SUPPLEMENT: ATLAS MAP OF THE UNITED STATES

VOL. 120, NO. 1 JULY, 1961

NATIONAL GEOGRAPHIC

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THE JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D. C.

NATIONAL GEOGRAPHIC Society

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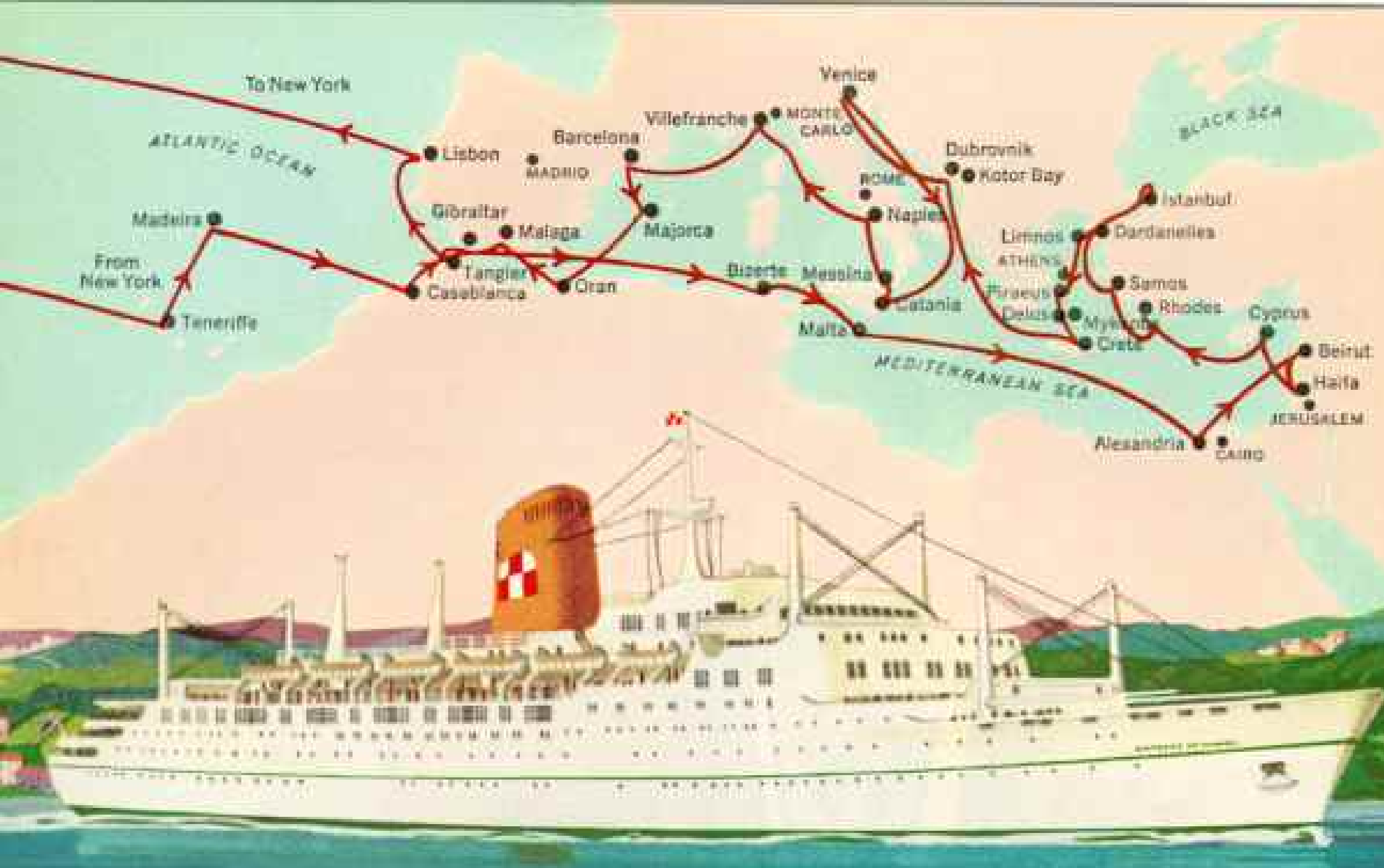
National Geographic Magazine

ORGANIZED IN 1888 "FOR THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

The National Geographic Society is chartered in Washington, D. C., in accordance with the laws of the United States, as a nonprofit scientific and educational organization for increasing and diffusing geographic knowledge and promoting research and exploration.

The Society has conducted more than 160 major expeditions and scientific projects. It disseminates knowledge to millions through its world-famous National Geographic Magazine, its 19 million color maps a year, its books, monographs, bulletins for schools, its information service for press, radio, and television.

COVER: *U. S. Route 40 cuts a cross section of the Nation from Atlantic City to San Francisco (page 1).*



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BRAZIL'S SUYÁ INDIANS DISCOVER THE OUTSIDE WORLD

It can still happen, even in the 20th century: A remote tribe, virtually untouched by civilization, suddenly makes contact with the rest of the world.

It *did* happen recently, in the Upper Xingu region of Brazil. The Suyá Indians, who knew as little of the outside world as it did of them, paddled down a jungle river one day into the Atomic Age.

So the "big-lipped men" discovered civilization. But civilization didn't really discover them until Brazilian ethnologist Harald Schultz studied and photographed them for the São Paulo Museum and the National Geographic Society.

What was the Suyá reaction to modern life? The answer shows in the strange faces of Robndo and Ngere (above) as they study Mr. Schultz's much-traveled GEOGRAPHIC—upside down.

Ethnologist Schultz became the adopted "nephew" of Ngere (right). Learning many Suyá words, he acquired a vast amount of fascinating information about the lives and customs of these primitive people—notably the practice of greatly distending the lower lip by inserting successively larger plugs of light wood. Soon Mr. Schultz will pass the information on to you in a NATIONAL GEOGRAPHIC article.

Such expeditions—and the opportunity to help make them possible—are constantly attracting new members to the rolls of the world-wide National Geographic Society, whose membership now totals 2,700,000. We welcome those new members. We would welcome *your* friends as new members, too. Use the convenient form below to send us their names.

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Scallop Shell on the ocean floor ▸

How a Scallop Shell became a world-famous trademark

Seashells carried halfway around the world – from an ocean floor in the Orient to Marcus Samuel's curio shop near the London docks–started a chain of events that created one of today's best-known trademarks.

Sailors coming off their ships sold the seashells they had collected to the curio shop owner. When used on ornamental boxes and trinkets, the shells found favor in mid-Victorian eyes, and the merchant imported thousands upon thousands of shells.

Later, the sons of Marcus Samuel gave this Far Eastern trade a new dimension by shipping the first bulk cargo of kerosene through the Suez Canal. They gave seashell names to their ships, and when a company was formed to engage in the oil business, the scallop shell became its trademark.

Perhaps it was out of sentiment for their father's beginnings that Marcus Samuel's sons thought of the shell. Yet their choice proved most appropriate for the enterprise that was to become the Shell Companies.

Since antiquity the shell has symbolized the sea, the voyage and the quest. Venus, born of the sea, was identified with the shell. It was the badge of pilgrims to the shrine of the apostle, St. James—and of Crusaders in their quest to the Holy Land.

In our day, as name and trademark of the Shell Companies, the shell continues to be the sign of the quest. Shell men search for oil in forests, deserts and under the ocean floor. Then the quest goes on in Shell laboratories where research people seek new products from petroleum.

Examples: man-made rubber that duplicates tree-grown rubber for the first time. New insecticides to aid the farmer in his age-old battle against pests. Adhesives so tough they replace rivets in airplanes. And, of course, always finer gasolines and motor oils.

When you see the Shell sign think of it as the symbol of the quest for new ideas, new products and new ways to serve you. *The Shell Companies: Shell Oil Company; Shell Chemical Company; Shell Pipe Line Corporation; Shell Development Company; Shell Oil Company of Canada, Ltd.*

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Your travel agent will help you plan your trip. Or, for a free brochure describing special "Open House" attractions write: European Travel Commission, P.O. Box 258, Dept. 1B., N.Y. 17, N.Y.

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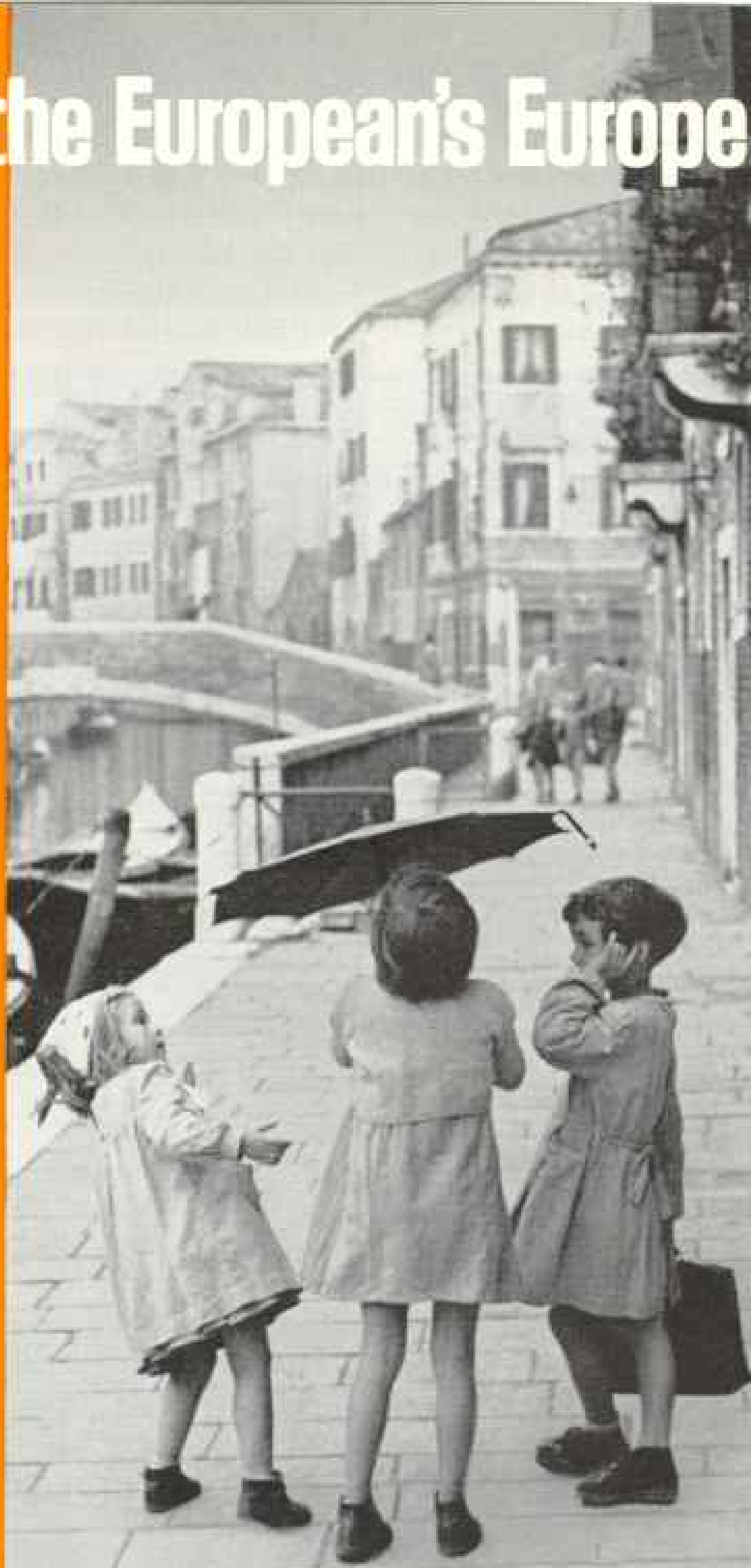

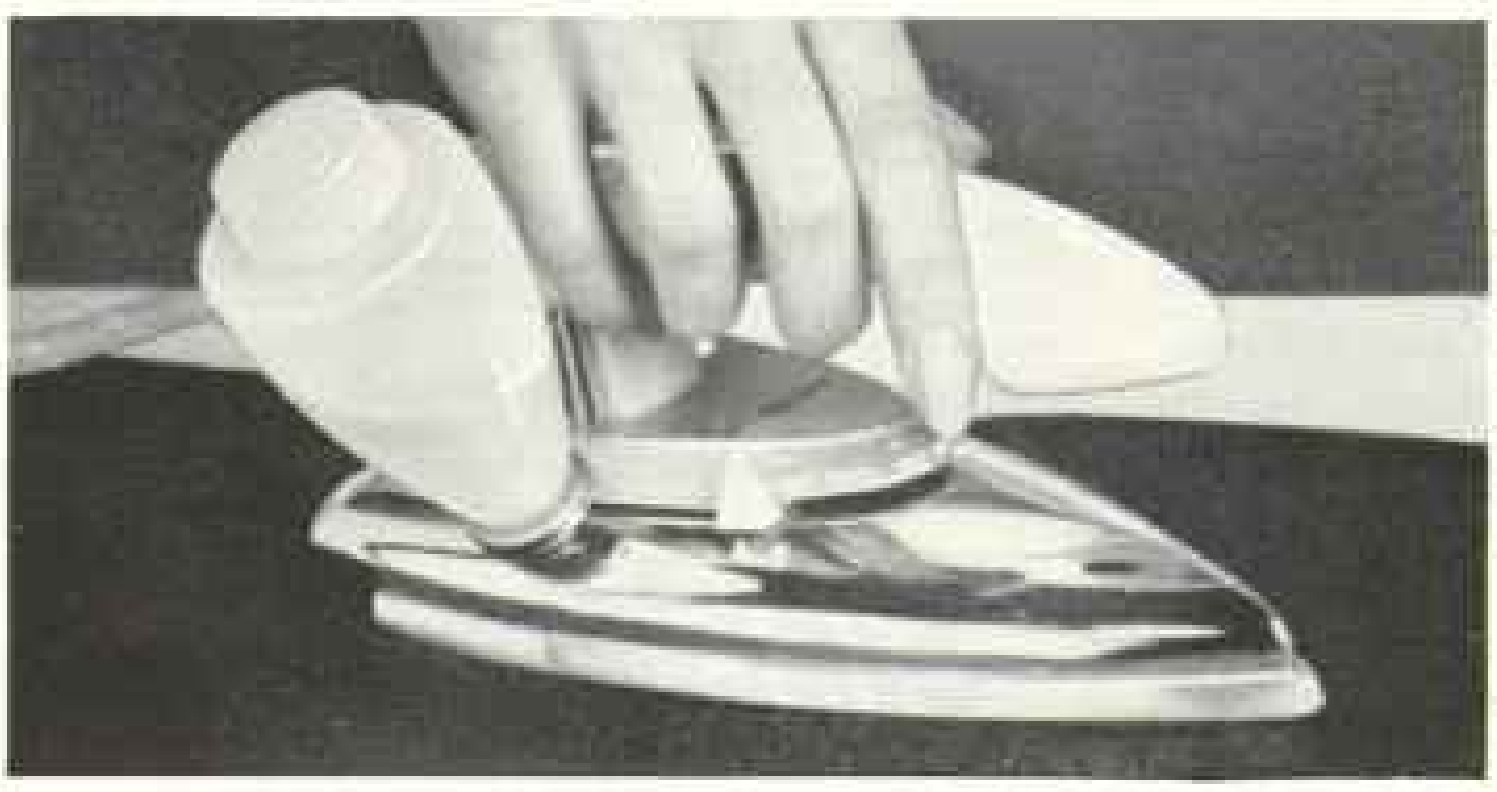

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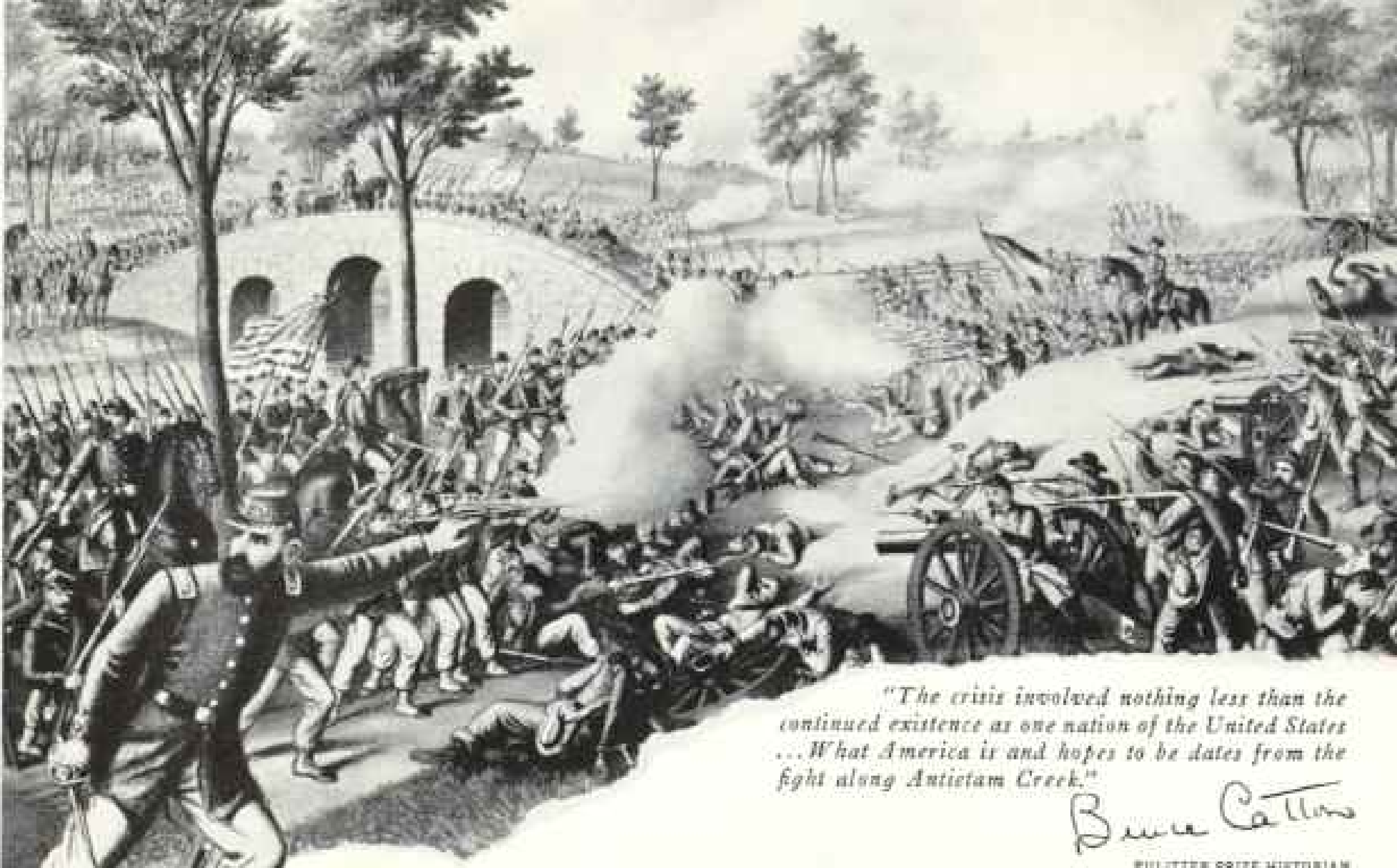

"The crisis involved nothing less than the continued existence as one nation of the United States ... What America is and hopes to be dates from the fight along Antietam Creek."

Bruce Catton

PULITZER PRIZE HISTORIAN
EDITOR, "AMERICAN HERITAGE"

ANTIETAM

"When Lee marched over the mountain-wall"—WHITTIER

In our illustration, you see "Burnside Bridge" over Antietam Creek as a wartime artist sketched it. Here, on September 17, 1862, Union troops stormed across, later to be driven back by A. P. Hill's Confederates in the last bitter action of the Civil War's bitterest day.

Come to Sharpsburg, Maryland, and stand where that artist stood. You will be pleased by how well the National Park Service has preserved and marked the battlefield as a tribute to the courage on both sides. The sapling by the bridge is much larger now, *but so is history's judgment of this battle.* In '62, many thought Antietam indecisive. We know now it saved the Union.

If a Confederate staff officer had not lost a copy of Lee's marching plans, Antietam would not have been fought. But a Union volunteer found the orders, wrapped carelessly around three cigars, and this battle blazed into history. Its legends have become immortal: white-haired Barbara Frietchie defying "Stonewall" Jackson, Clara Barton (who later founded the American Red Cross) saving lives under fire. And, poignant symbol of war's heartbreak, Dr. Oliver Wendell Holmes searching among the wounded for the young Union captain who lived to interpret, as a Justice of the U. S. Supreme Court, *the laws of the nation he gave his blood to defend.*

Men died at Antietam to save the American idea and all that it might mean. Many are buried here. Stand by their graves with your head bowed and gratitude in your heart. And bear this in mind: our generation, too, faces perils to its freedoms. May it find inspiration to measure up to the courage and devotion, North and South, *to which this battlefield is now a proud memorial.*

PUBLISHED IN COOPERATION WITH THE CIVIL WAR CENTENNIAL COMMISSION, ESTABLISHED BY ACT OF CONGRESS TO INCREASE AWARENESS OF OUR HISTORICAL HERITAGE—THE MEN AND EVENTS WHICH SHAPED OUR NATION'S GROWTH.

L'ÉCONOMIQUE EST TRÈS CHIC

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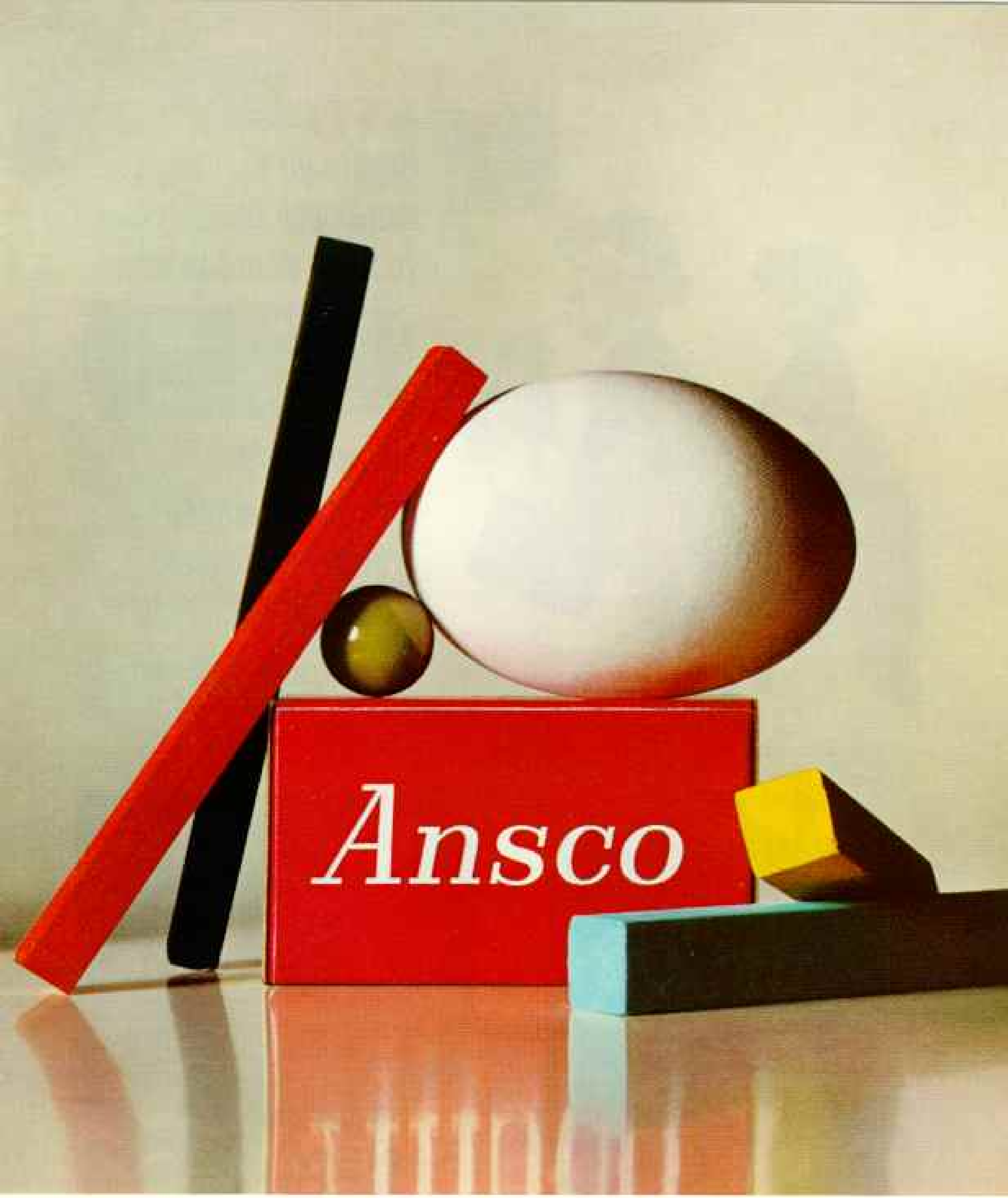
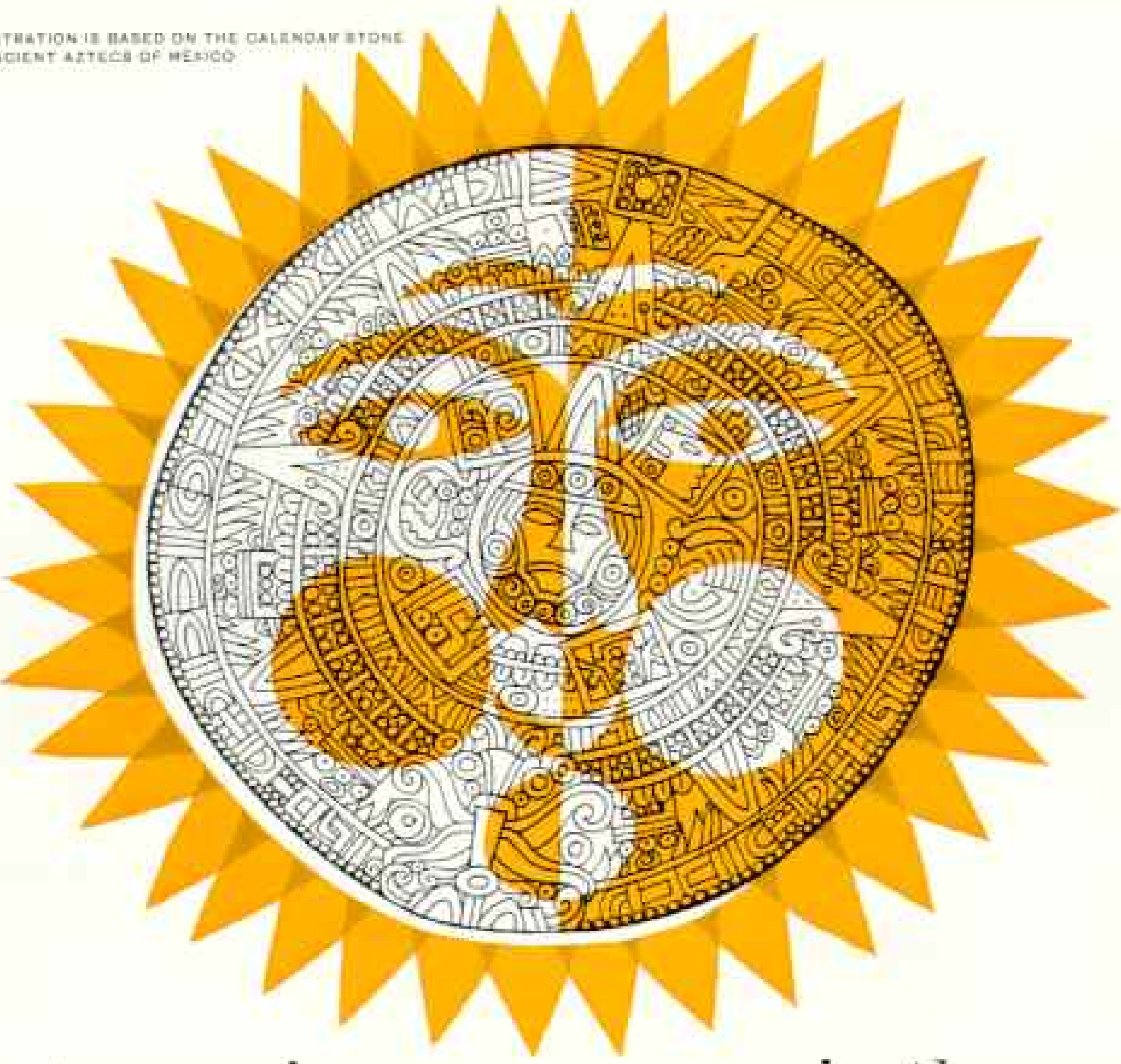


PHOTO BY IRVING PENN ON ANSCOCHROME® COLOR FILM.

color latitude: *(in film)* **1.** a forgiving nature, **2.** an ability to compensate for improper exposure settings without radical color distortions, **3.** the tolerance that allows the greatest possible margin for error: one full stop of under or over-exposure, **4.** the ability to record the greatest range of details in scenes with the greatest range of brightness: strong sunlight and heavy shadow... *(as in Anscochrome).*

YOU CAN HAVE BETTER PICTURES BUT FIRST THERE MUST BE ANSCO



How to survive your season in the sun . . .

To HELP you! have a wonderful time during your season in the sun, these do's and don't's are worth remembering.

Do get your suntan gradually. Never expose more than a few minutes at first. Increase sunning five minutes daily thereafter. Use a protective cream or lotion. Should you get a severe burn with blisters, have your physician treat it.

Do take it easy. If you suddenly plunge into strenuous activities, you'll probably regret it. Break in gradually . . . that way you'll avoid unclue muscular aches and pains and perhaps a strain on your heart. Pace yourself. Stop when you begin to feel pleasantly tired.

Do be a careful camper. If you plan a camping trip at some far-away place, take along an adequate selection of first aid supplies—plus a few household remedies.

When building a fire outdoors, watch it constantly and have pails of water or sand nearby. Never leave a fire until it is out completely.

Don't take chances in the water. Always follow a most important rule of safety . . . never swim alone. And when toddlers are around water, watch them constantly. Even if you think you're an expert swimmer, be extra careful in strange waters.

Stay out of water during thunder storms. Learn rescue breathing as illustrated and explained on Metropolitan's first aid chart offered below.

Don't be a risky boater. Know and obey all the marine "rules of the road." Provide life jackets for every passenger at all times. If possible, stay with any small craft that upsets, and signal for help.

Keep away from swimmers and go slow when near docks and where the waterways are crowded. Watch the weather. Stay ashore, if it's threatening.

Metropolitan Life
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THE NATIONAL GEOGRAPHIC MAGAZINE

VOL. 120, NO. 1 JULY, 1961

From Sea to Shining Sea

By RALPH GRAY, Chief of School Service, National Geographic Society

Illustrations by National Geographic photographer DEAN CONGER and the author

O beautiful for spacious skies, for amber waves of grain,
For purple mountain majesties above the fruited plain!
America! America! God shed His grace on thee
And crown thy good with brotherhood from sea to shining sea!

KATHARINE LEE BATES, 1911

THE CALL of the open road sometimes comes without warning.

It came for me on the Boardwalk one chill winter night while I was attending an educational convention in Atlantic City, New Jersey. A little sign with a map said that here was the start of United States Highway 40, traversing 14 States and ending on the Pacific at San Francisco, more than 3,000 miles away.

"Wouldn't it be wonderful," I said to my wife Jean, "if we could bring the children here next summer and follow U. S. 40 all the way to the other end?"

"Why not?" she said. "We've lived in a station wagon before. The baby is old enough to travel. And it would help the older children with their school work."

The idea took root, and on the first day of vacation we arrived in Atlantic City with a car full of kids, a small library of United States history, and all the gear necessary for tail-gate living.

Ahead of us a continent of geography and an epic of mankind awaited exploration. U. S. 40, a concrete cummerbund girding America's sleek midriff, would be our guide. (See the ten-color Atlas Map, **The United States,** distributed to members with this issue.)

Driving from sea to shining sea, we would rub elbows and perhaps bumpers with people in four of the most populous States—California, Pennsylvania, Illinois, and Ohio—and in the second smallest, Delaware.

We would relive history in Maryland, see steel mills in West Virginia, and visit fat farms in Indiana. Missouri's cities would rise above her rivers, and horizontal Kansas would end in vertical Colorado. From the vast emptiness of Utah and Nevada we would plunge into the anthill activity of Pacific coast cities.

Big Truck Farms in Little New Jersey

As we put Atlantic City behind us, Donna, the baby, wanted to eat. As usual, what she wanted she got. Then she went to sleep in her mother's arms, and we rolled through the piny flats and truck farms of southern New Jersey.

West of fast-growing Vineland we came to Seabrook Farms, one of the world's larg-

BREAKWATER BY DEAN CONGER (ABOVE

est agricultural enterprises. Our high-school daughters, Judith and Mary Ellen, and their younger brother Will were amazed as we drove mile after mile past flat, fertile fields toward the giant quick-freezing plants.

"I didn't expect to see anything like this till we got to Kansas," Mary Ellen said.

Far from looking like a vital national artery in this corner of the Garden State, U. S. 40 winds amiably along, ignoring the pull of great cities to the north. Its indifference ends when it joins the main stream of east-coast traffic at the Delaware Memorial Bridge (page 5). Continuing through Delaware and Maryland to Baltimore, U. S. 40 thunders night and day with traffic.

We played tag for miles with a 14-wheeled pneumatic mastodon that trumpeted past us on downgrades and sullenly fell behind on hills. Trafficmanship absorbed my attention. The crescendo of movement muted the rolling hills to a monotonous green blur, storied bays became nondescript water, historic landmarks receded to the textbooks.

Enough! This trip was to be no marathon. Alongside the superhighways lie the byroads where America grew up and still lives. We would take time to see them.

Abruptly I doubled back, and soon, from Delaware's six-lane highway, one of these byroads took us two centuries in two miles to a cobblestone street of unchanged New Castle. Dreaming awhile in this bower of history with its enduring colonial architecture, we visited Amstel House and stood on the hearthstone where George Washington, at a wedding

Sign on the Boardwalk at Atlantic City marks the eastern terminus of U. S. Highway 40. Cutting across the Nation's heart, the road traverses 14 States. Though the fact has nothing to do with its name, the highway crosses the 40th parallel four times on its route to the Pacific some 3,000 miles away.

Dawn's Golden Light Silhouettes Seaside Towers of Atlantic City

New Jersey's famous resort entertains 16 million guests a year. Fun seekers and conventioneers dine and dance, shop for souvenirs, and promenade along the famous Boardwalk, a busy midway rebuilt in 1957-60. Atlantic City's castles in the sand rise from an island that wages unceasing struggle against the waves' clawing fingers. Sea breezes cool the city in summer; the ocean moderates winter temperatures. Tower at left caps the 350-foot Claridge Hotel.

Weekend swimmers throng Atlantic City's beach. Lifeguards rescue some 1,200 bathers each summer. Convention Hall stands at left; Steel Pier juts into the sea at right.

ATLANTIC CITY

Flagpole and cannons at Coochs Bridge, Delaware, mark the spot where Continental troops fought the British in 1777. Edward W. Cooch tells the author's son Will how Lord Cornwallis commandeered his ancestral home.

reception in 1784, "kissed the pretty girls—as was his wont."

We picnicked on the courthouse green, admiring the restored building that was Delaware's first statehouse. Here on the Delaware River estuary, where Swedes, Dutch, and English put down some of the first fumbling colonies in the New World, our heritage engulfed us as strongly as had the traffic an hour before.

We stood with William Penn in 1682, when he first arrived in America, and saw New Castle townsmen give him "one turf with a twigg upon it a porringer with River water and soyle" as symbols of their loyalty.

"William Penn, George Washington—who next?" demanded Judith as we sped on.

"How about John Smith, Lord Cornwallis, and Ralph Gray?" I joked. "Watch for the Susquehanna River and Chesapeake Bay."

John Smith explored these waters in 1608, the first white traveler on U. S. 40, I explained. A British military expedition under Sir William Howe and Lord Cornwallis landed where Elkton, Maryland, now stands, and marched up the road to Brandywine Creek in 1777.

"And how does Ralph Gray

get into the act?" one of my children dutifully asked. I modestly explained that my 1949 Susquehanna canoe trip had ended under the U.S. 40 bridge.*

On the way to the Brandywine, the redcoats stopped at Cooches Bridge, where the Americans engaged them in the only Revolutionary action on Delaware soil. A parklike pasture beside the little bridge invited us to linger (opposite).

"This is where Old Glory first flew in land battle," Mr. Edward W. Cooch told us. Not all historians, he admitted, agree.

The clear stream burbled, bird song filled the air, and yesteryear's brief but furious fusillade was hard to bring to mind.

Horses Stabled in a Parlor

Across the creek Old Glory rippled in front of a large stuccoed house. Mr. Cooch invited us inside.

"This is the front room where the British stabled some commandeered horses while Cornwallis was using my home as his headquarters," he said. "Cooches have lived on this land since 1746. The house itself was built in 1760."

*The author described his Susquehanna River canoe trip in the July, 1950, NATIONAL GEOGRAPHIC.

Undismayed by his dizzy catwalk, a workman inspects a cable housing on Delaware Memorial Bridge. Twin towers as high as 40-story buildings hold cables that carry U. S. 40 across the Delaware River. Center span hangs 210 feet above the water. Delaware lies in the distance.

Station wagon odyssey from sea to sea totaled 17,000 miles, counting side trips. Near the village of State Road, Delaware, the author's family chats with a State trooper.

Ships Crowd Baltimore Harbor, One of the Busiest in the Nation

Reaching into the heart of the city, Baltimore's 40 miles of waterfront include 270 piers and 500-odd miles of railroad track. The port serves 124 steamship lines.

Downtown Baltimore remains congested, but a face lifting is under way. Demolition makes room for new stores and offices of the $127,000,000 Charles Center project. Workmen are building a new Civic Center covering four square blocks. Landscape gardeners plant trees along busy streets. Planners hope to deepen the harbor channel, permitting the biggest supertankers to enter.

White marble steps and row houses stretch in endless repetition in the older residential sections of Baltimore. Housewives scrub the stone blocks every morning.

Now counting a population of almost a million, the city takes its name from Lord Baltimore, who founded the colony of Maryland in 1634. Oliver Wendell Holmes described Baltimore as the "gastronomic metropolis of the Union."

At Fort McHenry, on Baltimore's Locust Point, we dipped into another war. Dungeons and sally port seemed archaic indeed in our age of intercontinental defense. But here, on the night of September 13, 1814, determined defenders repulsed a British fleet.

Francis Scott Key watched the bombardment while detained aboard an American truce ship. So moved was the young lawyer to "see by the dawn's early light" that the fort's "flag was still there," that he poured out his emotion in the immortal lines of "The Star-Spangled Banner" (page 9).

George Washington recommended Baltimore as one of the "risingest" towns in America. Here a gracious social life developed. Fish and fowl from the Chesapeake—an "immense protein factory," H. L. Mencken called it—made the city a gourmet center. Charles Dickens, drinking an "enchanted" mint julep with Washington Irving, found it a bright spot on his American tour of 1842.

Concrete Ribbon Heads West at Baltimore

Many tourists remember Baltimore for its narrow streets and miles of row houses with white steps. Too few visitors see the tidy Georgian campus of The Johns Hopkins University, the magnificent estates, and the green valleys where pink-coated huntsmen gallop after foxes.

KODACHROMES BY RALPH GRAY (ABOVE) AND M. E. WARREN © N. G. S.

Rural charm supplants urban as U. S. 40 cuts through Maryland's Piedmont hills. Leaving tidewater at Baltimore, the route sets out with high purpose in one unmistakable, manifest direction—west!

"San Francisco, here we come!" I said as we skimmed along the dual highway.

Judith, reading a sign, asked, "Why do they call this the Frederick Pike?"

"That's short for turnpike," I answered. "Early in the 19th century better roads began replacing mud paths between Baltimore and Frederick. The builders charged for use by putting up toll bars, or turnpikes, every few miles. The name stuck, even though this highway is free."

There was no better place to discuss the country's highway history. Beyond Frederick lies Hagerstown, and farther west Cumberland pushes against the encumbering hills. In 1806 Congress appropriated money for the start of a national road from Cumberland over the Alleghenies to Ohio. It was the Federal Government's first public highway ven-

ture and the last completed until the auto age.

The National Road reached its end—Vandalia, Illinois, 609 miles west of Cumberland—in 1852. The cost was $7,000,000—enough to build only seven miles of highway to Interstate Highway System specifications today! But then it was the greatest wagon road in the Nation, loud with the rumble of massive Conestogas pulled by six-horse teams.

My children waved as we passed a modern Conestoga—a 14-wheeled refrigerated semitrailer. We knew that, to the north and south, parallel roads groaned under similar loads of trucks and passenger cars.

National Road Tied East to West

"Try to imagine what it would be like," I said, "if only one highway crossed the mountains today, and you'll know how important the National Road was 150 years ago."

The country was smaller then, but growing—and exuberant coon-skinned westerners threatened to break away from the east coast just as the Thirteen Colonies had separated from England. George Washington had foreseen the necessity to tie east and west together, and the concept of a national road followed his thinking. Not only politics but geography dictated the route Congress chose. A highway from Cumberland to Wheeling would connect the Potomac and Ohio Rivers at the closest practical points. The eastern terminus would be easily accessible from the Nation's Capital and, more important, from a major seaport—Baltimore.

Thus the Cumberland Road, or the National Road, as it came to be called, cut arrowlike through the Allegheny barrier to link a world port with one of the richest inland valleys ever opened up by man.

"What's all this got to do with U. S. 40?" Mary Ellen asked.

I explained that when the Bureau of Public Roads set up the Federal system of numbered highways in the mid-1920's, the National Road became a part of U. S. 40. By coincidence, this coast-to-coast route now crosses and recrosses the 40th parallel.

I noticed the new interest with which everyone watched the miles click by on this highway which, more than any other, has influenced the course of American history.

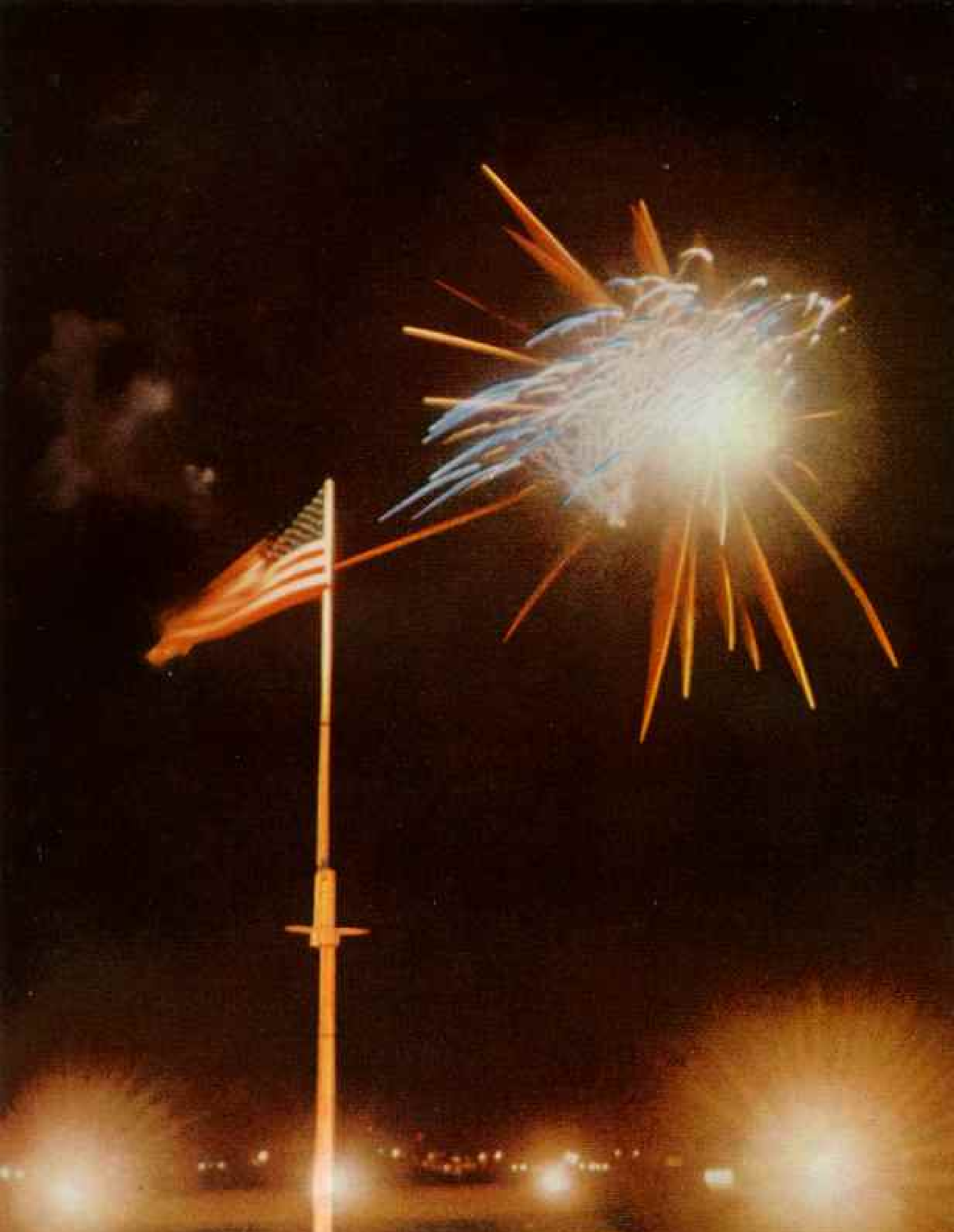
At the same time, we were getting a look into the next highway era, when Interstate

Bombs Bursting in Air Salute the New 50-star Flag at Historic Fort McHenry

Restored by the National Park Service, Fort McHenry flies the flag day and night. Hand-hewn pole, a copy of the original, stands on the exact spot where waved the Star-Spangled Banner immortalized by Francis Scott Key.

Built on a peninsula in the Patapsco River, the fort stood in the way of a British fleet bent on capturing Baltimore during the War of 1812. Sixteen warships opened fire on September 13, 1814. Key witnessed the 25-hour bombardment from a vessel in the river. Daybreak disclosed the flag still gallantly streaming above the ramparts, inspiring him to write the words of the national anthem.

Wide-eyed and openmouthed, visitors watch fireworks on July 4, 1960, marking the first raising of the 50-star flag.



AS ESTABLISHED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER

70 and other routes will partially replace U. S. 40, and people will cross a continent without meeting a single stop light.

Will was reciting John Greenleaf Whittier's "Barbara Frietchie" as we approached Frederick. Its first seven lines still sound like a gazetteer description of the area:

Up from the meadows rich with corn,
Clear in the cool September morn,
The clustered spires of Frederick stand
Green-walled by the hills of Maryland.
Round about them orchards sweep,
Apple and peach tree fruited deep,
Fair as the garden of the Lord. . . .

We visited Barbara's cottage, a reproduction standing beside Carroll Creek. Only a narrow sidewalk separates it from U. S. 40, where Whittier's "rebel host," with Stonewall Jackson riding ahead, marched all day long after one of the least believable conversations in history:

"Shoot, if you must, this old gray head,
But spare your country's flag," she said. . . .
"Who touches a hair of yon gray head
Dies like a dog! March on!" he said.

Confederate forces occupied the town only briefly. A few days later Frederick people heard the guns booming from South Mountain, hard upon this fight came bloody Antietam, September 17-18, 1862.

When the Union's Lew Wallace and Confederate Jubal A. Early squared off at the

JOHN CONGER © N. G. S.

Meeting of minds brings together members of the Tudor and Stuart Club at The Johns Hopkins University, Baltimore. Visitor A. L. Rowse of Oxford University leads the discussion. Art galleries and libraries enhance the city's cultural life. Johns Hopkins scholars have influenced the study of medicine, astronomy, chemistry, and the classics.

Heart surgeons in sterile masks operate at Johns Hopkins Hospital.

Highway, Creek, and Rails Snake Through the Narrows Near Cumberland, Maryland

This cleft in the Allegheny Mountains provided a corridor to the West. In 1834 the old National Road, U. S. 40's predecessor, was relocated through the gorge.

Highway planners chose a route hugging a bank of Wills Creek. Baltimore & Ohio Railroad (right), coming later, dug a right of way into the slopes of Wills Mountain. Western Maryland Railroad skirts Haystack Mountain (left).

From their perch on Lovers Leap, the author's daughters, Mary Ellen (left) and Judith, can see Piney Mountain in the distance.

Thundering hoofs and the crack of whips proclaimed the passage of sway-backed Conestoga wagons along the National Road. Crafted by Pennsylvania wagonmakers, Conestogas could travel the worst of roads with five-ton loads. Boat-bottomed bodies sloped toward the center to prevent cargo from shifting. Drivers sometimes sealed their wagons and floated them across streams.

A Conestoga teamster sat astride the left wheel horse. Meeting another wagon, he passed to the right in order to watch the space between the hubs. From this practice apparently stems the United States rule of driving on the right.

EDWARDSPORT BY RALPH GRAY, NATIONAL GEOGRAPHIC STAFF © N.G.S.

edge of town in 1864, residents watched troop movements from rooftops. Early, who won the battle, demanded $200,000 ransom.

"It was either give him the money or he'd burn the town," Joseph F. Eisenhauer told me. Local bankers raised the sum, and as a result the Civil War didn't end for Frederick until 1951, when the mayor made the final payment to the bondholders.

Pie Trucks and Radar Traps

In a motel that evening we watched dusk turn the green wall of Catoctin Mountain to purple. This small range was the first of a dozen or more rising across our route. Cars and trucks swished softly up the grade, leaving the crowded, boxed-in Atlantic world behind. In the morning some of these drivers would turn off their lights in the broad reaches of Ohio, covering in one night the mountains it took civilization 100 years to cross.

Tomorrow we would follow them. But tonight we forgot history and listened to the sounds and read the signs of America still young, still growing up, and still enjoying it. A pie truck pulled up to the kitchen entrance of the snack bar next door. "Hit me easy—I'm full," said the sign across the back. Two State patrolmen rolled in for a cup of coffee before the long night ahead. "I'm driving home soon. Where have you got the radar trap set up?" asked the waitress.

Across the way, at the drive-in theater, John Wayne waited until darkness to kill a

PAINTING BY CHARLES WILLSON PEALE

Lt. Col. George Washington, only 22, led Virginia militia into western Pennsylvania against the French in 1754. He surprised the enemy at Chestnut Ridge, near Uniontown, winning a battle that launched the French and Indian War.

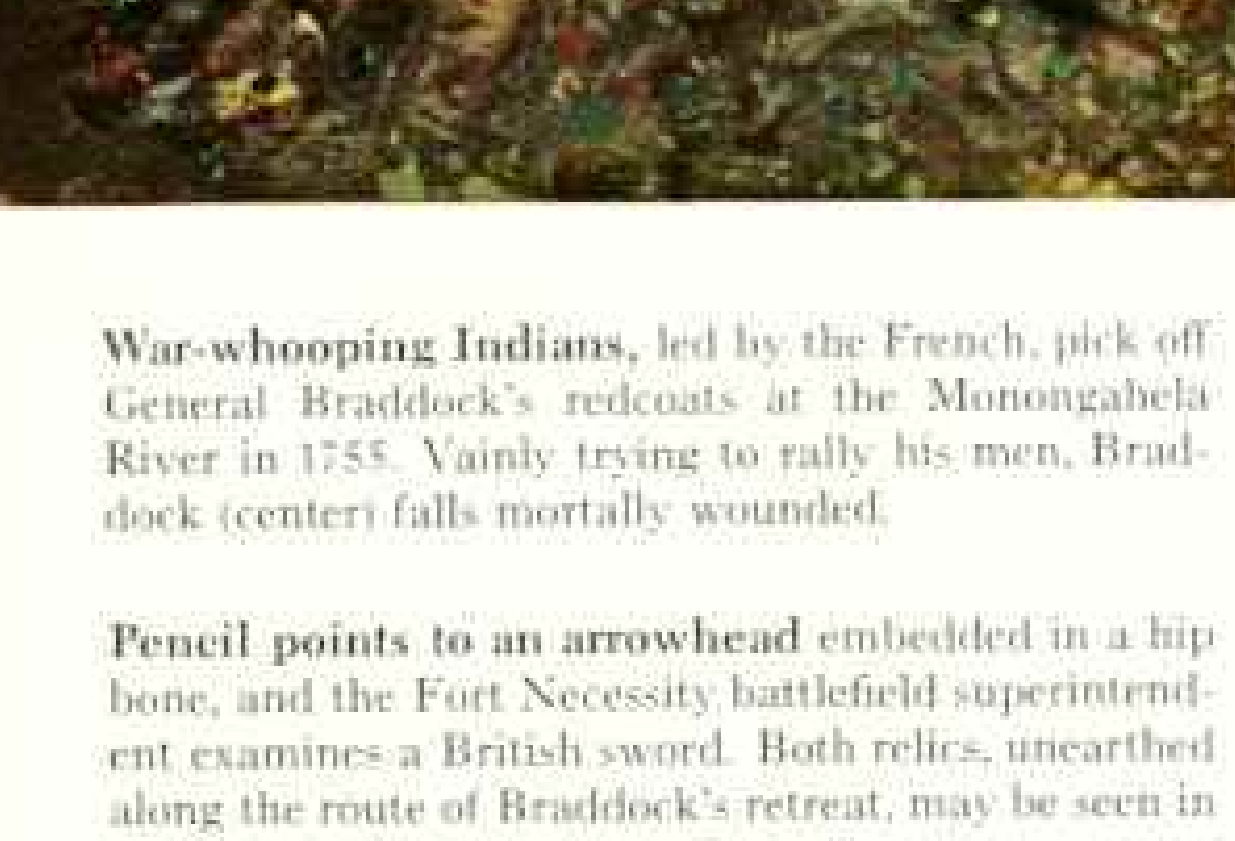
Circular stockade re-creates Fort Necessity near Farmington, Pennsylvania, where Washington surrendered to a larger French force. The National Park Service, which built the restoration, flies an 18th-century British flag.

RENDERING BY RALPH GOBY © N.G.S.

PAINTING BY KEVIN WILLARD HORNE, WISCONSIN STATE HISTORICAL SOCIETY

War-whooping Indians, led by the French, pick off General Braddock's redcoats at the Monongahela River in 1755. Vainly trying to rally his men, Braddock (center) falls mortally wounded.

Pencil points to an arrowhead embedded in a hip bone, and the Fort Necessity battlefield superintendent examines a British sword. Both relics, unearthed along the route of Braddock's retreat, may be seen in a museum near Fort Necessity.



ROBACHAUMES BY NATIONAL GEOGRAPHIC PHOTOGRAPHER BATES LITTLEHALES © N.G.S.

Kodachrome by National Geographic photographer Bates Littlehales © N.G.S.

Costumed Stagecoach Riders Portray Travelers of Yesteryear

Nostalgic exhibits turn back the clock at the Frontier Travel Gallery, a show place in Oglebay Park, Wheeling, West Virginia. Although the stage saw service in the Mad River Valley, Vermont, it typifies the coaches that plied rutted roads across the Alleghenies. Little-theater members in 19th-century dress alight from the carriage.

few Indians. From a convertible a too loud radio blared, "Come with me . . . to the sea of love." When the blast ended, a cultured voice intoned weekend weather prospects.

Pageant of Mountain History

Next day we entered the Appalachians. Where Wills Mountain rears rugged slopes above Cumberland, we walked up the rocky spur to view, in our minds' eyes, the pageant of history passing below. First, there is no town at all but only Thomas Cresap, "Maryland's one-man outpost," and Nemacolin, a Delaware Indian. The pack-horse trail they survey for the Ohio Company becomes known as Nemacolin's Path.

Maj. George Washington, 21 years old, shakes hands with Christopher Gist, who could have stepped full-bodied out of *Leatherstocking Tales*, and follows him along the path to the French settlements on the Ohio. War is in the air and here is Washington again, with 150 Virginians, under orders to oust the French from Fort Duquesne—later Pittsburgh. The trail must be widened for the little army's supply wagons—the first vehicles to cross the Alleghenies. None of the wagons come back over Washington's road after a defeat at Fort Necessity.

Then comes the hammering and shouting from Fort Cumberland, being built to defend this gateway to the west. Suddenly it is 1755 and the French and Indian War is on in earnest. British Gen. Edward Braddock arrives with two regiments and colonial reinforcements. The road is widened to 12 feet, and the unsuspecting army marches off to disaster (pages 14-15).

Half a century passes easily. Here comes 1806, and three commissioners crisscross the overgrown route to mark the National Road to the Ohio River. Soon the road builders

arrive on the scene. By 1818 the history-making highway stands completed all the way to Wheeling!

Now, almost a century and a half later, U. S. 40 still follows essentially the same route. At tollhouses and taverns dating from early days, we learned what it was like to travel this road in a Conestoga freighter or a Concord coach. The freighters, whose wider wheels were less damaging to the gravel surface, paid 5 or 6 cents for 10 miles, while the average passenger vehicle paid 16 cents. Dinners were 25 cents, a shot of whisky 3 cents.

Tolls were charged by the States, which had taken over highway maintenance from the Federal Government. Deterioration set in a few years later. The road was so rough at one spot in Pennsylvania that when Kentucky's Henry Clay rode over it, his carriage upset and he fell onto the gravel. The suave statesman dusted himself off, with the observation, "This is mixing the Clay of Kentucky with the limestone of Pennsylvania."

Father's Flivver Tames a Mountain

Crossing into the Keystone State, we paused at the top of Chestnut Ridge near Uniontown, with a four-mile downgrade ahead. I told my children about another traveler in difficulty on this slope—my father. In 1926, in a Model-T Ford, he brought his brood from Missouri to Washington, D. C. It took him more than an hour to climb this slope we were now descending.

Father tromped down harder and harder on the clutch to keep the low-gear band engaged. His knee cried out and his leg gradually turned to stone, but he didn't dare take his foot off the pedal and lose what little momentum we had. The engine labored

Whizzing Cars on U. S. 40 Bypass an Old S Bridge in Eastern Ohio

Once numerous, S bridges date from an era when a horse and buggy rarely exceeded ten miles an hour. To save time and materials, builders bridged streams at right angles, often necessitating S curves in the roads. The coming of automobiles turned the spans into deathtraps. Erected about 1829, this structure crosses Fox Creek near New Concord.

Corncob pipe at a jaunty angle, a bearded Ohioan surveys the fun. Pumpkin Show visitors ride a Ferris wheel, gorge on hot dogs and pumpkin candy, and lustily compete in pie-eating contests.

False whiskers, canes, and derbies disguise youthful showgoers.

South Court Street in Circleville, Ohio, Becomes a Midway for Pumpkin Paraders

The town takes its name from an Indian earthwork laid out in a circle. Some 200,000 visitors gather each October to honor the pumpkin and to taste the pies made from it.

mightily and became red hot. The radiator cap blew off, and a column of steam shot ten feet high.

Fortunately there was a spring near by. We wheezed to a stop, and my father walked around gingerly on his petrified leg while the radiator cooled. We watched in awe as our older brother approached with a bucket of water. In the manner of gentling a stubborn mule, he splashed a bit into the radiator and stepped back to avoid the geyser that erupted from the Ford's furnacelike innards. After a few more dousings the machine was ready to receive liquid refreshment—and then the cranking began.

With the precision of circus aerialists, father and eldest son developed a routine: turn on ignition, advance gas, retard spark, crank engine until life stirs, advance spark, retard gas—dead silence—turn off ignition. They took turns, one cranking, one behind the wheel.

Suddenly the motor started with a burst and a strong, even pulse. Above the din they shouted, "What did we do different that time?" Neither had the slightest idea.

Six Helpers Get Lizzie to Top

From here to the summit the grade was steeper. Father's leg paralysis came back after five minutes of unremitting pressure on the clutch pedal. The vehicle faltered until father suddenly ordered, "Everybody out and push!" Three doors flew open and six children added their strength to that of the engine. In this manner we reached the swank Mount Summit Hotel.

We had come, that day in 1926, the grand distance of 43 miles. The entire trip from Missouri plains to Potomac tidewater consumed eight days—a journey I have gradually reduced in annual retracings to two and a half days. U. S. 40 was then in its birth throes.

In 35 years of motoring on U. S. 40, I

Unusual window sifts sunlight into Weaver Chapel at Wittenberg University, Springfield, Ohio. Ordinarily, stained glass itself, outlined in lead, forms the picture. Here glass gives color to a "stencil" cut in sheet lead.

Chapel and library occupy a single building, symbolizing the partnership of religion and culture at the Lutheran institution.

Zebra-striped fields trace swirling contours on the fertile farmland of central Ohio.

have watched the disappearance of the crank, running board, spark-plug wrench, and now gearshift. Road junctions became cloverleafs, and these evolved into more complicated interchanges. Cities and towns reversed themselves, first opposing bypasses which would divert traffic from downtown stores, and later demanding them. "Tourist cottages" gave way to elegant motels.

Like bees swarming in a flower patch, motels cluster where the traffic is heaviest. One such point lies just west of Washington, Pennsylvania, where Pennsylvania Turnpike and Pittsburgh traffic join U. S. 40. The motel we picked overlooked a cold hillside where I had camped with my father in 1926.

Next morning we entered West Virginia and rolled into Wheeling, sprawled over steep hills and huddled against the broad Ohio River. I dropped into the local office of the American Automobile Association and surprised my old friend John K. Randolph.

"Do you know any old-timer in town who remembers the days of the National Road and the Conestoga wagons?" I asked.

"I surely do," John said. "Try Jimmy Dyson. He not only recalls the Conestogas, I believe he was here when the Ohio River was put through!"

"I don't go back quite that far, but I was born here," Mr. Dyson confessed, "and I'm 85 years old. The other day I drove to Cumberland in three hours. But my first trip there over the National Road in a horse-drawn Columbus buggy took three and a half days."

Mr. Dyson took me to Oglebay Park's Frontier Travel Gallery to see an original Conestoga—a massive blue-bodied, red-wheeled

Dark ribbons of meadow anchor the soil; golden bands of stubble survive the harvest

wagon, crowned with soaring white canvas, capable of carrying five tons (page 12).

My family and I crossed the Ohio River and climbed out of the valley to the Allegheny Plateau. The hills grew softer and gradually relaxed altogether.

Congress Creates a Giant Checkerboard

Signs of the Midwest appeared—nostalgically noticeable to a native son. First we saw the courthouse at Cambridge, Ohio, sitting in its standard square, with its standard tower and Civil War monument rising through the standard elms, and all the clocks recording standard time. Among the blue-denimed loungers in the courthouse yard, the talk was of silos, windstorms, road oilings—and attracting new industries.

Between Zanesville and Columbus the terrain becomes flat and man's marks upon it geometric. No longer do side roads trickle in at will; we cross one every mile, regularly as clockwork, each one going north and south, ruler straight. Follow one and you'll intersect east-west roads precisely every mile.

This is the stamp of the Midwest, this giant grid imposed on the earth by Congress before the settlers came. Property lines should not develop helter-skelter, surveyors would make a checkerboard (page 34). Each square would be a square mile, or section, and roads were to follow section lines. (The National Road, being special, would run independent of the grid.)

Today, from Ohio to Colorado, from Oklahoma to Minnesota, the blueprint still exists in continuous pattern. Nowhere is man's stamp of orderliness so evident over such a

Twelve-ton Block of Indiana Limestone Rises From a Bloomington Quarry

Some 300 million years ago an inland sea drowned the Hoosier State. Shells deposited by minute organisms fused into a bed of limestone, a favorite building material.

Huge machines cut away strips of stone, which are split into blocks, hoisted out of the quarry, and sent to a mill for sawing and shaping.

Seven telephones a minute pass girls on the final assembly line at Western Electric Company's Indianapolis Works. This line delivers complete models of the Bell System's new Princess phone to testers at the far end. The plant turns out 30,000 sets a day.

large area. Fly over it; mile sections shrink to city-lot size, and a State suggests a subdivision.

The ever-present rectangles seem to impart to the midwesterner a spare angularity of thought and feature, the lean look of Grant Wood's painting, "American Gothic." His house must be set "square with the world" or he is uncomfortable. Ask him directions even in a big city and he'll use "north" or "south" rather than "right" or "left." Easterners are regarded as living in a world as hodgepodgy as Europe, while westerners are pitied for being so restless they couldn't remain content in God's garden.

We read the signs and listened to the air waves. "Wheat futures are steady, but hogs dropped half a cent. . . . Rain is expected around the Great Lakes . . . no break in the dry spell gripping the rest of the State . . . Now back to our parade of hits; number nine and climbing fast: 'Come with me . . . to the sea of love.'"

At a drive-in movie, John

HI EXTACHROME (ABOVE) AND KODACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JEAN CONSER © N.G.S.

Wayne waited until dark for a showdown with the crooked sheriff.

At the village of National Road, Ohio, an elderly resident told us of changes he had seen. Had he lived here all his life?

"Oh, no," he said. "I was born and raised on a farm two miles north."

In 1825, seven years after the National Road reached Wheeling, construction began on its western extension through Ohio and Indiana. As far as Zanesville it approximated the route of Ebenezer Zane's Trace of 1796, a horse path. From there it knifed through trackless territory, reaching Columbus in 1833.

Lone Skyscraper Signals Columbus

Columbus seemed a long time coming, for we could see its one tall skyscraper from far out. A filling-station humorist said, "It seems farther than it is, but you'll find it ain't."

This is the biggest city in the world named for the discoverer of America. There's a statue to him in front of the capitol, which Ohioans call "one of the purest examples of Greek Doric architecture in the United States."

"Where's the dome?" Will demanded.

"Buckeyes have to be different," a bystander said. "We put a cupola on our building."

In the great chamber where Lincoln spoke in 1861 on his way to Washington, we mounted the dais and took turns in the high-backed chair that they told us he used. Later, on his final trip through Columbus, Lincoln lay in state in the rotunda. More than fifty thousand mourners filed past the black catafalque on April 29, 1865.

The nostalgic Indiana of poetry and song came through to us at Greenfield, boyhood home of James Whitcomb Riley, and at Terre Haute, where Paul Dresser grew up and wrote "On the Banks of the Wabash Far Away." Greenfield's Riley Memorial Park lies beside U. S. 40, adjacent to fields where the Hoosier poet must often have seen the frost "on the punkin" and the fodder "in the shock." Near the site of "The Old Swimmin'-Hole" we saw hundreds of Greenfield's youngsters splashing in a modern pool to the recorded strains of "Come with me . . . to the sea of love."

The industrial look of Terre Haute today makes it hard to get a view of the Wabash River that might have inspired a song writer. The river brought New Englanders, then a wave of southerners, to the raw settlement on "high ground"—above the flood line. When the National Road was laid out in the middle 1830's, it guided a stream of northerners and European immigrants into the States north and west of the Ohio.

Nodding leaves of autumn shade picnickers near Terre Haute; Wabash River flows placidly at their feet. Scenes such as this inspired Hoosier song writer Paul Dresser, composer of "On the Banks of the Wabash Far Away." The river takes its name from *Ouabache*, French rendering of an Indian word for "white," perhaps because its waters gleam in moonlight.

Carved cane bearing the likenesses of 23 U.S. Presidents fascinates Will Gray in the Indianapolis home of Benjamin Harrison, the 23d President. Twelve faces appear here; the remaining eleven are on the opposite side. Lincoln's portrait hangs in the library of the 14-room mansion, now preserved as a memorial.

KODACHROME (ABOVE) BY RALPH GRAY AND NO CAPTION
BY DEAN CONGER, NATIONAL GEOGRAPHIC STAFF © N.G.S.

This east-west axis played a part in stopping the spread of slavery and in determining the alignments of the Civil War. It may also have inspired the postwar cry, "Go west, young man." This famous advice made its first appearance in 1851 in a Terre Haute *Express* editorial.

"I hope you tell all your NATIONAL GEOGRAPHIC readers that Horace Greeley and the New York *Tribune* get a little too much credit for those words," said Bruce R. McCormick of the Terre Haute *Star*, successor to the *Express*.

Telephones Grow in Indianapolis

Doubling back to Indianapolis, we toured the capital's industries. Indiana's largest city sprouts factories in all directions. At the Allison Division of General Motors we visited "Powerama," a permanent exhibit featuring engines and research projects.

Another modern plant—Western Electric—makes 30,000 telephones a day; assemblers put the instruments together almost as quickly as you can dial the office. All phones for the nationwide Bell System are assembled here and shipped by the millions every year (page 23).

It is easy to cross Illinois at its narrowing southern end and never feel you're really in the State. U. S. 40 trends away from Chicago, and connects big cities of Indiana and Missouri (see U. S. map supplement). Towns are bypassed; none are large. They click past on the prairies like moving scenery beside a treadmill. But we always make a point of "driving off the slab" and spending time in one of these communities.

Vandalia long has been my favorite. With grateful relief we sank into the insulated quiet of its elm-shaded streets and entered the Hotel Evans dining room.

"Don't order tomato aspic. The cook was experimenting. But she was lucky with everything else," the waitress whispered quickly as the manager approached to greet us.

"Where's Shorty?" one of the children asked, referring to the bachelor bellhop of fifty or so who had taken them for rides on his motor scooter during previous stops.

"You'd never believe it, but Shorty up and got married," the waitress said.

She turned on the lights and a mural came to life. There was Vandalia as it looked when the town was the capital of Illinois

As Abraham Lincoln knew it, old Vandalia, Illinois, endures in a mural by John Matthew Heller. The painting, in the town's Hotel Evans, turns back the clock to 1836. Lincoln, here arriving by stagecoach, meets Stephen A. Douglas, his colleague in the Illinois Legislature. Vandalia, then the State capital, housed the lawmakers in the red-brick building, to which a columned portico has since been added.

Madonna of the Trail Honors Mothers of Covered Wagon Days

The heroic stone figure of a strong-featured woman clad in homespun, a child in her arms and another clinging to her skirt, strides forward on a street corner in Vandalia, terminus of the old National Road.

Identical statues erected by the National Society, Daughters of the American Revolution, stand in 12 States stretching from Maryland to California. They remind modern America of the Nation's infancy and the courageous families who poured across the Alleghenies to plant their homes in the western wilderness.

Behind the statue stands Vandalia's old capitol building, now a State memorial.

Glowing fireball in the western sky, the setting sun beckons motorists on U. S. 40 to follow it across the horizon.

from 1820 to 1839 (page 26). There stood beaver-hatted Lincoln, just off the stagecoach, being greeted by Stephen A. Douglas in front of the wooden hotel that once occupied this same corner. Across the street, through our dining-room window, we saw the onetime statehouse.

"That second window from the corner on the second floor is the one Lincoln jumped from, according to the local story," I told the children. "Serving in the State legislature, he disappeared to prevent a quorum being present to vote on a bill he opposed."

Up to that time Illinois had been largely settled from the south, and Vandalia's "metropolitan" citizens prided themselves on eating hog meat instead of venison. While the legislature met here, it passed the act incorporating the "town of Chicago."

Long before the first settlers poled their flatboats up the Kaskaskia River, other agricultural peoples had invaded Illinois. One group settled along Cahokia Creek near present-day East St. Louis. These prehistoric

Long as a city block, the steamer *Admiral* pulls away from St. Louis, Missouri, and heads down the Mississippi on an excursion cruise. The Nation's largest all-steel river boat, the five-decked liner accommodates 4,000 passengers. The city's proposed Jefferson National Expansion Memorial will replace parking lots beyond the levee.

KODACHROMES BY NATIONAL GEOGRAPHIC PHOTOGRAPHERS DEAN CONGER (ABOVE) AND J. DARLES ROBERTS © N.G.S.

Girl Flyer and Instructor Pilot a Cessna Above the Broad Missouri

Stephens College, a school for women in Columbia, Missouri, offers ten aviation courses. Students may keep horses and aircraft, but not automobiles. Jetties, jutting into the river, stabilize the banks by holding the current in a fixed channel.

people, using crude tools, built 80 or more earth mounds. The largest, Monks Mound, has a base of 16 acres—three more than the Great Pyramid of Khufu in Egypt.

Standing on the crest, our feet rooted in the mysteries of prehistory, we looked across the green flatland to the hazy buildings of St. Louis, Missouri, rising in almost equal mystery and improbability beside the continent's greatest river.

Here is a city in the midst of America that was French and Spanish before it was American. It was the lodestone that drew the National Road west, and it became the jumping-off point for the real West.

But now, as on all previous visits to St. Louis, I felt as if I were dipping into the South, not the West, and this was strange because most of the people are of German stock. And, although there are few visible remains of the city's Latin origins, St. Louis smacks more of New Orleans than of Chicago.

A big reason is the Mississippi, a busy two-way canal that carries hard northern goods south and soft southern ways north.*

Re-entering one's native State always lifts the heart a little, especially when the Father

*See Willard Price's articles on the Upper and Lower Mississippi, NATIONAL GEOGRAPHIC, November, 1958, and November, 1960.

Ten thousand attend the Veiled Prophet Ball in St. Louis's Kiel Auditorium. Honor guards stand at attention for the spotlighted entrance of Maids of Honor at far right. On the throne at extreme left sits the Veiled Prophet, whose identity remains a secret.

Glamorous guests watch the promenade of 62 Ladies of Honor, summoned by His Mysterious Majesty to his Court of Love and Beauty.

Geodesic dome, an air-conditioned, moisture-controlled greenhouse, rises beside famous lily ponds in the Missouri Botanical Garden at St. Louis. Asian coffee trees and Amazonian jungle flourish beneath the gleaming bubble.

of Waters is the gateway. From the great bridge that carries U. S. 40 across to Missouri, we looked down on St. Louis, a thriving port more than 1,000 river miles from the Gulf. An all-steel diesel towboat muscled several acres of barges upstream, the S. S. *Admiral* swooshed south with the world's biggest boatload of excursionists (page 28), and the showboat *Golden Rod*, one of the last of its kind, placidly sun-bathed at dock.

Salt Fosters a Superhighway

West of St. Louis we crossed the Missouri River on the Daniel Boone Bridge and drove deep into Missouri's wooded hills and grassy pastures, following Boon's Lick Trail (in frontier days every man was his own Noah Webster). Will, a Davy Crockett man, wondered why things around here were named for Daniel Boone.

I explained that the Kentuckian's last years were spent in this part of Missouri. Boone—or more likely his sons—marked an overland trail in 1807 to a salt spring in central Missouri. This spring, or lick, supplied salt for St. Louis; the trail eventually became Missouri's main east-west highway. The lick still burbles saltily in a pasture near Boonville.

Recrossing the Missouri River, we climbed out of the bottom lands to a high, flat level that stretched to infinity. I broke out, as usual, in a rash of nostalgia, for these were the Osage Plains, my native geography. This green steppe sweeps hot, wide, and windy 115 miles southwest to my birthplace, the town of Nevada, Missouri, and on through Kansas

Former Presidents Herbert Hoover and Harry Truman dedicate the Truman Library in Independence, Missouri, on July 6, 1957. The crescent-shaped building (below) shelters hundreds of thousands of personal documents detailing Mr. Truman's role at such critical moments as the end of World War II and the start of the Korean War. "My papers," said Mr. Truman, "will be the property of the people."

and Oklahoma into Texas. Summer blasts from the southwest were still blowing, recalling the old wisecrack that there was nothing between here and the Equator but a barbed-wire fence with the gate open.

The lay of the land, the feel of the air, a promise of riches—something here has always pulled men toward the West and Southwest. Here men left the comfortable rivers and woods and struck boldly across limitless lands where little or no water flows.

Traveling almost as the crow flies, we arrived in Independence, once the major eastern terminus of the Santa Fe and Oregon Trails, now almost swallowed in greater Kansas City. But don't call it a suburb. The man from Independence, Harry Truman, maintains with some historical justification that Kansas City is a suburb of Independence.

We craned past the former President's house, heard his name often, read of his doings in the paper, and noted a road named for him.

"If men from Mars landed here," Judith commented, "and said, 'Take me to your leader,' no one would wonder where to send them."

I found Kansas City as up to date in cultural activities as in stock slaughtering and wheat weighing. Perhaps the city's most unusual educational institution is the Linda Hall Library, legacy of a grain fortune. It

RECEIVED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER DEAN CONGER © N.G.S.

Dawn's curtain rises over the domed capitol of Kansas. Behind it, the new State Office Building stands in stark simplicity. Topeka's unlighted houses slumber in the final fleeting seconds of darkness. Topeka High School's tower gleams at upper right.

Checkerboard Fields of Kansas Dwindle Into Hazy Infinity

Starting in 1860, Government surveyors divided Reno County, Kansas, into six-mile-square townships, which they subdivided into mile-square

sections and then quarter sections. Settlers laid out their farms on this imaginary grid. Roads at lower left follow section lines. Trees planted as windbreaks border some of the quarter sections. This air view shows wheat fields near Hutchinson, 50 miles south of U. S. 40.

Hip-deep in a sea of wheat, a harvest captain commands a fleet of combines near Partridge, Kansas. Crossing the field in echelon, the machines reap, thresh, and winnow the grain. Many combine operators follow the harvest north from Texas to Canada.

Golden torrent of grain flows from combine to truck, which rushes it to an elevator. Last year Kansas grew a near-record wheat crop of 291 million bushels.

specializes in basic science and technology.

The head librarian, Joseph C. Shipman, led me to his paneled office and spread open a huge, richly illuminated volume.

"This is the Cellarius Atlas of the Heavens, printed in Amsterdam by Jansson in 1661," Dr. Shipman said. "These figures show Tycho Brahe and his instruments. He was the most efficient observer of motion of the stars in the 16th century."

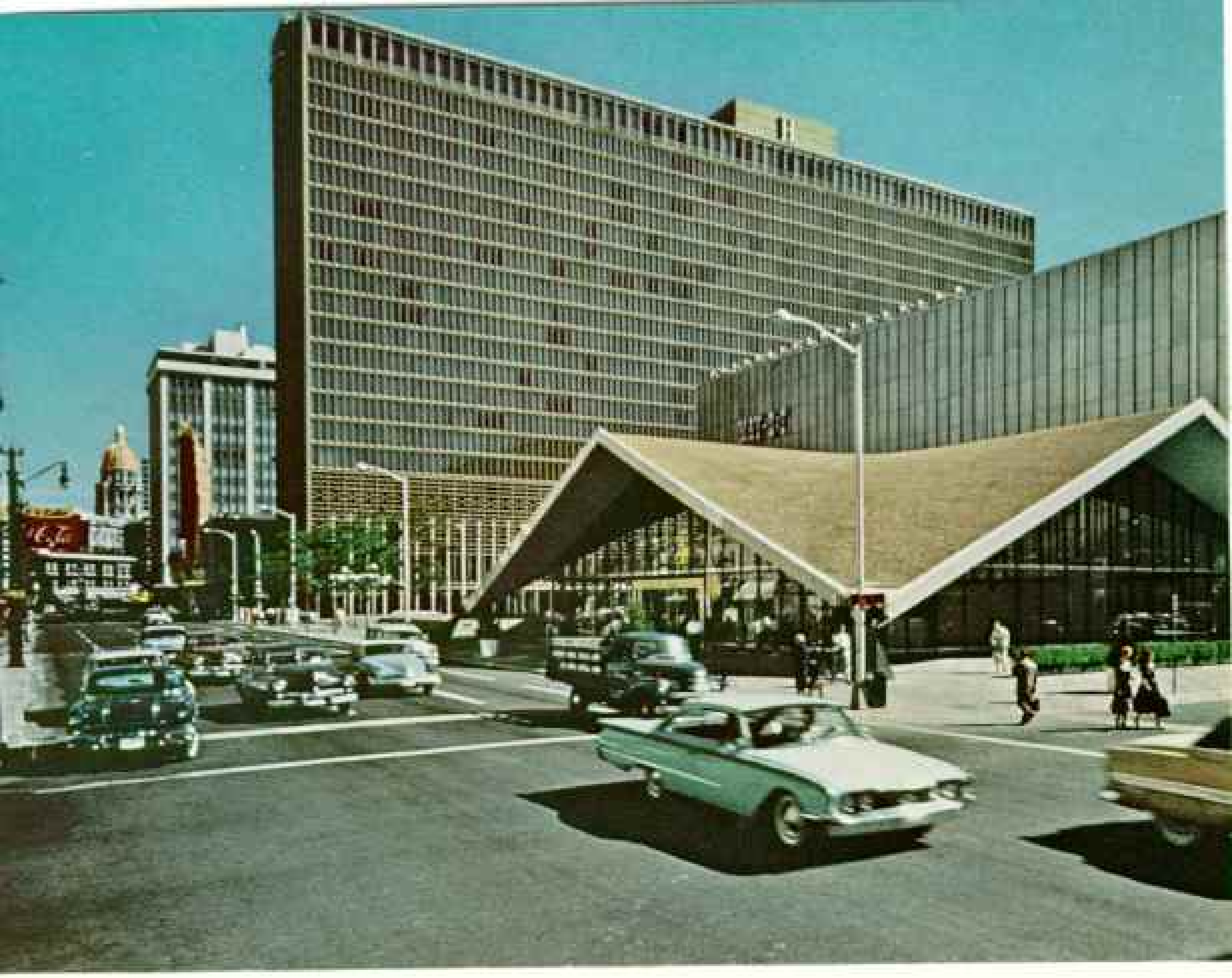
That night, with friends in Prairie Village, Kansas, I gazed at the heavens with some of the wonder of childhood and youthful prairie-night observations.

On the route we were now tracing, I had hitchhiked across Kansas and Colorado when I was 19, sleeping beneath the stars. One night, near Lawrence, Kansas, I left the hot pavement and walked through wheat stubble to an Osage orange hedge. As I bedded down, grasshoppers made tiny thuds in the quiet dark, cicadas sang their saw-rasp of a song, and two whippoorwills carried on a long-distance conversation.

Little Civil War Raged at Lawrence

These sounds, and the stars above, were the same when abolitionist John Brown struggled over "bleeding Kansas." I could imagine Old Brown of Osawatomie, with his sons and followers, riding grimly to Lawrence in 1855 and '56, first to avert and then to avenge its sacking and burning by pro-slavery forces. The Civil War in miniature

ROUCHAUSE (UPPER) AND AS EXCHANGE BY NATIONAL GEOGRAPHIC PHOTOGRAPHER DEAN CONGER © N.G.S.



raged here years before the bombardment of Fort Sumter.

But now, as my family and I visited Lawrence, its pleasant elm-shaded prosperity and college air gave no hint that the city had ever experienced anything worse than high water on the Kansas River or a low score by the University of Kansas football team.

Green Grass Turns "Orange"

Approaching Topeka, we drove through a part of Kansas that always reminds me of New England, with its trees, hills, and neat towns. But beyond the State capital the highway knifes suddenly through range country: the Flint Hills. Covered with succulent bluestem grass and fat red Herefords, these treeless hills are virgin prairie—most of them never plowed because a layer of rock lies just inches under the surface.

Like a ship lane through a green rolling sea of grass, the highway plunged west with hardly a curve for 65 miles. Then, beyond Junction City, we entered the wheat belt, a change so abrupt that Donna exclaimed, "Look at the orange grass!"

The truck ahead had a message for us: "I may be slow, but I'm ahead of you." In the roadside eating places the talk was about the tax on diesel fuel, Federal crop controls, and too much rain.

Next morning the breakfast menu offered a "stack" (three pancakes) for 30 cents; a "short stack" (two pancakes) for a quarter. No orange juice was available, and the toothpick seemed a socially accepted implement. "You bet" replaced "You're welcome."

Nothing made me feel as much at home as visiting the Eisenhower house in Abilene. A white frame structure with trellised porch, it reminded me of my own birthplace—even down to such details as the "Sunday parlor" and the adjoining family room with its upright piano, Seth Thomas clock, Maxfield Parrish print, Harold Bell Wright novels, and old NATIONAL GEOGRAPHICS.

Next door, on a plot once gardened by Dwight David and his brothers, stands the new Eisenhower Museum, filled with a $2,000,000 collection of mementos, trophies, and tokens of honor. This year an Eisenhower Library will open across the street.

Gleaming Buildings Reshape the Skyline of Mile-high Denver

Gold-anodized aluminum sheathes the nearly windowless May-D & F department store. Low, swooping roof covers the main entrance, a glass-walled pavilion.

Sixteenth Street traffic speeds past the 21-story Denver Hilton Hotel, Centre Theatre, and the Petroleum Club Building, all built in the past seven years.

Sunlight glints from gold leaf atop the State capitol dome at far left.

Plexiglas-covered bridge across Court Place links the May-D & F store with the Denver Hilton Hotel at right. These boys walk on the curb.

Memento of an earlier era is the boulder on the post office lawn marking the end of the Chisholm Trail. Here, in the late '60's and '70's, hundreds of thousands of cattle from Texas reached the railhead, and Abilene gained an immortal place in dime novels, movie scripts, and TV serials. Lusty cowboys hit town with a hoorah, washed down trail dust with copious shots of redeye, squandered away their money, indulged in a little gunplay, and woke up in jail under the flinty eye of the marshal.

I explained to my children, all TV fans, that the cowboy was quite a different character on the trail—quiet, skilled at his trade, and lonely as a coyote. Such renowned marshals as Wyatt Earp and Wild Bill Hickok were not always true blue and pearly white themselves, as stories in the Kansas newspapers of the day attest.

Geography has a way of making history take a back seat in Kansas. West of Hays we embarked on the High Plains with the same sense of drama that attends a mountain expedition. Man and his works recede, and bare earth takes over. The elevation rises with each mile west: Topeka, 926 feet above sea level; Hays, 2,000; Sharon Springs, 3,440. At the same time the rainfall drops: 38 inches a year at the Missouri border; 23 inches at Hays; 18 at the Colorado border.

Your car, going a mile a minute, stands still in space as you fix your eyes on a distant speck. The speck slowly rises out of the horizon to become a 100-foot-high grain elevator, which you eventually pass in a neck-twisting instant. Then you pick out another speck—the next town—and spend another lifetime reaching it. Good training ground for astronauts.

Rocky Mountains Bespeak the West

Somehow it comes as a surprise to cross the line into Colorado and still be 150 miles from the Rockies. But it was not long before I started looking for that "small blue cloud" that Zebulon Montgomery Pike first spotted from these plains in 1806. It soon glimmered in my vision, indeed like a small cloud hanging just above the horizon: Pikes Peak.

I stopped the car on a rise to show the children. They did not believe this tiny halo

Corral fence becomes an impromptu exercise bar for aspiring dancers at the Perry-Mansfield School of the Theater near Steamboat Springs, Colorado. Besides dancing, students learn acting and horsemanship.

Fishing derby lures hundreds of junior anglers to a trout-stocked stream in Washington Park, Denver.

could be the mighty mountain. But shortly they were pointing out other peaks as the glittering Front Range of the Rockies took shape. Like every traveler since Pike, we could only marvel dumbly at this great frozen breaker of rock piling up on the beach of the plains.

In the motel row at Limon that evening I sensed excitement among travelers seeing the mountains for the first time. But as we strolled the main street, I struck up a conversation with the wrong man.

"Nope," he said. "I'm not passing through. I live here. Why travel? We've got all the wonders of the world right here

Mountain skippers beat to windward on Grand Lake, Colorado. Leeboard riders help

in Colorado. And you can't beat the climate. In fact, it's so healthful here we had to kill a tourist to start the cemetery."

In the restaurant a teen-age boy cradled a portable radio to his ear. Judith eavesdropped and nodded to us: "Come with me . . . to the sea of love."

A truck thundered through town. "No riders," its sign said, "except blondes, brunettes, and redheads." And in a drive-in down the road John Wayne was putting a greenhorn cavalry officer to rights.

Denver Gets a New Skyline

Denver looks like a girl who can't decide whether to wear her hand-me-down hoopskirt or a modern sheath. Any doubts she has are being dispelled by two ardent suitors,

keep their Class-E scows from tipping over. Fickle winds cause frequent dunkings

New Yorker William Zeckendorf and Texan Clint Murchison, who are rapidly changing her from a Queen Victoria to a Jacqueline Kennedy.

These men are building spare, trim, slender skyscrapers of steel and glass and are finally giving the 100-year-old city a skyline (pages 38-39). From the roof of the "Mile High Center," 22 floors above the street, I watched the sun set behind Denver's eternal skyline—the Front Range.

The building official with me pointed northwest to a dim, slowly moving light near the foot of the range.

"That's a train coming out of Moffat Tunnel," he said.

When the tunnel opened in 1927, Denver was still living with the gold and silver ghosts

Golden Petals Weave a Floral Carpet for a Meadow Near Rabbit Ears Pass

U. S. 40 crosses the Continental Divide over three passes—Berthoud, Muddy, and Rabbit Ears. Berthoud, at 11,315 feet, marks the highway's highest point from coast to coast.

Sunflowerlike blossoms adorn balsamroot, a member of the thistle family. A perennial like many mountain flowers, *Balsamorrhiza sagittata* bursts into bloom in midsummer. Mary Ellen and Judith Gray inspect the knee-high plants near Steamboat Springs.

Roadside fireweed near the headwaters of the Colorado catches the eyes of Will and Donna Gray. Plant's name refers to its ability to cover burned-over land with lavender blossoms.

Headed for the frying pan, a plump rainbow trout dangles from Will's line. He hooked the prize in a mountain lake near Steamboat Springs.

Hands and feet out of the water, the author's children bob like corks in Great Salt Lake, Utah. Last fall the lake shrank to its lowest level in a century; the remaining water became about seven times as salty as the ocean's.

of the past. Now the city spread around us in all directions—half a million strong. Its lights seemed to fill all the space between us and the purple mountains.

Since World War II, Denver's population has increased by a third. The lure of mile-high daily living and two-mile-high weekends in the Rocky Mountains is still pulling. Seven hundred newcomers a month pour in.

But its geography, so appealing today, once threatened to stop Denver in its tracks. Backed against the highest ramparts of the Rockies, Denver early felt the need for a mountain route west to compete with lower passes in Wyoming and New Mexico.

Mountain Pass to "Elephant Land"

"That stream of traffic going straight west and disappearing behind the Hogback is U. S. 40," a Denver acquaintance commented. "Look at it! And to think there wasn't a decent road over Berthoud Pass until 1923."

In 1861 engineer E. L. Berthoud and scout Jim Bridger set out to find a pass west of Denver for a stage route to Salt Lake City. Berthoud worked his way up the east face of the Continental Divide. At 11,315 feet he noticed a stream flowing northwest and correctly surmised it to be a tributary of what we call the Colorado River today.

Denver had its westward route, but Berthoud Pass was so formidable that not until the coming of the auto was it much used. Recurring talk of a tunnel at the 9,000-foot level reveals that Denver still is not satisfied with Berthoud's route—one of the Nation's highest passes on a major highway.

With mounting excitement we entered the high country "to see the elephant," as had countless westering people before us. Seeing the elephant is a state of mind; pioneers coined the phrase to show they were ready to believe everything, ready almost to be hornswoggled rather than admit that anything was impossible in the Golden West.

One of the early West's biggest elephants was gold. So naturally we stopped when we saw the roadside signs and paid $1.50 for the privilege of panning three cents' worth of gold from Clear Creek.

After this modest success we felt qualified to visit Central City, the ghost town where tourist dollars have replaced the largely mined-out diggings. We did our bit to keep Central City green by adding to several latter-day deposits. We explored a mine, heard opera in the restored Opera House where miners used to applaud with gunfire, dined in the Teller House after admiring its "face on the barroom floor," and rode a wild Jeep over mine-bitten slopes and rock-strewn gulches.

Our Jeep driver, a college boy with the perfect summer job, pulled up negligently beside the 1,000-foot-deep Glory Hole saying, "Don't worry. We have a spotless safety record. We've never lost a driver."

Taking my own wheel, I drove my children up the highest auto road in the United States, to the top of Mount Evans—14,264 feet above sea level. We gazed through the chill mist at a tumble of snow-pocked mountains, from Pikes Peak in the south to Longs Peak.

Soon we were traversing Rocky Mountain National Park via Trail Ridge Road and looking south toward Longs Peak, 14,251 feet, highest in the park area. The Centennial State's alpine regions—more extensive than Switzerland's—lay all about us.

As we returned, our windshield framed the Never Summer Mountains, fittingly spangled with July snow. Near its source we picked up the brawling Colorado, followed it past lakes and through its first canyon, then threaded Rabbit Ears Pass into the valley of the Yampa River.

Near Steamboat Springs a roadside dude ranch made us welcome. Will caught rainbow trout for breakfast (page 45), and afterward we saddled up and rode toward the distant Elkhead Mountains. All the promise of the West came true for

Salt flats in western Utah mark the bed of vanished Lake Bonneville. Water a thousand feet deep once drowned this bleak expanse and lapped distant Silver Island Mountains. Racing cars try for speed records on a salt straightaway beyond the fence.

Cradled by mountains, Salt Lake City fills a valley selected by Mormon pioneers in 1847. Domed capitol dominates the city. Wasatch Range rises beyond.

Exposing fossils of prehistoric animals, a workman at Dinosaur National Monument chips away with hammer and chisel on a rock face that forms one wall of Dinosaur Quarry Visitor Center. Spectators watch the excavation of a 140-million-year-old burial ground. National Park Service maintains the monument in Utah and Colorado.

Steamboat Rock juts 700 feet skyward within a loop of the Green River. Relentless action by the stream carved this parapet in Dinosaur National Monument. Yampa River joins the Green at right; Echo Park lies below the confluence.

the children when a couple of deer sprang from an aspen glen, spooked the horses, and sent them galloping madly down the trail to the Elk River.

Steamboat Springs is a place for youth. Gifted youngsters come from all parts of the country to the Perry-Mansfield Camps and School of the Theater (page 41). Others absorb the outdoor life at near-by Whiteman-Gaylord and Columbine Boys Ranches.

Local kids learn skiing in elementary school, if not before, and have a band on skis. They are proud of the town's eight Olympic performers. Graham ski jump, visible from any place in Steamboat Springs, was the scene of America's record jump—316 feet.

Springs and irrigation canals became scarcer each mile we drove across the furnacelike plateaus. With no crops or cattle to speak of, people in the little roadside places west of Craig talked uranium, gasoline-producing Gilsonite, and other bonanza deposits.

Flood Plain Trapped Dinosaurs

"There! Is that the elephant?" Will joked after crossing into Utah. He pointed out a concrete dinosaur rearing beside a filling station, reminding us that Dinosaur National Monument was near.

In Vernal, an irrigated oasis, Will and I met John Good, naturalist at National Park Service headquarters, and went tearing across the desert in his pickup to the monument's scenic canyons. In Echo Park we picnicked in a cottonwood grove across the Green River from Steamboat Rock (opposite).

PAINTING BY FRANCIS M. RUSSELL, THOMAS GILCREASE

Returning, John Good spotted a dead doe caught in a wire fence outside the park.

"Happens all the time," he said with a conservationist's sorrow. "Too bad she didn't make it into the park."

Millions of years ago, when this region was a semitropical flood plain, other animals—the dinosaurs—also met their fate here. Their bones washed into a pile, where the most modern of structures now houses the Nation's largest Jurassic graveyard. Museum displays explain the sad story of the pea-brained vegetarian monsters that once roamed the United States (page 49).

Driving through Utah's railroadless Uinta Basin, and the fearful salt flats in the west, we sometimes wondered how an area 93 percent non-arable could exist as a State. Exist it does, but people had to work like bees to bring it into being. The State symbol, in fact, is a beehive.

Mormons Pioneered in Irrigation

The Mormons call it Deseret, which means "honeybee" in the Book of Mormon. We found the spot in Emigration Canyon where the persecuted pioneers first beheld their promised land in 1847. Brigham Young, their

Indians With Bows and Guns Attack a Wagon Train

Rolling west, the Grays shared memories of the pioneers who blazed the trails now traced by U. S. 40. Banding together for companionship and protection, settlers plodded toward the Pacific. If Indians attacked, drivers wheeled their prairie schooners into a defensible ring. TV and Western movies relive the scene countless times each week.

"Gunpowder and Arrows," by Charles Marion Russell, portrays such a scene. A cowboy artist, Russell left a pictorial chronicle of the conquest of the West. Admirers in Alberta, Canada, purchased one of his paintings for $10,000 and presented it to the Prince of Wales in 1919.

leader, indicated a sun-baked, treeless flat at the foot of the Wasatch Range, and told his followers, "This is the place."

We looked and saw Salt Lake City, largest metropolis between Denver and Sacramento, with suburbs sprinkled along a fruitful valley stretching south beyond vision. Beyond our vision, not Brigham Young's.

Near Ensign Peak's base rises the ornate six-spired temple, the heart of Mormonism. Higher, the State capitol's more conventional domes and columns stand out against the mountain's tawny slopes (page 47).

From canyon streams draining the Wasatch Range, pioneer Mormons took water running into Great Salt Lake and diverted it into modern America's first extensive irrigation system. They also ran bubbling mountain water down the gutters of their desert streets—and still do. Salt Lake City teems with water sprinklers, green lawns, leafy trees, and street-corner drinking fountains running day and night.

Liquid Mattress Supports Swimmers

But salt water quickly lured us to Great Salt Lake. Like many a tourist, we stopped at a beach on U. S. 40 and went "swimming" in America's dead sea. We walked a quarter of a mile to get beyond knee depth and lay back in the mineral-heavy water. Five to seven times as salty as the ocean, the lake supported our bodies like a soft mattress. We couldn't sink (page 45).

A little was enough. The salts stung and left us coated with rime. The girls' hair seemed streaked with white taffy.

Salt continued seasoning our trip as we put the lake behind and plunged on a 40-mile straightaway across Great Salt Desert (page 46). All this was the floor of ancient Lake Bonneville, of which Great Salt Lake is a remnant.

Bonneville brine still makes up part of the crystalline salt beds near the Nevada border. U. S. 40, slightly raised above the ancient lake bed for 15 miles, is lined by ditches filled with the saltiest of water.

Nevada begins with a giant mechanical cowboy beckoning one and all to its slot ma-

Buckaroos drive Herefords down from a mountain range on the Spanish Ranch near Elko, Nevada. Powdery dust kicked up by the milling herd blots out the blistering August sun, cakes the faces and clothes of the cowpokes, and turns sagebrush gray.

Tenting on the range, Nevada cowpunchers relax around a campfire at the end of a day's hard riding. Buckaroos like these Allied Land and Livestock Company cowhands sleep outdoors the year around, except in bitter winter weather.

chines and gaming tables. We stopped to eat in an Elko hotel and walked past a healthy stand of one-armed bandits to reach our table. The children were thrilled.

"Let's try a few dimes, Dad," Will begged. I quietly explained the percentages and other considerations involved.

"But isn't this one of the ways to see the elephant?"

Hoist with my own petard, I resorted to the universal dodge of fatherhood: "We'll see. Some other time."

Liquor, cigarette, and gambling taxes pay about one-third of Nevada's bills. If this prosperous State could exact a charge for viewing its scenery, 16 million annual tourists would make Nevada's 285,000 citizens even richer. Its range-and-basin terrain is starkly magnificent and well-nigh unbelievable.

And in every town Will wistfully pointed out the slot machines—especially in Reno, whose heartbeat is the whirr and thump, thump, thump of the slots. When we stopped for gas at the California State line, Will spied a casino with its "last chance" signs. I finally gave in.

"All right. We'll try one dime, just to prove that you won't win."

Will put the dime in; the machine whirred and came to rest.

HIS ENTOURAGE BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JOAN CONDON © N. G. S.

Virginia City, a Lively Ghost Town, Treasures Memories of Bonanza Days

Nevada's celebrated boom town sits atop the Comstock Lode, which poured out about $700,000,000 in gold and silver. At its zenith in the 1870's, the Queen City housed 30,000 free-spenders.

Today the Gothic spire of St. Mary's-in-the-Mountains rises above weather-beaten buildings filled with relics. Exploring the town, the Grays relived its days of bustle and glory.

Young visitors to Occidental Mine put on hard hats to explore the workings.

Grizzled actor portrays a prospector at Sundown Town, near Reno, Nevada.

Soundscapes by Merle Severy and (lower left) Jean Conger, National Geographic staff © N.G.S.

And sure enough, as luck would have it — he lost.

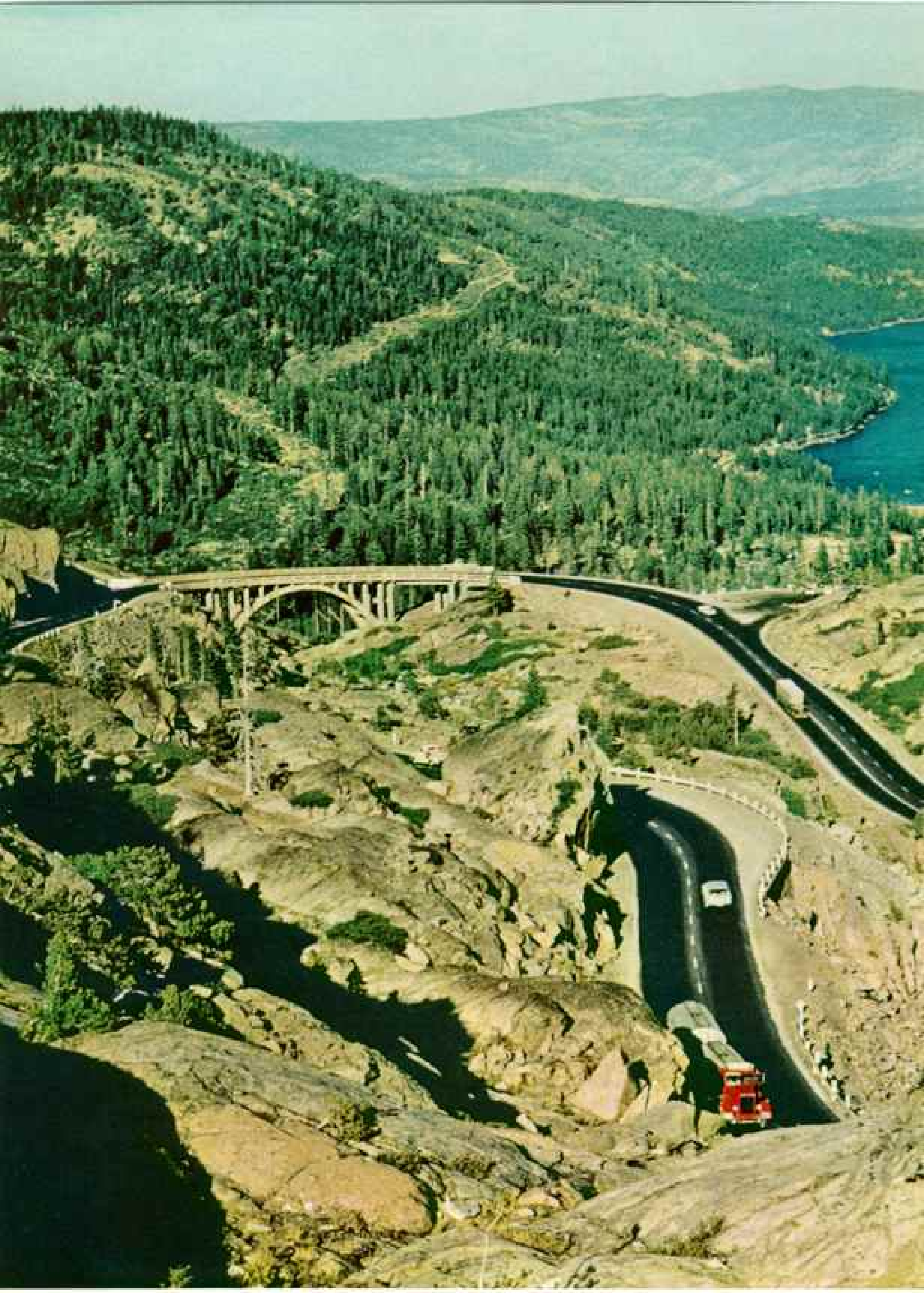
We climbed into California, with pines and cool breezes replacing sagebrush and desert glaze. I pulled to a stop beside Donner Lake, cyclopean eye of brilliant blue beneath the giant brow of the Sierra Nevada.

Donner Pass Recalls a Tragedy

The lake and the pass above us were named for perhaps the most famous of all emigrant wagon trains (next page). The Donner party's history lives on because it was pure Greek tragedy in the flesh. Beset with bad luck, bad judgment, and poor leaders, the California-bound pioneers became snowbound in November, 1846. Thirty-four people died as the party struggled to escape the snow's numbing clutch. There was heroism, raw courage, and self-sacrifice; there was also cannibalism and murder.

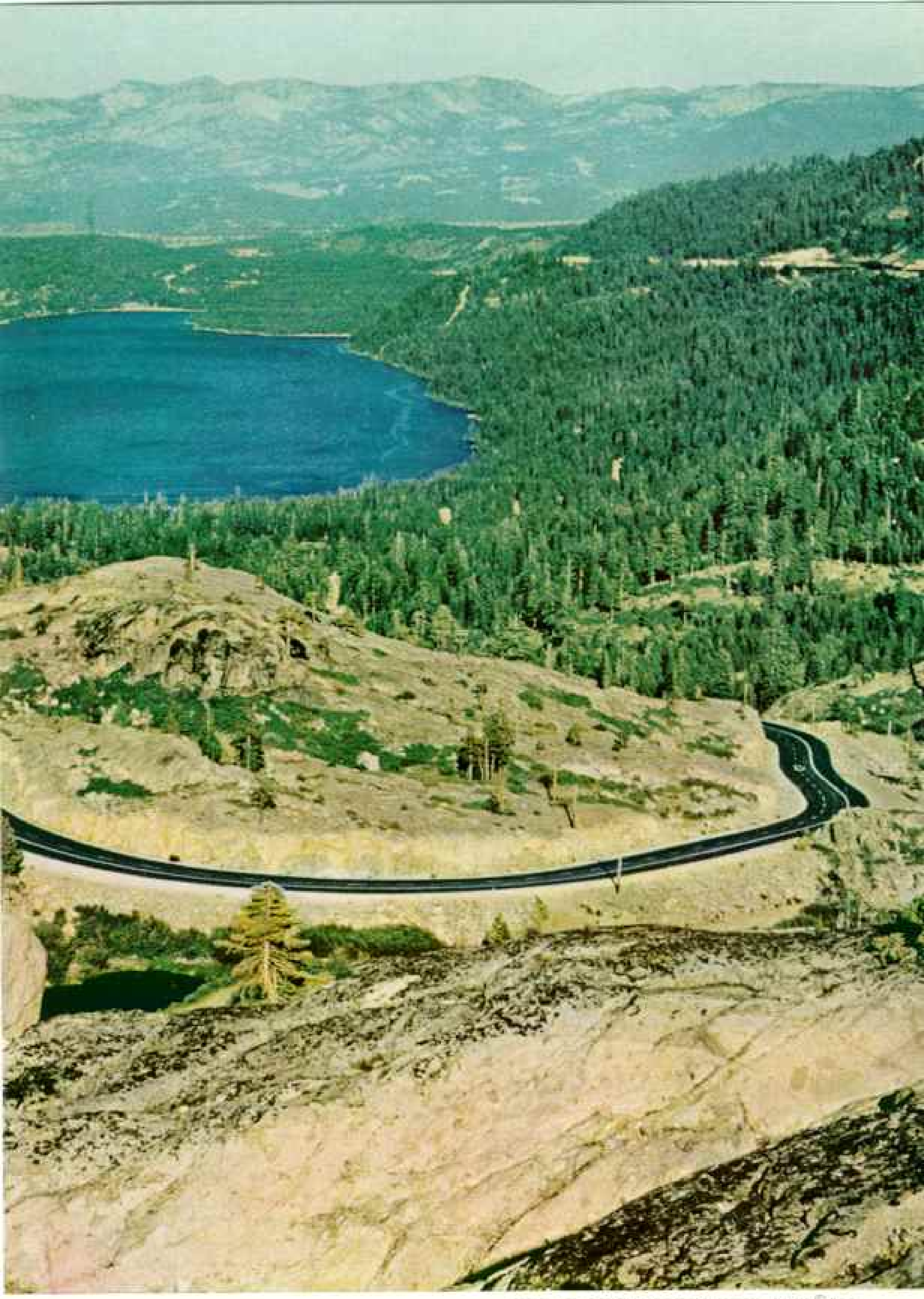
"Why had they tried to cross the Sierra in winter?" wondered Judith.

Actually, the party started early enough, breaking off from the Oregon Trail in what is now southwest Wyoming in July, 1846. Ill-advisedly following the so-called Hastings cutoff, they required 21 days to hack their way 36 miles through a forested canyon. Then the Great Salt Lake Desert took its



Corkscrew Highway Conquers Donner Pass, Where 34 Snowbound Pioneers Starved

A blue, mountain-walled jewel, California's Don-
ner Lake in its sparkling beauty belies the epic



tragedy of a century ago when early snows trapped an ill-fated wagon party. Thirty-four of the pioneers perished within a day's journey of the Eldorado they sought beyond the Sierra pass.

REENACTMENT BY NATIONAL GEOGRAPHIC PHOTOGRAPHER

toll. Oxen died; wagon and household goods left a grim trail across the salt.

After recuperating at the same springs that water present-day Wendover, the Donner group pushed across Nevada, losing more and more time, finally making their rendezvous with disaster at the sunny lake where we now watched children swim and teenagers water ski.

We joined the flow of traffic to the pass and marveled at the granite ledges and domes that Elisha Stevens had muscled his five wagons over in 1844—the first wheels through this gateway to golden California.

Wheels hummed on all sides as we coasted down the smoother, more gradual west slope of the Sierra to see what the emigrants were seeking. Soon it spread before us—the great Central Valley—the fabulous end of the wagoneers' rainbow—a land fertile as Eden, promising as Canaan, rich as Croesus. Today its major crops total 88, making California the richest agricultural State.

The elephant was not a hoax after all!

In fact, in California, the resplendent animal is panoplied with a howdah of pines and palms, and it flaunts tusks of gold.

In Auburn, at 1,300 feet above sea level, we saw our first palms. And a side road from this old gold-mining town took us to the sawmill at Coloma where James Marshall discovered the yellow metal that triggered the gold rush of 1849 (below).

Marshall's sawmill partner, Swiss emigrant John A. Sutter, had obtained a grant on the Sacramento River from Mexico. The gold

J. BAYLOR ROBERTS (RIGHT) AND DEAN CONGER © N. G. S.

Color Guard at Sutter's Fort Parades During the Pony Express Centennial

Forty miles from John Sutter's walled headquarters, his sawmill partner James Marshall picked up the flakes of metal that touched off the gold rush of 1849. Once the base for hordes of prospectors, the fort has been restored as a State historical monument. Color guard representing Sacramento, western terminus of the Pony Express in 1860, observed the line's centennial last July.

Marshall's Monument on the south fork of the American River marks the spot where the Californian discovered gold. Fleck identified as Marshall's first find (left, below) belongs to the Smithsonian Institution.

Pacific Combers Lather San Francisco's Shores at Journey's End

Six miles east of this seaside setting, route 40 terminates near the San Francisco-Oakland Bay Bridge. End of the line for the author and his family — as it was for countless westward migrants— the port city by the Golden Gate bears the twin stamps of richness and roughness that made it unique.

Nature provided the spectacular setting, but San Francisco's blend of nationalities created the sophisticated, pulsing metropolis. Here spreads a city of sunshine and fog, roller-coaster streets and cable cars, a city ever cooled by breezes.

Almost invariably, San Francisco's beauty and vitality charm the foreign visitor or the American sampling its delights for the first time. They leave with regret, remember with affection, and yearn to revisit "that wonderful town."

Here, bathed in afternoon sun, an arrow-straight boulevard known as Great Highway parallels the beach south of Sutro Heights. Golden Gate Park (left center) cuts a green four-mile swath from the city's heart to the sea.

lust which dumped tens of thousands of rowdy, rough-shod miners on Sutter buried his plans for an agricultural utopia in the New World.

"People are running over the country and picking it [gold] out of the earth here and there, just as 1,000 hogs, let loose in a forest, would root up groundnuts," ran a feverish newspaper report in August of 1848.

At Sacramento we headed for Sutter's Fort, his walled headquarters which was literally taken over as an outfitting base by the forty-niners. Absorbed in California history, we lingered two days in this beautifully restored site, not leaving each evening until— as Donna put it—"the man turned off the flag" (pages 58-9).

The State capitol grounds were also a delight. Its plants are a botanical gazetteer of the world—palms, cedarlike deodars from India, giant sequoias, olive and orange trees, magnolias, Spanish irises, camellias.

My wife, my children, and I were now nearing the end of our trek. Many a mile we had shared with men who helped shape our land, men who carried the light of civi-

KODACHROME BY RALPH GRAY, NATIONAL GEOGRAPHIC STAFF © N.G.S.

lized freedom from the Atlantic to the Pacific.

And everywhere we had gloried in the lay of the American land, the land that was here before man, the land that patiently succors man and his plunderous ways: the Atlantic's coastal plain, the swelling Alleghenies, the prairies, the Rockies, plateaus and basins, the Sierra, and California's fecund valley.

Now we threaded low passes through the Coast Ranges and saw Pacific tidewater as we crossed Carquinez Strait in a sudden shower.

Instead of taking the San Francisco-Oakland Bay Bridge immediately, I drove through Berkeley to the crest of the Berkeley Hills, where we got out and looked down through rain-washed air. Our eyes sped across the brilliant whitecaps of San Francisco Bay to the towers and hills of the city; through Golden Gate to the shining sea.

We seemed at one with the pioneers and with the Maker of mountains and bays. We were proud that He had found men to match His mountains and tame His plains. Enlightened by our trip, we felt more than ever privileged to call them kin.

New Atlas Marks the

JUST 185 YEARS ago this month, the big bell on the statehouse in Philadelphia rang out the great news of the independence of the Thirteen Colonies.

From a small new Nation of two and a half million people strung along a narrow strip of the eastern seaboard, the United States has become a giant of 182,000,000 Americans extending not only from coast to coast but a third of the way across the Pacific and beyond the Arctic Circle.

Hawaii and Alaska, the newest States, appear as insets on the National Geographic Society's latest Atlas Map, **The United States,** distributed with this issue to a worldwide membership of 2,700,000—more than the entire population of the country in 1776.* Yet when the Liberty Bell rang, Hawaii had not been discovered (Capt. James Cook was to find it two years later) and Alaska was little known except to Russian seal hunters.

Young America Gazes Up at the Liberty Bell

"Proclaim liberty throughout all the land, unto all the inhabitants thereof"—so reads the inscription cast into the Nation's Liberty Bell which rests in Independence Hall, Philadelphia.

Like the one and a half million visitors a year who inspect the symbol of freedom, these Girl Scouts instinctively focus their gaze on the crack in the 2,080-pound bell. Tradition says the break appeared in 1835 while the clapper tolled the death of Chief Justice John Marshall. Pronged clamps mounted within protect against further damage.

Map of the United States Nation's 185th Anniversary

The map is published at a time when more Americans than ever before are setting out by car to explore their country—an estimated 100,000,000 in 1961. The map will help Society members planning such trips; not only does it show the whole country on a single convenient sheet, but it indicates major highways and growth of the new, federally supported Interstate Highway System.

Run your finger along Interstate 44, for instance, as it angles southwest from St. Louis toward Oklahoma City. Stretches under construction show as dashed lines; solid lines indicate completed portions.

Canada Links Its Seacoasts

In Canada, too, road builders have been busy. A twisting red line on the map just above the U. S. border marks the Trans-Canada Highway, the hemisphere's longest national road. By year's end, engineers hope to complete a gap between Golden and Revelstoke in British Columbia. Then the highway will reach from sea to sea.

It's all a far cry from April, 1923, when National Geographic members received their first large-scale U. S. map as a magazine supplement. That map listed only 34 "important automobile trails and national highways."

Even today you may choose one of these older routes, such as U. S. 1, the old Boston Post Road in New England, which often parallels broad throughways as it meanders south along the Atlantic Coast. Follow it to the end, and you will thread your way by causeways over the Gulf of Mexico to Key West—as far south as you can drive in the continental United States.

Only 93 miles away, beyond the Straits of Florida, Cuba sprawls across the bottom of the map. Near the island's eastern tip, alert U. S. Marines guard the Guantánamo Naval Base, where the cold war has crept close to America's southern doorstep.

To the north, shearing off into the Atlantic, a dashed red line leads off the map. It charts the Atlantic Missile Range, its western end pinned to Cape Canaveral, Florida. There the earth trembles as deafening rockets hurl metallic messengers of the Space Age far above—and sometimes completely off—this or any other terrestrial map.

On the Pacific Coast, 2,400 miles west of Cape Canaveral, Vandenberg Air Force Base, near Lompoc, California, also sends rockets probing through space.

Los Angeles, 140 miles to the southeast, leads the Nation in producing "space hardware": the machinery of the rocket era. These and other booming industries make this one of America's fastest growing cities. A prime example of what municipal planners call urban sprawl, Los Angeles registered 2,479,015 inhabitants in the 1960 census—more than a 25-percent increase over the 1,970,358 recorded in 1950.

In only a year the country's population has increased by 2,900,000—or more than the total for Los Angeles itself—to the current estimated figure of 182,000,000.

Yet traveling Americans still have plenty of wide-open spaces in which to stretch their legs. Nevada, the seventh largest State in area, and Alaska, the largest, still have fewer than 300,000 people each.

The red stars on the inset map of Alaska locate airports with scheduled air service and illustrate another fact about the Air Age—it's often easier to travel by plane than by car. The map shows 135 airline stops but relatively few roads and rail lines, testimony to how Alaskans have leapfrogged whole eras of transport in their eagerness to conquer their rugged domain.

*"**The United States,** numbered as Plate 5 for insertion in the Society's Atlas Folio, is twenty-fifth in the series of uniform-sized maps issued as magazine supplements in the past three years.

More than 250,000 members have ordered the convenient Folio, at $4.85, to hold their maps. Single maps at 50 cents each, or a packet of the 21 maps issued 1958–60 at $8.25, may be ordered from the National Geographic Society, Dept. 74, Washington 6, D.C. Folio plus all 21 maps: $12.50.

Blue-eyed Indian

A city boy's sojourn with primitive tribesmen in central Brazil

Article and photographs
by HARALD SCHULTZ
Assistant Ethnologist and
Chief of Expeditions
São Paulo State Museum

Fresh from a city of 3½ million, eight-year-old Alexander Schultz steps from an airliner at Araguacema, a sleepy adobe village in the heart of Brazil. Behind him lie schoolbooks and the city life of São Paulo; ahead, a vacation with primitive Indians far up a jungle river.

VACATION TIME has come to São Paulo, and the children romp homeward from the last school class. Among them frolics our blond, blue-eyed, eight-year-old son. His name is Alexander, but we call him Teemaree, the name given him when he was two by one of our Brazilian Indian friends.

It is an exciting time for every youngster, but most of all for Teemaree. His vacation will be a great adventure in the virgin forest.

Our trip plans have been made carefully. My wife Vilma and I have stocked medicines for tropical diseases, preventives for malaria, and special food rich in proteins and vitamins. Friends and relatives try to persuade us not to take the boy, but we know the region and the dangers and merely thank them for their concern.

Araguaia Pierces Heart of Brazil

After a day's flight, the old DC-3 plumps down on the earthen landing strip of Araguacema, State of Goiás. Like a splendid explosion, the blue, cloudless sky stretches out above us. We relax in the hot, dry air of July in central Brazil.

A mile or so away flows the Rio Araguaia, cutting through the heart of Brazil from south to north and thus separating in its upper course the vast, primeval-forest States of Mato Grosso and Goiás. Farther north the Araguaia empties into the Tocantins, which finally joins its waters with those of the mightiest river on earth, the Amazon (map, page 82).

For hundreds of miles rapids prevent development of the Araguaia as a great water highway into central Brazil. But the whole middle course is navigable to small craft throughout the year.

Free Indian tribes still live today on both banks of the Araguaia. In the middle of 209-mile-long Bananal Island, one of the largest river islands in the world, dwell the Javahé, the tribe we were going

"Painting the Body Tickled Me"

Shedding civilization, clothes, and even his name, Alexander permits himself to be decorated with traditional tribal designs. Javahé Indians, he finds, "go around in black and red paints." They call him Teemaree, a musical name of no specific meaning, which the Indians prefer to the "ugly" Alexander.

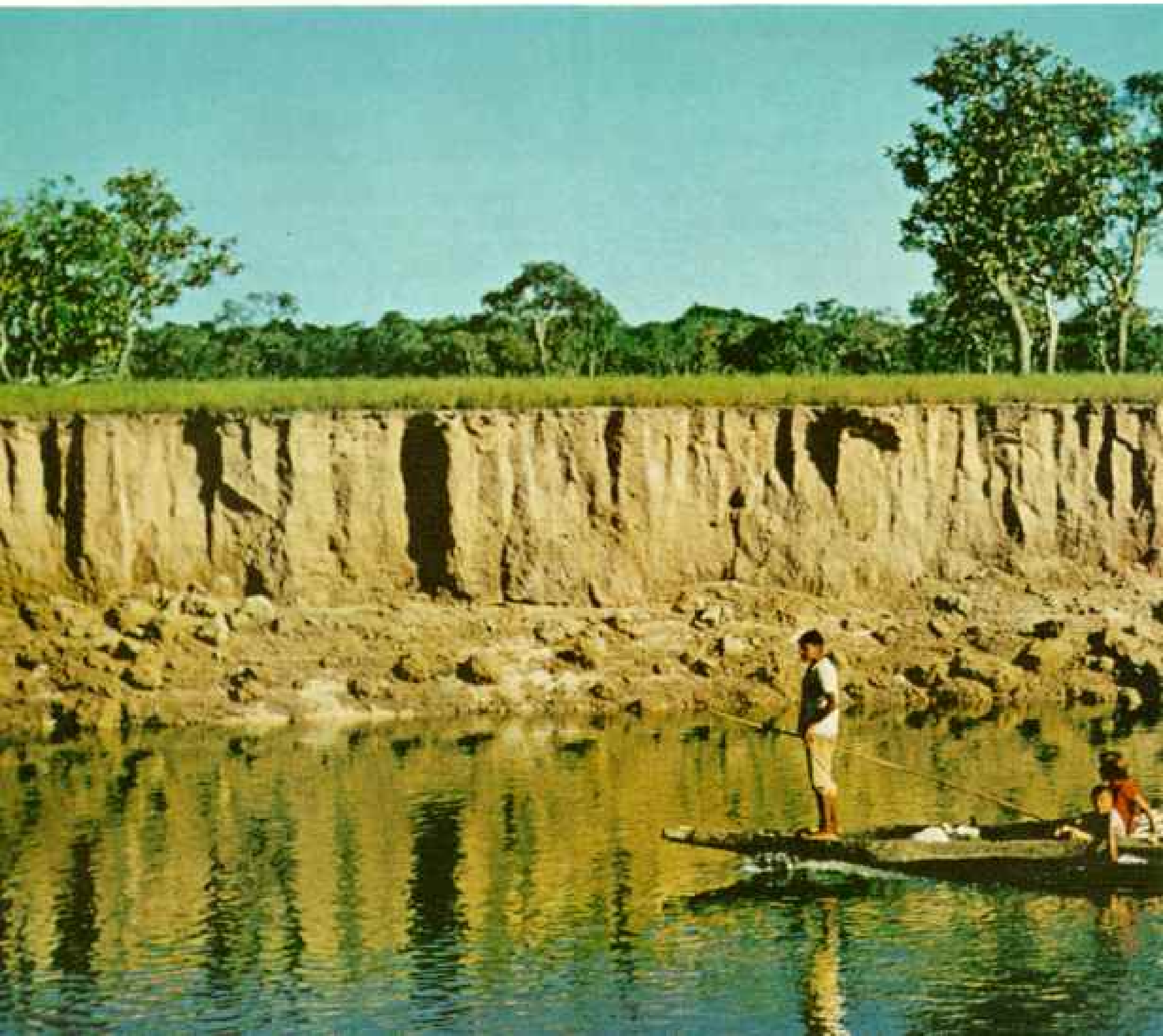
"Indian Boys and I Became Good Friends; One Traded Me a Feather Hat for a Knife"

Dohobare (opposite) treated Teemaree like a brother.

"He taught me to stand still in the water, like a stork, until fish got used to us and came near. Then we grabbed them, as quick as storks do.

"Jungle life is good. When you live in a hut, there is no harm in spilling water on the floor, and if you break a pot, your Indian mother just makes another. You do not have to be scolded or sent to school, and you are never late for anything. Oh, I would like to live here forever!"

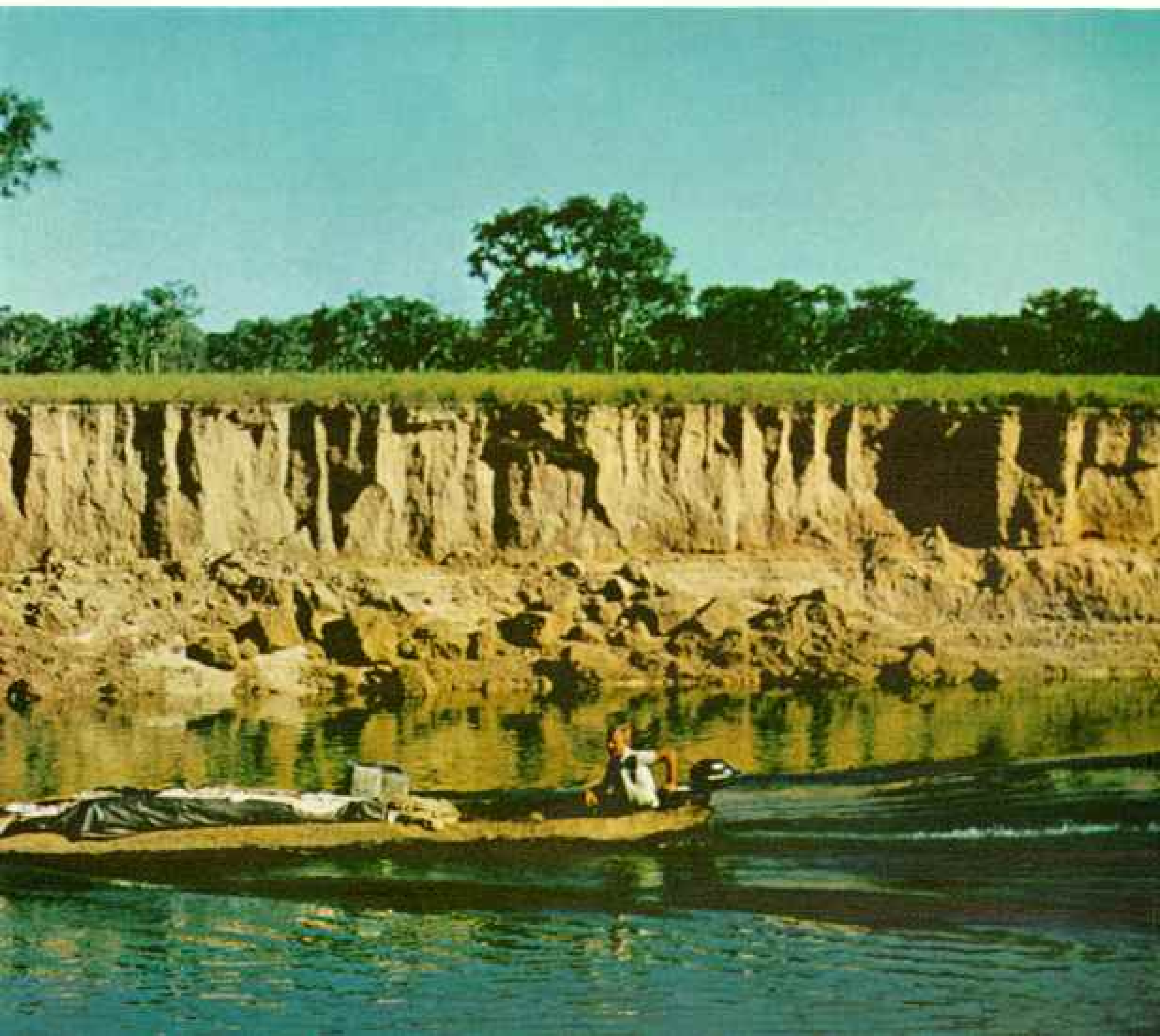
Rivers provide the only road to Javahé land. The Schultzes' outboard-powered dugout trails its wake on the Rio Lever, which wanders through huge Bananal Island (map, page 82). There Teemaree and his family will live in a Javahé village. From bow to stern: Suria, their guide, Teemaree and his mother, and Udo Loew, a cousin.



to visit; on the west side of the island live the Carajá; on the endless savanna of Mato Grosso, the Shavante, until recently very warlike, and the dreaded Cayapó; finally, on a tributary of the Araguaia, live the vanishing Tapirapé.

A few years ago it was folly to pass the night on the west bank of the Araguaia. There was danger of an attack by the Shavante. Today these Indians are peaceable, but encroaching civilization threatens their way of life, their hunting and fishing grounds —possibly even their continued existence.

The Indians most frequently in contact with our civilization are the Carajá, on the main stream of the Araguaia. They relate that their god Kanashivue made the stone barriers in the lower Araguaia in order to dam the waters upstream and hold back the fish that are so necessary for their daily food. If Kanashivue had not done that, all the fish would have swum away with the down-flow-



Tonià, a Medicine Man, Endures Pain While His Legs Are Scraped

Openmouthed, Teemaree watches the ritual bloodletting. The Indians slash the skin of arms, chests, and legs with fish teeth embedded in a piece of calabash. They clean the wounds with a palm leaf and rub in pepper juice, an astringent.

Tonià told the boy that the cutting helped him see farther, hear better, and catch more fish and game.

"It must hurt a lot," says Teemaree, "but Tonià was calm and even laughed.

"Tonià was my best friend—my big brother. He took me everywhere and taught me many things."

ing water, and the Carajá and their children would have starved.

For Teemaree the village of Araguacema is a new world. For the first time in his life he goes near a cow, which he spies ambling through the streets, among the little adobe houses. He and the village boys climb trees and take their baths in the river. Soon he brings home his new friends and a handful of colorful frogs they caught under the stones.

The President of the Municipal Council of Araguacema places a 30-foot dugout at our disposal. A missionary from the United States helps us find gasoline for our 2½-horsepower outboard motor. In the local market we buy provisions for a month. Three days after our arrival we are moving upstream (page 66).

Nets to Keep Out Mosquitoes—and Jaguars

Because of the hot sun, we halt for lunch in the shade of the forest on the bank. Toward evening we cook our main meal and rest on the beautiful, clean sandbanks.

We stretch mosquito nets over four posts and, beneath, a ground cloth to lie upon. At this season, mosquito nets protect from the heavy dew, which

Women Follow Male Dancers in Outlandish Costumes

Mother-of-pearl eyes stare from macaw-feather masks that represent river spirits. In the dry season the Indians don the hoods for dances petitioning the gods for favorable crops. Men make the costumes in a bachelors' hut, where youths go to live until they take a wife.

Two girls follow each pair of masked men but always keep their distance, stopping when the men stop and never venturing onto forbidden, male-only ground.

The rhythm of rattles sounds a cadence for the steps of the palm-leaf-skirted dancers.

drenches everything. There is a theory also that jaguars do not attack a person sleeping under a net; the white stuff gleaming in the dark makes them uneasy.

Suddenly I hear Teemaree cry: "Papa! There is a round, flat fish! He is this big!"

He opens his arms, making a circle with them. It is a sting ray, which has a barb at the root of its tail, covered with a caustic slime, or mucus. The fish generally remains invisible, covered with sand or mud. Woe to the unwary who tread upon it. The muscular tail slashes with great force, and the barb pierces the victim's heel or calf, inflicting wounds that are difficult to heal.

In the evening the rays like to rest in the shallow water. Here they are secure from enemies. The next morning we see numerous round holes in the sand, where the rays made their bed for the night.

"When you wade in the water," I tell Teemaree, "always push your feet along the bottom; never lift them. If you only touch a ray without stepping on it, it swims away without injuring you."

After a three-day journey, we meet our first Carajá Indians, camped on a big sandbank. They have already adopted some of the trappings of our civilization—battered aluminum containers, tin plates, and rags of clothing. But they also still use some original articles of their Indian culture—clay pots, feather ornaments, bows and arrows.

Pet parrots screech, dogs bark, and children romp in the sand. Teemaree joins them, playing with their baby caymans, turtles, parakeets, and terns.

Lesson Not Learned at School

On the other bank stand a few houses of Brazilian cattle raisers.

"It is only about three hours up to the northern end of Bananal Island," they tell us.

A boy brings horses down the steep bank for watering. One stands with its forelegs in the water, which drops rapidly to an unknown

In big pots beside the river, women make a mushy soup out of manioc root. "Before the soup is done, they chew the root, then put it back in the pot. I learned this only after I got to like the soup, so I ate it anyway."

"**Often I helped peel** the manioc root, which looks like a long, rough potato. Soup made from it tastes bitter, but sweet right after the bitter. The Indians have maize, too, and squash, watermelons, sugar cane, and bananas."

depth. It bends its neck far down and touches the water with its lips.

Suddenly the big placid beast stumbles. It rights itself, stumbles again, then rushes violently up the steep bank. A long black something has emerged from the depths and brushed against the horse's foreleg. When the horse first righted itself, the black thing came to attack again.

The boy who is holding the animals on the halter cries out and throws stones at the water. An electric eel as long as an arm disappears into the depths.

"See, Teemaree?" I say. "Don't jump into the deep waters. That horse received an electric shock."

Day by day he will see and learn where danger lurks in these wild regions.

In the middle of the stream, schools of river dolphins are playing. They dive and splash, snorting happily. Teemaree rejoices when he recognizes these animals he has read about in books.

With an Indian from a near-by cattle ranch as guide, we turn into the east branch of the Araguaia, which, with the main stream, encircles Bananal Island.

Firelight Glow and a Radio Set Lure Blanket-wrapped Visitors

Nighttime hospitality draws Javahés to the Schultz campfire—to get a cup of coffee, watch with delight as Mrs. Schultz makes manioc-flour pancakes, or simply listen to radio music (left). Blankets give protection against insects, active only in early evening.

During the rainy season the Indians leave the sandy riverbank for huts on higher ground.

"**This little heron** couldn't fly because he was too young. We took care not to let his bill loose; it could put out your eye. Our guide said so."

"**Toniá made a bow** for me and showed me how to shoot in front of a flying bird so it and the arrow come together. But I wasn't very good at it. Often I chased lizards in the grass."

Teemaree Engages Toniá in a Favorite Javahé Sport

"I thought Toniá would let me win at wrestling, but he did not; he stood strong like an iron rod stuck in the ground.

"Some days the boys and young men wrestled for fun at the *mak* house, where the bachelors live. Toniá always won, but he did not boast about it, and the others did not get mad when he beat them. Everybody laughed during the fights."

"**Making mats from palm strips** takes quick fingers. This man showed me how. He could not speak Portuguese, so we could not talk, but we became good friends."

Javahé put the mats to use in numerous ways. Tossed over a framework of sticks, the woven strips provide shade from the tropic sun. Lashed to upright supports beside cooking fires, they prevent sand from blowing into the pots. And at night they serve as sleeping pads.

Indians Fashion Dolls From Riverbank Clay

Helping a tribal artisan, Teemaree learns that the clay dolls must dry for days in the sun, then be painted with tiny lines. He tried to make dolls but soon gave up.

Women shape the dolls' hair from beeswax and color the bodies with the same paints they use on themselves. Indian children play with the toys, and traders buy them.

Red pigment comes from urucú seeds, and the bluish-black tinge from genipa fruits.

Javahé babies still nurse long after they can walk. This child, who already has teeth, eats fish and manioc. Like the dolls (above), he wears a red bracelet. The baby's is made of crocheted cotton stiffened with urucú. Adults darken and dress their hair with paint and palm-nut oil.

Finally we turn again, this time into the Rio Lever, a narrow, winding riverlet that rises in the south of the island. No one can live here during the high-water season, for then great expanses are flooded and form extensive marshes.

When we camp for the night on a dry sandbank, terns cry complainingly above. Near us we find some speckled gray eggs; naked baby birds run away from them and hide in the sand. Teemaree wants to handle the little birds, but their parents, with frightening cries, swoop close above his head. He does not dare follow the little ones any more.

Teemaree Catches Bloodthirsty Piranhas

Our main foods are rice, coffee, zwieback, and the bloodthirsty little fish called the piranha. The sun and air make the boy forget all his preferences. He is hungry and devours whatever we give him.

Teemaree is proud of his ability to provide food for the family. Every five minutes he cries out, with a sparkling silver-and-red piranha dangling on his line. He does not yet realize how dangerous these fish are and wants to take them off the hook himself. One of us has to jump and take them off for him. The powerful snapping jaws could easily tear away a piece of his hand.

In the morning we see water pigs—capybaras—lying on the riverbanks in the sun. A shot rings out; a capybara rears, plunges down the steep bank, and quickly disappears into the river.

Our Indian companion fired the shot. Now he pokes about with a long pole until he has found the pig. He dives and brings the animal up intact. No piranha has bitten into it.

Yet at noon, when we wash a leg of the water pig in shallow water, hordes of piranhas swarm out of the depths and bite into the meat. So greedily do they hold on that we bring them in clusters onto dry land, where we shake them off. Naturally, no one—not even Teemaree—wants to bathe here.

At dusk there is a great splashing and a tapir comes swimming across the river. Teemaree runs to the water, welcoming this new friend. He had no thought of hurting or killing it, so he is surprised when the animal turns and disappears into the water.

All night we hear the wailing cry of the jaguar. He sneaks around our camp at a discreet distance. Toward dawn his voice is no longer heard, and Teemaree looks both sorry and glad. He wants the jaguar to come near so he can see it, but he is afraid, too, and sleepy.

Herons flap aloft at the approach of our boat. Black-headed storks stand on a sandbank. From a distance they look like a gathering of philosophers, with their heads deeply bowed. Teemaree likes to see them flying. He jumps and cries, waving his arms. These long-legged birds run clumsily, flapping their wings and giving the appearance of an airplane taking off and retracting its landing gear. They are almost as big as Teemaree.

Young Stork Gets Foster Father

A chorus of screeching, whimpering, wailing, and singing leads us to a nesting colony of storks. Numerous herons nest near by. Ground and trees are dead white from the birds' droppings.

High up in a fork the parent storks crouch beside huge nests made of twigs. They peep down at us curiously and fly up only when we come close.

Our Indian guide climbs a tree and brings down a half-grown black-headed stork.

"There, take it. It's for you, Teemaree!"

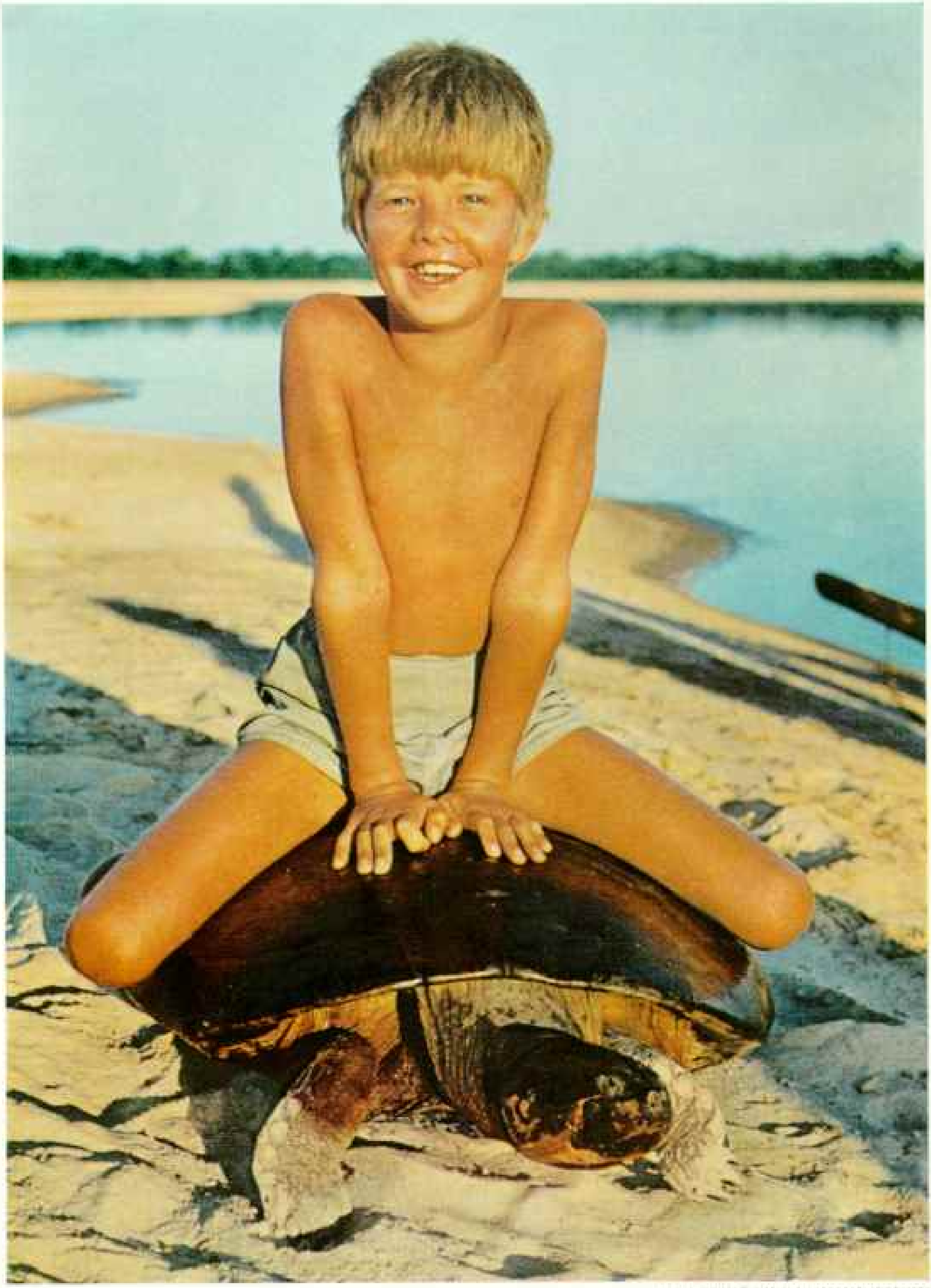
The present means catching more fish now, for the young bird's appetite is insatiable.

Teemaree smiles proudly. "I'll catch plenty of piranhas for him. I'll take care of him. He is mine!"

A few decades ago, the fauna in this region was abundant. Herds of water pigs grazed on the banks. Families of otters swam close to the boats of travelers, crying like humans. In the woods lived herds of wild pigs—peccaries—which the Indians killed with lances tipped with jaguar bone.

There were thousands of caymans. These alligatorlike creatures lay sunning on the banks with their tooth-armed jaws wide open.

The Author: Harald Schultz, father of Teemaree, has provided GEOGRAPHIC readers with unparalleled insights into the life of Brazil's remote Indian tribes: "Children of the Sun and Moon," March, 1959, and "Tukuna Maidens Come of Age," November, 1959. The Brazilian-born, German-educated ethnologist has led many expeditions for the São Paulo State Museum. Mrs. Schultz, also a member of the museum's staff, has shared many of her husband's adventures among primitive peoples. She recently completed several months of study in the United States under a fellowship from the Organization of American States.



Vacation-time Indian Tries a Ride on a Plodding Steed

"Indians kept this turtle captive with a rope through a hole cut in its shell. We boys perched on top while the turtle crawled to the water, and that was fun. But in the river it could turn on you and bite with a bony beak or scratch with sharp claws. Once I ate some turtle meat, and it tasted better than chicken."

Today they are rare in all the rivers of the Amazon system. *Caiman niger*, in particular, which grows up to 15 feet long, has been almost exterminated. When it was discovered that its skin could be used for leather, a veritable hunt to the death began. In the course of a few years untold millions of caymans were slaughtered. Now the hunters are turning to a smaller but still rather abundant species of cayman, which averages only six feet in length.

We have already traveled five days on the Rio Lever in the heart of Bananal Island. Human beings are rarely seen, and no one knows exactly how far it is to the Indian village. Finally, we are assured: "It is still three days' journey with your motor."

Searching for Turtle Eggs, Teemaree Follows a Telltale Trail in the Sand

Morning sun shadows turtle tracks by the river's edge, making them easy to see. Winds soon will erase the marks, and only trained eyes then can spot the hillocks where the turtle laid her eggs. Taught by the Indians, Teemaree became expert in finding nests.

"One day I gathered so many eggs we nearly got sick eating them." The Schultzes tried the yolks raw, with sugar, and found them delicious.

At last we see a dugout coming down the river. We stop the motor. The Indian boatman comes near and asks our names. "Arode!" exclaims our new friend, Kumaná, in the typical Carajá pronunciation of my first name, Harald. "I know the name. My relatives have told us of thee. I will help thee."

I am surprised and pleased, for many years have passed since last I visited the Carajá. We should have turned back in despair soon if we had met no one after so many days of traveling.

Kumaná turns his dugout and travels upstream with us. After an hour we find the deserted Javahé village on a steep bank. The villagers have just moved up a tributary of the Lever and camped on a sandbank to be near the water; they do this each year as the river recedes.

When later we looked at the map of Bananal Island, we were astonished that we had found our way. Our Indian guide had never been here before, and the Rio Lever is a ramified system of many branches, channels, and lakes.

The Javahé village, we learn, is called Jatobã. About 30 people—men, women, and children—live here. The chief is the oldest, a strong man of about 50; he has three wives, the other men one each.

In late afternoon two young men arrive in a dugout. Their canoe is covered with palm-fiber mats so that nothing can be seen of its cargo. The youths take out two bundles and open them in the mask house, a hut at the end of the sandbank. A screen of palm leaves walls one side for privacy.

The bundles yield two fantastic costumes—red, blue, and yellow, with rows of feathers and big eyes of mother-of-pearl. The skirts are long, spirally coiled fringes of palm leaves. These are the *aruanã* fish masks of the Carajá (page 69). We have had the good luck to arrive just at the beginning of a dance.

Old myths tell of the origin of the masks and dances. Some describe strange beasts that came up from the bottom of the river; others tell of the time big *piraruch* fish appeared as human beings and then disappeared into the water again. The Indians perform their deeply religious dances throughout the dry season.

Telling Men's Secrets Invites Peril

Kumaná comes to us, very serious, and says: "Arode, I know that you are an old friend who understands our ways and respects our religion. Your boy does not know. Tell him about it."

"Teemaree, come here and pay attention," I say. "Those masks are very dangerous. Never speak about them to the women. You must be extremely careful; never forget and

Teemaree fishes from an Indian dugout. Ashore (right), he feeds a catch of voracious piranhas to a baby *carará*—a snakebird, or anhinga. "I caught the red-and-silver fish with a hook; the big *aruanã* Tonià shot with a bow." Piranhas, vicious denizens of the Amazon and its tributaries, can clean to the bone the body of a wounded animal within minutes. They take a fisherman's bait readily, and their flesh makes a tasty meal.

tell at the village what you do and see around here. The Indians would become very angry, and perhaps even kill you if you did. This is a very serious matter. Beware!"

There is dancing every day. One or two masked dancers appear in front of the screen that hides the mask house from the sight of the women. Rhythmically they swing the rattles, singing and executing little dance steps. The head parts of the masks rock, the palm-leaf skirts rustle, and the sand crunches under foot.

The women sit in the sand near the airy palm-leaf huts combing one another's long, smooth, blue-black hair or spinning cotton. According to ancient custom, two of them are clad only in girdles made of inner bark. Their naked bodies are adorned with beautiful black geometric patterns.

Soon two of the masked men approach, dancing and singing. They turn around at the halfway point, then come quite near and turn around, beginning their long way back to the screen.

When the dancers are some distance away, the two women follow them with tripping steps (page 68). They move with knees bent and, in rhythm with the singing, rub their bare bodies with their hands.

If the masked male dancers stop, the women also stop immediately. Finally, they turn about and run quickly back to the women sitting in the sand, while the masked figures dance to the screen.

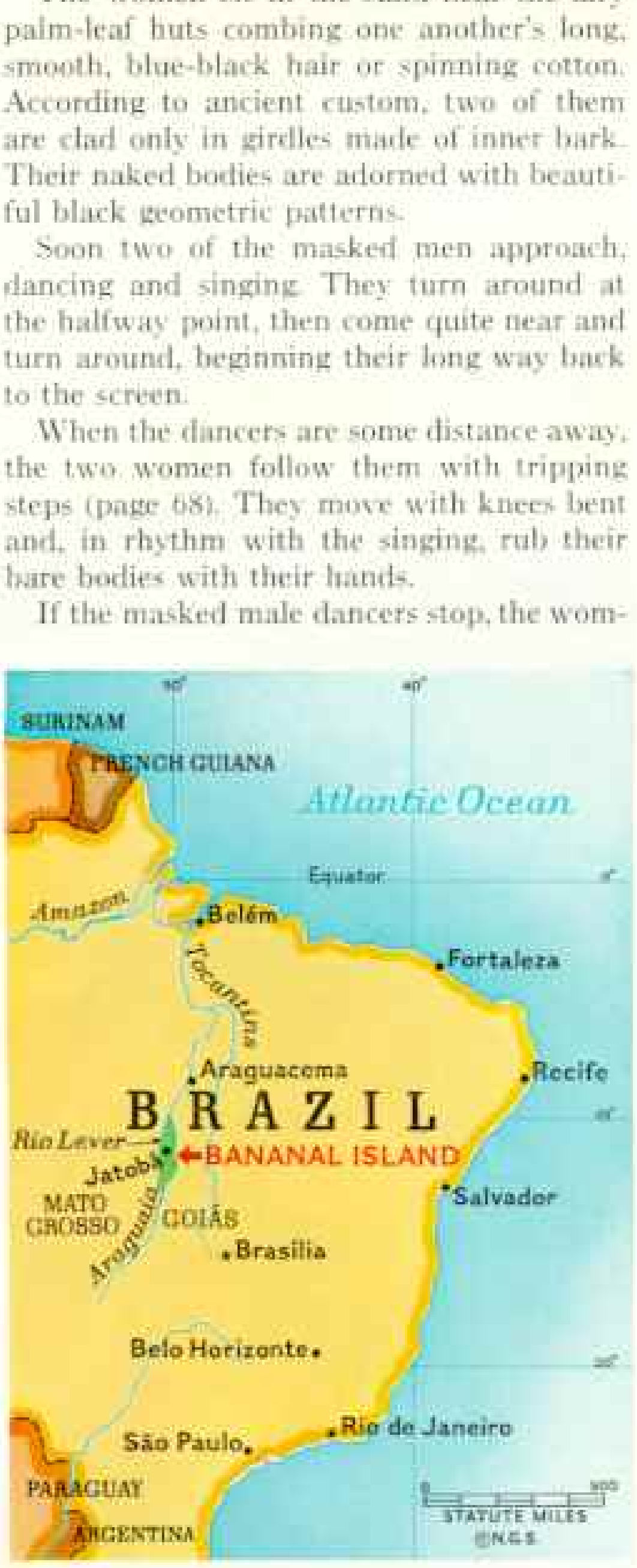
The masked pair disappears behind the screen and another pair starts up. This continues the whole afternoon until late into the night, every day, every evening, throughout the dry months.

Old melodies are sung with age-old verses whose meaning is no longer easily understood by the Indians. New rhymes and new tunes are also invented and carried from one village to another, until all are singing them.

When the time comes for work in the fields, a pause intervenes. For ten days the dances cease and then are continued until the rains, when the sandbanks grow small and the Indians are compelled to move their houses to higher ground.

Visiting the mask house is forbidden to

Muscled Javahé hunters trap



New Jersey-size Bananal Island lies 800 air miles from Teemaree's city home in São Paulo.

KODACHROME BY HARALD SUND/TI © NATIONAL GEOGRAPHIC SOCIETY

a swamp deer at a river crossing. Noose and pole help to drive the animal ashore

women. If, however, a young woman's curiosity is too great, and she cannot help attempting to fathom the secret of the men's mask house, the punishment is severe. In earlier times she could have been killed; today she risks becoming the prisoner of the young men living there.

Boys of about 12 leave their parents' house and live in the mask house. Here they are initiated into the old traditions, learn all kinds of manual work, make the holy masks, and learn the songs thoroughly.

Bachelors Enjoy Life of Ease

Not until men are married may they dwell in the village. But during their bachelorhood they are supported by the village. For this reason a lazy fellow frequently prefers to delay his marriage.

A Javahé of about 30, with a large hooked nose, dark eyes, and muscular body, took Teemaree to his heart from the very first day.

"May Teemaree go fishing with me?" he asked.

The look of the man won our confidence. Toniá became Teemaree's trusted friend and took the boy everywhere with him.

When they are in the canoe, we can see from afar the boy's yellow hair gleaming among the dark Indians. At sundown they return, and Teemaree drops a string of piranhas on the sand. They are dead, he believes, but one still has strength enough to snap at his finger.

Teemaree returned from one of his fishing expeditions in a state of high excitement. In a lake he had found a school of tiny blood-red fish, a kind he had never seen before. When I went to the spot, I recognized the species as one I had collected 12 years earlier. All my specimens had died, however, on the trip back to civilization.

This time I collected 200 of the inch-long fish and carefully kept them alive in cans of fresh water. Forty survived the journey to São Paulo, and of these I sent a number to the National Museum of Rio de Janeiro, where they were given the scientific name *Hyphessobrycon haraldschultzi*.

During the course of the dry season, the river recedes farther and farther and the Indians follow with their possessions, to be close to the water. The children spend the whole day bathing, fishing, and playing.

One day the Indians row to the other bank, where the timbó vine thrives. They cut long pieces and tie them into bundles, for they plan to kill fish with the poison sap.

Early next morning, the Indians again set forth in their dugouts. Teemaree helps with his small paddle, and at length they reach a lake hidden in the forest.

The Indians push forked poles into the ground. The bundles of timbó vine are crammed into these forks, and then heavy blows with clubs reduce the vines to fibers.

Next the Indians wash the frayed timbó bundles in the lake. The soapy sap of the timbó sinks into the depths. It will clog the gills of the fish, causing suffocation.

The work stirs the mud and the water becomes more turbid. At first no fish are to be seen. The lake seems devoid of life.

Now the silvery light of the sun bathes the surface.

"There come the fish!" an Indian cries.

Near the bank, where the water is shallow, troops of tiny fish move along as in a dream. The sight stimulates the Indians again. The clatter of the cudgel on the bundles of vines becomes faster.

"Tomorrow," says an Indian, "all the fish will be dead!"

Early next morning, before sunup, women and children appear at the lake with baskets and knives. The terns have already arrived;

Trading Boats Come Up the River to Buy the Indians' Sun-dried Fish

Javahés trek to the area's lakes for *pirarucú*, fish that sometimes exceed six feet in length. They trap them in nets stretched on the lake bottom. Dried, the catch may be bartered for tools, clothes, kerosene, and other needs.

Rubbing salt on a slab of pirarucú, an Indian prepares it for drying. Traders sell the meat to rubber tappers and other Amazon Basin dwellers.

they cry shrilly as they seize the dead fish from the surface. Kingfishers whir over the water and dive almost perpendicularly, then soar upward and fly in soft wavy motion to a branch to devour the prey, a small fish.

Into a small, shallow stream bed, the outlet of the lake but now almost dry, tens of thousands of dead fish have drifted, their bellies turned upward in death. The Indian women wade in, groping for dead or dying fish. They seize them and throw them into the baskets on their backs.

Teemaree tries to save the most beautiful fish by putting them in fresh water in a bucket. We know it is useless but do not stop him.

Traders arrive at the beginning of the dry season. They hire the Indians for catching fish and hunting. The largest scaled fish of the region, the pirarucú (*Arapaima gigas*), lives in the big lakes. It grows to more than six feet, and its flesh is a delicacy. Fresh or dried and salted, it constitutes the basic food in many regions of the Amazon and central Brazil.

Some Indians now harpoon these giant fish, but our Javahé friends still know how to catch them by the ancient technique of using narrow bottom nets with wide mesh.

They observe attentively the surface of the lake. Over there something moves, a flashing body springs half out, showing red-speckled scales.

Medicine Man Makes Waders Brave

As soon as the Indians see where the big fish are, they know where to stretch the net. They will hold it to the bottom of the lake with poles. Indians will wait at both ends of the net, one of them armed with an ax.

But first the water must be made safe. One of the Indians waiting on the bank has shot a fish with a bow and arrow. He hands it to the medicine man. Another brings the tail of an iguana.

The medicine man builds a frame of branches, kindles a fire underneath, and roasts the fish and iguana tail lightly. Then he lays them together on the bank and utters some conjuring words, at the same time throwing small pieces of the roasted animals into the water. Finally he and a companion energetically puff on a short pipe, raising huge clouds of tobacco smoke.

This ritual, the Indians believe, guards them against attack by the piranha and the sting ray. Now, without hesitation, they wade into the lake.

Teemaree wants to jump into the water, too. He says there is no danger: "Did you not see the doctor making his spell?"

We try to discourage him tactfully, so as not to offend the Indians.

Starting at the end of the lake, the Indians flail the water with long sticks. Frightened by the noise, the huge fish dive and swim along the bottom to the spot where the net is stretched.

A fish becomes entangled, and Teemaree's friend Toniá, tending the net, dives quickly. When he reappears, he holds the big, fat fish, with his arms wrapped tightly around it. The Indian with the ax swims over and deals the fish a lethal blow.

Proud of his friend, Teemaree looks at him openmouthed. Toniá is proud too; he looks down at the amazed boy and laughs, then hoists Teemaree to his shoulders.

So now the Javahé have meat for salting and drying. Civilization has not yet destroyed the abundance of nature here.

In the fields, manioc grows in profusion. Maize ripens at the beginning of the rainy season and is stored against times of need. Squash, beans, and sweet potatoes provide a change of diet. Sugar cane, bananas, watermelons, pineapples, peppers, cotton, and other produce are to be had for the picking.

Every year another piece of forest is cleared. Shortly before the first rain, seeds and slips are planted, and soon a new yield thrives in the fecund earth. Forest and savanna provide honey and fruits, and game is not yet scarce here.

Whole Village Pursues a Deer

In the fierce noonday heat, humans and animals take refuge under the palm-leaf roofs; all work is suspended. Yet even the tropical siesta may be interrupted.

"A deer!" a cry rings out. "A deer!"

"Where?" asks someone excitedly, springing up eager for the hunt.

"There, at the end of the sandbank!" comes the reply. "Now it is going to cross the river. It is going into the water!"

Only the animal's head can be seen on the surface of the water. Two boats move quickly to the opposite side of the river to head off

"The Indians Kept Lots of Pets, and I Played With Most of Them"

Parrots perch on sticks or hut posts; many have feathers missing because the Javahé use them for decoration.

A baby anhinga squirms in Teemaree's lap. To the young stork standing at his side he gave the name Kua-kua "because that's the sound he was always making."

Spindly black legs of a heron, which the Indians call *magnaree*, serve as stilts when the bird goes wading.

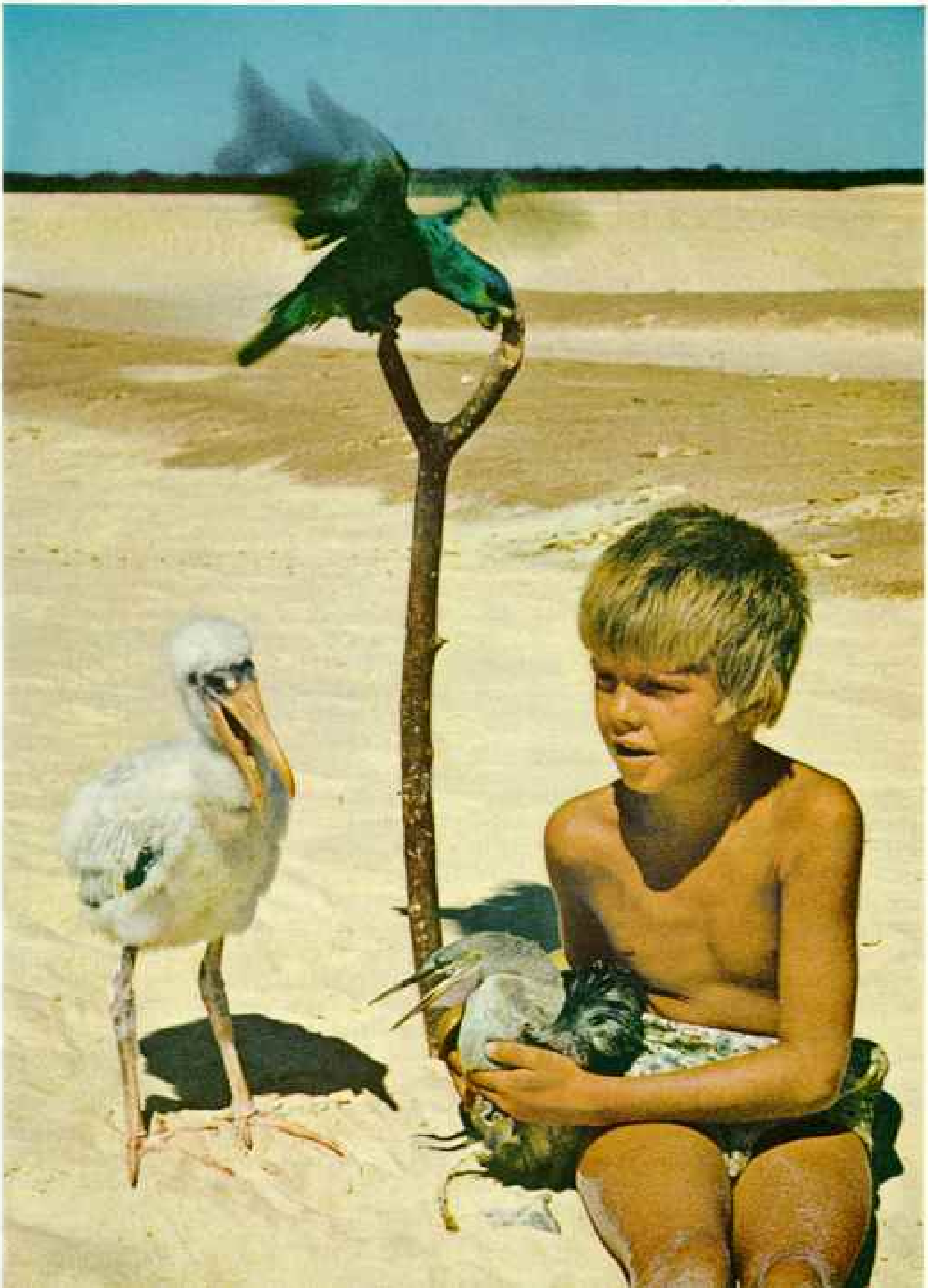
the animal. Others surround it and drive it to the bank, the beast swimming for its life. We see that it is a young one.

In the shallow water the hunters hinder the animal from running with long punting poles (page 82). The deer springs up, makes a mighty leap, and lands in one of the boats. There is loud laughter.

Now the women and young people rush from the camp to join in the chase. A youth attempts to lasso the animal with a noose, and the frightened deer tries to strike him with its sharp hoofs.

After many attempts the Indian finally catches the exhausted animal in the noose. Soon savory venison simmers in every pot.

This carefree life is too much for a city boy. Teemaree forgets completely who he was. He



Sleek baby otter, crying for its mother, lets Teemaree pet it. Traders killed its parents, giant otters that in Brazil grow nearly six feet long. "Papa says there used to be lots of them, but they are scarce now because ladies liked their fur."

feels that he wants to become a Javahé, and to us he announces his decision.

"I want to be an Indian. I want to live here for the rest of my life."

Then he adds, "You are going to live here, too, with me?"

"Well, we could," we say. "But we have our friends, our house, our whole life in São Paulo, you know. We have to go back."

Forest Would Become His School

"If I stay here, you can come to visit me," Teemaree replies. "I spoke to Toniá already, and he said he is willing to take care of me if I want to stay. He is a wonderful man. I like him; he likes me. Everything is settled. I am staying here! Instead of going to school, I will learn my lessons here, fishing and hunting."

"And eating only what they have to eat?" we ask. "And working in the fields, and bearing mosquito bites, and having no medicines when you are ill, and being far away from us, papa and mama, who love you so much? Would you be away from us forever?"

"Well, let us say two years. All right?"

Noting our astonishment, Teemaree says: "O. K. One year, and then you come to fetch me. And about all the rest, I do not mind."

Fortunately, the decision is taken out of our hands.

From time to time the men gather for a strange ritual. The medicine man appears with a triangle of calabash into which he has inserted a row of teeth of the *cachorra*, or "puppyfish." He pushes a pole into the sand, upright. An Indian grips it with both hands.

With rapid, sure movements, the medicine man passes his sharp instrument over the upper arms, the chest, and the upper thighs. The patient betrays no emotion whatever. Stoically he clenches his teeth, and soon the blood streams from the long wounds and covers arms, chest, and legs (page 68).

A piece of dried palm leaf is used to wipe off the blood, and the wounds are washed in the clear river water. Then the Indian crushes a green pepper pod in his hands and rubs its juice into the wounds. Its strong astringent effect closes them.

The Javahé have themselves bled in this way every few months. They say it purifies and renews the blood, but they also believe that it is important before fishing and hunting expeditions, and, formerly, before going on the warpath. Many believe also that it is helpful to them in matters of love.

Toniá is the medicine man. Teemaree is also watching. Toniá says: "Well, Teemaree, do you really want to be Javahé?"

"Yes!"

"All right, hold on to the pole."

Teemaree obeys. Toniá quickly turns the wound scratcher over and with the harmless back side draws it over the boy's arm. Teemaree, relieved, only laughs. He has seen through the joke, perhaps. He says: "I am still too little."

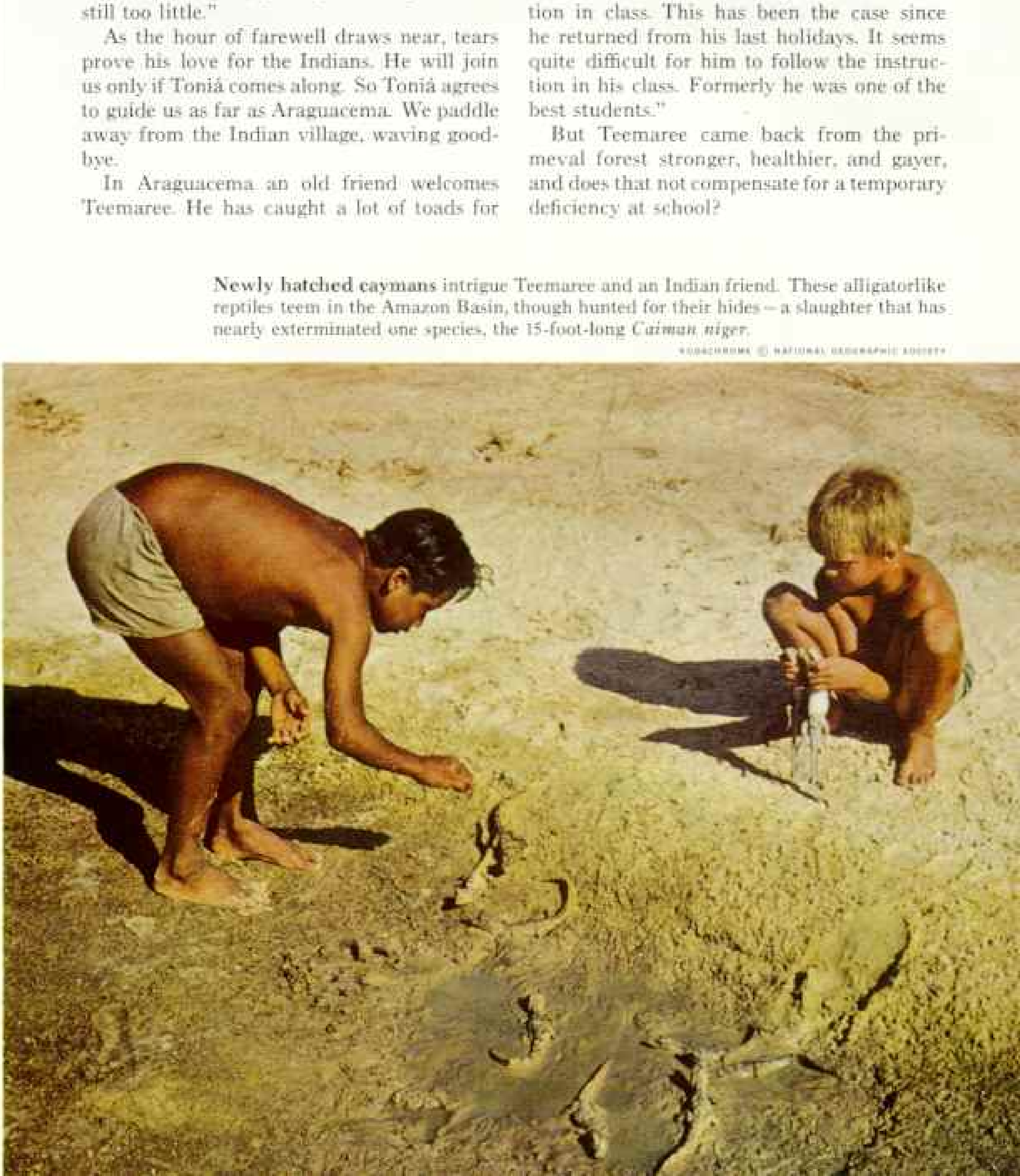
As the hour of farewell draws near, tears prove his love for the Indians. He will join us only if Toniá comes along. So Toniá agrees to guide us as far as Araguacema. We paddle away from the Indian village, waving goodbye.

In Araguacema an old friend welcomes Teemaree. He has caught a lot of toads for him. When Toniá leaves to return to Bananal, Teemaree is immersed again in new experiences. He is sad, looking at the canoe that soon is lost in the distance, but the toads wait in wooden boxes at the house of his friend.

Months later, in São Paulo, Teemaree's teacher writes me a note.

"Your son Alexander passes his time in dreaming and does not pay sufficient attention in class. This has been the case since he returned from his last holidays. It seems quite difficult for him to follow the instruction in his class. Formerly he was one of the best students."

But Teemaree came back from the primeval forest stronger, healthier, and gayer, and does that not compensate for a temporary deficiency at school?



Newly hatched caymans intrigue Teemaree and an Indian friend. These alligatorlike reptiles teem in the Amazon Basin, though hunted for their hides—a slaughter that has nearly exterminated one species, the 15-foot-long *Caiman niger*.

High in Bolivia's Andes, Laguna Colorada spreads its red waters at 13,500 feet above sea level. In this rarefied atmosphere, the New York Zoological Society expedition captured the James's flamingo, which authorities had feared extinct. Author Conway, with telescope, sights a flock.

First published close-up by color camera shows the red eye mask and powder-horn bill of James's flamingo.

In Quest of the Rarest Flamingo

By WILLIAM G. CONWAY, Associate Director and Curator of Birds, New York Zoological Park

Photographs by BATES LITTLEHALES, National Geographic Staff

BLOOD-RED WATERS and sleeping volcanoes, shores streaked white with salt and a plain pitted black with lava, snow-capped Andean peaks ringing an arid Bolivian basin—this was the vista that awed us the day we first saw the home of the rarest flamingo.

But did the bird actually live in this forbidding domain? Our first anxious gaze revealed no sign of the mysterious James's flamingo, a creature ornithologists had come to fear might be extinct.

In laboring Jeep and power wagon—a converted military ambulance with four-wheel drive and folding bunks—we descended from a 15,000-foot pass toward the red lake 1,500 feet below. Laguna Colorada's ruby hue, caused by billions of microscopic algae, made it hard to sight the bright-feathered water birds we sought.

The first specimen was taken some 110 years ago, but the bird remained little known even after an expedition in the 1880's sent a skin back to England. The name, *Phoenicoparrus jamesi*, honors the expedition's sponsor, H. Berkeley James, a British businessman and ornithologist. While scholars studied the other five forms of flamingo, no *jamesi* was sighted for decades. By 1956

James's flamingos gather speed in a sprint across shallow Laguna Colorada

Preening flamingos prepare to bathe in clear water flowing from a warm spring into the lake. Colored alike, the sexes differ in size, males being considerably larger. The author counted some 3,600 James's flamingos even after they began migrating. Where they go in winter, no one knows.

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

and dance into flight. Patches under the wings flash scarlet

it was doubted that the *jamesi* survived.

Then a Chilean expedition rediscovered the elusive bird on salty, mountain-trapped Laguna Colorada, 13,500 feet up in the Bolivian Andes. In 1957 United States ornithologist Roger Tory Peterson, guided by Chilean naturalist Luis E. Peña, found the incredible red lake swarming with James's flamingos.

Now this bird was the quarry of the New York Zoological Society's Andean Expedition. We had come to study, photograph, and trap the James's flamingo. We also hoped to capture a cousin, the less rare Andean flamingo, for the New York Zoological Park. Neither species had ever been exhibited alive, and their habits were almost unknown.

Our party had assembled in the Chilean port of Antofagasta on a hot January day, summer in the Southern Hemisphere (map, page 97). NATIONAL GEOGRAPHIC photographer Bates Littlehales and I, arriving by airliner, were met by the same Luis (Lucho) Peña who had guided Dr. Peterson. Lucho's youthful face contrasted with his record as a veteran naturalist.

Lucho had provided the Jeep, power wagon, camping equipment, and three field assistants: Gerardo Barria, his right-hand man; Jorge Rottmann, a promising 18-year-old Chilean naturalist; and Leopoldo Jara, new to field work but armed with a wide grin.

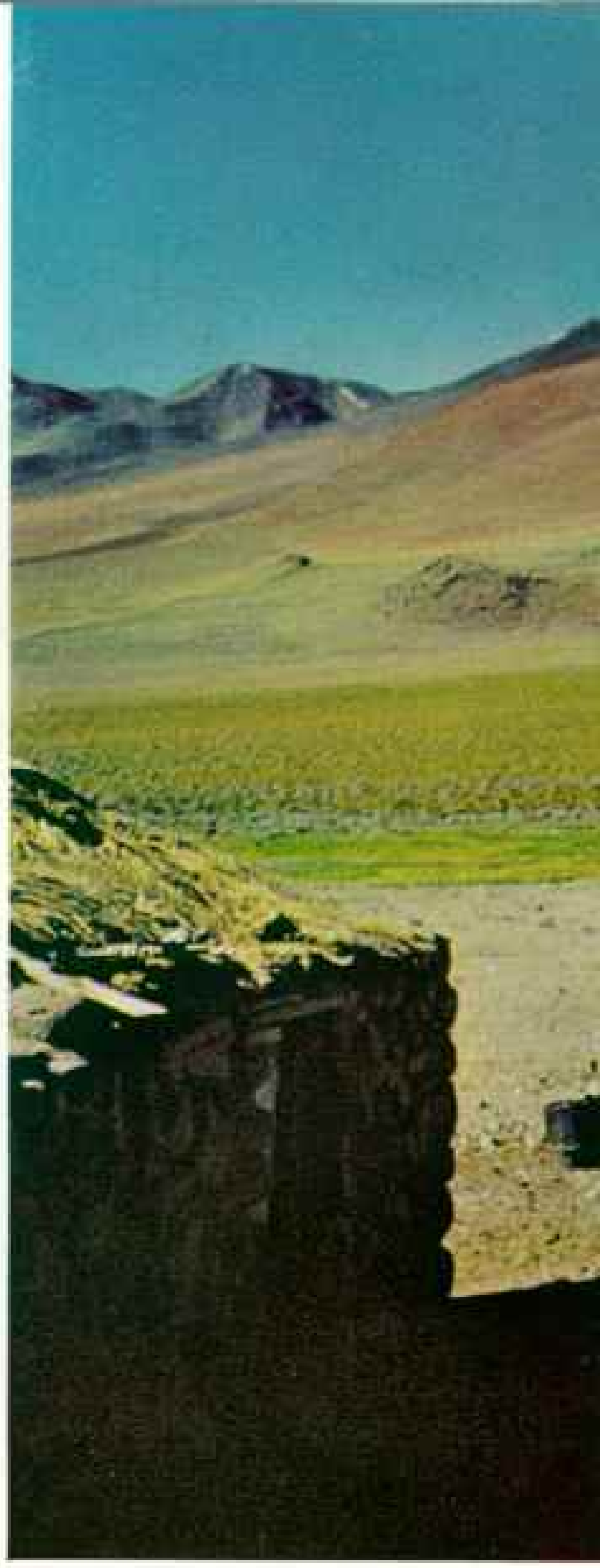
Loneliness Haunts the High Plain

Our first stop inland was the mountain town of Chuquicamata, home of the great copper mine of the Chile Exploration Company. There we met Mario Soza, our diplomat in dealing with Laguna Colorada Indians.

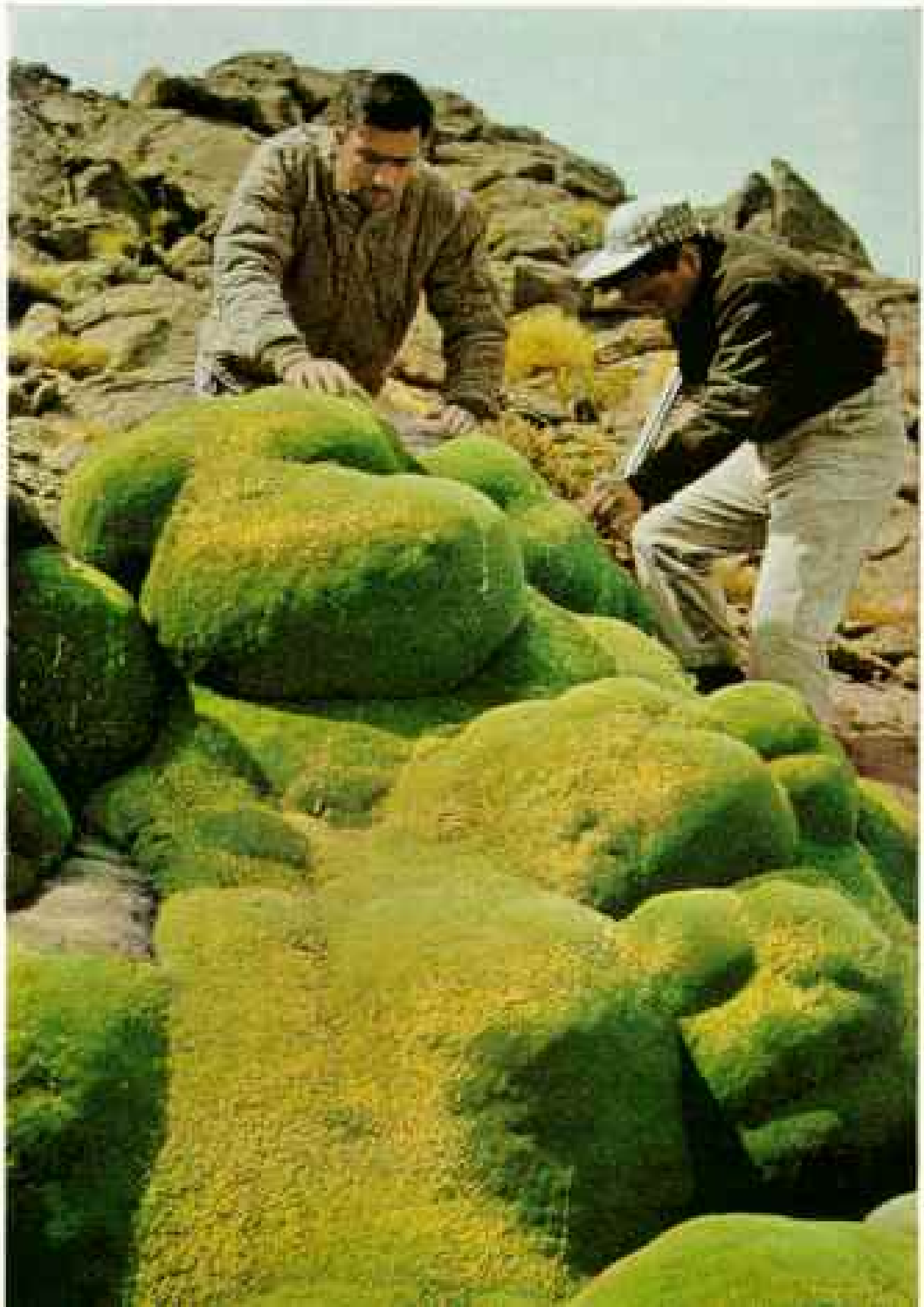
Chilean Indians Glean a Bare Living Beneath the Icy Dome of Inacaliri Peak

Each summer herdsmen drive sheep and llamas to sparse pasturage on the *puna* (background), the lofty tableland on the shoulders of the Andes. Before winter's arrival, they return to tend crops on the lower slopes. Barrel chests and extra oxygen-carrying blood cells enable these people to live an active life at altitudes that made the author's party violently ill. Children playing at 15,000 feet laughed at the visitors' heavy breathing.

Mother and child bring in *llareta*, a plant dried for fuel, from a stockpile in their yard (below). They live in the stone hut chinked with mud and roofed with *stipa* grass.



Billowy llareta, a brick-hard member of the parsley family, provides the chief fuel in an area devoid of wood and coal. In some parts of the Andes, Indians have chopped the slow-growing plant to the point of extinction. Indian boy at lower right holds a chunk of llareta.



FOOKSHRUMES © NATIONAL GEOGRAPHIC SOCIETY

Beyond Chuquicamata, the needle of Lucho's pocket altimeter neared 12,000 feet.

"The *puna* begins here," he said.

The puna is the high desolate area of the central Andes, where sparse *tola* bushes and *stipa* grass are the only vegetation (above). Snow-crowned peaks loomed ever higher and closer as we pushed into the barren region—homeland of vicuñas, of herdsmen descended from the Incas, and —we were virtually certain—of the James's flamingo.

Thunder and lightning bombarded the passes ahead as we reached Inacaliri near the Bolivian frontier. While we waited for sleet and chilling rain to move from our path, the high, thin air imposed a further delay: altitude sickness. Bates took to his bed, and the least exertion caused Jorge to suffer severe nosebleed. Others of us endured splitting headaches and nausea.

It took us and the weather two days to recover. Then we set out again to drive the remaining 30 miles to our goal.

Lake Alive With Brilliant Birds

Now the lake lay before us, its red water ruffled under a cold wind (page 90).

Or was it the wind?

Suddenly the red waves turned into reddish objects, the objects into wings, feathers, and bodies. Before our eyes the lake came alive with James's flamingos—hundreds of them! Wherever we looked they were feeding, bathing, strolling in stilt-legged dignity, their watery reflections seeming to double their numbers and redden their plumage.

Duck-trapping Mist Net Veils San Pedro Volcano

Teeming with bird life, the San Pedro marshes form a verdant oasis on the desolate puna.

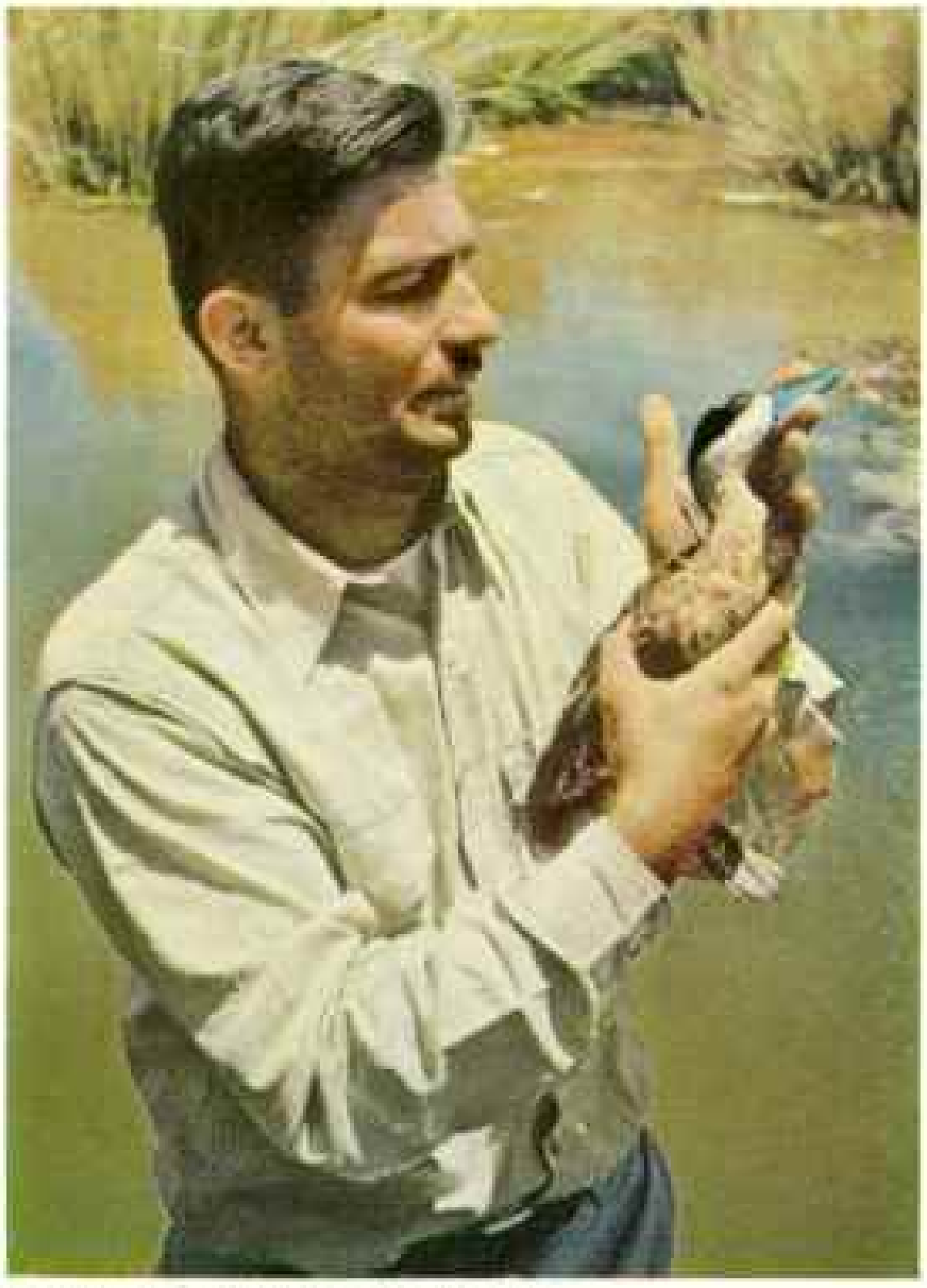
To capture the puna teal, the author stretched an almost invisible mist net in the birds' flight path. Yielding mesh braked the birds to a gentle stop and held them fast, like fish in a tangle net.

Naturalist Luis Peña steadies an extension pole while the author flattens grasses below the net. Hoary Mount San Pedro rises 20,207 feet.

Map shows Laguna Colorada, home of James's flamingo. Jeep and power wagon carried the author to Bolivia's Andes from Antofagasta, Chile.

Wild puna teal in the author's hands undergoes close examination.

Mr. Conway began his career at the St. Louis Zoo. In 1956 he joined the staff of the New York Zoological Park as Associate Curator of Birds. Recently he became Curator and Associate Director as well. Working in Trinidad with famed naturalist Dr. William Beebe, he captured the first mossy-throated bellbird ever exhibited alive.



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With the rare birds in sight, we impatiently deferred capture attempts until we had made camp. Pitching the tents was a battle; the wind, whipping out of the west, flapped the canvas exasperatingly (page 100). We later discovered that it blew on a regular schedule, arriving about noon each day and departing at eight in the evening. Such winds are characteristic of high valleys, the result of unequal heating of the slopes by the sun.

We shielded the campsite with the two vehicles, anchored our tents, and then donned hip boots for our first trapping effort. We could see flamingos preening near a mud spit (page 92). Perhaps we could catch the birds there. Our net must be placed by evening, we knew, to avoid alarming the birds near the trapping site next day.

Quickly we unpacked our "field artillery" —three small cannons. The guns would fire weights attached to the leading edge of the 30-by-75-foot net, casting the nylon web over any birds in the target area.

As the sun sank and the icy wind tore at our faces, we waded into the salt-laden lake and with stiff fingers placed the net. Then we

loaded, wired, and waterproofed the cannons. We strung cables to a distant blind, where we installed a detonator. There, next morning, I would keep vigil, ready to plunge the blasting handle home should flamingos venture into range.

The cold numbed our awareness of scenic surroundings until Gerardo called out one word: "Sunset!"

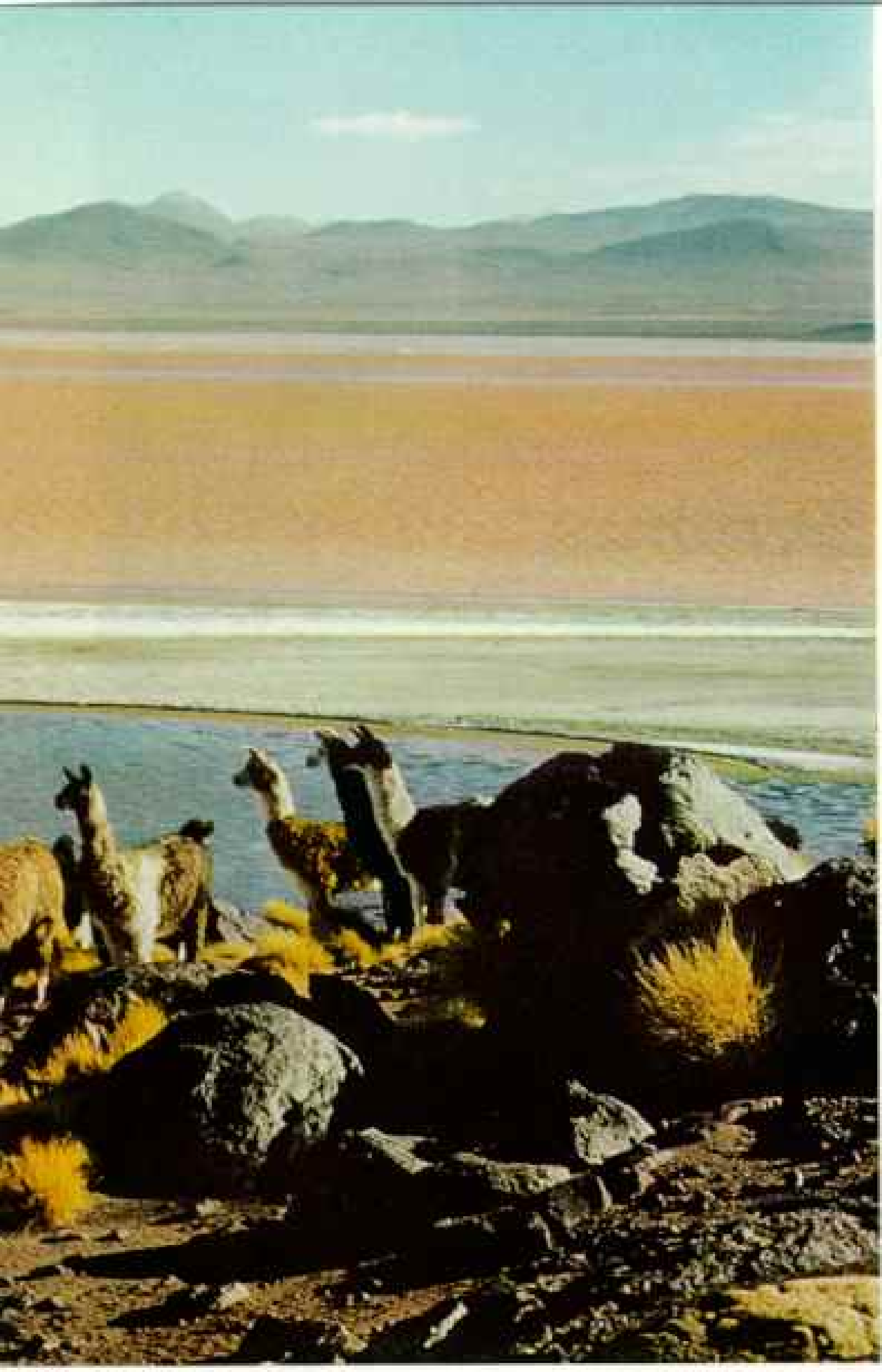
Looking up from our work, we beheld silhouetted peaks and a carmine sky above inflamed waters. Caught up by wonder, we forgot flamingos and marrow-chilled bones.

Next morning an inspection of the trapping site brought a nasty shock and delayed our trapping efforts. The water level had risen nearly six inches, flooding the cannons and submerging the net. Thus we learned that Laguna Colorada has a seiche, or "tide," raised by the powerful afternoon wind.

Equally depressing, we discovered ice in the shallows near the shore. While summer's daytime temperatures at the lake sometimes rose to 70° F., the thermometer fell drastically at night. We had assumed, even so, that the briny water would not freeze.

Wary Flamingos Avoid Net Area

Succeeding days brought no flamingos into range. To reach the blind unobserved, I rose in predawn chill and groped stiffly to the trap site. I spent hours watching the birds walking tantalizingly near by, bathing, feeding, fighting, and courting, but none set foot within the markers. Frustrated, I filled notebooks with sketches and fascinating data on



Llamas Stare at the Camera Beside Bolivia's Red Lake

These animals form part of a herd of some 300 belonging to an Indian who wears city clothes, rides a bicycle, and rents grazing rights from the government. Llamas are related to the Old World's camels.

Flamingo feather floats on Laguna Colorada's bright salty waters. The same algae that tint the lake provide nourishment for James's flamingos.

previously unrecorded habits of the species.

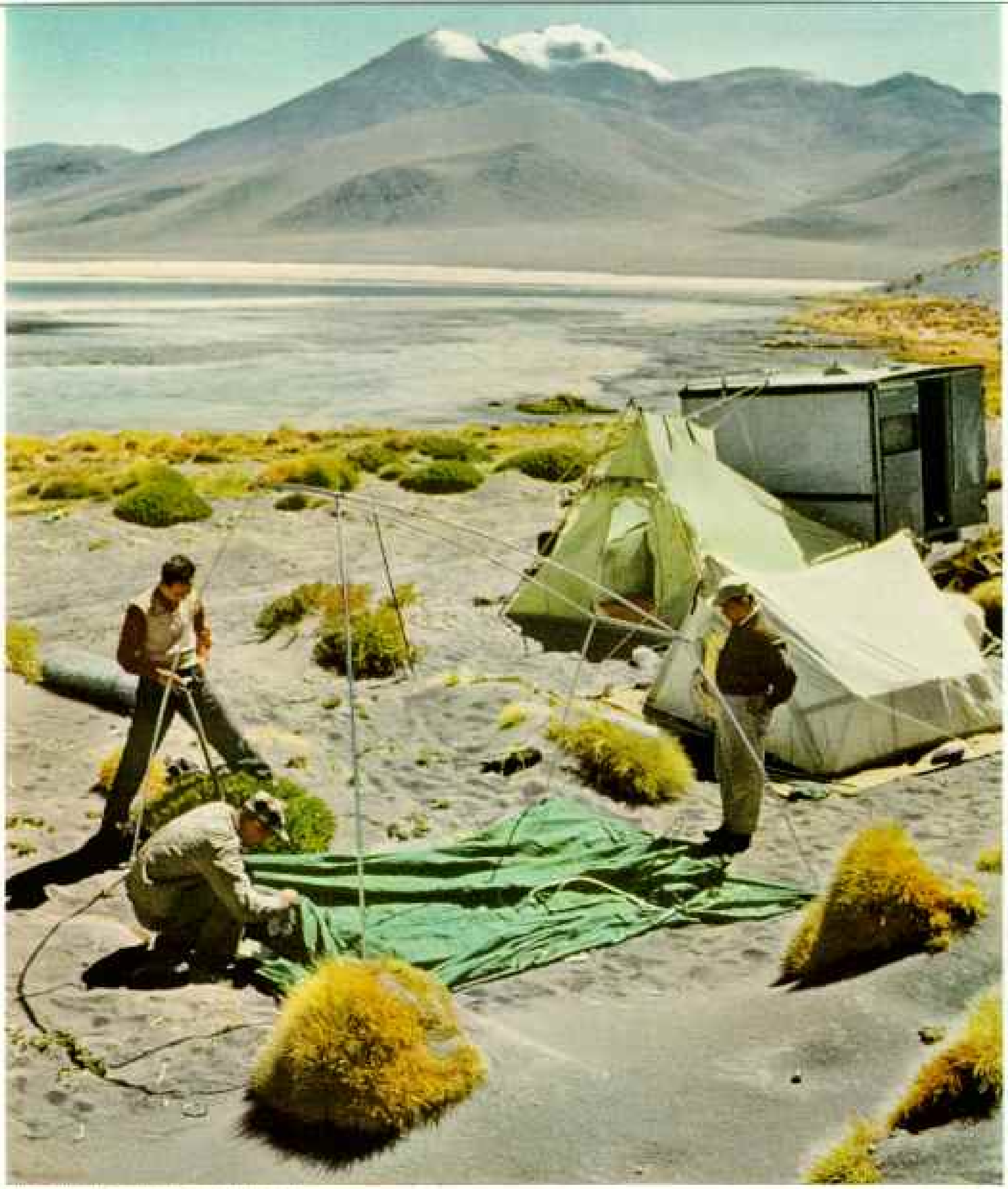
Do the *jamesi* migrate? Previous belief was that they stayed at their high lake the year around, but we saw flights departing for a less rigorous winter home, for autumn arrives early at these altitudes. Where the birds go remains unknown. The region, however, offers other salt lakes at lower elevations; these we regard as more likely havens than the seacoasts.

I looked in vain for clues to another mystery: When does the James's replace its flight feathers? The bird's cousins—the American, the Chilean, and the Greater flamingo of the Old World—drop all wing feathers at once, becoming temporarily flightless. We think it probable that all flamingos share the characteristic, although a search of discarded plumage on the shores of Laguna Colorada failed to produce a single flight feather. Our conclusion was that James's flamingos molt after they have completed their autumn migration and not before, as do other flamingos.

"Soup-strainer" Beak Traps Food

Despite the fact that migration had already begun, our flamingo census totaled some 4,000 birds in six colonies; 90 percent were the black-and-yellow-beaked, two-foot-tall James's. The blue-legged Chilean species, about a foot taller, ranked next in numbers. We saw only about 80 of the still bigger yellow-legged Andean flamingos, a few of which we hoped to trap along with the James's.

Each species had its favorite feeding grounds. The James's usually dined well out



RUDOLPH RUIZ © NATIONAL GEOGRAPHIC SOCIETY

Violent wind impedes the erection of the tents. Once it blew down the larger of the two shelters already rigged. Aluminum frame under construction will support a third. Van-bodied power wagon holds bunks, storage cabinets, and fresh water.

Each day at noon a bitter wind came in from the mountains and blew continuously until about eight in the evening. The bright summer sun burned rather than tanned. Temperatures rose to 70° F. by day, but fell below freezing at night.

Andean avocet turns its recurved profile to the camera. A mist net trapped the bird unharmed.

from shore, while the Chileans frequented the mouths of fresh-water springs. Yet even when they ate side by side, the two species probably did not compete for food. One reason: a difference in size of the grillwork in their amazing, soup-strainer beaks (page 102).

All flamingos possess intricate, toothlike filaments on tongue and upper beak, a feature that is both a strength and a weakness.

With tongues pumping powerfully, the birds suck water or mud from shallows, and the filaments help trap minute animal and vegetable life, while unwanted matter escapes. Thus the family taps a food source for which no other large vertebrate competes. Add the fact that the adult flamingo need fear no predator except man, and his survival chances seem good.

Like dinosaurs and other extinct creatures, however, the flamingo has become narrowly specialized. It can survive only in protected, salt shallows that produce the food it needs —including the microscopic plants that give Laguna Colorada such startling red hues. If deprived of its feeding grounds, it will not breed and ultimately must starve.*

Though we welcomed the chance to observe the birds, the long vigil at the traps sank our spirits. Then, one day about noon, flamingos suddenly appeared between the target markers—or so it appeared from my blind. With pounding heart, I fired the net.

Mountain Mirage Foils Aim

I succeeded only in frightening some birds that were well out of range. I had fallen victim to the puna's light-warping temperature inversions, which at times produce mirages rivaling those of the Sahara.

We needed a better trapping site, and a survey of the flamingo colonies was in order. We turned to the Indians who were camping near by in caves.

The Indians' spokesman was a slender young man in gray fedora, black pin-stripe suit, red sweater, and green shirt. Joaquin

*See "Flamingos' Last Stand on Andros Island," by Paul A. Zahl, NATIONAL GEOGRAPHIC, May, 1951.

Treacherous ooze mires the author's party, which slogged across the lake to a flamingo colony nesting on a mud bar. In freezing water and biting wind, these men prepare to load the small cannon with a charge that will hurl a net over unsuspecting birds and trap them unharmed. Neither cannon nor mist net captured the flamingos, but snares laid under water succeeded (following page). Elevated mud nests in foreground protect flamingo eggs from seiches, or "tides," of up to six inches, raised by the daily wind.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Snared flamingos placidly submit to capture. Fishline loops held them fast without inflicting injury. The author crouches to loosen a snare from webbed feet. Bird at his back waits to be released.

Specialized beaks (below) impose different feeding habits on flamingo species. The James's (lower) strains diatoms through comblike fringes in its bill. The Andean flamingo's beak retains coarser fare.

Villca, or Juanito as we came to call him, was a man of substance. He possessed 300 llamas, a mule, and a beautiful English bicycle.

Lucho and Juanito clasped hands and pounded each other on the back, for they were old friends. With cordiality assured, I questioned Juanito (with Lucho as interpreter) about the habits of Laguna Colorada's flamingos. He had camped by the lake each summer for years to graze his llamas.

Like many of the highland people, he knew the lake's three species by onomatopoeic names based on the birds' calls—the Chilean flamingo was "Tococo," the Andean, "Jetete," and the James's, "Chururo"—all recognizable imitations. He could also identify flamingo young to some extent, despite their confusing juvenile plumages.

Juanito insisted that there was a fourth species at the Laguna. "Guaichete," he called it.

Apparently this mystery bird resembles the James's. Though we failed to find the species, it is not impossible that it exists.

The Indians revealed another astonishing aspect of the flamingos' struggle for survival, when Juanito shortly announced that his people were going to take the eggs of the flamingo colony nearest our camp. The Indians, we learned, raid nests for food every two or

three weeks. This practice poses the question: How do the birds survive at all?

Careful inquiries gave us the fascinating answer: The Indians, like ourselves, prefer fresh eggs. When an egg is incubated, an air cell forms in its blunt end and grows larger as the embryo develops. So a well-incubated egg will float, but one just laid will not. The Indians give eggs the water test; those that float go back into the nest. Incredible as it seems, human hands touch many of the world's rarest flamingos before they even hatch.

Hip-deep in Ice-cold Mud

The most difficult part of the expedition still lay ahead—to get within observation and trapping distance of colonies far from shore. I knew of Roger Peterson's terrible struggle through the lake's abrasive salt and almost impassable mud. Lucho repeatedly said of that trek with Peterson: "It was the worst experience of my life."

With Gerardo and Leopoldo dragging a collapsible boat full of equipment, including our cannons and net, Bates and I set out in early morning. We planned to place the cannon net near some nests that the Indian egg hunters had spared at our request.

None of us wore boots, lest mud suction lock us in our tracks or even wrest the boots off. The water was like ice on bare feet. It gradually became shallower and the mud deeper.

Blundering into seemingly bottomless holes caused by subterranean springs, we stayed close together to assist each other. The gummy mud became knee-deep, in places even hip-deep (page 101). Layers of sharp salt crystals cut our feet mercilessly, causing them to bleed. Progress became a series of short struggles punctuated by long gasps for breath in the rarefied air.

Even talking was an effort, but Gerardo felt compelled to announce: "Here Doctor [Peterson] crawl on knees."

At last we sighted the nests, curious mud mounds in long rows on low islands. As we crawled nearer, I realized how tired I was: Dizziness plagued me, and each heartbeat blurred my vision.

The colony consisted of several hundred gabbling flamingos, almost all James's. A few sat upon nest mounds to incubate eggs the Indians had spared. As we approached, they took to the air.

The nests varied in size, like those of other flamingos, but averaged seven inches high and 19 inches across at the base. Those spared

Hooded against snow flurries, which veil the far shore of the lake, Gerardo Barria, a Chilean member of the author's party, retrieves a trapped flamingo. Tide blown in by the daily wind swirls at his feet. Even in midsummer, salty mud freezes at night along the edges of the lake.

James's Flamingos, Surprisingly Tame, Adapt to Life in New York

Head keeper of birds Joseph Bell offers cereals and poultry feed; a salt ration maintains body fluids. Dark-legged diner in foreground is a young *jamesi*. Other dark-stilted birds are Lesser flamingos from Kenya, whose presence calms the newcomers.

At home in the Bronx. Now thriving under sea-level conditions, the visitors wade at the New York Zoological Park. James's flamingos, the first ever to appear before the public, stand on red stilts. Yellow legs mark the Andean species.

by the Indians each held a single white egg about the size of a goose egg, but quite pointed at one end. Splotches of orange-red yolk marked several broken eggs. We saw only one chick there, a downy, soot-colored youngster about one-third grown.

The colony rested on mud that seemed bottomless. While arranging the cannon net, I sank so deep that it took both Gerardo and Leopoldo to extricate me. With net and cannons set, we fell back exhausted to a salt island to await the flamingos' return.

Storm Ends Fruitless Watch

The afternoon wore on, and the birds did not return. The usual winds rose, the temperature plummeted, and the sky turned ominous. We had to make shore before a storm caught us. Abandoning our equipment, we struggled back to camp.

Next morning we spent hours considering the trapping problem and decided to try snares. I showed Lucho how to tie the little nooses, and in two days we had set a hundred of them in the lake shallows.

While we awaited results, Gerardo, Lucho, Bates, and I struggled once more to the offshore colony to retrieve our equipment. The agony of the return with the gear—at least a hundred pounds heavier with accumulated mud and water—still appalls me.

Each step was torture. At last, with the shore still half a mile away, Lucho said with quiet dignity: "I cannot continue."

We dragged him in the boat for a short distance. Then, despite terrible leg cramps, he climbed back into the mud and walked the rest of the way.

That night chills wracked Bates until he could scarcely speak; several of us had violent nightmares. Laguna Colorada had enforced our respect. Beyond the solidity of its shores, it is a world without mercy.

Next morning, as I gathered my soap and toothbrush and started for a near-by spring, Gerardo excitedly shouted: "Two *jamesi!*"

He was right. Two James's flamingos had stepped into our snares. After brief tugging, they stood stolidly, each caught by a foot.

The camp sprang to life. Bates, in the tent, struggled into his longies shouting, "Wait! Wait for pictures!" Cameras in hand, he

joined us in a race through thin ice toward the ensnared birds. Soon we cradled in our arms the first two James's flamingos ever captured alive (page 102).

We gasped at their delicate coloring. One bird was large and heavy, probably a male; the other, much smaller, appeared to be a female—an auspicious start. They had a grace and daintiness not found in the other five species.

Captives Show Little Fear

We clothed our prizes in sugar sacks, head and neck protruding, to keep the birds from injuring themselves. Remarkably tame, they walked boldly about me as soon as they were released in an enclosure that we had built.

Next day we snared three more *jamesi;* succeeding days brought more, and eventually an Andean flamingo as well.

After the rigors of Laguna Colorada, the return to New York seemed uneventful. But I remember being unable to suppress a laugh at a question put to me in Antofagasta.

With our flamingos loaded on a plane, the craft's worried copilot said: "This plane stops at La Paz, Bolivia, and the cabin pressure drops. Can your birds stand the 12,000-foot altitude there?"

The flamingos adjusted quickly to life in the New York Zoological Park (above), strolling so near the fences that we had to discourage children from trying to pet them.

Feeding remained a worry, however; we wondered if the rarest flamingos would live on a man-made ration. Happily, they are now thriving on a concoction of chicken feed, alfalfa-leaf meal, and baby cereal.

But zoo meals cause many red birds to fade. In recent years we have discovered a substance that remedies the pigmentation lack in flamingos: carrot oil. Now we give them daily dosages and they retain their beautiful hues. Why, we still don't know.

A more vital question is: Will these birds breed in captivity? Few of the world's zoos have ever bred flamingos, and ours is not one of them. We wait anxiously for the signs of courtship, but the vigil could last years. Still, if their life span compares with that of other species—more than 40 years in some cases—they need not hurry.

Tirol

AUSTRIA'S PROVINCE IN THE CLOUDS

By PETER T. WHITE
National Geographic Staff

Illustrations by National Geographic photographer VOLKMAR WENTZEL

THE MOMENT I SAW my first big mountain in Tirol, western Austria's Alpine province, I wanted to climb it.

This will surprise my friends because I am a man of the city, and the climbing I usually do is in and out of cars and elevators. But there I stood—rooted to the main street of Innsbruck, the provincial capital, bemused by the miles-long rock wall of the Nordkette, which rises 6,000 feet straight up where the trolley line ends (opposite). The urge to get up there was overpowering.

The ascent was easier than it looked. First you take the Hungerburgbahn—it works like the cable cars in San Francisco, but the cars are bigger. Then an aerial cable car with a 50-passenger cabin; transfer to another cable car, and there's the last stop, the lofty Hafelekar, one of the 30 peaks on the Nordkette.

I took the trip and found the view staggering: rocky pinnacles near and far, mountain meadows close, glaciers on the horizon, and far below, Innsbruck bisected by the proverbially green Inn River.

But my urge to climb persisted. I yearned to do as those tanned athletes were doing, the men I had seen in Innsbruck with tightly packed rucksacks, coiled ropes, and dented hats sporting the silver edelweiss of the Austrian Alpine Club.

Mountains are the essence of Tirol. To learn about the terrors and joys that these rugged peaks bring to the men living among them, I had to grasp this living rock as soon as I could. I didn't know what I was getting into.

Before I take you climbing with me, let me introduce you to my first Tirolean friend, whom I will call Max. (I won't use his real name because he asked me not to: "I'm not really an authority on Tirol.")

Yet in a way he was—and more. Max

Jagged rampart glowers above Innsbruck, capital of Austria's Tirol, and its postcard valley. Haloed Virgin Mary on a marble shaft divides Maria-Theresien-Strasse.

Bearded mountaineer in festival dress parades at Innsbruck (page 116)

Sailplane pilot over Innsbruck glides above the Inn River between cloud-topped ranges.

PHOTOGRAPH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER VOLKMAR WENTZEL © N.G.S.

Warm winds that flow in from the south make the mountain valley ideal for soaring

"**Always first-grade fresh meat,**" proclaims a sign in an Innsbruck sausage shop, its window laden with delicacies.

Green floodlights bathe the Golden Roof in the Altstadt, Innsbruck's Old Town. This gleaming canopy of more than 3,000 gilded copper tiles caps a balcony built during the reign of Maximilian I. From this box the 16th-century emperor and his court looked down on jousting tourneys, mountebanks, and jugglers in the square. Interior lighting shows golden in the upper loge, which today fronts a tenant's apartment.

Tirolean beauty models an after-skiing ensemble inspired by the traditional dirndl. Her audience gathers at a fashion show in an Innsbruck hotel.

had been a prisoner of war in Texas during World War II. More recently he had visited the United States to study American ways of training engineers. He was the ideal guide, full of fanciful facts that always turned out to be true.

"It's lucky that your German is good," he said, "but I warn you: The way some of our Tirolers speak German, you may not always understand. For centuries each valley was a little world, developing its own dress and customs and speech. The mountains have held us together and yet kept us apart. This is changing of late, because we are building roads as fast as we can. More and more visitors come, and more and more Tirolers sound like Viennese."

Kings Once Fought for Tirol

In the arcades of old Innsbruck, we paused before the Golden Eagle Hotel and read the names of famous guests engraved on slabs of marble: 1548—the King of Tunis. 1786—Goethe. 1828—Paganini.

"Sooner or later," said Max, "everybody comes to Tirol."

He pointed out that Tirol, in the heart of the Alps,

EKTACHROME BY ERNST HAAS © NATIONAL GEOGRAPHIC SOCIETY

Life dangles over an awesome gorge as an "injured" climber rides a cable between rock towers of the Kalkkögel, often called the Dolomites of North Tirol. A member of the Austrian Alpine Rescue Team, an unpaid volunteer corps, plays the victim in this practice at the 8,000-foot level, a half mile above Senders Valley.

Finger of mountain and meadow, the Austrian Tirol juts between Germany and Italy. Many of its chalets perch above panoramic gorges, and castles cling to the brinks of lofty cliffs. Gingerbread villages rise against steep, forested slopes of the Alps.

was briskly sought from Roman times for its strategic passes and in later centuries for the silver and copper in its mountains (maps, above and opposite). And so Tirol assumed an importance quite out of proportion to its size, which is a bit smaller than Connecticut.

Max said that one of Tirol's greatest fans was the Habsburger Maximilian I, the Holy Roman Emperor whom historians call the Last Knight.

"Tirolers call him the Emperor Max," my friend Max said. "He watched tournaments from over there in the Gothic alcove with the gilded tiles [page 111]. He was a mountaineer, too. He got into trouble on a rock face near Zirl. One story goes that when he could move neither forward nor back nor down, an angel appeared and carried him to safety. Actually it was a gamekeeper."

I told Max that he couldn't scare me, that I was impatient to go climb a mountain. So he took me around the corner to the headquarters of the Austrian Alpine Club.

Generalsekretär Walter Schmidt-Wellenburg told me what to buy: Windbreaker and plastic rain cape. Wool mittens, wool socks. Rubber-soled boots with chunky cleats like a snow tire. Knickers of *Loden*, a wool cloth cleverly woven to let air in and keep water out, to be warm in the cold but not too hot in the sun. A rucksack. An umbrella.

An umbrella?

"I use one myself," said Dr. Schmidt-Wellenburg. "It packs neatly into the rucksack.

Handy in case of a shower, if you aren't actually climbing."

Dr. Schmidt-Wellenburg wrote to Alois Auer, manager of the Adolf Pichler Hut—ten miles southwest of Innsbruck, 6,430 feet high. When Auer came to town for supplies, he took me back with him in his Jeep.

And that's how I found myself among 26 men in the annual training course of the Austrian Alpine Rescue Service, all proven climbers of rock and ice, among the world's best. The man in charge was Ernst Senn of Innsbruck, who had been in the Himalayas three times and was in the seventh party to conquer the north wall of the Matterhorn.

At dawn we were off—to the Three Needles atop the Kalkkögel, the Chalk Peaks, 8,500 feet high and rosily aglow in the early sun. We hiked in serpentines over a sloping field of gravel. Where the cliffs began, we passed a bronze plaque bolted to the rock.

Here Hannes Schmidhuber,
Mountain Guide, Gave
His Life on October 16,
1953, in Selfless Exertion
to Rescue Others

"A heart attack," said Ernst Senn. "Anyone can run into trouble on a mountain, but so often it's a tourist in shorts and low-cut shoes who says to

Mountain-climbing author claws his way to an edelweiss high above a glacier. Though local law allowed him five flowers, he plucked but one and immediately regretted that.

Revisiting his boyhood homeland, Vienna-born Peter White scaled peaks and poked into castle dungeons in quest of the essence of Tirol.

himself, 'It's a fine day; what could happen?'

"The weather changes, and suddenly there's a fog around him like skim milk. He's cold, and so he can't stay put. He gets panicky, and he slips and breaks his ankle, or falls a hundred feet. Then volunteers like us go and find him. All right, let's move on."

From now on I was in rope harness with a steel eyelet over my chest. Knotted to the eyelet was another rope, tied at one end to Hugo Abfalterer, an Innsbruck policeman, and at the other to Rudl Haider, a forester.

The path grew narrower. When there was no more path we tackled a "chimney"—a two-foot split in the rock. With my back pressed against one wall and my rubber-cleated soles against the other, I inched up and up and up. Hugo, 20 feet above me, helped by tugging.

Cliff Climbers "Hug the Mountain"

We came to a rock face steep as the Empire State Building and more than half as high. We would cross from right to left.

"Hug the mountain," said Hugo. "Hands a little over your head and hold on to anything you find. Your feet on the little ledges." Those ledges, no wider than my soles, were not continuous. I had to step from one to the other.

Soon the ledges were narrower than my soles. My hands, scratching for a hold, broke pieces from the cracked and crumbling rock.

Hugo, off to the left, said: "We've got you on the rope. You can't fall far."

Ha! Just sliding down 30 feet on that wall would take a man's face off. I made space between myself and the mountain to look down. Nothing for hundreds of feet, nothing. The calf of my right leg began shaking.

"Step down with your right foot," said Hugo.

Down?

But I did it, and a little ledge was there. Somehow I got off that wall, to a small platform on one of the Three Needles. Rudl Haider showed me how to hammer a steel hook into a crack in the rock.

"Hit it until the sound is clear, until it rings," Rudl said. "Then it'll hold."

Mountains Stand Out Like Islands Amid Racing Rivers of Cloud

Five climbers attain the crest of Klein Glockner, the lesser pinnacle of 12,461-foot Gross Glockner, Austria's highest peak. Even in August deep snow feathers the cornice, and icy winds buffet the adventurers.

From his window perch in Innsbruck, a costumed spectator watches a parade celebrating the 150th anniversary of Tirol's revolt against Napoleon. Men bear a crucifix and halberds, pikes, and swords like these used by their forebears. Casks carried by the girls contain *Schnaps*, made from the root of the blue gentian that grows on the heights.

Relief for weary feet rewards a marcher after the seven-hour procession.

ROSACHRIST (ABOVE) AND ITS DUPLICATE BY NATIONAL GEOGRAPHIC PHOTOGRAPHER VOLKMAR WENTZEL © N.G.S.

With my rope tied to the hook, I swung from it; the hook bent.

"Don't worry," said Rudl, "it's supposed to give a little. If the steel were tempered hard, a sudden pull might snap it right off. Here, have some grape sugar."

Those little white cubes and the security of the hook braced me for a good look around.

On a cliff 50 feet away, Senn's men sharpened their lifesaving skills. A man was lowered on a rope with another man on his back, the supposedly injured climber. An improvised cableway carried a "victim" from peak to peak, as a boatswain's chair carries sailors from ship to ship (page 112).

Around us lay a realm of unremitting change. The sunlit emerald meadow far below was soon a fluffy sea of fog; through the mist, a cowbell still rang up to me. In the passing of a cloud, a darkling backdrop turned into a pinnacle embossed with snow. Above it all receded infinite layers of translucent blue.

Salt Bath Soothes Aches and Bruises

The descent to the Adolf Pichler Hut brings painful memories. My ready-made boots fitted poorly. To be large enough in front, they were too large in back, and going downhill slid my feet forward, bruising the toes.

The next day, when I hiked alone from the hut over a pass and down across rock and meadow to the town of Fulpmes, my shoes dimmed my appreciation of the rhododendron, the gentian, and the cyclamen. I hardly glanced at the forges of Fulpmes, where hooks and ice axes are made. I got right into the Innsbruck train. When I reached my hotel, I climbed straight into bed.

In the morning my legs were big, sore knots. The Tirolers call it *Muskelkater*, a "hangover of the muscles." Max said: "Get a bath. Innsbruck has pine needle baths, sulphur baths, and hay flower baths. But the thing for you is the salt bath in Solbad Hall."

A drive paralleling the trolley line down the Inn Valley took me to the medieval town, built on the mining of salt. Director Alois Hornsteiner of the municipal spa ushered me into a tiled room.

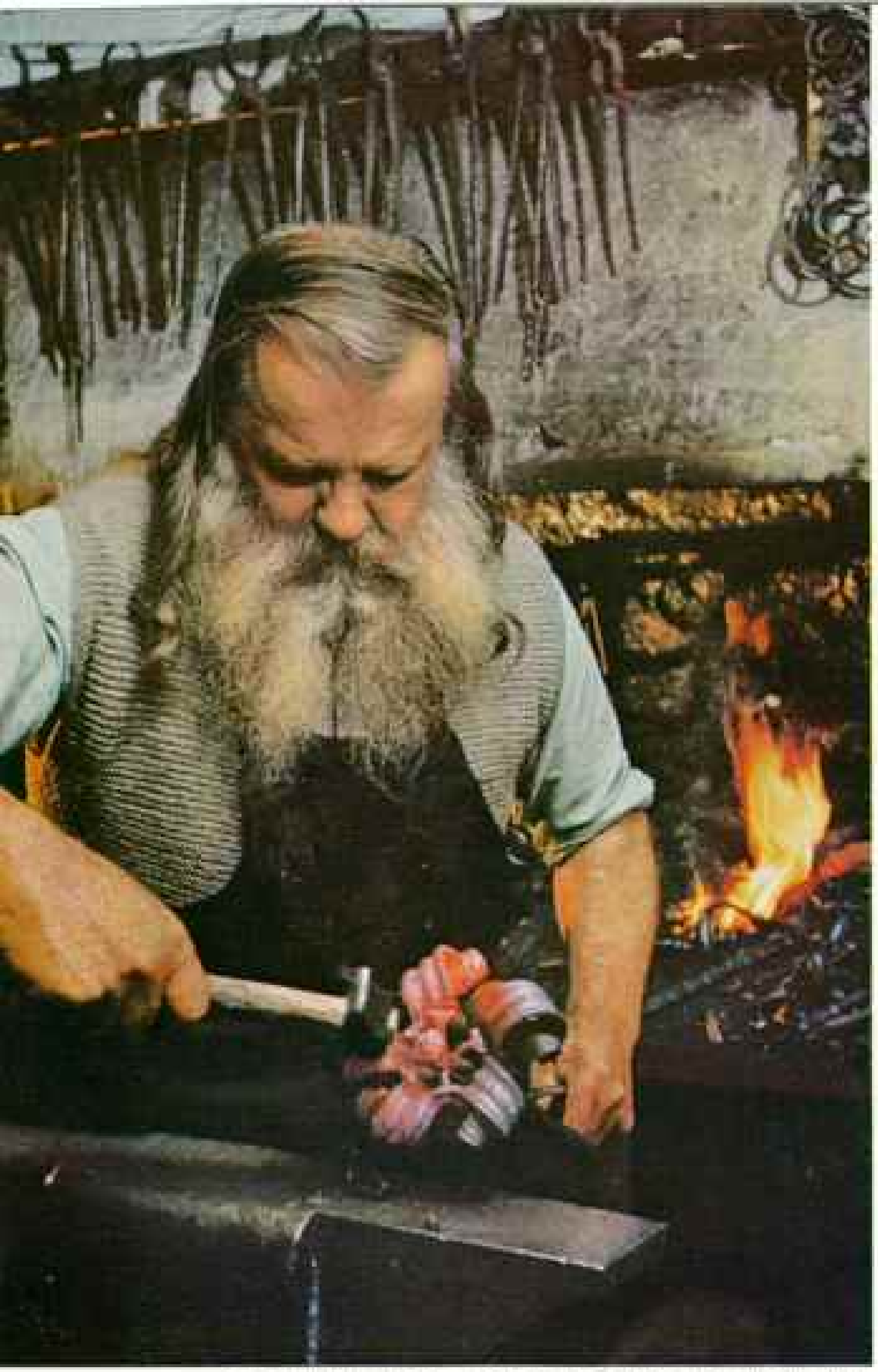
"We pump water into chambers excavated in the mountains seven miles north of here," he said. "There the water stays for months until it is saturated with salt. The solution then flows into our building through old wooden pipes.

"Our baths are fine for rheumatism, arthritis, and so on. We treat more than 1,000 patients a year. Not counting muskelkater, of course. Please get in."

He pointed to a tub of water to which an attendant had added four gallons of salt

Bronze mourners, larger than life-size, guard the cenotaph of Maximilian I in Innsbruck; the emperor lies buried in his native town, Wiener Neustadt. Aged to a smoky patina, the figures stand in the Imperial Court Church.

Resplendent in crown and coronation robes, an image of Maximilian passes the reviewing stand during Innsbruck's parade celebrating Tirol's 1809 revolt. This figure copies a bronze of the emperor shown in the background on the opposite page.



SCHLOSSBURG (ABOVE) AND ITS ENTHUSIASTS © NATIONAL GEOGRAPHIC SOCIETY

Tirolers Fashion Art Objects in Iron, Glass, and Wood

In medieval and Renaissance days, Tirolean smiths produced armor that rivaled the finest in Europe.

Hand-crafted ironwork survives in the shop of 70-year-old Josef Infeld, who forges an ornamental rose. With two married daughters and 11 grandchildren, Infeld dwells in a 400-year-old house above his smithy at Kitzbühel.

Religious figurine takes shape under the fingers of a second-year student in the wood-carving school at Elbigenalp. To complete her training, the young woman must study two more years.

Baroque and Gothic madonnas worthy of the old masters are a specialty of Kléofas Bogaitel. Grinding his own pigments, gilding and polychroming by age-old methods, he turns worm-eaten wood into masterpieces. His shop lies near Alpbach in a chalet that no road touches.

In the crystal-glass center of Rattenberg, Ferdinand Kisslinger, Jr., engraves a handsome vase.

AS ESTABLISHED © NATIONAL GEOGRAPHIC SOCIETY

solution from a faucet. I slid into the tepid, buoyant mixture, ready to rest.

But no. The attendant brought a machine on wheels, equipped with hoses and a four-jet nozzle. Roaring like a vacuum cleaner, the machine pulled water from the tub and shot it back again. The attendant moved the nozzle close to me in slow underwater circles. Without ever being touched, I received a forceful massage.

"Don't dry yourself," said the attendant when he let me crawl out at last. "Wrap this sheet around you and lie on the bed. Let the salt soak in."

An hour later, I was convinced that the treatment was worth its salt. I was a weaker and a lesser man—I had lost three pounds—but I found I could walk straight again.

Back in Innsbruck I encountered a tale of love triumphant 400 years ago, a Grace Kelly romance of the Renaissance. It was told in a sightseeing bus by a girl guide, first in German and then in English, French, and Italian, so everybody would understand.

Indoor Pool for Philippine

Archduke Ferdinand, nephew of Emperor Charles V, wedded golden-haired Philippine Welser, daughter of a merchant. The marriage meant that his children could never inherit a throne. But Ferdinand was content to rule Tirol and live with his adored Philippine in Ambras Castle, just outside Innsbruck.

"Everyone praised her beauty," cooed our

ROSCHNEIDER © NATIONAL GEOGRAPHIC SOCIETY

nificent hodgepodge of weapons and armor, art, and true and imagined marvels for his curiosity cabinet – a stuffed shark and a weird model of the sea bottom, studded with coral, turtles, and snails.

Ambras, a peaceful place in Ferdinand's time, was built for defense. It is one of scores of such fortresses that survive today. Max told me that some are still lived in.

He drew a circle on my map where the Ziller River meets the Inn and the Ziller Valley joins the Inn Valley.

"These castles were built close together in order to keep an eye on one another. One,

Sleek Haflinger horses, a sturdy Tirolean breed especially suited to mountains, graze green-velvet heights between Kitzbühel and Oberndorf. Peaks of the Kaiser Mountains provide a spectacular backdrop.

Farmwife with a twisted whip urges an ox team along a grassy lane in an isolated valley near the Brenner Pass.

guide into the microphone. "Her skin was so transparent and her neck so slender that people claimed they could see the red wine trickle down her throat."

"How awful!" said the lady next to me. But she approved of Ambras Castle on its hilltop amid parks and whispering woods, and she said she would never forget Philippine's bathtub. This is an indoor pool—lined with zinc—that measures 4½ feet deep, 9 feet long, and 6 feet wide.

No water was piped in. Philippine sat on a bench in the middle and let her maids splash her from above with water carried up stone stairs from the kitchen.

Philippine wrote a cookbook, while her husband the archduke assembled a mag-

PHOTOGRAPH BY PETER T. WHITE, NATIONAL GEOGRAPHIC STAFF

Kropfsberg, is a ruin. Another one, Matzen, was recently bought by an architect from California. The third, Lichtwert, belongs to friends of mine. I'm sure they would want us to drop in for tea."

Life in a Castle—Without Bath

When we drove into the outer courtyard of Lichtwert, the owner, Dr. Hanns Inama von Sternegg, was away, but his wife Gerda showed us around.

Lichtwert had everything. A chapel. A great hall turned into a comfortable living room. A dungeon.

"Eighteen rooms and walls six feet thick are delightful," said our hostess, "but we have no drains and only one water tap. In winter we live in an Innsbruck apartment, *with* bath.

"We love it here in summer. My husband drives to his office, and I do what every housewife does, plus as much restoring as I can."

The castle was built toward the end of the twelfth century on an island in the Inn River; the stream has long since changed course, and Lichtwert now rises amid green meadows. For some 400 years, the estate has been owned by members of the same family.

We stayed late, and as we drove off, the last rays of the sun made the great tower of Lichtwert glow pink.

Cattle market in Steinach-am-Brenner attracts sharp-eyed buyers. What do they seek in a cow? "Horns must not be too big, and her expression should be agreeably feminine," an expert told the author. "Hardly scientific," he admitted, "but old farmers rarely go wrong."

Pretty dairymaid welcomes a cow back to her valley home after a summer in the high meadows.

Plumed and belled, bull and cow lead a parade of livestock returning from summer on the heights. Even the goats and dogs wear garlands for the joyous procession into the village of St. Johann-in-Tirol. Stymied motorists creep at the pace of the cattle.

EXTACHROME BY PHOTO LAB. © NATIONAL GEOGRAPHIC SOCIETY

On Fields This Steep, One Man Must Steady the Plow, Another Lead the Team

Arable Tirolean soil, less than 4 percent of the total, grows wheat, rye, oats, and potatoes. Sure-footed Haflinger horses work in the Wildschönau district, below the Kitzbühel Alps.

"Just like the mountains," I said to Max.

Max said: "It's the same rock."

What about Tirolers without castles?

The 100,000 Innsbruckers live much like townspeople everywhere, watching television and dodging traffic, except that in winter they may extend their twelve-to-two lunch period and ski in the city's back yard.

The remaining 350,000 Tirolers include 110,000 farmers and foresters, and of these, thousands live on the mountains, as high as crops will grow. Their fields are steep. Mountain shadows keep some holdings without sunshine from October to March. Wheat, rye, and oats grow where the mountains let the warm south wind in. Elsewhere the north wind tolerates only potatoes and grass.

"We have 6,000 farms still without access to roads," explained Josef Muigg, President of the *Landeslandwirtschaftskammer*, the province's central agricultural authority. "Where the mountains won't let us mechanize farming, men must continue to do the work by hand."

Women, too. Here is a housewife's description of her typical summer day:

"You get up at four, make a fire, feed the chickens, clean the stable, milk the cows, separate the cream from the milk with a centrifuge, wash the centrifuge, and cook breakfast, wash dishes, make the beds. Then up the mountainside to mow the fields, if the weather is good. If not, you bundle grass or bring home hay.

"At noon, half an hour for bread and cheese. More field work until six. Cook supper and eat until the cows come home at seven, do the milking, and out to the field again until it gets really dark at nine-thirty."

High Village Seems to Defy Time

Frau Maria Lechleitner, who told me this, was 60 years old, a grandmother. I can testify that her work was as hard as it was long, because I stayed with her and shared her chores in Pfafflar, 5,000 feet up in the Lechtal Alps, a cluster of houses without a road, population 55.

When I arrived, puffing under my rucksack after a steep climb, Pfafflar seemed touched with magic. It wasn't just the Alpine setting. Or the brook. Or the charming houses—five here and six there—made of logs laid in the blockhouse manner, their protruding, criss-

Fresh scent of new-mown hay wafts over the fields as all hands rake the August harvest. Six-year-old Idamaria Reinstadler, one of the few children in the village of Pfafflar, works on one of 6,000 Tirolean farms still lacking access by road. 127

PHOTOGRAPH BY PETER T. WHITE, NATIONAL GEOGRAPHIC STAFF © N.G.S.

crossed ends not neatly cut. The oldest house there was said to date from 1256. You could see that the builders had no saws.

No, what beguiled me was something stronger than the merely visible, something saying softly: This village has not changed in centuries . . . it has not grown older . . . stay, and you too will live on without getting old.

Scythes Cut a Mountain Pasture

On a grassy incline 2,400 feet above their houses, Benedikt Perl and his wife Martha wielded their scythes in unison. Frau Lechleitner and her sister Emma raked grass. So did Anna Reinstadler; her husband Josef roped the grass into bundles, which he carried to a collection point for drying.

The steepness scarcely bothered anyone, least of all six-year-old Idamaria Reinstadler. She was one of the few children in the village (page 127). She became my special friend.

Idamaria never talked much. But when I said that something was nice, that is, *schön*, she would say no, it's *schiach*, meaning not nice, ugly; and what I called schiach, she called schön. It was our little game.

One evening when Frau Lechleitner and I had seen to the cows, we stepped through the stable door into the tiny kitchen with the great charred chimney. It was raining, and so this was a late supper, with no more work on the mountain afterward.

We cooked eggs and carried them with our bread and bacon to the *Stube*, the good room, warmed in winter by its huge stove of tiles with a dome like St. Peter's. If only the ceiling could have been built a little higher, and the windows a little bigger—but no, then it would not have been the old Tirol.

We ate in the *Herrgottseck*, the corner of the Lord, under a slanting crucifix,

Old Mint Tower in Solbad Hall struck silver coins five centuries ago, using metal from the mines of Schwaz. The beauty of the coinage carried the mint's fame to Europe's farthest corners. The tower is part of Hasegg Castle, which domiciled early rulers of Tirol when they visited the town.

Hilltop Castle Housed the Counts of Tirol, Who Ruled the Central Alps

Italy in 1919 acquired South Tirol, a territory below Brenner Pass larger than the part that remained Austrian (map, page 113). Girl and cow wander a tilted meadow.

and Frau Lechleitner talked about the hard old days.

Today a cable lift brings supplies (but no passengers) from Boden. In the days when men had to carry all goods for the village on their backs, in eight-hour marches over the high Hahntenn Joch, death was never far away. I had seen the markers with their simple paintings. Johann Lechleitner, 1815, felled by a tree. Another Johann Lechleitner, 1856, frozen to death. Benedikt Lechleitner, 1867, avalanche.

Frau Lechleitner's face brightened. "Nowadays people complain about the youngsters—they want too much; they want to live where roads are and buy motorbikes and race to the movies. Well, I think they need a little fun. We had our fun too. We walked up on the peaks, we played the mandolin and the zither, we danced. How we danced! *Schuhplattler* and *Ländler!* The boys almost threw us through the ceiling."

Frau Lechleitner rose and said: "Excuse me, the news." She switched on the radio.

Electricity reached Pfafflar five years ago. Money from the central agricultural authority helped to string conveyer cables from the high fields down to the village, so that hay bundles now land close to home at 40 miles an hour. On impact, some burst spectacularly. But isn't that better than carrying down the hay on one's head?

In the Lech Valley, in Obergiblen, I looked up Rudl Haider, the forester who had helped me on my climbing expedition. Rudl introduced me to his 80-year-old father. Herr Haider said when he was 10 the family sent him to be a cowherd in Bavaria, because there was not enough food at home. It was the usual thing.

Today the Lech Valley knows better times, and not only because of its many visitors. In Stanzach I saw a modest factory turn out bright carpets in traditional and modern designs. Women can earn money at home, preparing wool for the factory's looms. And in Elbigenalp I visited a school for the training of wood carvers (page 121).

Where the Lech Valley widens to the north, I passed an airport with sailplanes waiting for updrafts along the mountains. I drove through the town of Reutte to a factory employing more than 1,000 of Reutte's 4,000 inhabitants, the Plansee Metalworks, pioneers in the wondrous business of powder metallurgy.

Happily some metals, which won't combine in molten state, make useful alloys when mixed in powder form. Powdered metals produce fine finished parts when pressed into shape and baked at 2,500° C.

"An American-built car carries about two and a half pounds of powder-metallurgical parts," said Dr. Walter Schwarzkopf, who did graduate work at Massachusetts Institute of Technology. His father, Dr. Paul Schwarzkopf, plant founder, as early as 1910 used powder-mixing techniques to produce tungsten filaments for light bulbs.

"Now we are mixing tungsten with a bit of iron, or nickel, or copper, and one of the results is a dense metal we call Densimet," said Dr. Schwarzkopf, pointing at a silvery block the size of a brick. I tried to pick it up and broke a nail trying to get a grip. The thing weighed 53 pounds!

Who or what on earth could possibly use this stuff?

"It saves space in shielding atomic reactors. In a self-winding watch a tiny piece fixed to a wheel makes the wheel turn a bit whenever you move your hand. Similar material is used in stabilizing mechanisms of many aircraft. . . ."

Enough.

Doctors Take to Helicopters

In the following weeks I saw more of Tirol's striving to improve life in the mountains. I joined *Gendarmerie* officers surveying lofty landing sites for helicopters, so that doctors might fly in when roads are blocked by avalanches of snow or rock. I visited a mountain laboratory studying plants to learn which can grow high up. Object: to hold snow in place and prevent avalanches.

I attended the opening of a stud farm for Haflingers, sturdy yet graceful Tirolean horses with chestnut bodies and straw-blond manes. Haflingers, especially suited to mountains, are exported as far as the United States.

Gradually my muscles accustomed themselves to the mountains. I crossed glaciers with steel spikes strapped to my new, made-to-order boots. I spotted furry marmots sitting upright in the sun and closed in on them until they would whistle, like a boatswain piping an admiral aboard, and herd their young to underground safety. I clawed my way to an edelweiss growing high on a slope that was nearly vertical and completely grassy, and all the more slippery for that (page 113).

For a long time I looked at a lone flower trembling in the wind. Then I plucked it. Why not? The law permitted me to pick five. But at once I was sorry. The spot looked bereaved, laid waste, as if nothing would grow there any more.

Now I felt ready for a supreme experience, the hunt for the chamois, the mountain antelope. From the back of the male's winter coat come long, silky hairs, a favorite trophy when gathered in a silver holder and stuck in one's hat. This is called the *Gamsbart*—literally, and misleadingly, the

Weissenstein Castle, relic of the feudal age, hugs a promontory in the rugged Tauern Valley.

More than 500 castles once studded the Tirol; today many crumble into decay or stand as roofless, windowless shells.

The farmer's creel holds leaves for his compost heap.

SCHLOSSHOTEL © NATIONAL GEOGRAPHIC SOCIETY

"beard of the chamois": the longer the hair, the better. The visitor who is in a hurry hunts his gamsbart in the shopping preserves of Innsbruck. Surprising numbers of Tirolers do likewise, because a chance to shoot one does not come easily.

Chamois Herd Follows a Female

Hunting rights in Tirol are rented, area by area, to the highest bidder. He must hire a professional hunter to care for the animals all year round, and he, his hunter, and his guests may take only such game as the authorities in Innsbruck prescribe. Anyone else caught shooting in his preserve risks a fine or jail sentence.

Some unrented areas offer game to all comers. But to "buy a shot" at a ten-point stag costs 4,000 schillings, or $160, roughly two months' wages for a good mechanic. It's a sport few Tirolers can afford.

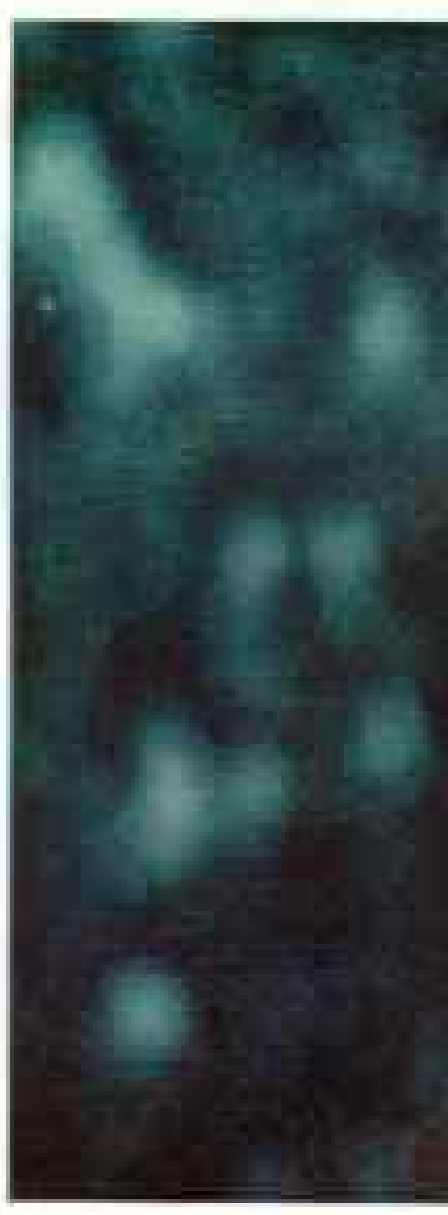
At dawn, as the craggy, 7,000-foot Karwendel Mountains turned orange in the rising sun, I huddled with professional hunter Andreas Leitner on a ledge over a meadow.

Within half an hour, the grass teemed with chamois, some only 80 yards away. Because we kept still and the wind was toward us, the animals took no notice. Two kids, close to their mothers, playfully banged their miniature horns. While I was still counting, the leader, a big female, moved on.

Andreas said, "All right, that old one."

I lifted my rifle—and put it down again.

US EKTACHROME BY PETER T. WHITE, NATIONAL GEOGRAPHIC STAFF



Maybe it was my regret over the edelweiss. I just couldn't do it.

One night in Reutte I heard the Engels sing. Four boys (Hans, Max, Fritz, and Pauli, who is 11); three girls (Liesl, Resl, and Rosl); and Papa Engel—they are masters of song and of 30 different instruments. Pauli, the youngest, played flute, violin, double bass, timpani, piano, glockenspiel, a Tirolean dulcimer called *Hackbrett*, and *Hölzernes Glachter*—an ancient xylophone whose name says "laughter of the wood."

Mama Engel rarely plays but encourages everyone to practice up to ten hours a day. On Fridays she hustles everybody to the Innsbruck Conservatory. The result is perhaps the most accomplished musical family in Europe, as

Young Tirolers' Rosy Faces Reflect Zestful Life Amid the Alps

Small boys with cowbells tied to their waists run through the fields to "coax the grass from the ground." Thus does spring begin in the Tirol, home of a sturdy, devout, fun-loving people.

Especially in the children, a stranger can glimpse the contentment so characteristic of Tirolers. Prime examples are the pig-tailed schoolgirl at right, waiting for a bus near Kitzbühel; the tousle-haired boys below, who work in a wheat field near Ober Tilliach; and the lad at center left, heading home from school near Kals.

A summer shower fails to daunt the gay spirits of two misses on a stroll (opposite, above). Sweater girl in red leggings, on a Sunday outing in Thaur, carries a bouquet to her grandmother.

much at home with Beethoven and Hindemith as with folk music of Tirol.

The Engel family is in great demand. In an Innsbruck concert hall I heard them perform for a scientific congress. And back home in Reutte they played once just for me.

Music's Goal—to Make Men Good

Papa Engel defined good music: "It's good if it makes you want to imitate it, if you want to hear it again, or want to have others hear it and enjoy it." He said the purpose of music is to make men good.

I was curious about another question of quality—less exalted, to be sure, but in Tirol no less important: What makes a cow good? I went to the cattle fair in Lienz, in East Tirol, where a bull auction was on.

Men, boys, and occasionally a woman held some 100 young bulls on ropes. The judges moved among them, followed by men who snapped metal tags into bulls' ears, clamped rings through their noses, and graded them by painting Roman numerals on hindquarters, I, II, III, IV. I asked Dr. Hans Walla, a cattle expert, what determined a bull's value.

"Build, for one thing," he replied. "A bull should not be pigeon-toed. He should have springy legs, so that he'll be good in the mountains. Look at his mother's milk record in the catalog. How much milk, and how rich is it? It goes by weight. Six thousand pounds

of milk a year is a nice average, with 4 percent fat content.

"We guard the quality of our cattle because it's the third highest source of income in Tirol. Lumber is second. First come the visitors, like you."

Milk Runs Down the Mountain

A wise old farmer from St. Johann-in-Tirol, Eduard Angerer, invited me for a traditionally happy time: the day the cows come home into the valley, after a summer on the high meadows (page 125).

Up there I saw my first milk pipeline, of plastic, two inches in diameter. Almost three miles long, it led to the road in the valley, where a truck collected the milk.

Milk ran an hour a day. The rest of the time water from a mountain spring kept the pipe clean. The need was old, but the technique was brilliantly new.

On my way back to Innsbruck I stopped in Kitzbühel. Population: 7,000; yearly visitors: 62,000. Roulette wheels spun in the Golden Griffin, a centuries-old hostelry turned luxury hotel.

Kitzbühel's old stone houses reminded me of how the mountains, in one way or another, have bestowed bounty on the area. Besides providing building material, the rock-boned slopes once yielded metals that made the town rich.

The silver and copper in the Kitzbühel Alps gave out about 1650. Today Kitzbühel has a gold mine: skiers.

Until about 1900, Tirolers viewed skiing as strictly utilitarian. Today, it is sport; winter makes every slope around Kitzbühel but a stage for slalom and schussing. Evening finds the ladies in varied after-ski fashions—mink, tight sweaters, toreador pants of gold lamé.

The young Kitzbüheler lightly turns to ski teaching. Max had briefed me: "A school teacher gets 2,000 schillings [80 dollars] a month; a ski teacher may earn twice as much. Ski teachers also get around. In the cafes you'll hear them

Sleigh Bells Jingling, Riders Glide Through a Sparkling Winter Scene

For the skier, Tirol's winter-long flooring of snow ranks as its finest asset. The less athletic, snug under lap robes, sample crisp air and brilliant skies in more leisurely fashion.

Archduke Leopold V built this lakeside chapel near Seefeld in 1628.

reminisce about night clubs they knew in New York, when they were married to American women."

Max was right again. But he could never have guessed what happened to me the next evening.

I had just checked into a modest inn and sat in the dining room, impatient for a real Tirolean *Gröstl*. This is veal or beef with thinly sliced potatoes, roasted in one big pan with lots of butter.

Behind a screen the landlord was whispering to the waitress. I heard him say that I was an American, that I liked statistics, wanted to be admired, and loved to talk to anybody about anything.

Astounding. This landlord had seen my passport, but how could he know so much about me so soon?

"It's straight from the book," he

Saint and sundial decorate a home in the Lech Valley. To the Tirolers, who weave religion into everyday life, the saints are confidants of family and community. Signs of the zodiac appear on the centuries-old sundial above the window of this house in Holzgau.

St. George slays the dragon on another house in Holzgau.

said when I inquired later. Sure enough, in a paperback text on tourism by a student of tribal foibles, I found entire nations helpfully stereotyped for landlords.

Englishman: Reticent, doesn't want it noticed if he wears new clothes. Never introduces himself.

Frenchman: Very talkative, temperamental, kisses even nonrelatives. White bread.

Italian: Warmhearted, amenable to any request, loves children. Lots of meat.

West German: No garlic.

Visitors Bring Tide of Money

This earnest approach to visitors could be felt throughout Tirol, but nowhere more than in the bustling government Tourist Office in Innsbruck. Visitors had posed a problem, and Dr. Hans Mansbart, one of the Tourist Office's busiest men, took time to remember.

"Our tunnels and railroads were bombed hard in World War II. The beauty of Tirol survived, of course, but people told us: 'You are crazy, you want to bring tourists when we don't have enough potatoes to feed ourselves.' Then the Marshall Plan helped us revive our economy, and so we were able to buy cheese in Denmark, sardines in Portugal, canned goods in the United States.

"Our office sold food coupons to foreign guests. They handed the coupons to the waiters, and the hotels turned them in to us, to get the food. Dollars, pounds, Belgian francs, French francs, Swiss francs! Oranges, salami, mayonnaise! An administrative miracle."

On Maria-Theresien-Strasse, in Innsbruck, I walked to the baroque marble column rising in the middle of the street (page 106). It made a traffic island that allowed me a breather amid an international whirlwind.

I had just dodged a sports car with a big DK, meaning Denmark. A policeman dispensed directions in Dutch and French. A lady with a guidebook asked him the way to Schindler's, the superb pastry shop; as she crossed over to the sidewalk, she barely escaped being squashed by a sightseeing bus from Germany.

Medieval Solbad Hall earned the sobriquet "Envy of Princes" because of the wealth gleaned from its salt mines. Today the town dreams of former grandeur. This view looks toward a gold- and silversmith's shop beside St. Magdalena's Chapel, which adjoins a larger Gothic church.

Pipe-smoking elders relax over wine and watch energetic young folk do the *Schuhplattler* (right). The scene is the living room of a 500-year-old house near Matrei-am-Brenner, and the dancers have climbed steep mountain paths to join a Saturday-night party. Women in swirling skirts and men in leather shorts stamp to the music of an accordion.

The ever-rising tourist curve does not delight every Tiroler. A thoughtful man weighed the pros and cons for me. He recognized a dilemma that is becoming serious for Tirol—and for much of the world.

"The tourists are saving villages that would otherwise die out. But when the village is saved, when it attracts many visitors, the boys and girls see all those cars, all that money, the lady who wears a new dress every day. They don't know that a vacationer may scrape and save all year to make those two weeks possible. They think everything from the city, from abroad, must be superior to what we have.

Girls Discard Dirndls for Jeans

"The youngsters feel inferior. They put away their traditional dress and buy blue jeans. Grandmother's pride is a 200-year-old plate, but they'll sell that like scrap and buy something cheap and ugly, if only it's new."

The speaker was the priest of Obergurgl, the highest town in Tirol.

"What can be done?" I asked.

"The province subsidizes the traditional dress," said the priest. "Parents send their daughters to special sewing classes, to make clothes that are smart and comfortable but keep the true traditional designs. If a girl knows that the visitor will admire her dirndl, she'll wear it gladly. The idea is to restore self-esteem to the village, pride in something of its own, in something the city doesn't have, something that will im-

press even the foreigner. Next Sunday in Innsbruck you'll see whether it works."

Saturday night bathed Innsbruck in soft light as candles flickered in thousands of windows. On the Nordkette the word Tirol was spelled out in flame. By morning, 54 special trains had disgorged passengers from every corner of Tirol. This would be the climax of a year of solemn celebration of the 150th anniversary of Tirol's 1809 revolt against Napoleon, led by Andreas Hofer.

Nine Thousand Musicians March

When the sun was high, a tide of color unrolled into an unbroken parade. Banners, rifles, sabers, medals, thousands of beards. Coats of scarlet, blue, yellow, maroon, and green. Stockings of white and blue, hats in myriad colors and shapes with long white plumes afloat in the breeze.

And what sounds! Nine thousand musicians thumping and blaring away in 287 bands, one from each community. Each main valley formed a battalion. Some marchers carried the tools of their specialty—woodcutters' axes, carpenters' squares, ice axes. Dirndled girls carried the traditional kegs of refreshment and silver cups to dispense it in. There were flowers in hats, in belts, on guns—flowers everywhere (page 116).

On the reviewing platform before the old Imperial Palace, in the spot where the Emperor Franz Josef had smiled at just such a parade some 30 years before, sat Dr. Adolf

Schärf, President of the Austrian Republic. Flags dipped, sabers flashed, and 24,000 Tirolers turned eyes right. Were Americans to parade in similar proportion, eleven million would have to pass before the White House.

My friends among the onlookers supplied clues to the passing splendor. This army, the traditional militia of Tirol, grew out of ancient liberties, explained a university professor, Dr. Anton Dörrer.

"Emperor Max freed Tirolers from service in wars elsewhere on condition that they always be ready to defend this strategic land, the fortress of Austria. From this sprang what you see today. Of course, this is no army for the Atomic Age. Now it's mainly ceremony, representing Tirol's historical traditions."

The Man Who Defied Napoleon

More color, more music, more applause, and the saber of Andreas Hofer was carried past the reviewing stand on a velvet cushion. It is the symbol of the innkeeper who defied Napoleon and triumphed, suffered defeat and betrayal, and walked to the execution wall without regrets.

Other great Tirolers crowded into my mind. The peasant girl Notburga, for one. She refused to mow on Sunday. She flung her sickle into the air, asking the Lord to let the sickle hang there, as a sign that she was doing right. The sickle stuck on a sunbeam, and St. Notburga has a shrine in Tirol.

I thought of Jakob Steiner, who transformed wood from the forests of Absam into violins whose voices rivaled those of Stradivari. I thought of the painter Albin Egger-Lienz, who drew into his Tirolean faces the fire and sorrow of the world.

Then I looked at the faces around me, and at the Nordkette above, and I recalled an admonition from Egger-Lienz:

"When you have something to say, say it as strongly as you can."

The people and mountains of Tirol had spoken to me, of trials, of joys, of new challenges — of new pride. And they couldn't have spoken more strongly.

"**Be happy in this place,**" reads the quotation on the wall of the popular Delevo cellar in Innsbruck. Zither player and companions relax beside a warm tile oven after a day of skiing. Tirolean dress has exerted wide influence on the world of fashion.

EXTACHROME BY PHOTO LIBRARY © NATIONAL GEOGRAPHIC SOCIETY

Shedding skis and sinking into deck chairs, vacationers soak up February sun at the mountain station of the Penken cable lift. They look across Tuxer Valley to the 9,406-foot Grünberg, its shimmering peak masked beneath ice and snow.

Inflatable Ship Opens Era of Airborne Undersea Expeditions

Portable craft and diving saucer can travel by plane to any ocean on earth

By CAPT. JACQUES-YVES COUSTEAU

"I CHRISTEN THEE *Amphitrite*," the beautiful golden-haired princess said in French. "May God watch over thy course and thy crew."

Princess Grace of Monaco, under an umbrella held by Prince Rainier III, swung a bottle of champagne at the bow of our new research vessel (page 144).

A man in the rain-spattered crowd said: "I'll bet it bounces off." Others probably thought the same, for *Amphitrite*'s hull is air-filled nylon cloth. Before the launching at Nice, however, we rigged a metal plate on the fabric to make sure the bottle broke. It did, and the world's largest inflatable ship, 65 feet long and 29 feet wide, skimmed away to join a new research unit: Airborne Undersea Expeditions.

Amphitrite skims over the Baie des Anges off Nice, France. Her hull, divided into nine compartments, draws only 14 inches.

Named for a Greek sea goddess, *Amphitrite* serves as carrier for the diving saucer (below), nesting the little submarine in a well inside her hull. The two vessels comprise the fleet of Airborne Undersea Expeditions, an oceanographic research unit that can travel by plane to distant seas.

Poised for a plunge off the coast of France, the diving saucer swings from a crane aboard *Calypso*, flagship of Capt. Jacques-Yves Cousteau's fish men. Pilot and observer peer through twin portholes that give the craft a goggle-eyed appearance.

PHOTOGRAPHS BY W. E. ROSCHER (ABOVE) AND LUIS MARDEN, NATIONAL GEOGRAPHIC STAFF © N.G.S.

Despite her size, *Amphitrite* weighs only six tons—hull, frame, engines, everything—and draws only 14 inches of water when she is fully loaded with expeditionary gear, five men, and a 2,000-mile fuel supply.

At her launching, one of the proudest witnesses was Commandant Jean Alinat, the alternate leader of our oceanographic endeavors, who had superintended the construction.

"What will you do if she is punctured?" a bystander wanted to know. Alinat pointed to the five-foot-high nylon cylinders that form *Amphitrite*'s bulwarks.

"Inside those are nine separate air-filled inner tubes," he said. "If every one of them is punctured and flooded, the crew will still stay afloat. The tubular girder structure is

Captain Cousteau tells Princess Grace and Prince Rainier III of Monaco of his hopes for the saucer tender.

Undersea explorer and co-inventor of the Aqua-Lung, the author heads the Oceanographic Museum in Monaco. His film on free diving, *The Silent World*, won a Hollywood Oscar for the best feature documentary of 1956. Cousteau and colleagues took only 11 months to complete the craft. A National Geographic Society grant aided the project.

Princess Grace, the former Grace Kelly of Philadelphia, christened the ship.

LES REQUINS ARMATEURS

Self-propelled Cranes Inch *Amphitrite* Through the Streets of Nice

The saucer carrier weighs six tons when fully equipped and ready to go to sea; a conventional vessel of comparable size would weigh 55 tons. Names at the bow identify contractors for the hull and framework. Outer skin of neoprene-coated nylon resists rips and punctures. Only 57 bolts hold the tubular frame together.

divided into light airtight compartments, and the plastic foam deck plates are buoyant, an additional safety factor."

People asked Alinat and me what had led us to make a vessel out of air and spun chemicals. The answer lay in the age-old riddle, "Which came first, the chicken or the egg?"

In this case the egg came first. It was the diving saucer *Denise*.* *Amphitrite*, the mother hen, was created to serve as carrier and tender for the little scientific submarine.

The genesis of *Amphitrite* went back to the 1959 trials of the diving saucer in the Cape Verde Islands. On our voyage back to France in *Calypso*, our oceanographic research ship, Alinat and I and the robust pilot of the diving saucer, Albert Falco, talked about the upbringing of our little submarine.

"Let's face it," I said. "*Denise* is a spoiled brat. She always wants to be in the water. The *Calypso* will get nothing else done but handle the submarine."

"She makes baby sitters out of the *Calypso* and 25 men," Alinat added, "just to put her in the bath and pull her out."

"We must build a special mother ship for the diving saucer," I decided, "and release the *Calypso* for her regular work."

Plastic Doughnut Becomes a Ship

The idea grew from there. Falco suggested a huge inflatable plastic doughnut big enough to float *Denise*. As we talked, the doughnut expanded to a small ship; she acquired a powerful engine and a cabin to sleep five.

But always she remained light and collapsi-

*See "Diving Saucer Takes to the Deep," by Jacques-Yves Cousteau, NATIONAL GEOGRAPHIC, April, 1960.

ble. In fact, by the time we docked in Nice, we had decided she should be airborne. We would load her and *Denise* on a plane and fly an entire submarine expedition anywhere on earth in a few days. We wasted no time, for after *Denise's* proving dive of 1,000 feet off Corsica, requests came in from around the world for help on undersea salvage, scientific, and engineering projects.

As soon as we had made rough drawings of the inflatable mother ship, I flew to Washington and presented the plan to the National Geographic Society's Committee for Research and Exploration. Despite the radical design, the committee put its faith in *Amphitrite*, as it had in the equally radical diving saucer a few years earlier.

Back in France, Alinat planned construction. We ordered the hull from the Zodiac company, French manufacturers of inflatable boats and rafts. The ship's size did not bother Zodiac. The company once built dirigibles. Moreover, they had obtained a fabric ideal for our purpose—a nylon-and-neoprene sandwich, hard to puncture and nearly rip-proof. We were in luck.

Craft Requires Strange Materials

We were asking for other phenomenally light materials without knowing whether they existed. For decking, we discovered a material of glass fiber and foam plastic that had less than half the weight of wood.

We needed a light metal for the tubular mainframe, from which the 3½-ton saucer would hang over her diving well amidships. We found a new stainless tubing of aluminum and magnesium alloy. The complete frame weighs 5,700 pounds and is held together by only 57 bolts. No component except the

Gold medal symbolizes high points in Captain Cousteau's career. The design, by National Geographic artist Peter V. Bianchi, groups Aqua-Lung divers, the research vessel *Calypso*, and its diving saucer around the inscription. Reverse side bears the seal of the Society, which, with the French Government, has been the oceanographer's principal sponsor. The medal pays Cousteau succinct tribute: "To earthbound man he gave the key to the silent world."

Jacques-Yves Cousteau Receives National Geographic Society Medal at White House

"HE IS ONE of the great explorers of an entirely new dimension, and I can imagine his satisfaction in having opened up the ocean floor to man and to science."

Thus President John F. Kennedy presented the National Geographic Society's Gold Medal to Capt. Jacques-Yves Cousteau at the White House on April 19, 1961.

"For me, this is much more than a personal award," Captain Cousteau responded. "It is recognition of a team effort led by my associates in France, together with our friends of the National Geographic Society, the Woods Hole Oceanographic Institution, and the Massachusetts Institute of Technology."

The National Geographic Society's President and Editor, Melville Bell Grosvenor, pointed out that for more than a decade the Society has been a cosponsor of Captain Cousteau's work. "This," he said, "is a wonderful example of international cooperation in science."

engines is too heavy for one man to lift.

Already we were discussing who would make up the five-man crew. We picked as captain the redoubtable François Saôut, veteran skipper of the *Calypso*, who was helping Alinat on construction. Also aboard would be several of our most experienced men: saucer pilot Falco, chief diver Raymond Kientzy, engineer Pierre Bernard, and a cook.

We decided that *Amphitrite*, like *Denise*, would be propelled by water jets; propellers might foul on coral heads or even on *Denise* herself. We wanted diesel power, because oil would be less of a fire hazard than gasoline. But where to find the light yet powerful jet pumps and diesels? I looked in vain in Europe and the United States.

Meanwhile Alinat received the mainframe and the deck plates and began construction in a shed in Nice. I decided to look for a temporary power plant so I would not hold Alinat back, and I asked our American associate, James Dugan, to find some powerful outboard motors. He selected an 80-horsepower model and placed an order for eight. Pan American World Airways flew them to us—the first flight for Airborne Undersea Expeditions.

Bulge in Hull Proves to Be Captain

The nylon hull arrived from the factory in La Rochelle, and Alinat and I went to look at it. We found it spread out like the hide of a bull elephant in a taxidermist's workshop. Could this ever be a ship? Captain Saôut seemed to have no doubts. The bulge we saw moving under the quarter acre of fabric was the future skipper, inspecting a pontoon.

Eleven months after our first discussion, Alinat saw *Amphitrite* launched—surely a

NATIONAL GEOGRAPHIC PHOTOGRAPHER J. BAYLOR ROBERTS

President Kennedy Congratulates a Pioneering French Explorer of the Deep

Beginning with Theodore Roosevelt, nine Presidents have presented National Geographic Society Medals. Speaking for the Society's 2,700,000 members, Dr. Melville Bell Grosvenor (right) thanked Mr. Kennedy "for being so gracious as to carry on this tradition." The President paid tribute to the Society as an "institution . . . which has advanced our information on a whole variety of horizons."

Here Captain Cousteau shows his medal to Mr. Kennedy after the ceremony in the White House Rose Garden. Mme. Hervé Alphand (left), wife of the French Ambassador, Mrs. Grosvenor, and Mme. Cousteau, who accompanies her husband on many of his expeditions, look on admiringly.

record time to conceive, design, and assemble a radical departure in marine architecture. We mounted the outboards on the fantail and operated them in teams of four. While we waited for our jets, they would give us an idea of how the ship performed.

I think none of us will ever forget the dedication ceremonies on December 10, 1960. A week before the date, it was evident that Alinat's people could not finish in time to take the ship apart, truck it three miles to the waterfront, and put it together again—a six-day job in all. Distinguished guests had been invited, including Their Serene Highnesses of Monaco. I hated to postpone the event. That would be a poor debut for an outfit that was supposed to pick up and go on short notice. So we decided to transport the ship fully assembled through the streets of Nice, from the yard to the quay.

The crowd on that rainy day in Nice watched the most animated street spectacle since the Turkish pirate Barbarossa sacked the city in 1543. Mobile cranes lifted *Amphitrite* for the slow, wet march to the waterfront. With police escort, we reached the heart of the old city during the morning rush hour (pages 144-5). Linemen snipped telephone and power wires to let the strange float through, and briskly dismantled a traffic signal while French motorists cheered.

At the quayside a flag-decked honor guard of ships looked on while the cranes placed *Amphitrite* gently on the blue water. She floated like eider down. The Princess christened her, and horns and whistles saluted.

Rollers to Launch Ship From Beach

I conducted our charming godmother and the Prince, who is a free diver and an ardent lover of the sea, aboard the portable ship. I asked them to imagine what happens when *Amphitrite* and *Denise* go on operations.

"Everything arrives in air-freight cartons," I expanded enthusiastically. "Saôut, Falco, and three other men truck the expedition to the seashore. It doesn't matter how primitive the port. They assemble the ship on inflatable rollers and, if necessary, can push her into the water without mechanical power."

Within ten days of a mission order, I added, *Amphitrite* and *Denise* can be on distant diving grounds. The little submarine can chart the Continental Shelf with her echo sounders, take electronic-flash photos and color movies, collect specimens with her hydraulic claw, and apply the finest scientific instruments of all, the eyes of expert human observers.

I got the surprise of my seagoing career when I took *Amphitrite* out on her first run. I set four motors ahead and four astern and she spun around on the spot, as though fixed on a pivot. She was stable and responsive, a vessel related to the water in a new way. I realized that my quarter of a century as a navigator was useless aboard a pneumatic ship. I would have to learn all over again.

Because she weighs so little, the raftlike *Amphitrite* does not roll or pitch. In a choppy sea the small wave shocks are distributed on the bottom, giving the sensation of riding a truck on a bumpy road. She sails well in a sea coming on the beam but is rougher in a head sea. A moderate drift is entirely overcome by her ease of maneuver. We have not yet encountered high waves, but we think *Amphitrite* will safely ride out storms with power shut down and the mainhouse sealed.

Infrared Cooking and Plastic Chairs

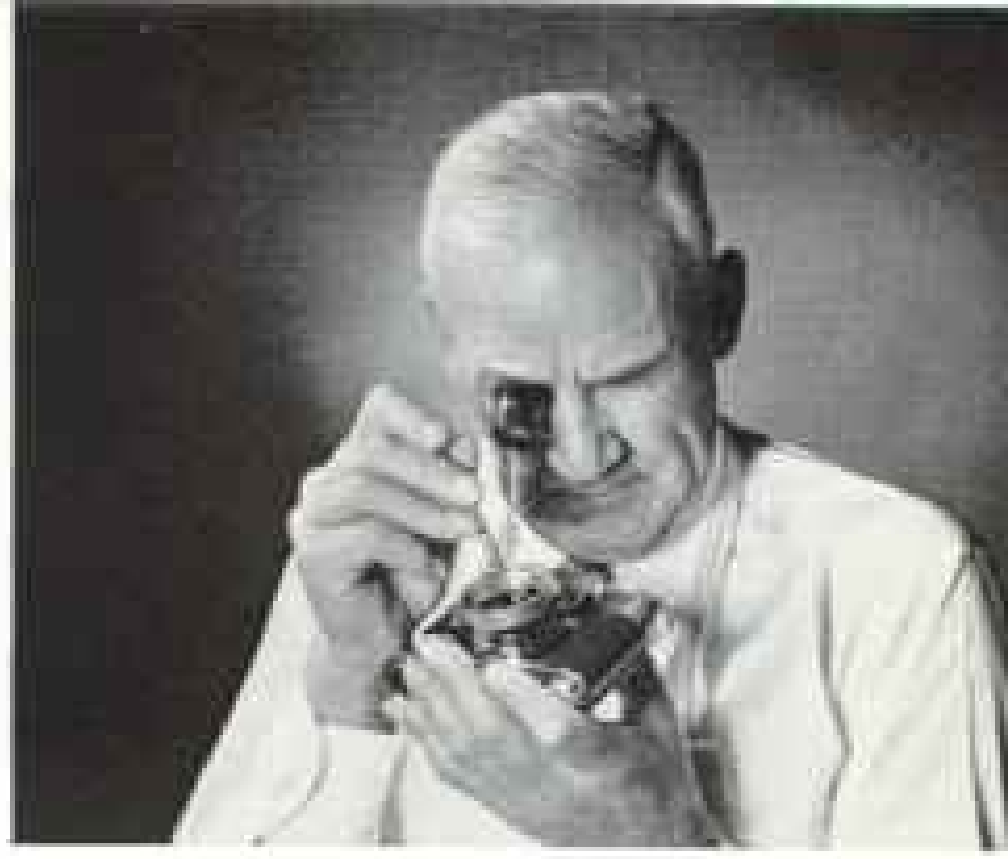
The seaman's life on the great nylon boat is strange but not uncomfortable. The men and the diving saucer and all living and working facilities are housed in a watertight mainhouse of translucent vinyl stretched over the mainframe. The house is slightly pressurized to swell the vinyl into smooth aerodynamic form and to keep water out. The crew cooks on an infrared broiler, sits on plastic chairs, and sleeps on foam rubber.

At night the interior electric lights shining through the vinyl tent make *Amphitrite* glow like some great phosphorescent jellyfish wandered up from the deep. The deckhouse will get terribly hot at diving stations in the tropics, but a portable air conditioner will overcome that.

After the first trials, we found a hydrojet propulsion system—light, compact diesels from Hispano-Suiza in France and jet drive pumps from the Berkeley Pump Company in California. Berkeley engineers were so taken with *Amphitrite* that they pushed production a year ahead to outfit her.

By the time you read this, it is likely that Captain Saôut and his four-man crew of Airborne Undersea Expeditions will be winging from Nice to some lonely shore, where they will assemble *Amphitrite* and launch her by means of the air rollers. They will jet across the sea at 30 knots, carrying *Denise* to a rendezvous with realms never seen by man.

The smallest part of this fine camera is almost microscopic: the biggest part is invisible



Four of the screws used in the new Kodak Retina Reflex III Camera are so tiny that you'd need a magnifying glass to make sure they're not just specks of metal.

The other 466 parts are, of course, larger. But the biggest, most important part of this camera is invisible. This is the patient human endeavor which makes it the camera it is.

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Palos Verdes is but one example of how Gen Tel's Industrial Development Department helps to foster growth in Southern California by aiding large and small companies to locate in an ideal research climate.

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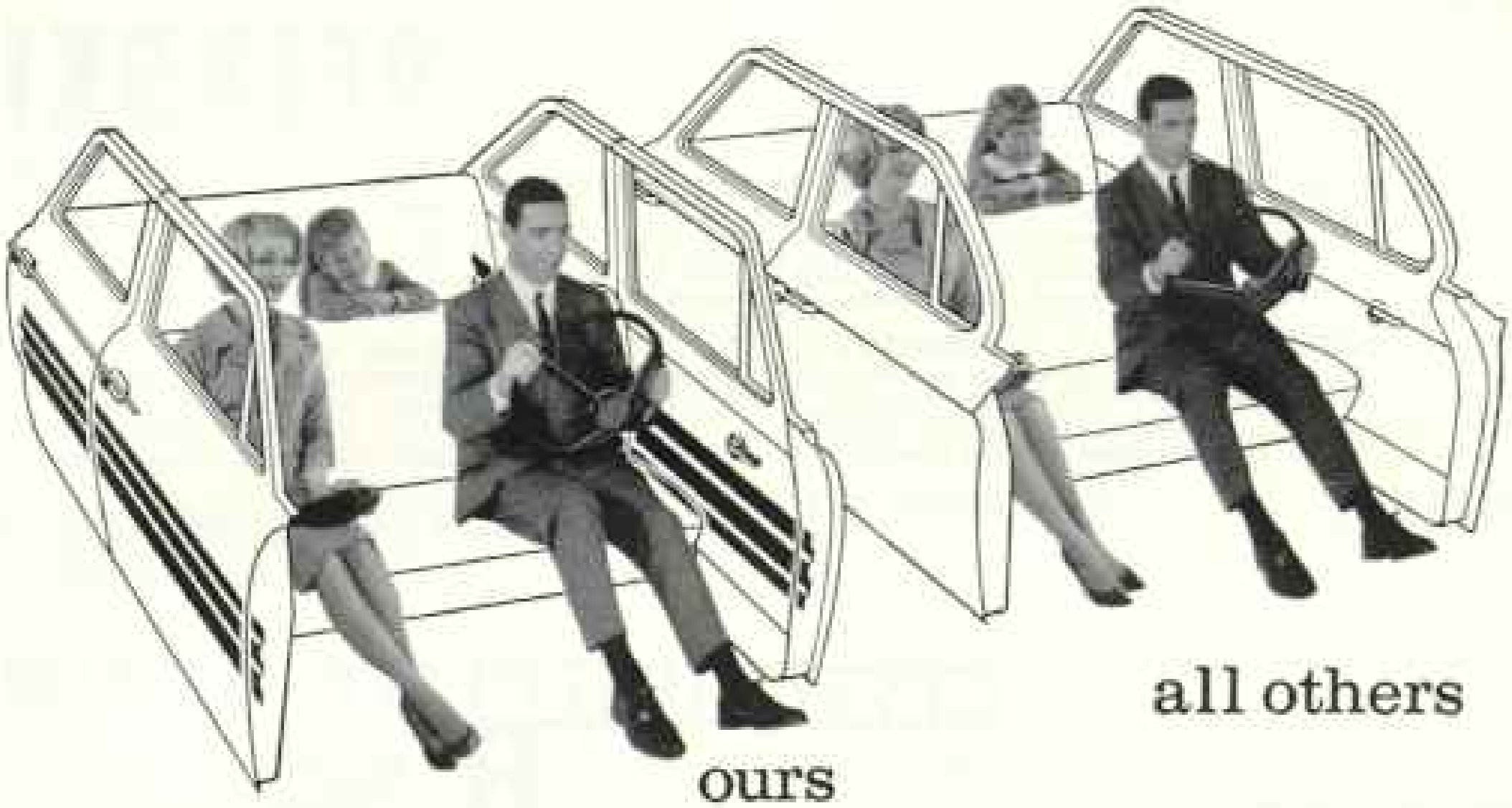

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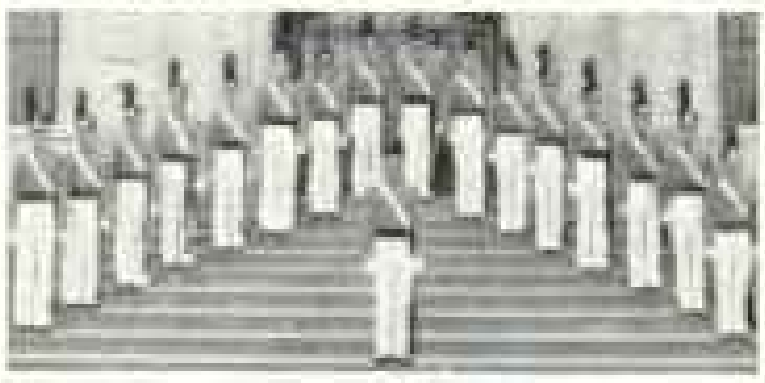

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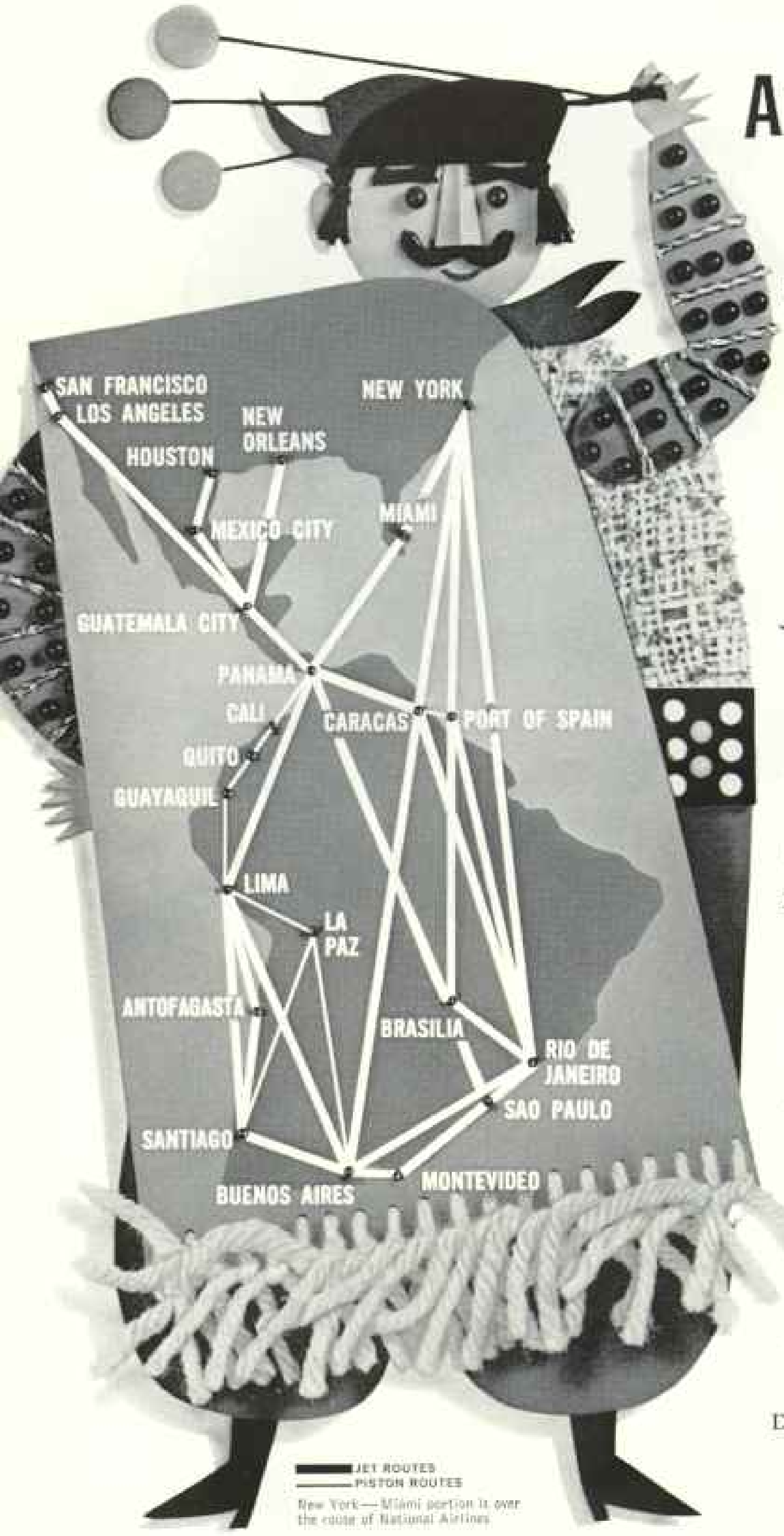

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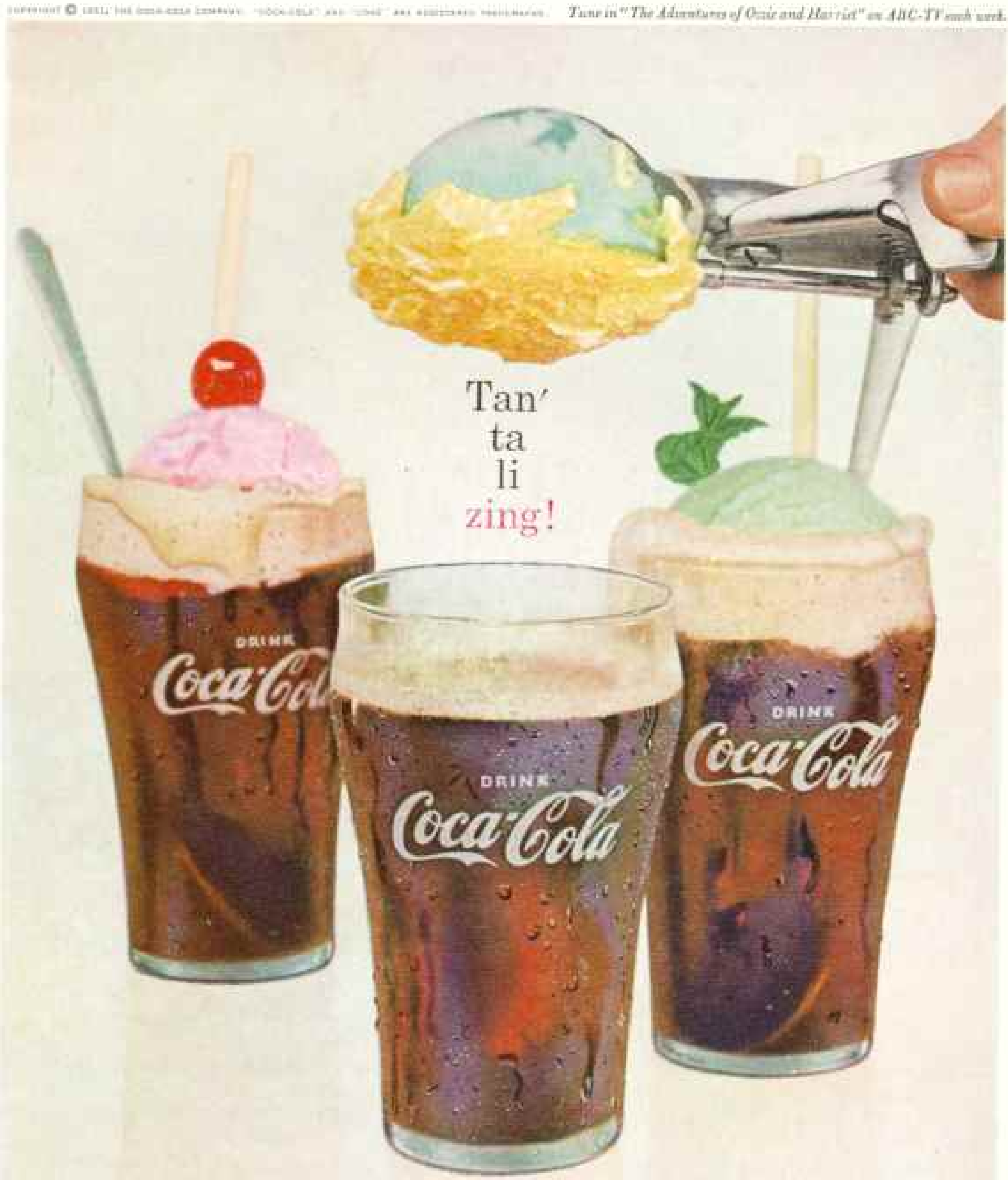

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