lord's house and I take care of it for Him."

### Workaday Toil Starts Early

Monday mornings the mood of the Amanas changes. Gone are the black shawls and caps. Shops and wineries open their doors. The roads rumble with workers on their way to the woolen mill or refrigeration plant.

It was only 7:30 a.m. one Monday when I called at the Amana Society office. Don Shoup, society secretary, was already there.

Don is largely responsible for day-to-day operations of the society-owned business corporation, with assets of more than eight million dollars; last year it netted \$527,000, nearly half from farming. The rest came from its two meat markets, a sawmill, furniture shop, building department, woolen mill, bakery and pastry shop, five general stores, three service stations, restaurant, implement store, feed mill, pharmacy, printshop, four fire departments, and telephone, electric, and water departments. Most of the businesses catering to tourists—gift shops, wineries, restaurants—are privately owned.

Employment in the colonies is more than 3,200—2,400 at Amana Refrigeration alone—even though their total population is only 1,650. The society's businesses, as well as the refrigeration plant, have had to hire many people from outside. Fewer than half the society's 420 nonagricultural workers are from the colonies.

"If we had more labor, we could have had

three shifts at the woolen mill last year," Don said. "We had the orders to keep them busy."

The woolen mill's fine cloths in Amanaite designs are among the colonies' best-known products. The others are furniture and meats.

Run by two brothers, Harold and George Schuerer, the Amana Meat Market operates much as it did back when it cured meats only for community use. Today thousands of customers yearly buy its products.

"We have a lot of tourists, ja," said Harold, a big, jovial bear of a man. "But they are like icing on the cake. We depend mainly on local restaurants and retail businesses, and mail orders from all over the country."

The Schuerers and their 30 employees do their own slaughtering, mainly animals from Amana farms. "My brother and I are third-generation meatmen, and we use the old sausage recipes for specialties like bratwurst, liverwurst, bologna, and wieners," Harold said, then smiled. "Ah, maybe we have modified them a *little* bit to improve them."

His hams are still cured in brine, then hung to smoke over hickory in the smoke tower, built in 1858 and big enough to hold 3,000 hams.

### Furniture Reflects Old Days and Old Ways

I made my way to the furniture shop, housed in the old calico mill. The salesroom was filled with visitors admiring the solid walnut and cherry pieces—many reproductions of early Amana furniture. Work progresses slowly, since each of the twenty or so craftsmen in the workshop creates a piece from beginning to end, except for the finishing, which is left to women's softer touch.

The caning of chairs is often done by part-time workers in their homes. Another popular home craft is the making of wine.

"Home wine making began decades ago, when the community grew its own grapes," Henry Schiff told me. "Everyone received a yearly allotment—the men 20 gallons, the women 12; 'women's lib' hadn't reached us.

"There was always some in stock because some people didn't use all of theirs. But in 1917, in compliance with Iowa's prohibition law, we uprooted every society-owned vine

"If it isn't perfect, it comes right back to me," says master craftsman Marvin Roalf, a cabinetmaker at the Amana Furniture Shop. Traditions of precise workmanship were established when Amanaite made furniture by hand to fill colony needs. Demand for excellence continues, but now most of the attractive hardwood creations, today often made by outsiders like Roalf, go to fill commercial orders.



Cinderella industry, Amana Refrigeration, Inc., grew from a village workshop producing beverage coolers into a manufacturer and international marketer of kitchen appliances and heating and cooling systems. On the assembly line a technician assembles a microwave oven (above). The firm merged with the Raytheon Company in 1965.



Looms that wove for the commune now weave yard goods and blankets (left) for retailers and tourists. A showroom at the Amana Woolen Mill accounts for nearly half the mill's income. Outside, the waters of a seven-mile canal, hand dug in the 1860's, drive electrical turbines that help power the machines.

Time flies when Rudy Blechschmidt adjusts new clocks at Krauss Furniture Shop, owned by an Amanaite but located outside colony boundaries. Rudy inserts West German movements into cabinets handmade from Iowa walnut and cherry wood to complete the grandfatherly timepieces, one product that early Amana colonists never made. "It's just part of the German tradition," he says.



and poured 19,000 gallons of wine into our sewers. Next day, every fish between Amana and New Orleans was asking for aspirin."

After Prohibition ended, a number of Amanaites went into the wine-making business, and today there are several small wineries. "The oldest, the original, and the ultra-best" winery, at least according to Alma Ehrle, is the Ehrle Brothers Winery in Homestead. But then, she's a little prejudiced.

I first met Alma and her family when, by mistake, I called at the front door of the large white frame house instead of the side sales-room entrance. No sooner had I knocked than I was ushered by Arthur Miller, Alma's son-in-law, into a spacious blue kitchen where his wife, Lynda, and daughter, Tamara, were sitting down to noon "dinner."

### Rhubarb's Not Only for Pies

I barely had time to introduce myself to little silver-haired Alma before dinner landed in front of me. It looked more like a feast: roast beef, fish, boiled potatoes, German potato salad, kidney-bean salad, cole slaw, warm crusty bread and, for dessert, rhubarb and peach pies.

Alma hurried to pour me a glass of her favorite red. "You like it, ja?" she lilt in her voice jumping an octave with "ja."

Emil Ehrle, Alma's late husband, started the winery with his brother and a cousin as a sideline in 1934. "I had to take over when Emil died in 1951," Alma said. "It was unbelievable! By then I had only one helper, and between us we made all the wine."

Although Alma still helps out in the sales-room, Arthur Miller runs the winery today. In September he makes the red wine. And in June he starts work on the rhubarb, or *piestengel*, wine, an Amana speciality.

"When the rhubarb is crushed, it looks like sauerkraut," said Arthur, showing me the old wood wine press. "Then it is pressed and the juice is squeezed out into barrels." I must have grimaced at the sauerkraut part, for Arthur urged, "Come taste some. You might change your mind."

I think I did. But it's hard to remember—maybe because the *piestengel* was preceded by dry grape, medium dry grape, and sweet grape. And followed by a notoriously potent concoction of dry *piestengel* and sweet grape called an Amana martini.

But the Amana martini is not the only intoxicant created in the colonies. The fragrant





BOHN BY ROBT. L. SMITH

**Clattering horn of plenty:** A conveyor spills corn from one of the Amana Society corporation's 25 granaries as farm workers rake it out of storage. Most will be used to fatten the 15,000 hogs and beef cattle the society sells each year.

Iowa's largest farmhold is also the Amana Society's biggest industry. The rich cropland often accounts for half the corporation's total income, just as it once amply provided meat and grain for communal tables. Today non-Amanaites fill two of every three jobs in the colonies, usually commuting from nearby towns. But even those, like swineherd Milo Rotter (below), who have lived for years within the Amana Society plot remain "outsiders." "The only true Amanaites," said an Amana elder, "are direct descendants of the early colonists."

875





aromas issuing from Hahn's Hearth Oven Bakery in Middle can be almost as heady.

Jack Hahn and his wife, Doris, were cleaning the hundred-year-old hearth oven when I arrived to buy a cinnamon loaf. "We're all out today," Doris apologized. But we chatted about the bakery, which is far smaller than the society-owned bakery in Upper South, and uses methods far more antiquated.

"Now, in summer, with so many visitors, we're up at three every morning to mix and bake about 150 loaves of bread and 120 coffee cakes," Jack said. "In winter, I split wood for the oven and Doris piles it. It's a proven system, using wood in the oven. If we switched to fuel oil, I don't know what would happen. We just know that three armloads for the first baking each day does it."

#### Local Firm Now a Corporate Giant

The half a mile from Hahn's to the Amana Refrigeration plant seems more than a century distant. For here are made such modern products as the Radarange microwave oven and the Deepfreeze (page 877).

Though it's now a giant with yearly sales of more than 180 million dollars, Amana Refrigeration's beginnings were humble. The company was formed in 1934 when a businessman who needed beverage coolers came to young Amanaite George Foerstner and asked if he could build them. He could and did. In 1936 the society bought Foerstner's budding business and kept him in charge. During World War II it became one of the U. S. Armed Forces' chief suppliers of walk-in coolers and refrigeration systems.

In 1950, when the division was worth about 1.5 million dollars, the society decided to sell out. Foerstner and a friend purchased the business and expanded it. Not long after Amana Refrigeration merged with the Raytheon Company in 1965, the Radarange was developed and the company skyrocketed.

"And that's about it," said Mr. Foerstner, now the refrigeration firm's president. "I'm happy to say that over the years we've had a little growth."

Yet, I thought that evening, listening to the plaintive bawling of a cow, business growth doesn't symbolize Amana. Its cattle, its fields awaiting harvest, even its barnyard smells better evoke its strikingly rural character.

In some ways, it's almost too rural. Said Harry Geiger, president of the society since 1956: "When we first settled here, we built



Stark for salvation's sake, the church at High Amana adheres to a major tenet in the Amana faith: Ornamentation detracts from spirituality. Members of this Community of True Inspiration once wore black daily, but now dress fashionably outside the sanctuary. Caretaker Minnie Setzer, 86, approves youthful freedoms but misses the fellowship of strict communal life. "To take the best of both times would be perfect," she says.

Simplicity and equality endure in the cemetery (right), where every gravestone is like the next.



barns right in our villages. Now a lot of those farm buildings are white elephants, what with houses crowding in all around them."

As if on cue, the scent of hogs wafted past us. "And people, they complain about the smell," he added. "So we are trying to get the livestock away from town."

There have been other, more substantial changes in the farm department, which now employs 52 workers, 20 of them Amanaites. Time was when there were seven farms for seven villages, each with a manager. In recent years the farms have been consolidated into two efficient units—the east division and the west division. They split down the middle, 11,000 tillable acres producing corn, beans, and hay, most of it used to fatten the 11,000 hogs and 4,000 head of cattle the society sends to market each year.



Home-run smile flashes from Joel Eckman after a teammate's victory clout in Little League baseball, once considered sinfully frivolous in the colonies. Despite the erosion of old-time strictures, Amana population and community spirit remain stable, a credit to "strong traditions and job opportunities," as one Amanaites sees it.

"Ja, you can't stand still," said Mr. Geiger gruffly. And with that he turned, bade me a brusque "*guten Morgen*," and strolled off past a defunct and dilapidated oxen barn.

There is a similar old barn over in Homestead, and several mornings, very early, I had seen a fellow named Fritz Marz tramping around in his denim overalls. I'd wondered what he was up to, so one day I trailed him home from the barn. I sat down next to him on the back stoop. A gray cat sailed over me and plopped in Marz's cushiony lap.

"Cats, they are my friends," he said with a toothy grin, stroking the curled feline. "I feed the cats at Homestead farm. Ja, I worked in the farm department since I was 13. After I retired at 67, Roy Moser, the manager, asked me to come over and feed the cats in the east division. Now I have seven cats here and eighteen cats at the farm. Cats are to take care of rats and mice, to keep the territory about a mile around *clean*."

He heaved himself off the stoop, the cat bouncing to the ground. "I got rabbits, fish, pigeons, and chickens, too. And I got something *really* special. Come and I show you."

Fritz lumbered off to his ramshackle chicken coop. "See there, see him," he said, pointing excitedly to a big, colorful bird. "See him, it is my turken!"

The huge chicken, the likes of which I'd never seen, cock-a-doodle-doo'd toward us. I quickly found the gate.

#### Bakers Share Recipe for Life

On the day I left the Amanas, I went to say good-bye to my baker friends, the Hahns. A gray dawn was just spreading over the horizon as I arrived in Middle and stopped in front of their home. It was the only house in the village with a light burning. Jack and Doris were waiting at the door.

"We hid your loaves away from our last customers yesterday," she said, laughing.

She wrapped them carefully, and together we walked out to my car. Jack half-opened the door, then paused.

"I couldn't leave the Amanas to live in a big city where there is no feeling of community. Here we have our church and we have each other to share things. To share the hard times and"—his tone hushed to a tender note—"when you have something to be happy about, you have friends to enjoy your joy."

I left the Amanas with a lot more than three loaves of cinnamon bread. □





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## NUTRITION INFORMATION PER SERVING

SERVING SIZE: 1 OUNCE (ABOUT 1/4 CUP) PRODUCT 19 ALONE AND IN COMBINATION WITH 1/2 CUP VITAMIN D FORTIFIED WHOLE MILK.

	PRODUCT 19	
	1 OZ	WITH 1/2 CUP WHOLE MILK
CALORIES	110	190
PROTEIN	3 g	7 g
CARBOHYDRATES	24 g	30 g
FAT	0 g	5 g

## PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCE (U.S. RDA)

	PRODUCT 19	
	1 OZ	WITH 1/2 CUP WHOLE MILK
PROTEIN	4	15
VITAMIN A	100	100
VITAMIN C	100	100
THIAMIN	100	100
RIBOFLAVIN	100	110
NIACIN	100	100
CALCIUM*	1	15
IRON	100	100
VITAMIN D	100	110
VITAMIN E	100	100
VITAMIN B <sub>6</sub>	100	100
FOLIC ACID	100	100
VITAMIN B <sub>12</sub>	100	100
PHOSPHORUS	4	15
MAGNESIUM	4	8
ZINC	2	2
COPPER	4	4

\*CONTAINS LESS THAN 2% U.S. RDA OF THIS NUTRIENT.

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for the new  
Super Colors.**





Around the turn of the century, this barkentine, *Fullerton*, carried fuel oil over 2,500 miles to Hawaii for the cane grinding mills of three sugar plantations. Now Union Oil is helping America's food production in other ways.

Beef is one of the major sources of protein in the American diet. It is also one of the more expensive. But there are ways to keep the cost of beef down. Dr. Alex Miller is helping to find them.

Working with other scientists at Union Oil's Research Center, Dr. Miller is developing new liquid food supplements for cattle. One of the new supplements that Dr. Miller helped develop contains urea—a product derived from natural gas—along with calcium salts, vitamins, and other key ingredients. This balanced supplement improves the nutrition of cattle.

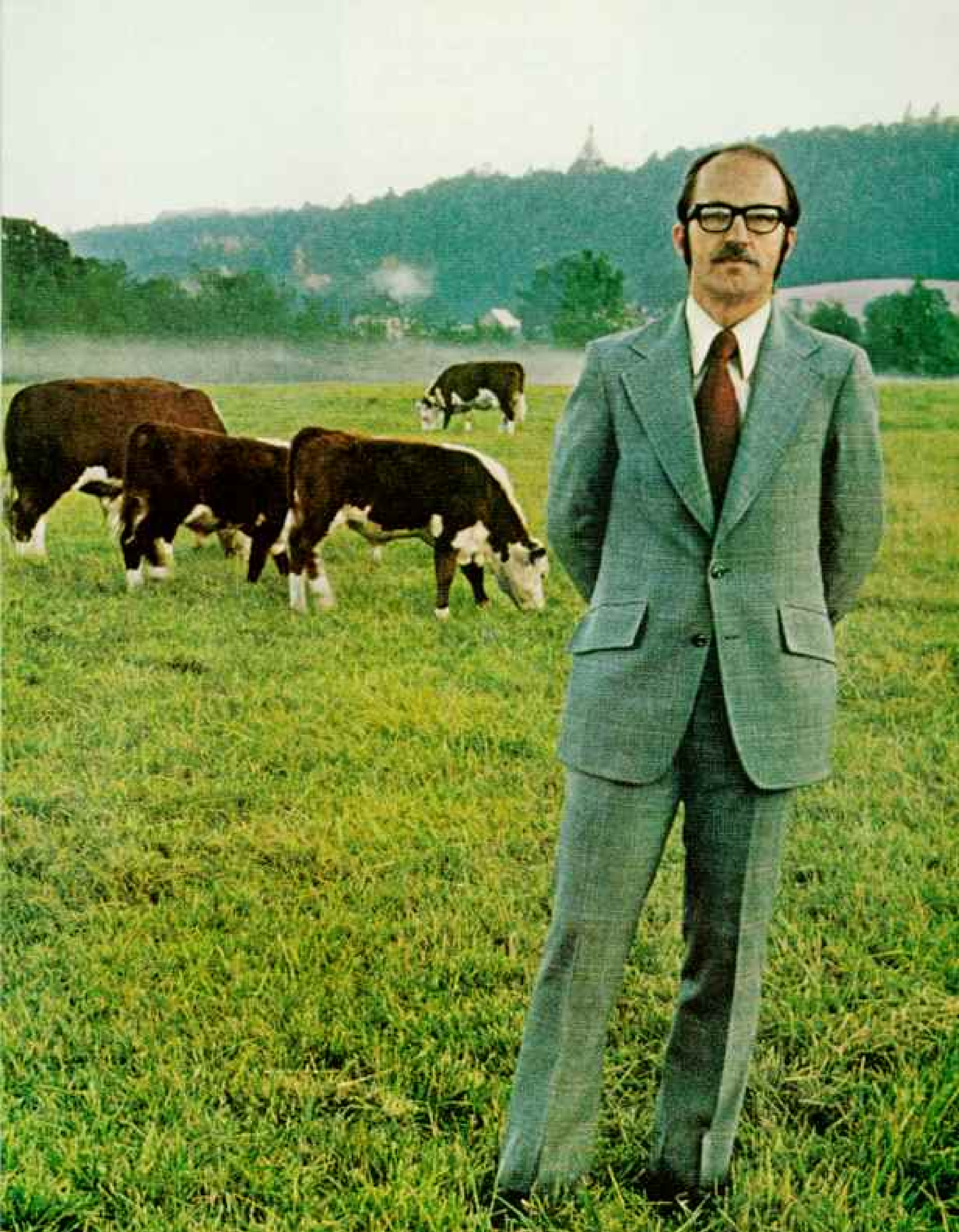
Dr. Miller's work expands the family of products called Protein Molasses Supplement (PMS). Union Oil's subsidiary, Collier Carbon and Chemical Corporation, markets PMS. It is designed to comprise 5 to 10% of the cattle's diet, taking over where nature leaves off.

Feeding cattle may seem a long way from finding oil, but it's an example of how Union Oil is determined to make the best of its research capabilities. Solving all kinds of problems, from energy to food, is part of our spirit.


If you are interested in knowing more about PMS, write Union Research Center, Brea, California 92621.

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The pioneering Spirit of 76. It wasn't just then, it's now.



**Today, the pioneering Spirit of 76 is men like Dr. Alex Miller developing new ways to feed cattle, for a cheaper way to feed man.**



**“Nuclear  
power plants  
frighten me.”**

The nuclear plant. Dark and foreboding threat? Or great future power source. There are reasons to support both views.

Today, nuclear fission provides about 2% of our energy. By 1985 it may provide 12%. America now has 55 operational nuclear plants. By 1985 the number could double.

But, can we accept the risks? Nuclear wastes may remain radioactive for thousands of years. Where can we store them that long? We can't allow the heat of fission to foul lakes and streams. The risk of human error is undeniable. So is risk of nuclear "spill" or even sabotage.

Yet we need energy. Our oil and gas must be conserved. New sources developed.

Where can we turn for tomorrow's power? To coal conversion? Oil shale extraction? The wind? The sun? The tides? The earth's internal heat? The atom? The answer is "all of these things and more." No one source will meet our total energy needs. The question is what part will each play?

Most energy planners look to nuclear energy to meet a portion of tomorrow's power requirements. A pound of uranium reactor fuel can yield the energy equivalent of 25 tons of coal, 107 barrels of oil.

But can we hold nuclear risks to levels most would judge acceptable? Levels that would permit us to complete those generating stations already planned—and those that could be added?


The more we delay this answer, the greater chance we may fall short of adequate future power. Concerned citizens, government and industry must move toward agreement faster.

Caterpillar's involvement is machinery used in energy production, site preparation and land reclamation. We are concerned over the lack of definitive national energy policy.

**There are no  
simple solutions.  
Only  
intelligent choices.**

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**“Nuclear power  
potential is too  
great to ignore.”**

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So that together you'll go a long, long way.



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FORD DIVISION





In commemoration of the 200th Anniversary of the Birth of the United States, Fleetwood proudly announces . . .

The Official Collection of

# The Signers of the Declaration of Independence

authorized by the Philadelphia '76 Commission



Cover shown  
reduced size.  
Actual size:  
8 1/2 by 2 1/2 inches.

The postmarks and stamps illustrated are an artist's concept of the way the stamps and postmarks are likely to appear. Postmarks, as officially applied by the United States Post Office, will necessarily be somewhat different. Because of uncertainty of postage rates, stamps used, while always appropriate, may vary from those illustrated.

Each of the fifty-six Philatelic Commemorative Covers in this collection will be authentically cacheted with a portrait of the Signer and lavishly engraved with his historic signature. Each envelope will be made from long-lasting laid-fibre paper in a special hue manufactured expressly for this series.

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A distinguished series of Philatelic Commemorative Covers  
portraying each of the fifty-six patriots  
who pledged their lives, their fortunes, and their sacred honors for Liberty.  
*Limit: One set per subscriber.*



Two hundred years ago next July the Fourth the massive bell in the steeple of the Pennsylvania State House, now Independence Hall, rang out the birth of the United States.

It signalled the adoption by Congress of the Declaration of Independence, the first great charter of the Nation. It marked the end of a long chain of political events which had eroded Colonial freedoms. And, it set forth the causes of the Revolution which had begun at Lexington and Concord the year before.

Today — as relevant as ever in its noble proclamation of the inalienable rights of man — the Declaration stands as an enduring legacy to us all and a lasting tribute to the fifty-six brave patriots who signed it.

Now, to appropriately honor those fifty-six men — who pledged their lives, their fortunes, and their sacred honors for the cause of Liberty — Fleetwood will issue, by authority of the prestigious Philadelphia '76 Commission, an inspiring collection of Philatelic Commemorative Covers authoritatively portraying *The Signers of the Declaration of Independence*.

### A COLLECTION WHICH RECAPTURES THE LIVES AND TIMES OF THE SIGNERS

Each of the fifty-six Commemorative Covers in the complete collection will focus on one of the Signers. Superbly produced on luxurious laid-fibre paper, each will be meticulously *cached* with an *authenticated* portrait of the Signer, lavishly engraved with his famous signature, and officially postmarked during 1976 at, or near, the place now enshrined to his memory on the exact date of an important event in his life.

Appropriately, the man who signed the Declaration first, *John Hancock*, will be the first to be honored when the inaugural Cover in the collection is issued at Boston on January 12, his birthday.

On July Fourth, the thirty-second and thirty-third issues will honor *John Adams*, who seconded the motion in Congress which led to the Declaration, and *Thomas Jefferson*, who drafted the fateful document. Issued at Quincy, Massachusetts, and Monticello, Virginia — their homes — they will commemorate the exact Bicentennial of Independence as well as the precise 150th anniversary of their deaths.

The series will conclude December 26, at Yorktown, where *Thomas Nelson, Jr.*, who carried Virginia's "independency" resolution to Philadelphia in May, 1776, was buried and the final battle of the Revolution won.

As a complete collection, all fifty-six magnificent Philatelic Commemorative Covers will recapture the lives, the times, and the achievements of fifty-six noble patriots. From the youngest, *Edward Rutledge* of South Carolina, to the oldest, *Benjamin Franklin* of Pennsylvania, all were champions of liberty who earned their honored places in our country's history as *The Signers of the Declaration of Independence*.

### AN IMPRESSIVE ALBUM WILL DISPLAY YOUR COLLECTION

Collectors who take advantage of this opportunity to acquire *The Signers of the Declaration of Independence* will also receive, without additional cost, a handsomely bound collector's album. With narrative by Pulitzer Prize winning historian Dumas Malone, and illustrations selected by Milton Kaplan, the Curator of Historic Prints of the Library of Congress, this lavish, over 200-page album will bring to life the entire history of our Declaration of Independence. It will be sent to all subscribers of record when the twenty-ninth issue in the series is shipped in late July, 1976; truly, an impressive way to appreciate this inspiring collection.

### A STRICTLY LIMITED EDITION

Participation in *The Signers of the Declaration of Independence* is limited to only one lot every 1776

Americans. Once this number has been reached, no further subscriptions will be accepted. Furthermore, there is a firm limit of only one collection per subscriber.

The historic postmark, officially imprinted on each cover by the United States Post Office, will certify to you and to future generations the irreplaceability of each Commemorative in the collection. It will guarantee that a Cover can never be issued again.

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The complete series of fifty-six Philatelic Commemorative Covers and the superb album will come to your home for the modest cost of only \$14.00 for each group of seven covers.

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Walt worked hard to get where he is; he thinks he's entitled to a reward—even in the car he drives.

So he bought a 1976 Oldsmobile 98 Regency. The Regency has the room, the smooth ride, the



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Inside, Olds has gone all-out to make it luxurious. You can see it in the loose-cushion look of the plush velour seats. You can even see it in the quartz-crystal digital clock and the zippered pouch pockets. And you can feel it, too. It's a good feeling to have Olds 98 around you. That's the way we build it.

You don't have to be a king to drive a 98 Regency. You just have to want to feel like one.



## 98 REGENCY

# *Oldsmobile*

Can we build one for you?

# TV service technicians name Zenith for the two things you want most in color TV.



## I. Best Picture.

In a recent nationwide survey of independent TV service technicians, Zenith was named, more than any other brand, as the color TV with the best picture.

**Question:** In general, of the color TV brands you are familiar with, which one would you say has the best overall picture?

**Answers:**

Zenith.....38%  
 Brand A.....20%  
 Brand B.....10%  
 Brand C.....7%  
 Brand D.....6%  
 Brand E.....3%  
 Brand F.....2%  
 Brand G.....2%  
 Brand H.....2%  
 Brand I.....1%  
 Other Brands.....3%  
 About Equal.....11%  
 Don't Know.....4%

**Note:** Answers total over 100% due to multiple responses.

## II. Fewest Repairs.

In the same survey, the service technicians named Zenith as the color TV needing the fewest repairs. By more than 2-to-1 over the next brand.

**Question:** In general, of the color TV brands you are familiar with, which one would you say requires the fewest repairs?

**Answers:**

Zenith.....38%  
 Brand A.....15%  
 Brand C.....8%  
 Brand D.....4%  
 Brand B.....3%  
 Brand I.....2%  
 Brand F.....2%  
 Brand E.....2%  
 Brand G.....1%  
 Brand H.....1%  
 Other Brands.....4%  
 About Equal.....14%  
 Don't Know.....9%

For survey details, write to the Vice President, Consumer Affairs, Zenith Radio Corporation, 1900 N. Austin Avenue, Chicago, IL 60639

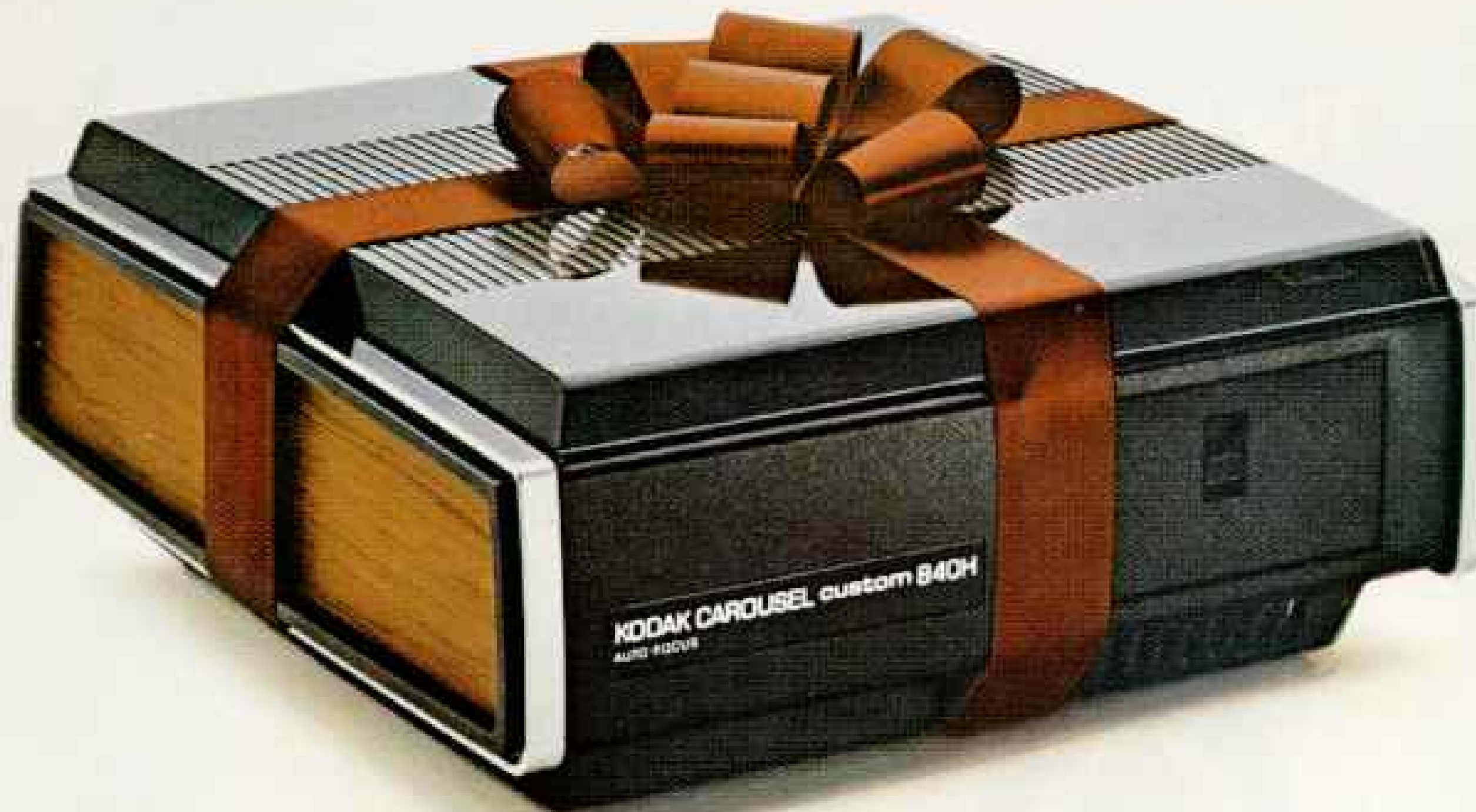
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Behind this motto may be found the American Telephone and Telegraph Company—the so-called "parent" Bell Company.

A unified policy is obtained because the American Telephone and Telegraph Company has for one of its functions that of a holding company, which federates the associated companies and makes available for all what is accomplished by each.

As an important stockholder in the associated Bell companies, it assists them in financing their extensions, and it helps insure a sound and uniform financial policy.

A unified system is obtained because the American Telephone and Telegraph Company has for one of its functions the ownership and maintenance of the telephones used by the 4,000,000 subscribers of the associated companies.

In the development of the art, it originates, tests, improves and protects new appliances and secures economies in the purchase of supplies.

It provides a clearing-house of standardization and thus insures economy in the construction of equipment, lines and conduits, as well as in operating methods and legal work—in fact, in all the functions of the associated companies which are held in common.

Universal, comprehensive service is obtained because the American Telephone and Telegraph Company has among its other functions the construction and operation of long distance lines, which connect the systems of the associated companies into a unified and harmonious whole.

It establishes a single, instead of a divided, responsibility in inter-state connections, and a uniform system of operating and accounting; and secures a degree of efficiency in both local and long distance service that no association of independent neighboring companies could obtain.

Hence it can be seen that the American Telephone and Telegraph Company is the active agency for securing one policy, one system, and universal service—the three factors which have made the telephone service of the United States superior to that of any other country.

American Telephone & Telegraph Company



Bell System

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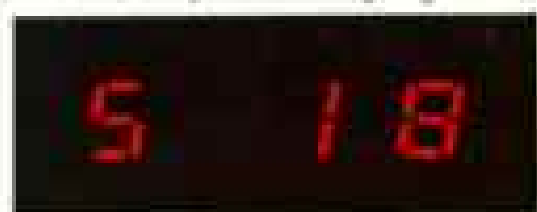
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Find your slides the easy way with Bell & Howell.



**BHMC**

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I want to find out about the complete line of Bell & Howell Slide Cube projectors. Please send me free information.

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Photograph the excitement of the Bicentennial.



## There are weekends. And then there are weekends.

Ground-bound weekends can be pretty limiting for the adventure-minded.

But when you can give wings to your fancies, your rewards multiply many fold.

Beech's legendary Bonanza can speed you to far-off Shangri-Las you couldn't consider before. And transform dozens of dull weekends into unforgettable mini-vacations.

The serenity of a sun-dappled, palm-fringed beach. The exhilaration of skiing downhill in ankle-deep powder. The wonderment of our nation's historical heritage. The thrill of a first-hand experience at a world-class sports event.

A Bonanza can take you

where the airlines go plus thousands of places they don't. Normally, you can land very close to your weekend adventure. And you'll use less fuel getting there than you would in a standard size car.

Using a Bonanza is a lot easier than you may think. Thousands of people, just like you, learn to fly each year. And in a lot less time than they had imagined.

All the more reason for you to escape from humdrum weekends.

Just to get you started, we've put together an updated and expanded version of our popular Beechcraft Adventure Kit. You'll find it an informative, entertaining guide to out-of-

the-ordinary places and events in the U.S. We'd like to send you one free of charge.

THIS IS NOT A COUPON

But we do urge you to write to us on your letterhead instead.

We'll send your Beechcraft Adventure Kit by return mail, absolutely free. And we know you'll like it.

Write to Beech Aircraft Corporation, Department A, Wichita, Kansas 67201.

Please include name, address, occupation, and title.

Also, please let us know if you're already a pilot.



Beechcraft Bonanza V35B



# This Christmas help a student with his homework.

Give him the Smith-Corona Cartridge Ribbon Typewriter.

Keeping up with all there is to learn today is a tough assignment for any student. The Smith-Corona® Cartridge Ribbon Typewriter can help. It's the world's most advanced electric portable.

For a fresh ribbon all you do is snap in a cartridge.

There's a correction cartridge that corrects errors faster than you can say "Ho, ho, ho."

There's a special film cartridge that makes typing look like printing. It's perfect for term papers and reports.

And for adding emphasis there are four color cartridges.

The Smith-Corona Cartridge Ribbon Typewriter. A smart gift for Christmas.

**SCM** SMITH-CORONA  
SCM CORPORATION

# This Christmas give your children a day at the circus and a trip into space.

## The Stamp Collecting Gift-Pak. The start of a lifetime adventure.

Give your children a very special Christmas gift this year. One that will take them on a colorful journey back into America's vibrant past to meet frontiersmen and Rough Riders. And forward into space to see man's

first step on the moon. It also pictures hundreds of beautiful stamps and tells the stories behind them. Like the American Circus stamp that brings your children the magic of the Big Top.

The Gift-Pak also includes the U.S. Stamp Collecting Kit. It has a booklet that tells, step by step, how to begin collecting stamps, a packet of colorful stamps, and an album to mount them in.

Finally, the Gift-Pak contains the Mint Set, which has all 29 U.S. commemorative stamps issued in 1974 and a handsome album to mount them in.



first step on the moon. It's the Stamp Collecting Gift-Pak, everything a child needs to build a stamp collection of his own. Your children will be thrilled by the brightly colored stamps. And when you see the fun they're having, you'll be thrilled, too.

The Gift-Pak pictured below costs \$7.50. It contains *Stamps & Stories*, a book



Included is the Skylab stamp. It brings to life the famous mission in which our ingenious astronauts repaired a damaged solar wing with only a pole and pruning shears.

There are other conveniently wrapped Gift-Paks, starting at only \$4.00. Get them at your Post Office, the place to discover the fun of stamp collecting.

 **Your  
Postal Service**



### The Stamp Collecting Gift-Pak