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From riverbank caves to mansions of brick and stone, colonial homes trace the founding of our Nation

Philadelphia Houses a Proud Past

By HAROLD DONALDSON EBERLEIN

Illustrations by National Geographic photographer THOMAS NEBBIA

"I WISH IT WERE POSSIBLE," wrote Benjamin Franklin two centuries ago, "to invent a method of embalming drowned persons, in such a manner that they may be recalled to life at any period, however distant; for having a very ardent desire to see and observe the state of America a hundred years hence, I should prefer to any ordinary death, the being immersed in a cask of Madeira wine, with a few friends, till that time. . . ."

What if Dr. Franklin could return to Philadelphia today? The changes might well amaze a man of even his imagination, but the city should not seem altogether unfamiliar to him. He could still find his way "up Market Street as far as Fourth Street . . . down Chestnut Street and part of Walnut"; or along the same cobbled alleys between the same little brick homes. And, of course, he'd recognize Independence Hall as the old State House.

Despite Philadelphia's growth since Franklin's day, the 20th-century metropolis has not crowded its colonial character into oblivion. On the contrary, a surprising number of eminent landmarks in and around this modern city stand to keep the past alive. No other part of our country, in fact, contains so many early buildings associated with the men who founded and guided the fledgling Nation.

In the course of a long life in the Philadelphia area, I have come to know and cherish its historic houses as one knows and cherishes one's favorite books. I like to show them to other persons, too.

Independence Hall Knew Long Neglect

With Howell Walker of the NATIONAL GEOGRAPHIC staff, I set out on a quest that took us first to the heart of Ben Franklin's town. What more logical starting point than the city's best loved shrine: red brick, white-trimmed Independence Hall, the birthplace of the United States.

In this masterpiece of Georgian architecture our Founding Fathers adopted the Declaration of Independence and wrote the Federal Constitution. Here, beneath the Liberty Bell, assembled such Americans as Franklin, Jefferson, and Washington, John Adams, John Hancock, James Madison, and Alexander Hamilton.

While time has enhanced the stature of these men, it has shown far less respect for the shrine. Ironically, the cradle of freedom served variously as jail, as bait in a real estate promotion, and as a popular museum—among

Twilight Shadows Independence Hall, Heart of Historic Philadelphia

Sending commissioners to found Philadelphia in 1682, William Penn ordered that "a great Towne" be planned so as to appear "greene" and "Country." According to a tradition, the Lord Proprietor ensured peace with the Indians by concluding a "treaty of purchase and amity" beneath an elm on a spot now known as Penn Treaty Park (below).

With such a start, Philadelphia soon grew far beyond its founder's dreams. Tall, regal mansions rose along its cobbled streets; gracious country estates embellished farmlands close by. Less than a century after it began, the City of Brotherly Love ranked second only to London in the English-speaking world for its importance in commerce and scientific achievement.

As differences with King George III flamed into revolt, leaders of the Thirteen Colonies gathered beneath the spire of Pennsylvania's State House (right). There they adopted the Declaration of Independence and the Constitution, giving birth to the Nation.

A prize during the Revolutionary War, Philadelphia heard the din of battles at the Brandywine, Paoli, and Germantown. When the redcoats departed, the city served as the National Capital.

Today Philadelphia can no longer claim to be a capital, nor "greene" and "Country." Her historic homes and gardens stand like islands amid a sea of concrete and brick, asphalt and industry. And yet, lovingly preserved, these islands still reflect the elegance and beauty of a Nation in the springtime of its life.

"We will live in love with William Penn and his children as long as the moon and sun shall endure," say the Delaware chiefs. Felix Octavius Carr Darley, who illustrated books by Washington Irving and James Fenimore Cooper, engraved this scene of Penn making his treaty with the Indians.

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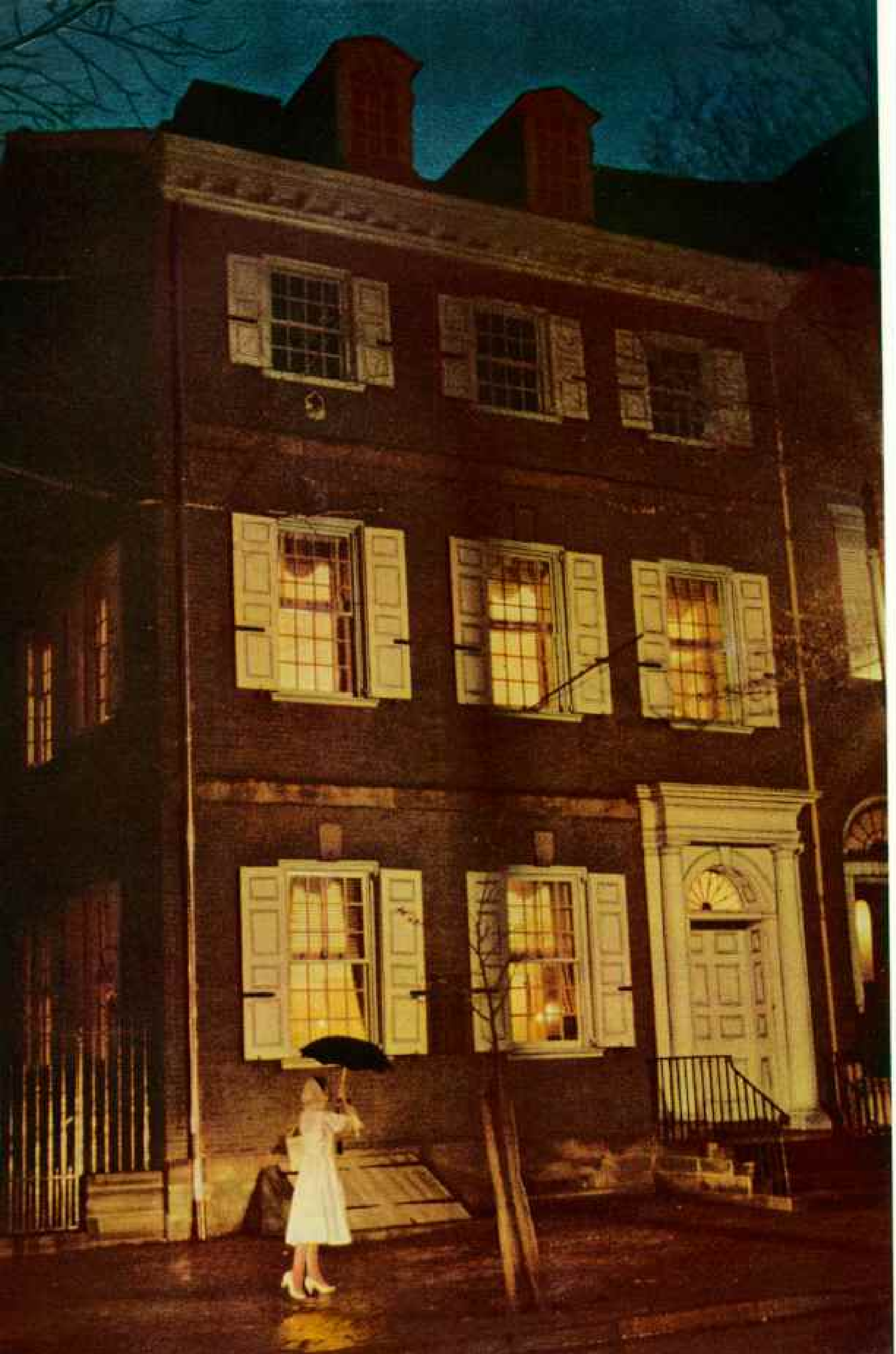
HIGH SPEED EKTACHROME © NATIONAL GEOGRAPHIC SOCIETY

its exhibits was a stuffed five-legged, two-tailed cow. The State House was saved from demolition in 1818 only when the city purchased it and adjacent property from the Commonwealth of Pennsylvania for $70,000. Not for years after the epic Declaration did the neglected State House take the now revered name of Independence Hall.

Today, however, its restoration, together with that of neighboring historic buildings and grounds, is the responsibility of the National Park Service. The multimillion-dollar project progresses slowly because of the research required to achieve absolute authenticity. Ultimately the removal of irrelevant structures and the revamping of entire city blocks in the vicinity will make way for Independence National Historical Park.

We call the colonial homes of the Philadelphia area historic because they reflect a telling phase of American culture and achievement. But men, not architecture, make history. Who, then, lived in these houses that were taking shape even as the foundations of this Nation were being laid?

(*Continued on page 159*)



Powel House Owes Its Hospitable Air to Philadelphia's Patriot Mayor

On the back of a wooden sundial in his garden, Samuel Powel inscribed: "I count Life by Sunny hours and them alone." The mayor, the city's last under royal government and first under republican charter, must have counted high, for he was a connoisseur of the good life.

Born in 1738, Powel inherited a fortune and as a young man went to Europe to enjoy it. On his travels he witnessed the coronation of Queen Charlotte, met King George III, and chatted with Pope Clement XIII, who received him with "great Courteousness and Affability." Thus educated in the ways of Old World society, Powel returned to Philadelphia to settle down. In 1769 he bought a town house on South Third Street (opposite) and filled it with treasures collected abroad. Quaker-plain on the outside, the mansion exemplified 18th-century luxury within.

Marrying Elizabeth Willing, a lady noted for her wit, Samuel soon made his home famous for hospitality. The elite of the day came to Powel dinners, balls, receptions, and teas (page 159). Benjamin Franklin's daughter Sally, writing to her father in London, reported that she had danced with President Washington in the great drawing room (above).

Bought and restored by the Philadelphia Society for the Preservation of Landmarks, the house today welcomes the public. Curator Edwin C. Moore delights especially in visits from his granddaughters, Victoria and Jennifer Brownworth, who admire the geraniums in the Powel garden (right).

History Haunts Old Homes OF PHILADELPHIA AND VICINITY

Souderton

Montgomery County

Lansdale

Perkiomen Creek

MILL GROVE: Home of John James Audubon. Here the French artist began to paint the birds of America in the early 1800's.

MILL GROVE

Norristown

THE HIGHLANDS

DAWESFIELD

Whitemarsh

Ambler

Valley Forge

Chester County

Battle of Paoli, Sept. 20, 1777 ✕

Paoli

U.S. 30

Wayne

WAYNESBOROUGH: Birthplace of Gen. Anthony Wayne. His father built the main house in 1740. William Wayne, the general's great-great-great-grandson, occupies it today.

Bryn Mawr

Conshohocken

Schuylkill River

Ardmore

PONT READING

Merion

Fairmount Park

WAYNESBOROUGH

PHIL.

Delaware County

West Chester

Battle of the Brandywine, Sept. 11, 1777 ✕

Media

JOHN BARTRAM HOUSE: Site of the first outstanding botanical garden in the United States.

GILPIN HOUSE

GILPIN HOUSE: General Lafayette's headquarters before the Battle of the Brandywine, September 11, 1777.

Chadds Ford

Brandywine Cr.

Chester

Delaware River

Ft. Mifflin

PENNSYLVANIA
DELAWARE

MT. PLEASANT

POWEL HOUSE

STATUTE MILES

Map by National Geographic Cartographers
W. N. Palmstrom and I. F. Alleman

Wilmington

Doylestown

LORD STIRLING'S HEADQUARTERS, known as the Thompson-Neely House, stands 4 1/2 miles upstream from Washington Crossing. Here Gen. George Washington and Lord Stirling made plans to cross the Delaware River on Christmas night, 1776, and attack Trenton, New Jersey.

* GRAEME PARK *

Washington Crossing

Delaware River

Newtown

Battle of Trenton, Dec. 26, 1776

Trenton

Morrisville

GRAEME PARK was planned as a malthouse in 1721 by Sir William Keith, then Governor of Colonial Pennsylvania, but it was completed as a dwelling.

Horsham

Hatboro

Bucks County

PENNSYLVANIA

NEW JERSEY

Bristol

Burlington

HOPE LODGE

* ANDALUSIA *

ANDALUSIA: The 19th-century home of Nicholas Biddle, who played a prominent part in the introduction of Greek Revival architecture in the United States.

Battle of Germantown, Oct. 4, 1777

CLIVEDEN

BELFIELD

GRUMBLETHORPE

STENTON

WYCK

STRAWBERRY MANSION

WOODFORD

MOUNT PLEASANT

Girard College

ADELPHIA

Penn Treaty Park

Camden

INDEPENDENCE HALL

POWEL HOUSE

GIRARD'S GENTILHOMMIÈRE

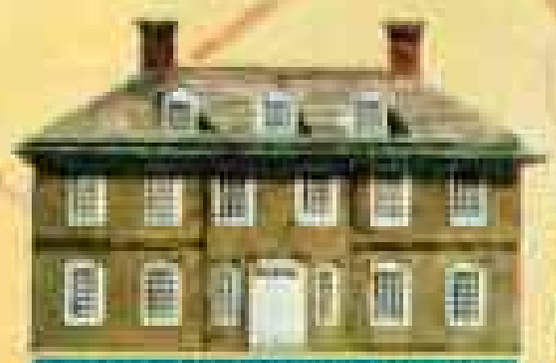
New Jersey Turnpike

STATE IN SCHUYLKILL, one of the English-speaking world's oldest social [illegible], was founded in 1732. Lafayette was an honorary member of the club which met at THE CASTLE.

* THE CASTLE *

EVEN IN COLONIAL TIMES Philadelphians were creating fashionable suburbs by building mansions well removed from the city's heat. The Revolutionary War saw country estates scarred by battle or occupied by the enemy. Those that endure have been lovingly restored.

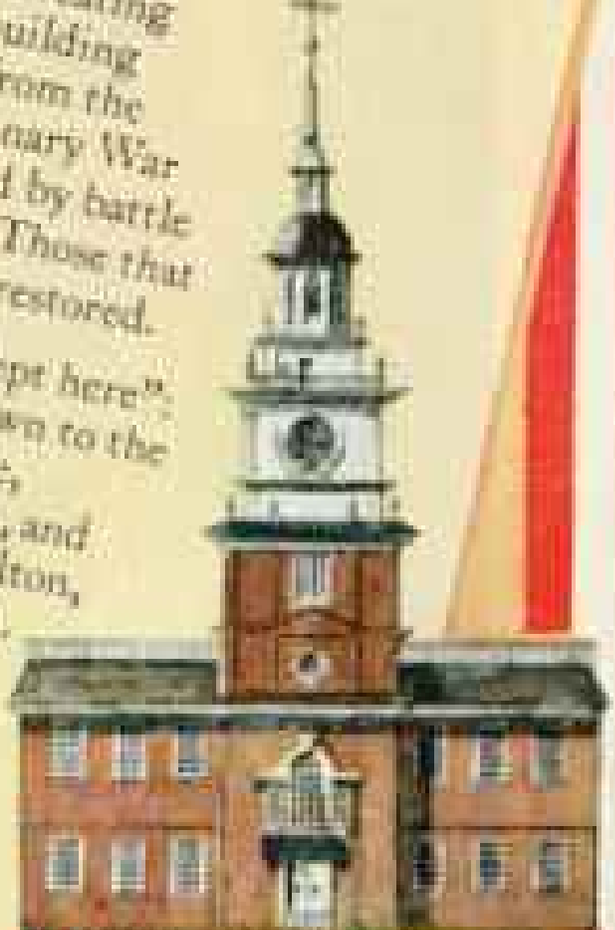
Not only Washington "slept here". These noble homes were known to the generals Lafayette and Wayne, the artists Peale and Audubon, and the statesmen Franklin, Hamilton, Jefferson, Adams, and Madison.



* STENTON *

* WYCK *

* CLIVEDEN *



* INDEPENDENCE HALL *

"Glory of the Snow," Spring Wild Flowers, Frame Stenton

Philadelphia was only 17 years old when James Logan, secretary to William Penn, arrived to guide its destiny. Scholar and scientist, statesman and jurist, farmer and merchant, Logan managed affairs in the colony for more than half a century. In 1728 he built this Georgian mansion as a country seat. Here he welcomed the Indians, who camped on the grounds and wandered at will through the house.

Sold to the city in 1910 by Logan's descendants, Stenton today is maintained by the National Society of Colonial Dames. The garden, following the original's plan, grows the kinds of flowers that Logan enjoyed.

Gold brocade drapes the windows of a refurbished reception room in Stenton. Margot Hubbard, daughter of historian Cortlandt Van Dyke Hubbard, arranges a bouquet of chrysanthemums.

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

During that most critical period of colonial history, the city was frequented by all the great men of America. They were the men who determined "That these United Colonies are, and of Right ought to be, Free and Independent States."

At that time Samuel Powel, mayor of Philadelphia, owned a three-story brick home (pages 154-5) which still stands not far from Independence Hall. He had traveled widely in Europe; he was something of a connoisseur and *bon vivant*, delighting in the pleasures of the table and good company.

When Philadelphia was the National Capital, President Washington, John Adams, foreign ministers, and other notable folk often dined or drank tea in the Powel House. Adams, who liked to chronicle anything that tickled his palate, must have licked his chops as he made the following entry in his diary:

"Dined at Mr. Powell's . . . a most sinful feast again! every thing which could delight the eye or allure the taste; curds and creams, jellies, sweetmeats of various sorts, twenty sorts of tarts, fools, trifles, floating islands, whipped sillibubs &c. &c., Parmesan cheese, punch, wine, porter, beer, &c."

Walking through the Powel House, we, too, encountered elegant variations to delight the eye: impressive paneling, doors of solid mahogany, exquisitely carved mantels above generous fireplaces, many-paned windows, a high ceiling decorated with plaster designs, and a handsomely balustraded stairway. In his garden Mr. Powel had embellished walks and alleys with statuary collected in Europe.

Obviously the Powel household sustained Philadelphia's reputation for good living.

Quaker Pioneers Lived in Caves

The first Philadelphians were troglodytes; they lived in caves beside the Delaware River. Challenging the wilderness of America, they had come from England in 1682 to help William Penn found a Quaker community he called his "greene Country Towne." But until these settlers could build proper houses, they occupied "holes digged in the Ground, Covered with Earth, a matter of 5 or 6 feet deep, 10 or 12 wide and about 20 long." They did not even have planks for floors or walls.

"Herein," wrote an experienced cave dweller, "we lived more Contentedly than many nowadays in their painted & wainscotted Palaces, as I without the least hyperbole may call them in Comparison of the aforesaid Subterraneous Catatumbs or Dens."

Before the end of the 17th century, another writer noted that "the Industrious (nay Indefatigable) Inhabitants have built a *Noble* and *Beautiful* City, and called it *Philadelphia*, which contains above two thousand Houses, all Inhabited; and most of them Stately, and of Brick, generally three Stories high, after the Mode in *London*. . . ."

Few Bricks Shipped From England

"Is it true," Howell asked, "that material for these early homes came from England?"

"Only to a small degree," I said. "You see, there was plenty of local clay for brickmaking, and Penn encouraged the construction of kilns. Also, the area offered excellent fieldstone. The surrounding forests contained abundant wood for the carpenters and other skilled artisans Penn induced to come over with the first group of settlers.

"Colonial Philadelphia relied on master builders rather than professional architects," I added. "But there were cultured men who, like Washington and Jefferson in Virginia, had sufficient knowledge of architecture gleaned from English sources to design houses as pleasing to look at as to live in."

Up to and somewhat after the middle of the 18th century, many of the appointments of the more prosperous American homes originated in England. English silver, china, books, and paintings, carpets, and furniture, together with luxuries from the Continent, graced the "wainscotted Palaces." Then came the vexatious import taxes on British wares, and the colony had to turn to its own craftsmen. Philadelphia distinguished itself in the field of cabinetmaking. Pride in workmanship also grew with the local production of silverware, pewter, glass, and wrought iron.

As Capital of the United States, Philadelphia became the official residence of George Washington, the first President. The city petitioned the legislature to build a presidential mansion, which, however, was not finished until Washington's second term had expired. No President, in fact, ever occupied it.

Eventually torn down in 1829, the presidential mansion leaves to posterity one abor-

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The Author: Long a Philadelphian, Harold Donaldson Eberlein has devoted much of his life to historic buildings; his books, written with Cortlandt Van Dyke Hubbard, comprise an authoritative survey of colonial American architecture. In March, 1931, and February, 1932, he described for readers of the NATIONAL GEOGRAPHIC some of Britain's ancient inns and forgotten beauty spots. His current project: a volume on Delaware's historic homes and churches.

BEECHWOOD (ABOVE), BY THOMAS

tive but happy vestige. Its cornerstone, now preserved in the Library of the University of Pennsylvania, bears the following inscription:

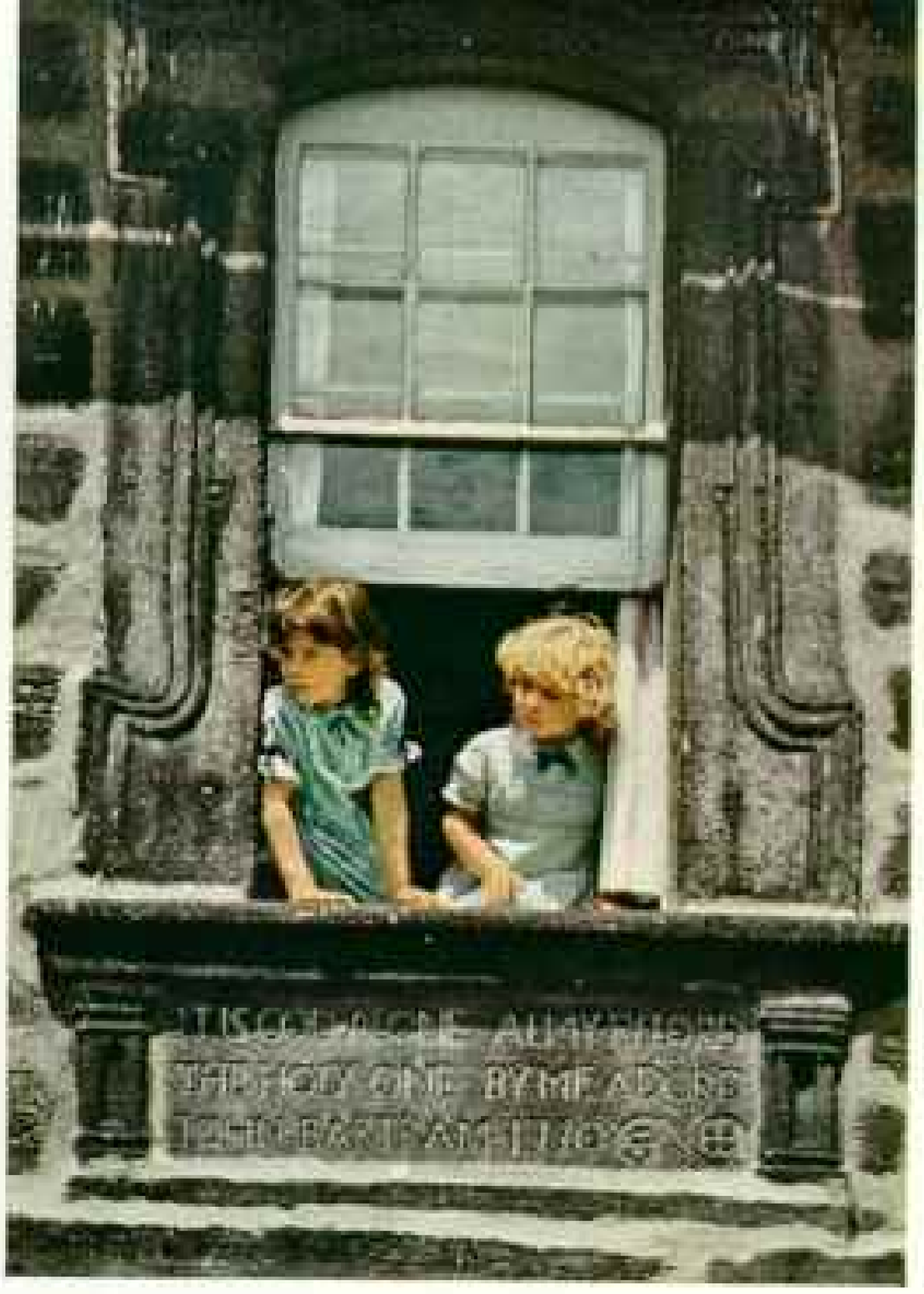
THIS CORNER STONE
OF THE HOUSE TO
ACCOMMODATE THE PRESIDENT
OF THE UNITED STATES,
WAS LAID
MAY 10TH 1792,
WHEN PENNSYLVANIA
WAS HAPPILY OUT OF DEBT;

THOMAS MIFFLIN,
THEN GOVERNOR
OF THE STATE

Some of the old houses Howell and I wanted to explore stood beyond the city limits. What influenced the selection of their sites? Or, for that matter, why did William Penn put Philadelphia where he did?

With good reason Penn laid out his neatly squared town near the confluence of the Schuylkill and Delaware Rivers.* These waterways were the main highways in an otherwise roadless wilderness. Men bold enough to settle outside Philadelphia built homes close to the rivers or their tributaries.

* See "Today on the Delaware, Penn's Glorious River," by Albert W. Atwood, NATIONAL GEOGRAPHIC, July, 1952.



Bartram House Rises From the Green of a 230-year-old Botanical Garden

As a youth, John Bartram had "no person, nor books to instruct me," yet his interest in plants eventually won him international fame. On countless expeditions through the Colonies he gathered notes, drew maps, and collected plants. Returning to his home beside the Schuylkill, the naturalist enriched his own garden with botanical treasures from his travels. Part of that garden survives, surrounding the stone dwelling on which Bartram chiseled the inscription above (page 167).

MERRIS AND KODACHROMES BY HOWELL WALKER, NATIONAL GEOGRAPHIC STAFF © N.G.S.

Beside the streams, gristmills began to grind. Sawyers, quarriers, brickmakers, tanners, and maltsters depended upon water courses. And when the peripheral pioneers came to town, they more often rowed than rode. Thus the exigencies of transportation, farming, milling, and related industries all combined to dictate the pattern of settlement in and around Philadelphia (map, page 156).

As the wilderness diminished and civilization increased, the richer urban families moved to country seats where they could escape the oppressive heat during the sultry months. Houses, begun as summer residences, grew into mansions occupied the year round.

In 1728 James Logan, right-hand man of William Penn, designed and built a country seat four miles out of town. The substantial mansion of brick rose on a 500-acre estate. Logan named it Stenton to commemorate his father's birthplace in Scotland.

Today the city has surrounded this property, squeezing it into three acres. But the Georgian house, thanks to the National Society of the Colonial Dames of America, has remained intact (page 158).

William Penn brought 24-year-old James Logan to Philadelphia as his secretary in 1699. Two years later, when Penn sailed for England, he placed all his Pennsylvania affairs in

A Kingfisher Surveys the Audubon Home on Perkiomen Creek

This mounted bird, borrowed from the collection in Mill Grove (right), calls to mind one of the naturalist's early triumphs as a wildlife artist.

While ranging the meadows along the creek, John James Audubon studied live birds and tried to sketch them, but "could finish none of my sketches.

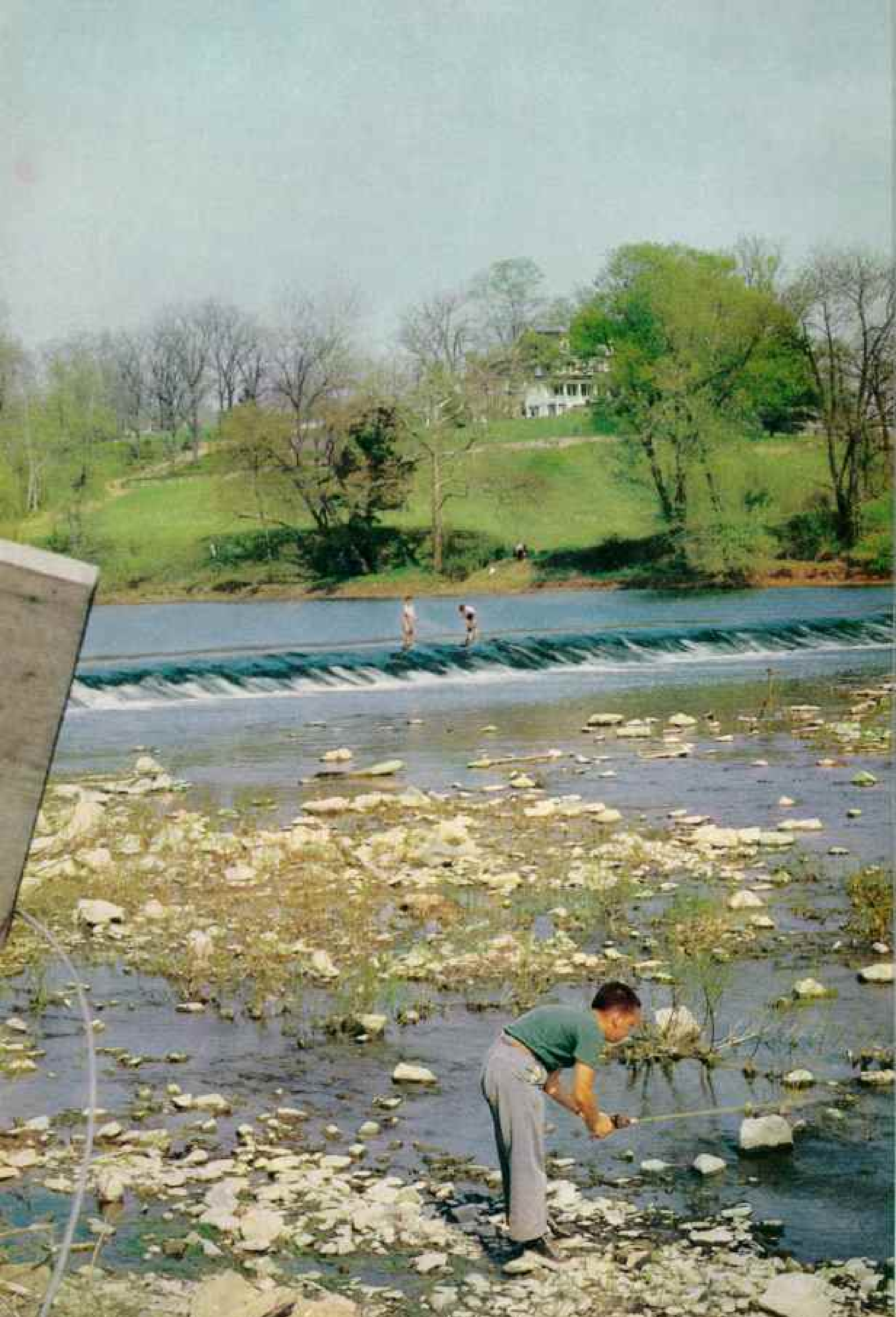
"I procured many individuals of different species," he continued in his journal. . . . "But alas! they were *dead*. . . . When I saw the living birds, I felt the blood rush to my temples, and almost in despair spent about a month without drawing, but in deep thought, and daily in the company of the feathered inhabitants of dear Mill Grove."

Then Audubon had an idea: he bought some wire and grabbed his gun. "I was off to the creek, and shot the first Kingfisher I met." After filing several wires to sharp points, Audubon pierced the body of the bird and fixed it on a board.

"Another wire passed above his upper mandible held the head in a pretty fair attitude, smaller ones fixed the feet according to my notions, and even common pins came to my assistance. The last wire proved a delightful elevator to the bird's tail, and at last —there stood before me the *real* Kingfisher.

"I outlined the bird, aided by compasses and my eyes, colored it, finished it. . . . This was what I shall call my first drawing actually from nature."

ENLARGEMENT BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS NEBBIA © N.G.S.



Ivy-covered Mill Grove, a shrine dedicated to Audubon's memory, welcomes 25,000 visitors a year. In spring many stroll amid blossom-laden fruit trees, watch birds feeding at stations in the sanctuary, or lounge on flowery meadows that roll down to the Perkiomen.

Audubon's life and travels, depicted in murals by George M. Harding, adorn the house where the naturalist lived from 1804 to the fall of 1806. Titles allude to scenes in the prairies and bayous.

Trumpeter swan snaps at an underwing moth. The Audubon water color, painted from nature, appears in reproduction at Mill Grove.

Logan's hands with these words: "I have left thee in an uncommon trust, with a singular dependence on thy justice and care. . . ."

Logan never betrayed that trust. In fact, he was the foremost agent in the making of Pennsylvania. During his useful career as statesman and jurist, he acquired a large fortune by purchase and sale of desirable tracts of land, as well as by trading with the Indians.

Logan's every dealing with the Indians was a model of integrity and fairness. To him was largely due the lasting friendship between red men and white in the Philadelphia region.

He saw to it that Stenton extended every hospitality to the Indians. They often came in large numbers—three or four hundred at a time—and stayed for several weeks, or as long as a year. Though most of these visitors camped on the grounds, many enjoyed the hearthside warmth of the house. Logan welcomed them all.

Throughout James Logan's tenure and afterward, Stenton was also the resort of notables, foreign or colonial. General Washington staged through here on his way to the Battle of the Brandywine. Later, Sir William Howe made the house British headquarters for the bitterly contested Battle of Germantown.

We entered Stenton by the front door, stepping into a wide, brick-paved hall with a corner fireplace. Large doors at left and right opened into paneled parlors. Toward the rear of the house we looked into what had been a small breakfast room, now a bedroom, on one side, and the main dining room on the other. We found no coat closet—only wooden pegs in a wall near the back door.

Library Warmed by Two Fireplaces

Upstairs a two-fireplace library, extending across the entire front of the building, once held the finest classical collection in colonial America. In this room scholarly James Logan spent much time during his declining years. He left his collection to the city. Now it is housed by the Library Company of Philadelphia, oldest subscription library in the United States.

Between the library and one of the bedrooms squeezed what has been called a secret staircase. A tunnel led from the mansion to the stable. If these were intended for escape

Waynesborough Preserves Memories of "Mad Anthony"

Family seat of the Wayne family since 1724, Waynesborough saw the birth of one of the Revolution's finest generals. A student in his uncle's school, young Anthony Wayne lacked enthusiasm for books. "He may perhaps make a soldier," wrote his teacher. "He has already distracted the brains of two-thirds of the boys under my charge, by rehearsals of battles, sieges, etc. . . ." Anthony indeed distracted the British at the Brandywine, Germantown, and Monmouth. He is remembered as "Mad Anthony" for his bravery in storming Stony Point.

According to legend, the enemy came to Waynesborough looking for its owner. Soldiers repeatedly bayoneted the boxwood in foreground, but Anthony was away with his troops.

Great-great-great-grandson William Wayne keeps the home, together with Anthony's portrait, pistols, dress swords, and sash.

from Indian raids, James Logan never used them as such during his tenure.

Along with his legislative and literary pursuits, Logan took warmly to botany, horticulture, and scientific farming. The Colonial Dames have been trying to restore all the planting in the garden at Stenton as it was in his day. Through their research they have learned that Logan liked to adorn his grounds with unusual items, once going so far as to send to England for 12 "naked ladies"—flowers, in this case—the meadow saffron.

Bartram's Garden Still Flourishes

Out of Logan's love for botany grew his friendship with John Bartram. Like Logan, Bartram lived outside the town, but in a less fashionable district. Bartram came of farming stock and didn't give a fig for fashion; actually he much preferred figs. At his farm on the west bank of the Schuylkill he erected with his own hands a large stone dwelling around a small house built about 1650 by Swedish settlers (page 160).

The farmer-mason showed skill as a sculptor, too. Though the micaceous rock he quarried on the place did not lend itself kindly to his chisel, he neatly carved the portico columns and grooved the window trims. Beneath one front window he inscribed:

IT IS GOD ALONE ALMYTY LORD
THE HOLY ONE BY ME ADORD
IOHN BARTRAM 1770

John Bartram, loving everything that sprang from the soil, had a natural bent for botany. Linnaeus called him "the greatest natural botanist in the world." And Benjamin Franklin introduced Bartram to a minister-botanist with: "I believe you will find [him] to be at least 20 folio pages, large paper well filled, on the subjects of botany, fossils, husbandry, and the first creation."

Bartram established the first well-known botanical garden in America. Besides the plants he collected personally throughout the Colonies, he received botanical oddities from all parts of the globe. We found Bartram's garden flourishing with at least 50 different species of trees, some set out by himself.

Over the 27-acre property we strolled with the caretaker. He identified Siberian elm, Syrian jujube, ginkgo, and papaw; also *Franklinia alatamaha* discovered by Bartram in southern Georgia; and, among others, the Bartram oak, a hybrid red and willow oak, which was first found on the botanist's farm.

Down by the river's edge the caretaker pointed to a rough-cut stone under a hawthorne tree, saying, "It marks the grave of Harvey, a faithful Negro slave, freed by his master a century before the Civil War."

After dining at Bartram's home in 1769, a guest wrote: "We entered into a large hall [a dignified term for the big kitchen] where there was a long table full of victuals; at the lowest part sat his negroes, his hired men were next, then the family and myself; and at the head, the venerable father and his wife presided."

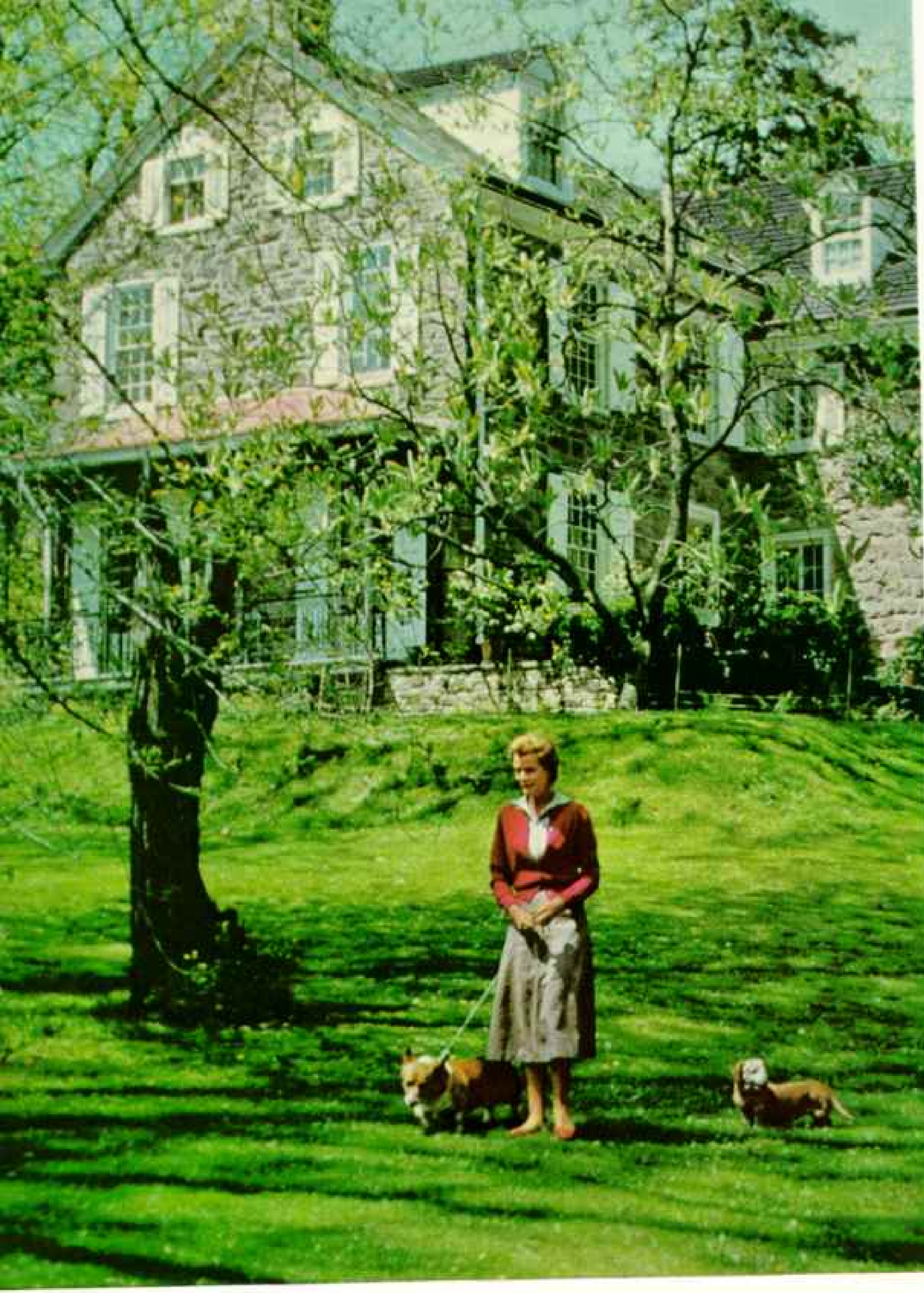
Later, the guest tactfully questioned his host about having Negroes at the table and got this forthright reply: "Those whom I admit to my table, I have found to be good, trusty, moral men; when they do not what we think they should do, we dismiss them, which is all the punishment we inflict. . . . I taught mine to read and write. . . . The oldest person among them transacts my business in Philadelphia, with a punctuality from which he has never deviated. . . . Thee perhaps hast been surprised to see them at my table, but by elevating them to the rank of freemen, they necessarily acquire that emulation, without which we ourselves should fall into debasement and profligate ways."

If John Bartram could return to his "country" property today, he would find it all but engulfed by the city of Philadelphia. A huge quick-mix concrete plant presses against the north edge of the estate; railways run along the west; to the south rises a gypsum mill; and eastward across the river lies an industrial jumble. But Bartram's garden stands its ground—a growing tribute to one of nature's gentlemen.

French Mariner Becomes U. S. Banker

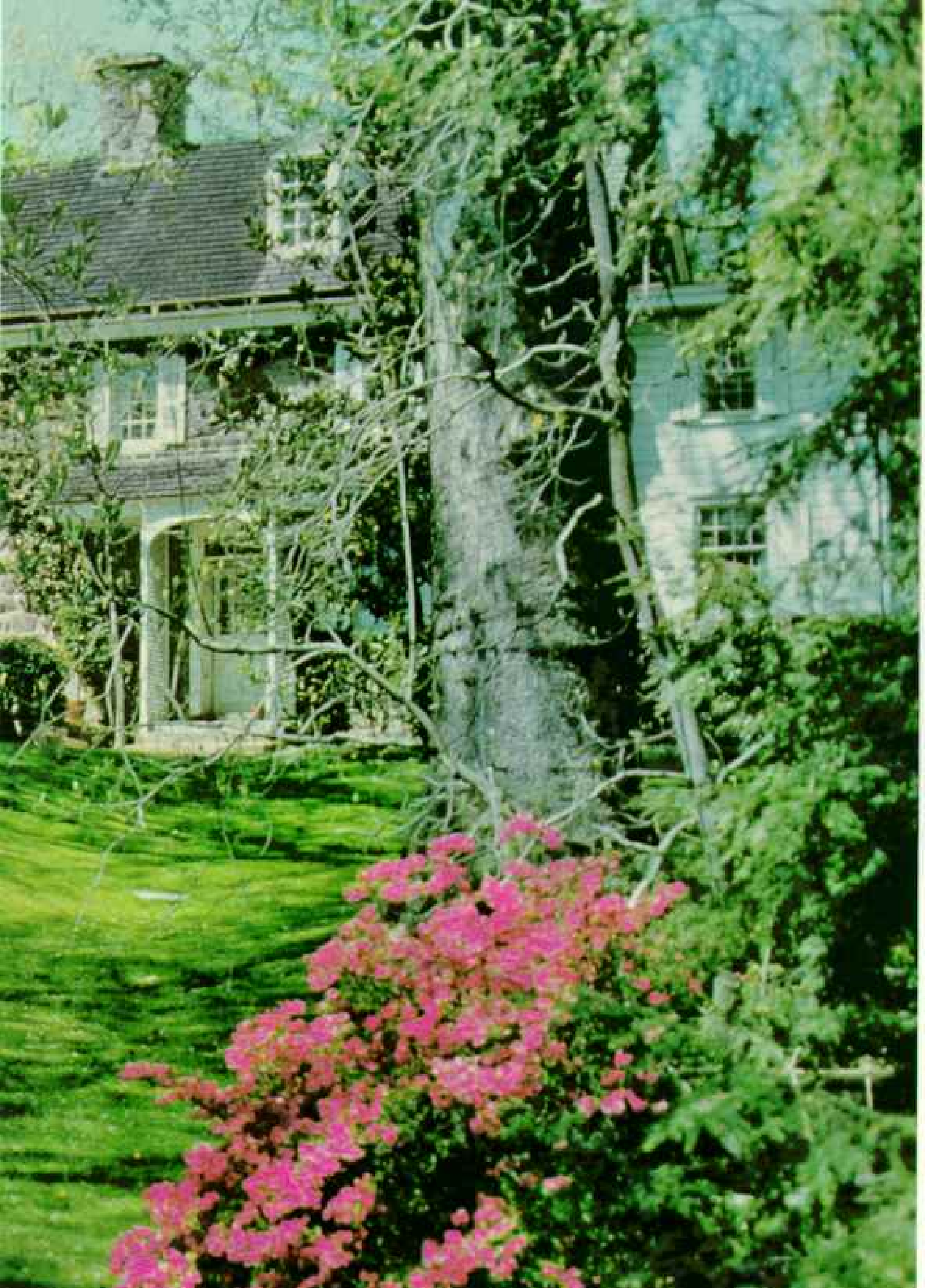
The city's expansion showed far less mercy for the rural seat of Stephen Girard. Except for the homestead now standing in a public square of south Philadelphia, not a trace of the once-productive acres has survived. When Girard bought his farmland in 1797, he remodeled the house already there. The finished building resembled a small 18th-century manor house such as one sees in the Bordelais of France today. It became known as Girard's Gentilhommière.

Bordeaux-born Girard first came to Pennsylvania in 1776 as master of a merchantman bound for New York. Storm damage and



Dawesfield Harbored George Washington After the Bitter Defeat at Germantown

Making this stone house his headquarters for a dozen days in October, 1777, the commander in chief faced "great and insuperable difficulties." Seeing his men exposed to a steady cold rain, he



REDUCTION OF NATIONAL GEOGRAPHIC PHOTOGRAPHER KATHLEEN REVIS © N. G. S.

allowed them to cut many of Dawesfield's trees for firewood. After a council of war, Washington decided to winter at Valley Forge. Years later he recalled the move in the presence of a friend, saying that one could have tracked the Continentals' march by the blood from their ill-shod feet. Mrs. James Cheston IV (above) and her husband preserve their home's many historical features.

PHOTOGRAPHS BY THOMAS NEBBIA (BELOW) AND HOWELL WALKER, NATIONAL GEOGRAPHIC STAFF © N.G.S.

Delft Tiles Beautify a Fireplace in Hope Lodge

The history of Hope Lodge began with an ill-starred romance. Becoming engaged to a young Quakeress, Samuel Morris bought a mansion decorated with Delft tiles. When the bride-to-be failed to claim the home, Morris's plight inspired the lines: "In rooms of State his cruel lot bemoans, and lofty chambers echo to his groans."

Here the Reverend Nathanael B. Groton, a Hope Lodge trustee, reads from an 18th-century Bible. Missing fireplace tiles were replaced in the 1920's by the same Dutch factory that made the originals (page 172). A new tile appears at upper left amid its 18th-century mates.

lack of water forced him into Delaware Bay and on up to Philadelphia. Once there, he abandoned the sea, opened a small store on the waterfront, and proceeded to prosper.

Girard did so well that by 1812 he had founded the Bank of Stephen Girard and was able to help his chosen country finance its war with Britain. And Philadelphia's Girard College—for "poor male white orphan children" to be trained in the arts and trades—was born of his generosity.

Girard earned his reputation as banker and philanthropist. But he was also a successful farmer. His agricultural interests were catholic in scope. Grape growing fascinated him. From France he imported vine sets and fruit trees. He also introduced little-known vegetables and cultivated what were perhaps the first artichokes in Pennsylvania.

Fate changed the career of another Frenchman in the New World. A contemporary of Girard's, he had been sent off to Pennsylvania to find himself a career to follow. In 1804 he settled into a stone farmhouse at Mill Grove, not far from Valley Forge (page 163). During exploratory rambles in the region, he lost whatever enthusiasm he was expected to have for business. Instead, he walked into a lifelong love affair with American birds. His name was John James Audubon.

At Mill Grove—that "blessed spot," as he always called it—Audubon first began to know and paint the wild creatures of his adopted land. Here he conceived the idea of compiling biographies of all the native birds.

In a cave beside near-by Perkiomen Creek, Audubon spent hours at a time observing a pair of nesting phoebes. If, thought he, there were some way to mark the fledglings, one might tell whether they returned to the same locality the next year.

So, in his own words, "I fixed a light silver

thread to the leg of each, loose enough not to hurt the part, but so fastened that no exertions of theirs could remove it." The following spring he had the gratification of finding two birds with "the little ring on the leg." Audubon was the first birdbander in the United States.

We found the old fieldstone farmhouse at Mill Grove well preserved as a national shrine to the memory of John James Audubon. Mr. J. d'Arcy Northwood, curator of Mill Grove and its wildlife sanctuary, attends to the feeding stations, checks numerous nesting boxes, and oversees a plant nursery of hundreds of trees and fruit-bearing shrubs. For the benefit of bird watchers and the pleasure of all nature lovers, five miles of trails wind through the 120-acre preserve's wooded hills and fields beside the Perkiomen.

Learning that Northwood in his seven years here had recorded 152 bird species, Howell asked about rare examples.

"During the winter of 1956-57 we had a 'chickmouse' on the place," the curator said.

"Chickmouse?"

"Well, that's our name for a cross between a chickadee and a titmouse," Northwood explained. "To prove to doubters that there really is such a creature, we netted the chickmouse. After a few people had seen it, we let it go because we couldn't bear to keep the bird in captivity."

Later we learned that other ornithologists have reported seeing "chickmice."

Seven bird miles south of Mill Grove stands Waynesborough, birthplace of Revolutionary Gen. Anthony Wayne and present home of his great-great-great-grandson, William. The charmingly asymmetrical fieldstone dwelling dates from 1724. Anthony's grandfather built it, and Mr. William Wayne is the eighth generation to occupy the family homestead. Not counting two dogs and some pet geese, he lives alone.

Alone? Well, not entirely. No one could be alone in a house so completely impregnated with the spirit of the Revolutionary general, in a house so well furnished with memorabilia of "Mad Anthony." One almost expects to see him burst into the front parlor, making the crossed swords above his portrait rattle and the brace of pistols dance on the chimney mantel (page 166).

Sitting on the back veranda with Mr. Wayne, we enjoyed a vista probably unchanged since the days of Anthony. No other house appeared among the groves or marred the gentle lines of the rolling meadows.

"That large clump of boxwood at the far end of the lawn caused some red faces among the redcoats," said Mr. Wayne. "They had come here looking for my great-great-great-grandfather. When the British got to the box bush, they repeatedly applied their bayonets, sure the general must be hiding there. And all the while he was three miles away, much too busy with his disordered Continentals at Paoli to think of hiding anywhere."

Washington Slept Here, but Badly

As a result of the Paoli Massacre, Anthony Wayne was court-martialed for his defeat (and fully exonerated) in the parlor of a house called Dawesfield. This rambling stone home sheltered two other distinguished Revolutionary generals (page 168).

Lafayette, nursing a wound sustained at the Brandywine, slept in the entrance hall because he couldn't climb the stairs to a bedroom.

Directly above the hall General Washington spent a dozen troubled nights. After the unsuccessful encounter with the British at near-by Germantown, he could face only with misgivings the prospects of wintering at Valley Forge.

At Dawesfield we met Mr. and Mrs. James Cheston IV who, while making it their eminently livable home, have guarded many of its features that speak of the past. They showed us upstairs to the room used by George Washington. A plaque on the footboard of a four-poster told that "General Washington slept in this bedstead during the encampment at Whitpain, Oct. 21st to Nov. 2nd 1777."

The American commander in chief had to decide whether to cross or not to cross the Delaware River. Should he drag his miserable little army of ill-equipped, hungry, suffering soldiers into winter battle against far superior British forces strongly entrenched at Trenton, New Jersey? In effect, General Washington had to decide whether to keep the Revolution going or to abandon the cause of freedom.

Being George Washington, he chose the course of greatest resistance. He reached this decision in a Bucks County farmhouse—the Thompson-Neely house—then the headquarters of Gen. William Alexander, titular Earl of Stirling, who sided with the Americans.

Here Washington and his staff laid plans to cross the icy Delaware for a daring attack on Trenton.

Even as the officers held council in this "house of decision," men lay groaning and dying on the floor of another room bravely called the hospital. Walking patients carried out the dead only to make way for other frozen, diseased, and dying Americans. The unmarked graves of a score of these Continental soldiers lie not far away on the right bank of the Delaware.

This tragi-historic house, dating from 1702, has proudly challenged time. As a monument to Washington's courage, it remains open to visitors every day of the year.

"And that means Christmas, too," Mrs. Ann H. Hutton, the house's chronicler, told us. "After all, December 25 is the most significant date in the history of the place."

Housewarming Has a Cold Ending

Is a house historic just because it dates back to colonial times? For instance, consider Hope Lodge, built about 1723 by Edward Farmar and bought by Samuel Morris in 1746. Who were they? What did they do for the country? Why, in short, do people visit this 236-year-old house, 15 traffic-crowded miles north of Philadelphia's City Hall?

As we approached Hope Lodge, I sketched for Howell the background of the big brick-fronted house. Once said to have been designed by a pupil of Sir Christopher Wren, it is one of the noblest examples of Georgian architecture on this side of the Atlantic.

Samuel Morris, of Montgomery County, prepared the home for his bride-to-be. When all was ready, he had a lavish housewarming before his lady appeared on the scene. Even more embarrassing than her absence was his presence. In the convivial heat of the party, Morris dropped a careless remark that reached the ears of his betrothed with miraculous—almost telegraphic—dispatch. She promptly broke the engagement.

"What was the remark?" Howell asked.

Samuel Morris had said, "I've got the pen; all I want now is the sow!"

After that regrettable incident, however, Morris behaved in a more exemplary manner. He became a justice of the peace and a much-respected Friend. But whatever hopes he may have entertained, a wife never shared his home.

In 1776 William West, a rich Philadelphia shipping merchant, bought the estate. He retired from business and settled down to enjoy bucolic peace. But the alarms of war blasted his plans; British forces camped round about him. And like many another dwelling in the area, Hope Lodge became an emergency hospital after the Battle of Germantown.

Mansion Earns a General's Gratitude

Later, when the Continental Army lay at Whitemarsh, the Wests frequently entertained General Washington. To show his gratitude, the general issued an order forbidding his soldiers to fell trees on the property; they had to seek firewood elsewhere. Walnuts, pines, sycamores, and maples still spread their branches on all sides of Hope Lodge.

After the Wests, various families successively occupied Hope Lodge. In 1922 it was threatened with demolition. But Mr. and Mrs. William Degn came to the rescue, purchased the property, and lived here to protect it. As nearly as possible, they restored the home to its original condition, furnishing it appropriately with authentic colonial pieces.

As Mrs. Evelyn Wentz, the caretaker, showed us through the unusually large but splendidly proportioned rooms, we learned that all the wooden moldings and gracefully arched doorways had been worked by hand on the place.

"How about the tiles around the fireplaces?" Howell asked.

"They were imported from Holland," Mrs. Wentz said. Then she recounted that the tiles came to Hope Lodge from Delft before George Washington was born. As the years went by, some were broken, some stolen, some fell out and got lost. In 1923 Mr. Degn sought to replace the missing tiles. He journeyed to the Netherlands, taking with him an original tile in the hope of having it matched (page 170). When he showed his sample to an authority in Delft, Degn learned that the factory where this very tile had been

Bright With Candlelight, Gilt-framed Glass Mirrors a Hope Lodge Bedroom

This and other rooms in the mansion saw wounded soldiers stretched on the floors after the Battle of Germantown. George A. Landell, seated on the bed, serves as a trustee for the onetime home of his friend, Mrs. William Degn, who bequeathed it to Pennsylvania as a memorial to her husband.

KODACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER KATHLEEN REVIS © N. G. S.

Tulips Herald Spring's Arrival at The Highlands

During the 1790's Philadelphia basked in the glory of the young Nation's "court." The President and Cabinet, Congress and ambassadors gave brilliance to a society that outdid itself in hospitality. Although Anthony Morris owned a mansion in town and a house at Bolton Farm, he yearned for a country seat designed on a grand scale. The Highlands, erected in 1796, satisfied his longing but nearly bankrupted him.

Today the Nicholas G. Roosevelts—he is a distant cousin of both Theodore and Franklin D.—treasure the house and keep its garden at the peak of perfection. Mrs. Roosevelt here admires the work of chief gardener Archie Coots. A side entrance of the home appears beyond.

baked 200 years earlier was still in operation. The rest was easy. Degn got all the tiles he needed.

A five-minute drive from Hope Lodge took us to The Highlands, where we lunched with Mr. and Mrs. Nicholas G. Roosevelt, the present owners. The house, built in 1796 as a summer residence for Anthony Morris, handsomely qualified as a country seat.

So high and wide is the main hall you could drive a bus through it. Two large front parlors off this concourse multiply their dimensions with immense mirrors. The dining room —really a banquet hall—appears capable of seating at least 70 guests. A beautiful stairway lighted by a broad Palladian window leads to huge bedrooms above.

Mrs. Roosevelt told of John Peter David Sheaff, a former owner of The Highlands and a courtly but eccentric gentleman who "always smelled delightfully of whiskey."

"He had a positive genius for procrastination," she said. "When he intended to make some change in the stairway—fortunately he never did—he put pine scaffolding about it. The scaffold stayed there for 60 years and turned mahogany color from age. He'd apologize to visitors, saying he'd just decided on some alterations that needed temporary scaffolding. It was still there when he died."

Mount Pleasant crowns a hill in Fairmount Park overlooking the Schuylkill valley. Flanked by twin outbuildings, the big house suggests a colonial plantation along Virginia's James River.

The high foundation of cleanly squared masonry supports massive stone walls coated with yellow-gray stucco. Heavy brick quoins at all corners and foursquare chimneys give the

building impressive solidity. It is hard to tell the back from the front; both east and west façades are imposing; both have broad flights of stone steps leading to classical doorways beneath Palladian windows.

No less striking is the interior with its superb woodwork. Hand-tooled cornices, pilasters, pediments, and window casings embellish the halls and high-ceilinged rooms. Every detail of recessed china cupboards, the stairway, and paneling around fireplaces reflects the care that was devoted to the building of a colonial home like Mount Pleasant.

Privateering Paid for Mount Pleasant

John Macpherson, a Scottish sea captain who made a fortune in privateering, built Mount Pleasant in the early 1760's. Its extravagant baronial aspect led John Adams to call it "the most elegant seat in Pennsylvania."

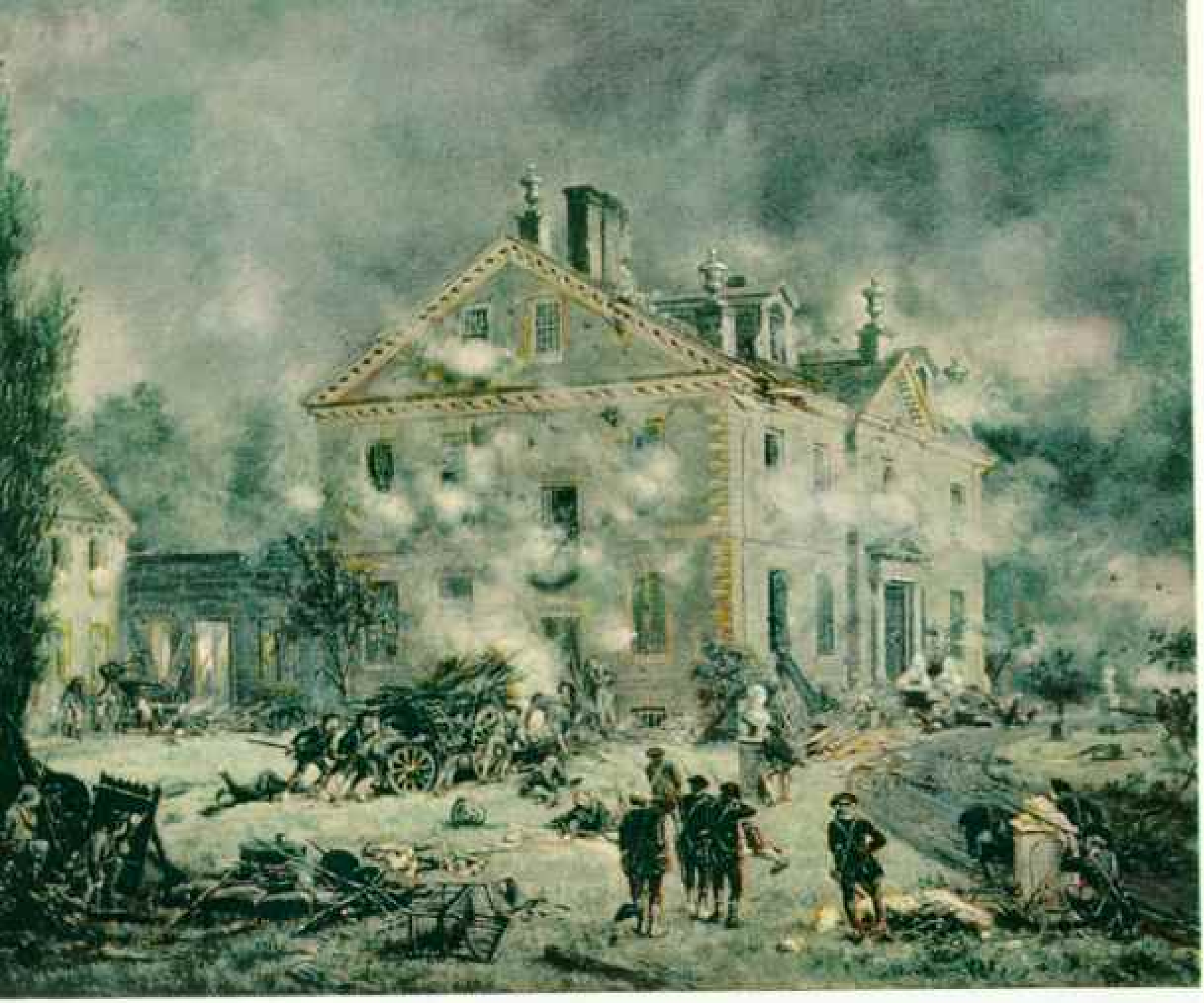
Of the builder himself Adams said he had "a clever Scotch wife, and two pretty daughters. . . . He has been nine times wounded in battle . . . an arm twice shot off, shot through the leg. . . ." Just how a man could have one arm shot off twice didn't seem to concern Mr. Adams. But then the captain was a man of many parts.

To wit, Macpherson devised an apparatus for moving brick houses bodily; lectured on astronomy; wrote of moral philosophy; compiled the first city directory; and acted as a land and ship broker. What's more, he invented an "elegant cot which bids defiance to everything but Omnipotence. No bedbugs, mosquito or fly can possibly molest persons who sleep in it."

In 1779 Benedict Arnold bought Mount Pleasant as a gift for his bride, the lovely Peggy Shippen. But Arnold never lived in his new home; shortly afterward came the discovery of the treachery to the American cause at West Point which necessitated his eventual flight to England.

Mount Pleasant was confiscated, leased briefly to Baron von Steuben (General Washington's drillmaster), and finally bought by Jonathan Williams, who became the first Superintendent of the United States Military Academy at West Point. The Williams family kept Mount Pleasant until 1853. Fifteen

Author Eberlein relaxes with friends in The Highlands' spacious garden



KODACHROMES BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS NEBBIA © N.G.S.

PAINTING BY AN UNKNOWN ARTIST

Treasures of Cliveden: Benjamin Chew's portrait, hat, and gun. As head of Pennsylvania's judiciary system under Crown and Commonwealth, Judge Chew ranked as one of Philadelphia's most distinguished citizens. He built Cliveden as a country residence in 1761, and a household of beautiful daughters kept it lively and gay until the Revolution.

Smoke of Battle Hangs Over Besieged Cliveden

Reeling under Washington's surprise attack against Germantown, the British converted Benjamin Chew's country home into a fortress. The Continental command, fearing "to leave a castle in our rear," threw men and artillery into a fruitless fight. When ammunition ran low, the Americans pulled back, leaving the house with scars that may still be seen. E. L. Henry's painting, done in the early 1800's, hangs in the house.

Handed down from one generation of Chews to another, Cliveden now appears serene and gracious.

Cliveden's chatelaine, Mrs. Samuel Chew, surveys the columned foyer that saw a glittering reception for Lafayette.

years later it passed to the city to become part of Fairmount Park.

Another show house in Fairmount Park, 160-year-old Strawberry Mansion, rose on the site of an earlier dwelling called Somerton. Charles Thomson, Secretary of the Continental Congress, lived in the older house, which Lord Howe permitted—or ordered—to be sacked and burned during the British tenure of Philadelphia.

Strawberry Mansion acquired its name belatedly but fairly. An enterprising woman, known to us only as Mrs. Grimes, purchased the estate in the mid-19th century. She was a farmer with a marked aptitude for business and a determination to make the property pay. Mrs. Grimes concentrated on the cultivation of strawberries. With the "carriage folk" who drove out from the city for a dish of her delicious berries and cream, she did a highly lucrative trade.

Following the era of Mrs. Grimes, Strawberry Mansion served successively as a kind of cabaret, a somewhat grubby picnic center, and police headquarters. In the end it was restored to colonial status by a ladies' committee admirably obsessed with respect for the past.

We found every room but one precisely furnished with proper period pieces. The exception was an attic to challenge all attics. No more convincing confusion of miscellany cluttered any loft I've known in my long career of probing old homes. And the collection so fascinated Howell that he wrote down some of the items:

Early American dolls and a well-appointed dollhouse, a spinning wheel, a harp, crude cooking utensils, a much-traveled leather trunk, tin bathtub shaped like a deep armchair, marble-topped washstand and everything that went with it, a shovel, earthenware pitcher and jars, and a modern fire extinguisher.

Battle Raged in Stately Mansion

Many a splendid dwelling in the Philadelphia area suffered during the Revolution. The focal point of the Battle of Germantown, for example, was Cliveden, the solidly built home of Chief Justice Benjamin Chew. And it was a sorry-looking place after this engagement. "A tempest of round-shot, grape and musketry" scourged the building and defaced statuary on the lawn. The stately front door and windows were shattered, the roof perforated. Smoke blackened the walls and ceilings, blood stained the floors. Only the mansion's massive stone sides still stood intact.

Before the war a galaxy of social satellites orbited around the Chew household. The judge was given to hospitality; his daughters were beautiful and gifted. The one called Peggy won the devoted attentions of Major John André, this British spy courting her in verse.

He began with:

The Hebrews write and those who can
Believe an apple tempted man
To touch the tree exempt;

and wound up with

What mortal Adam's taste could blame,
Who would not die to eat the same,
When gods might wish a *Chew?*

Lafayette's Breakfast Drew a Crowd

Judge Chew sold Cliveden in 1779 because war had left it such a wreck. But, still loving the place, he bought it back 18 years later. Chews have lived there ever since (pages 176-7). In 1825 the judge's son gave a breakfast party for Lafayette on the occasion of the French hero's triumphal return to the United States. One of the guests wrote of the event:

"... every person seemed so anxious to see him [Lafayette] eat, that a centinal had to keep guard at the door with a drawn sword—it was very fine indeed. When he departed the shouts of the multitude and the roaring of the cannon was almost deafening."

That same day a great reception was tendered Lafayette at near-by Wyck, the oldest house in Germantown (page 180). Built about 1690 and never sold, Wyck has passed by inheritance through nine generations to Robert Bowne Haines III, its master today.

In the vicinity of Wyck we entered a 216-year-old dwelling constructed of stone quarried on the place and timbered with beams hewn from the adjacent woods. Its builder, John Wister, was as charitable as hospitable: "He caused bread to be baked every Saturday to be distributed among the poor, who came in numbers to his door to receive it." One hungry fellow, invited in for a meal, stayed on for 20 years. Wister's grandson gave the house a name as memorable as risible: Grumblethorpe (page 181).

Perhaps more appropriately named, near-by Belfield received the artistic attention of Charles Willson Peale. He enlarged and occupied the house between 1810 and 1821. Upon his garden he lavished infinite care. This man, whose achievements ranged from making false teeth for General Washington

(Continued on page 184)

PHOTOGRAPHS BY DAVID S. BOYER (ABOVE) AND THOMAS NEBBIA, NATIONAL GEOGRAPHIC STAFF © N.G.S.

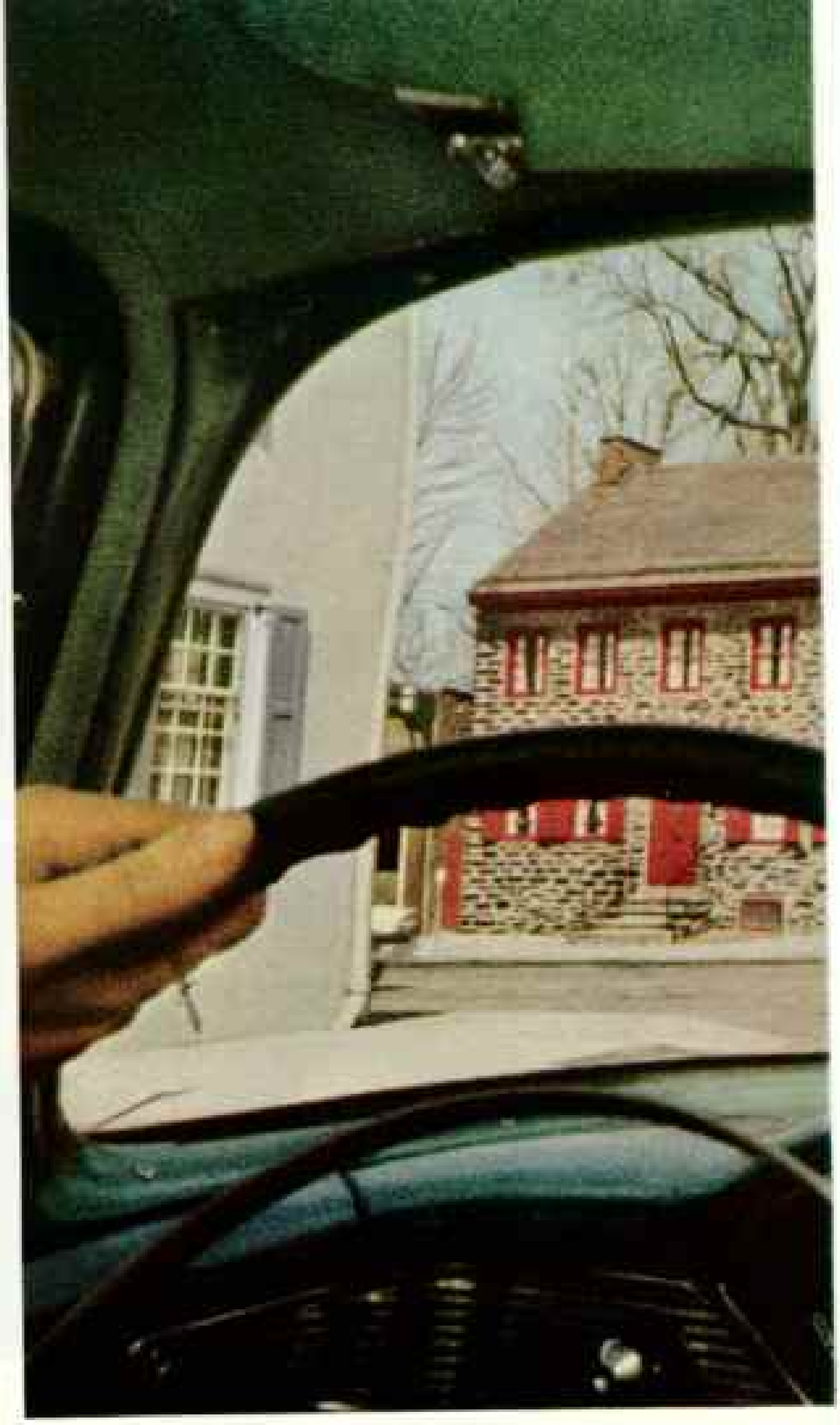
Citizens Congregate at the Castle of the State in Schuylkill

"To promote geniality," 27 Philadelphians founded the Colony in Schuylkill in 1732. The club, better known as the Fish House, continued through the years, granting itself statehood, electing Lafayette to honorary membership, and about 1812 rearing this wooden Castle. Since its founding, the Fish House has elected only 413 members. These men relax after the "simple pleasures" of cooking a meal "with their own hands," as their charter provides. Club law bans talk of religion or politics.

Mixing Fish House punch, citizen Benjamin Chew wears an apron emblazoned with his initials and a fish.

Germantown Traffic Swirls Past Grumblethorpe, Once a Country Seat

In 1744 John Wister, a prosperous Philadelphia merchant, built the house out of the stone and wood found on the extensive property then surrounding it. The dwelling soon became known as a refuge for those in trouble. One such person, a German girl of 17, was sent by her dying father to seek Wister "and trust to the goodness of his heart for relief." The relief lasted a lifetime; she served the family devotedly until her death as an old woman. Another beneficiary of Wister's generosity, a hungry Frenchman, came for a meal and stayed 20 years. Grumblethorpe's caretaker occupies the stone house at left.



Spinning at Wyck, a hostess for the Historic Tour of Germantown, held each May, shows visitors how their ancestors made thread. Descendants of builder Hans Milan own the 270-year-old house, Germantown's oldest.

"Rather old-fashioned, in the German stile," said artist Charles Willson Peale of the home he bought in 1810. Although modified and redecorated through the years, Belfield remains a charming, comfortable retreat in a crowded city. Here Mrs. Sarah Logan Starr Blain, great-great-granddaughter of the William Wisters who acquired the property as a wedding gift in 1826, sits in the library with her husband, Dr. Daniel Blain, an internationally known psychiatrist. A descendant of James Logan as well, Mrs. Blain bade the Indians welcome to Stenton on their last ceremonial visit to Philadelphia in 1922 (page 158).

HIGH SPEED EKTACHROME (UPPER) AND KODACHROME BY THOMAS NEBBIA © NATIONAL GEOGRAPHIC SOCIETY

Empire bedroom is one of the attractions of Strawberry Mansion, which dates from the early 1800's. Owned by the city, the house stands in Fairmount Park.

Benedict Arnold Bought Mount Pleasant for His Bride, Peggy Shippen

In 1761 John Macpherson, a sea captain, built Mount Pleasant on a hill overlooking the Schuylkill. John Adams described the house as "the most elegant seat in Pennsylvania."

Ambitious General Arnold saw the baronial mansion as a fitting setting for the fashionable life he hoped to lead with his beautiful wife. He gave it to Peggy as a wedding present, but betrayed his country and fled to England before they could live in it.

Exquisitely furnished with antiques from the Philadelphia Museum of Art, Mount Pleasant today stands open to the public, together with other historic houses in Fairmount Park. Twice-a-week bus tours give summer visitors an opportunity to inspect five of them within a few hours.

Water globe intensifies candlelight for eyestraining work. Mrs. William P. Barber, Jr., wife of the curator at Woodford, uses old-time quilting methods. Pinching the tail of a brass bird, she opens its beak to insert a circlet of cloth. The device makes it easier to sew pieces of the quilt together.

Woodford, one of the old homes in Fairmount Park, was restored by the estate of Miss Naomi Wood and furnished with her American antiques.

to painting portraits and engraving mezzotints, valued the exertions of gardening as welcome relaxation.

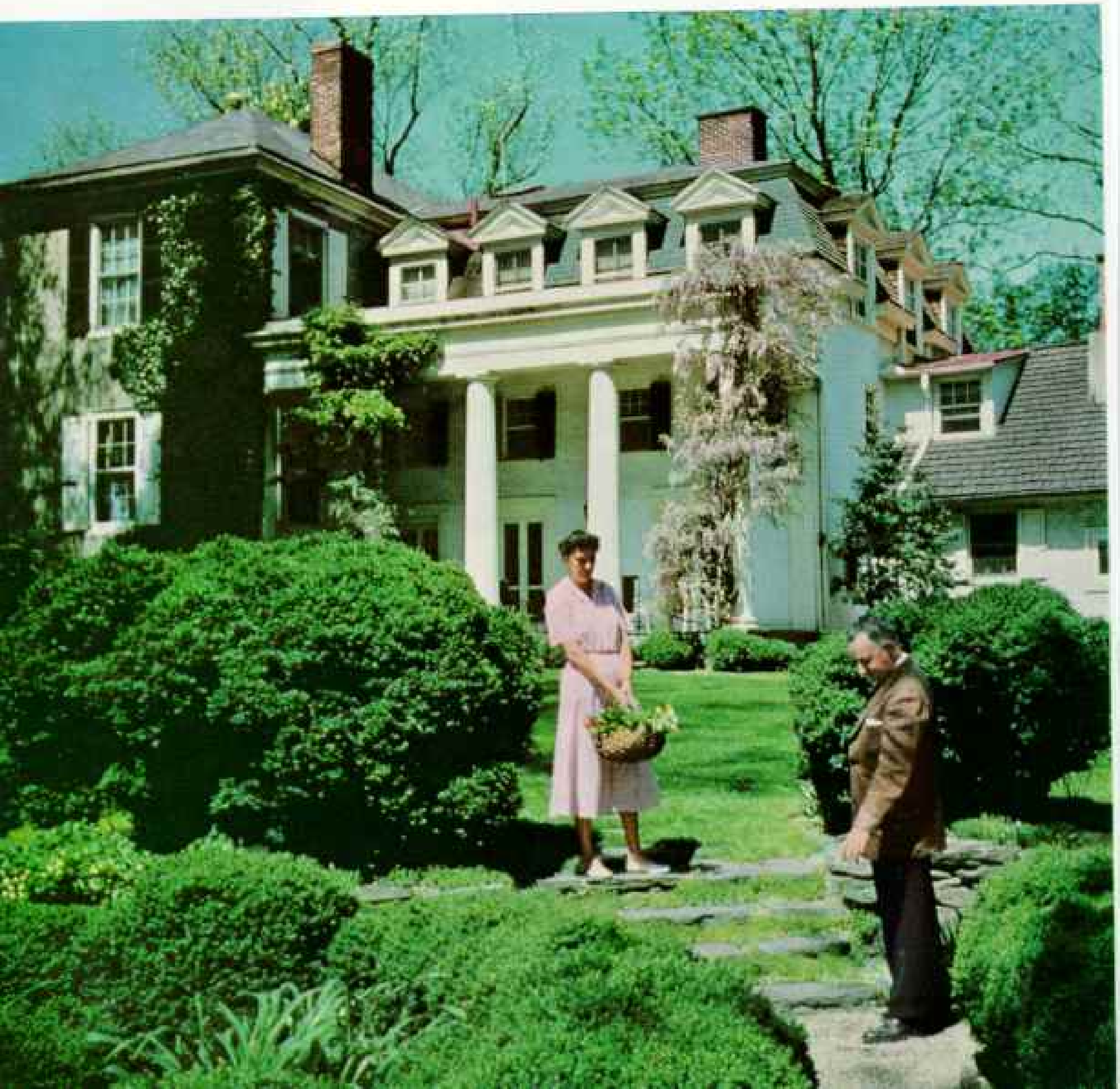
Peale's autobiography, written in the third person, tells: "That Garden now became his hobby-Horse, it was in the first beginning of it, a very difficult business to prevent it from ruin, when heavy gusts of rain occurred, but by making drains in many parts, thus dividing the streams into five passages, the evil in a great measure was overcome. And this Garden became the admiration of numerous visitors; it was in some measure like the Vaux hawl of Germantown."

In 1826 William Logan Fisher bought the farm and gave it to his daughter Sarah upon her marriage to William Wister. Their descendants have occupied the property ever since (page 181).

In the vicinity of what is now Ardmore, Daniel Humphreys built Pont Reading (below). Now the home of Mr. and Mrs. David B. Robb, it has stood since 1683.

Joshua Humphreys acquired Pont Reading in 1789. Mrs. Robb, a lineal descendant, has reassembled a large part of his library. Taking down a hefty volume of *Dobson's Encyclopaedia*, she opened it to a well-thumbed section on shipbuilding. "This book," she told us, "was one of the references used by Joshua Humphreys in the construction of ships for the early American Navy."

Humphreys was one of the Nation's first naval constructors. His well-considered advice determined the placing of navy yards along the Atlantic coast. His contribution to the American Navy really began during the Revolution. At that time he built the frigate *Ran-*

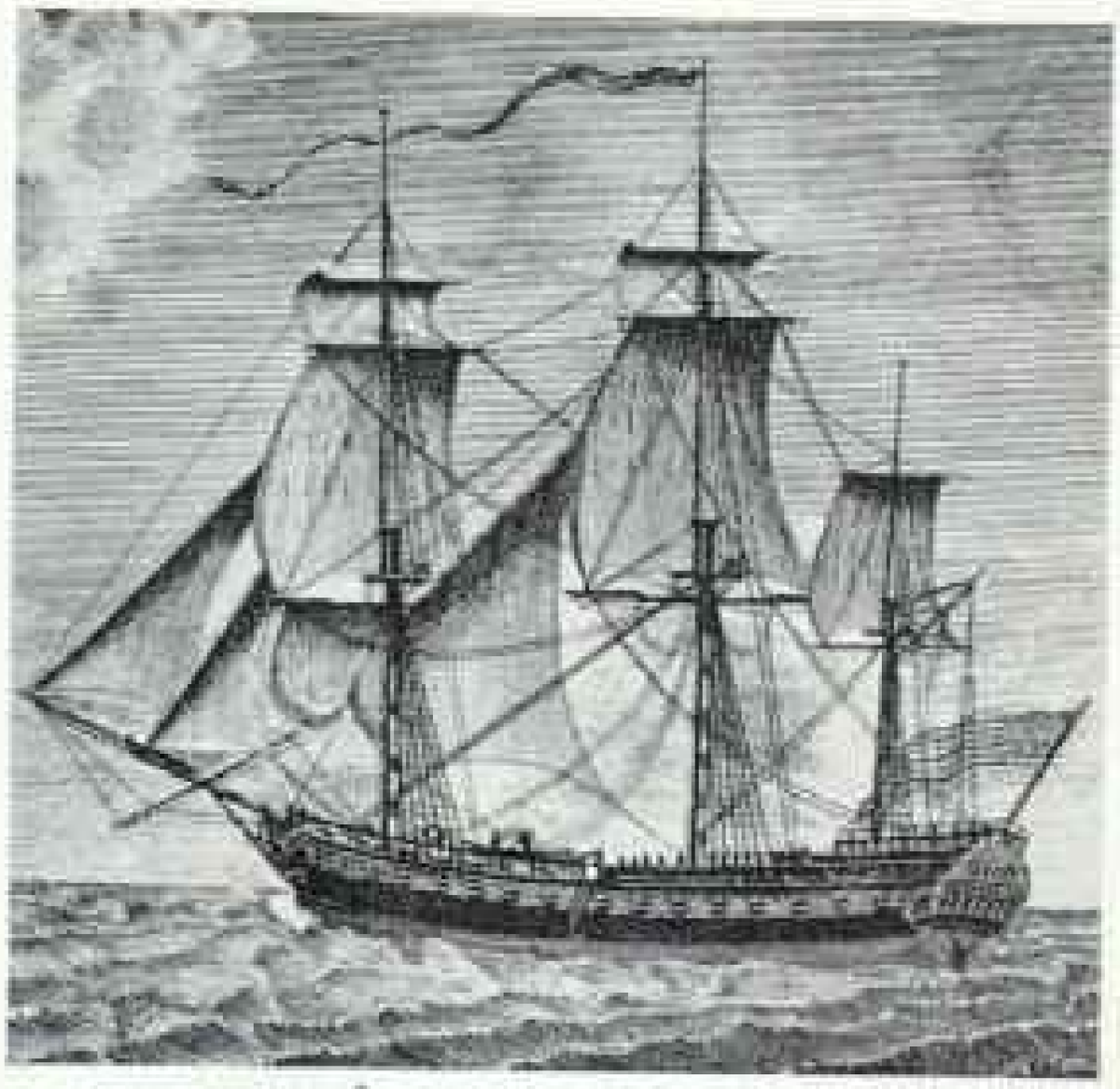


Pont Reading, Three Houses in One, Required 130 Years for Completion

Daniel Humphreys began the mansion soon after he arrived from Wales in 1682; he named it for the family seat abroad. As years passed the square house took on a columned portico and windowed attic, then a gabled kitchen to the rear. By the time the third wing was attached, in 1813, Pont Reading was the home of Joshua Humphreys, early naval constructor for the United States.

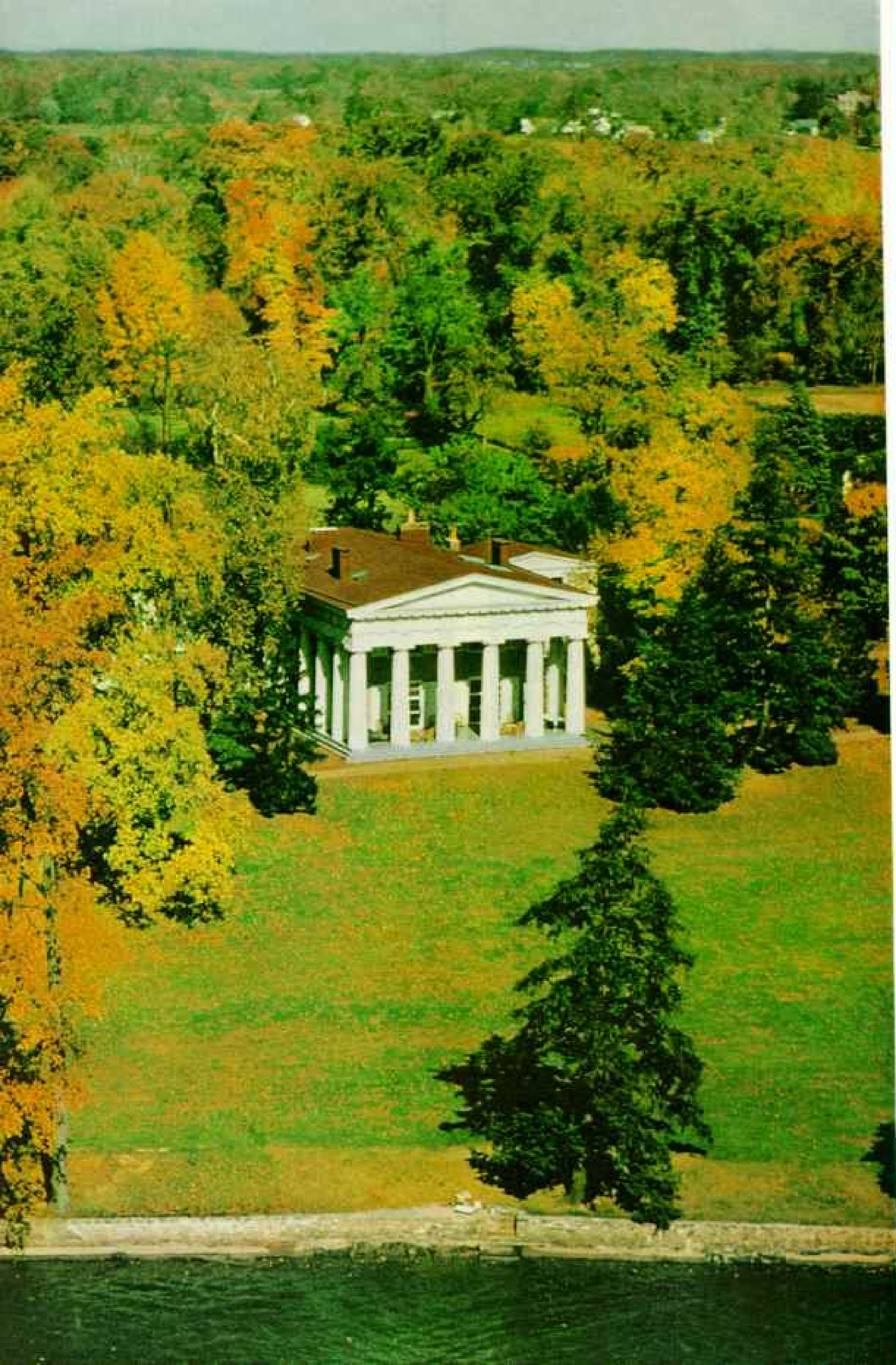
Here Joshua's descendant Mrs. David B. Robb, mistress of Pont Reading, reads a book from the shipbuilder's library at right and strolls with her husband in the boxwood garden below.

PHOTOGRAPHS BY KATHLEEN REVIS (BELOW) AND HOWELL WALKER, NATIONAL GEOGRAPHIC STAFF © N.G.S.



COURTESY THE LIBRARY OF CONGRESS

Co-designed by Humphreys, the *United States* captured H.M.S. *Macedonian* in the War of 1812.



dolph, of which Capt. Nicholas Biddle took command. In 1778 the *Yarmouth*, a British ship twice the American's gunpower, attacked the *Randolph*. At the height of the hotly contested battle, the *Randolph* blew up with her crew and gallant captain.

Another Nicholas Biddle, of a later generation, married into an estate delightfully situated on the banks of the Delaware about 16 miles northeast of Philadelphia. The house, completed in 1795, was a splendid example of the Regency, or Federal, style. It was called Andalusia (opposite).

Baths and Gaming "Disgraced" Andalusia

While traveling in Greece, Biddle fell in love with the classical architecture of that country. It influenced the additions he subsequently made to Andalusia. With remarkable skill he achieved a satisfying blend of the existing Regency and the more restrained early phase of Greek Revival. The Doric portico overlooking the river formed the most prominent feature of his finished building.

The versatile Mr. Biddle experimented in scientific farming and took a particular interest in grape culture. In a high stone wall on the shadier side of his vast garden he built coal furnaces and a flue system to keep his beloved vines comfortable.

Mr. and Mrs. Charles J. Biddle, who now live in Andalusia, have kept the tradition well. With Mrs. Biddle we walked along the box-bordered paths of the garden. When we came to what looked like an old Roman sarcophagus, she explained:

"In Nicholas Biddle's lifetime, popular prejudice persisted against bathtubs. People thought them somewhat immodest and possibly unhealthy things. But Nicholas liked to have his bath. So he installed an Italian marble tub in a bathhouse near the kitchen wing. Servants filled the tub with buckets of water heated over the kitchen fire."

With characteristic finesse, Nicholas Biddle got around yet another popular prejudice. Outspoken champions of morality had raised a terrible hullabaloo about the iniquity of John Quincy Adams. On his own initiative and at his own expense, this President of the United States had installed a billiard table in the White House—an outrageous example to set when billiard tables in private homes were sternly frowned upon.

Nicholas also liked to play billiards. Therefore, down by the riverbank he erected in classic style what I call a two-story den of domestic iniquity (page 189). A billiard

Andalusia, on the Delaware, Keeps the Timeless Beauty of a Greek Temple

In 1794 John Craig, a shipping merchant, bought a farmhouse on this site, and his wife designed a Regency dwelling around it. Later his daughter and her husband, Nicholas Biddle, added handsome Doric columns to the river-front side.

Banker and diplomat, writer and horticulturist, Mr. Biddle spent a lifetime improving his estate. His boxwood plantations, espaliered vines, orchards, and flowering shrubs make Andalusia a show place.

On the veranda, Mrs. Charles J. Biddle (standing) and her daughter-in-law, Mrs. Charles Biddle, discuss gardening.

PHOTOGRAPHED BY KATHLEEN REED (OPPOSITE) AND HOWELL WALKER, NATIONAL GEOGRAPHIC STAFF © N.G.S.

RESEARCHING BY NATIONAL GEOGRAPHIC PHOTOGRAPHERS

table disgraced the ground floor. And upstairs? Reserved, you'll be shocked to learn, for card playing.

Apart from this scandalous zest for bathing and gaming, successive generations of Biddles have contributed generously to Philadelphia culture and society.

"To Share the Simple Pleasures"

Not far from Andalusia we visited one of the oldest social organizations in continuous existence in the English-speaking world. Founded in 1732, it was at first called the Colony in Schuylkill. The official name became State in Schuylkill after 1776.

Flood, pollution, and chemical fumes in relentless waves forced the club's move to its present site on the Delaware. With the members went their Castle, a wooden structure of lemon color trimmed with white—a rare example of "Regency Gothick" (page 179).

Twenty-seven Philadelphia gentlemen originally formed the club "to promote geniality and to share the simple pleasures of taking fish . . . shooting game . . . and preparing the same with their own hands for the table." The number of active members, or "citizens," has never exceeded 30; and at no one time have there been more than 10 apprentices.

So exclusive is the club that its total membership over 228 years comes to only 413. Nothing but death or a resignation (almost unheard of) creates a vacancy for a new member, who must first serve an apprentice-

KATHLEEN REVIS AND JOHN E. FLETCHER © N.G.S.

ship of at least one year before achieving "citizenship."

Members themselves, not servants, do all the cooking for the Fish House, as the group is informally known. Club laws are as unalterable as those of the Medes and the Persians.

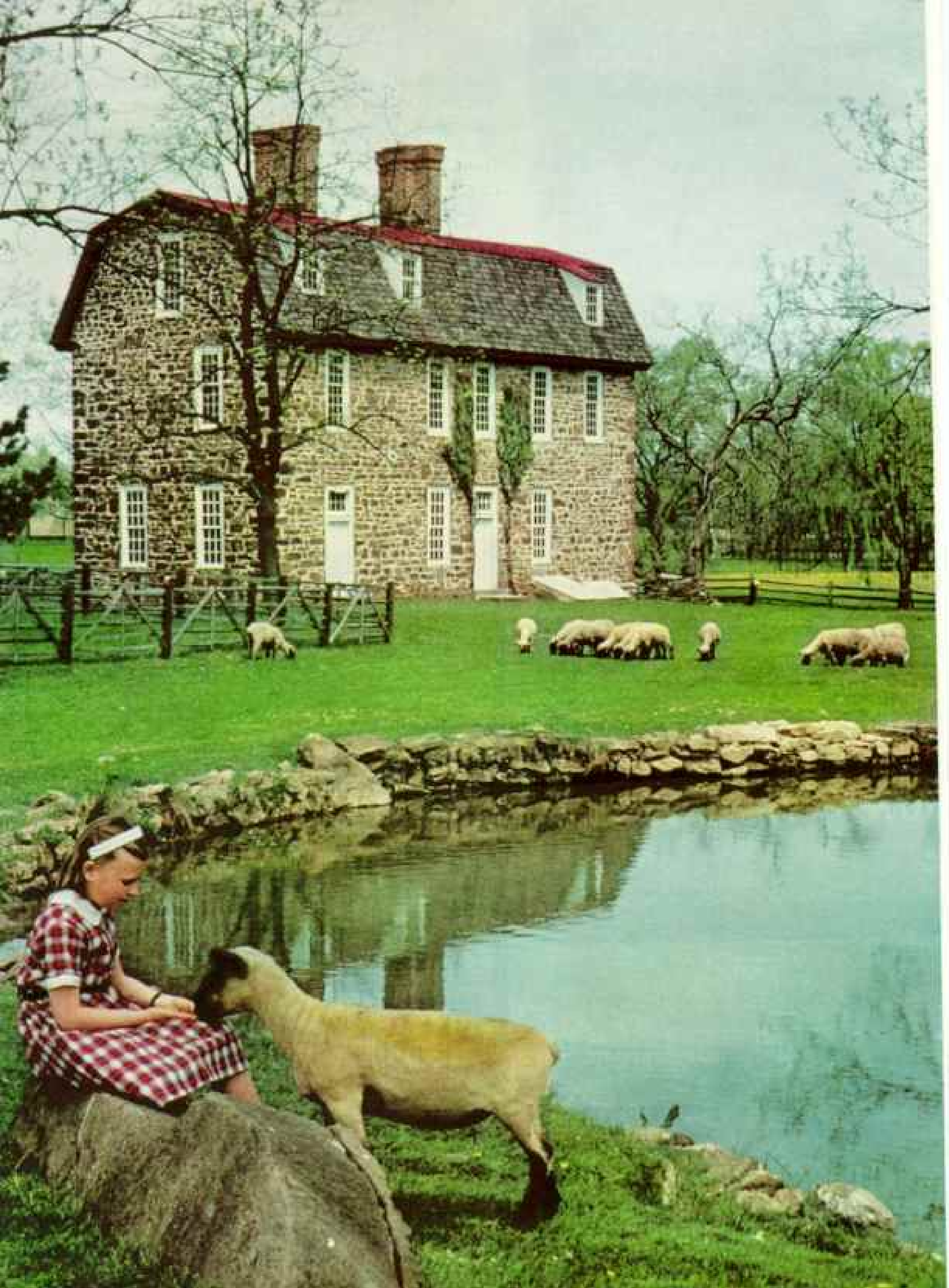
Among Fish House rituals, the building and drinking of its traditional punch demand precision and respect. It is solemnly concocted in a nine-gallon bowl brought back from China by a clipper captain 150 years ago and ceremonially presented to the State in Schuylkill. This made-to-order piece of Chinese "Lowestoft" is appropriately decorated with fish.

Italian Mantle and French Chandelier Adorn Andalusia's Gold-and-white Drawing Room

This home early gained a reputation for hospitality because of the generosity of its hostesses. Peter Stephen Du Ponceau, Baron von Steuben's aide-de-camp, writing of one of these women, said: "While speaking of the stars of that day [1782], I must not forget Mrs. Craig. . . . She was a little woman, but perfectly beautiful. She had her education in Europe and spoke French and Italian with perfect purity. She had read a great deal, and her manners were most attractive. She would not have been out of her place in the most brilliant circle of Europe. . . . Her house was the resort of all that was elegant and accomplished."

Andalusia's "den of iniquity" stands apart from the main dwelling. Loving billiards and cards, both taboo in the strait-laced society of his day, Nicholas Biddle in 1830 built this little gaming house where he could enjoy his pastimes in privacy.

HOWELL WALKER, NATIONAL GEOGRAPHIC STAFF



Graeme Park Remembers Tragedy Despite Its Pastoral Air

Built in 1721 by Provincial Governor Sir William Keith, Graeme Park passed to his stepdaughter, Ann, and her husband, Dr. Thomas Graeme. Hedging the 300-acre park, Dr. Graeme wrote: "I expect it soon capable of maintaining a large stock of sheep and black cattle; it would have been one of the finest parks for deer that could be imagined . . . as a piece of beauty and ornament to a dwelling I dare venture to say that no nobleman in England but would be proud to have it on his seat."

But sorrow snuffed out joy; Dr. Graeme spent his declining years grieving over the death of his wife.

Inheriting the property, Graeme's daughter, Elizabeth, and her husband, Henry Hugh Fergusson, had few years to enjoy it. A loyalist who acted as commissary of prisoners for the British, Mr. Fergusson was forced to abandon his wife and join royalist troops when they quit Philadelphia. The unhappy couple never met again. Tradition has it that their ghosts may still be seen when moonlight filters through the trees at Graeme Park.

Lafayette slept at Gilpin House before the Battle of the Brandywine. Construction is of half-timber with brick nogging.

A citizen led us past the long teakwood table in the Castle's banquet hall to a corner of the room. Through a pantry window another citizen dispensed glasses of punch ladled from the bowl. The first taste seemed innocuous, but we had been warned: the drink has the wallop of an elephant. To this day the citizens maintain the tradition that Washington was invited to sample the punch. History, however, remains obstinately mute.

The Fish House also entertained General Lafayette. In fact, the club elected him an honorary member in 1825. He enjoyed its geniality as he had enjoyed the hospitality of many a home in the Philadelphia area.

Bedridden Farmer Welcomes Lafayette

However noble or humble any dwelling that sheltered Lafayette, it proudly recalls this sympathetic Frenchman who warmed his hands at the family hearth and took his rest in a sumptuous four-poster or modest cot.

In Gideon Gilpin's rustic farmhouse, for instance, Lafayette slept before the Battle of the Brandywine. Half a century later the general made a sentimental journey to this battlefield and learned that Gideon still lived in the same house. The Marquis immediately went to see his former host because the bedridden fellow could not come to him. When Lafayette entered his room, the poor old farmer burst into tears.

Understandably, memories close to the French general's heart drew him back to the Brandywine and the Gilpin House. But what induces Americans, generations removed from colonial days and now on the threshold of a Space Age, to probe the homes that stand as landmarks in the country's history?

Perhaps the answer lies in what one Philadelphian wrote as long ago as 1850—an answer that gains weight with age:

"This love of visiting and contemplating places filled with local impressions, generated by the events and doings of our forefathers, is one of the strongest and purest feelings of our nature, and one which we wish to foster, with warm hearted interest. . . . It flings over the imagination a delightful spell, where fancy draws those pictures of the past, more homebred, social and endearing, when viewed glimmering through the mist of years."

Peking's Maze Suggests a Chinese Puzzle

Emperors lived in mystery behind the crenelated walls of the Forbidden City; few Westerners glimpsed the palaces until the Manchus fell in 1911. Outside lies the Imperial City, once a residential quarter for courtiers and government officials. Manchu monarchs garrisoned troops in the Tatar City, which surrounds both inner compounds, and drove the natives into the Chinese City to the south.

Today homes and factories crowd burgeoning suburbs outside the old walls. Imperial shrines and palaces now are parks. Huge Communist-erected public buildings take shape around Tienanmen Square (pages 200-201).

Inset shows the city's setting as far north as the Great Wall (page 199). Peking's latitude matches Philadelphia's; its climate resembles Nebraska's.

A China veteran comments on a photographic profile of Peking

The City They Call Red China's Showcase

By FRANC SHOR

Now Senior Assistant Editor of the NATIONAL GEOGRAPHIC, Mr. Shor lived and worked for many years in China. During World War II he served with both United States and Chinese forces. He made his home in China after the war, serving first as executive officer of the United Nations Relief and Rehabilitation Administration and subsequently as a magazine correspondent. He left after the Communist take-over in Peking.

PEKING has always been a city difficult to describe and even more difficult to interpret. Marco Polo was the first traveler to try it. For his pains he was branded the greatest liar of his time.

New Zealander Brian Brake has one advantage over his Venetian predecessor—a camera. What he saw in Peking a few months ago you can now see in the following pages. His photographs speak for themselves; here are the big new buildings of the Communist capital and showcase city, the disciplined mass demonstrations, the refurbished façades of historic monuments. Here is something for every Westerner to ponder.

To one who lived in China for many years and visited Peking dozens of times, these pictures are alive with memories. Memories of a city among the most beautiful in the world. Memories, too, of a way of life that is gone.

The Communist system of putting people into communes, where they sleep in dormitories and eat in mess halls, clashes harshly with the Chinese way of life. The family has always been the most important thing in China, the unit of authority and of culture.

I remember well the great Chinese houses of Peking. Serene behind high walls, they maintained their own small private worlds. Four generations often dwelt within a single compound, their relations harmoniously governed by a centuries-old code that taught respect for elders, affection for children, and a zealous regard for the rights of each other.

Here were the wellsprings that enabled China to endure for century after century, absorbing invaders and alien cultures, surviving flood and famine and pestilence.

Now new tenants have taken over.

Loud-speakers line today's carefully swept avenues, exhorting Peking's millions to work ever harder. It must seem strange indeed to a people accustomed only to the pleasant chants and distinctive calls of the peddlers who once furnished the myriad needs of the city's life.

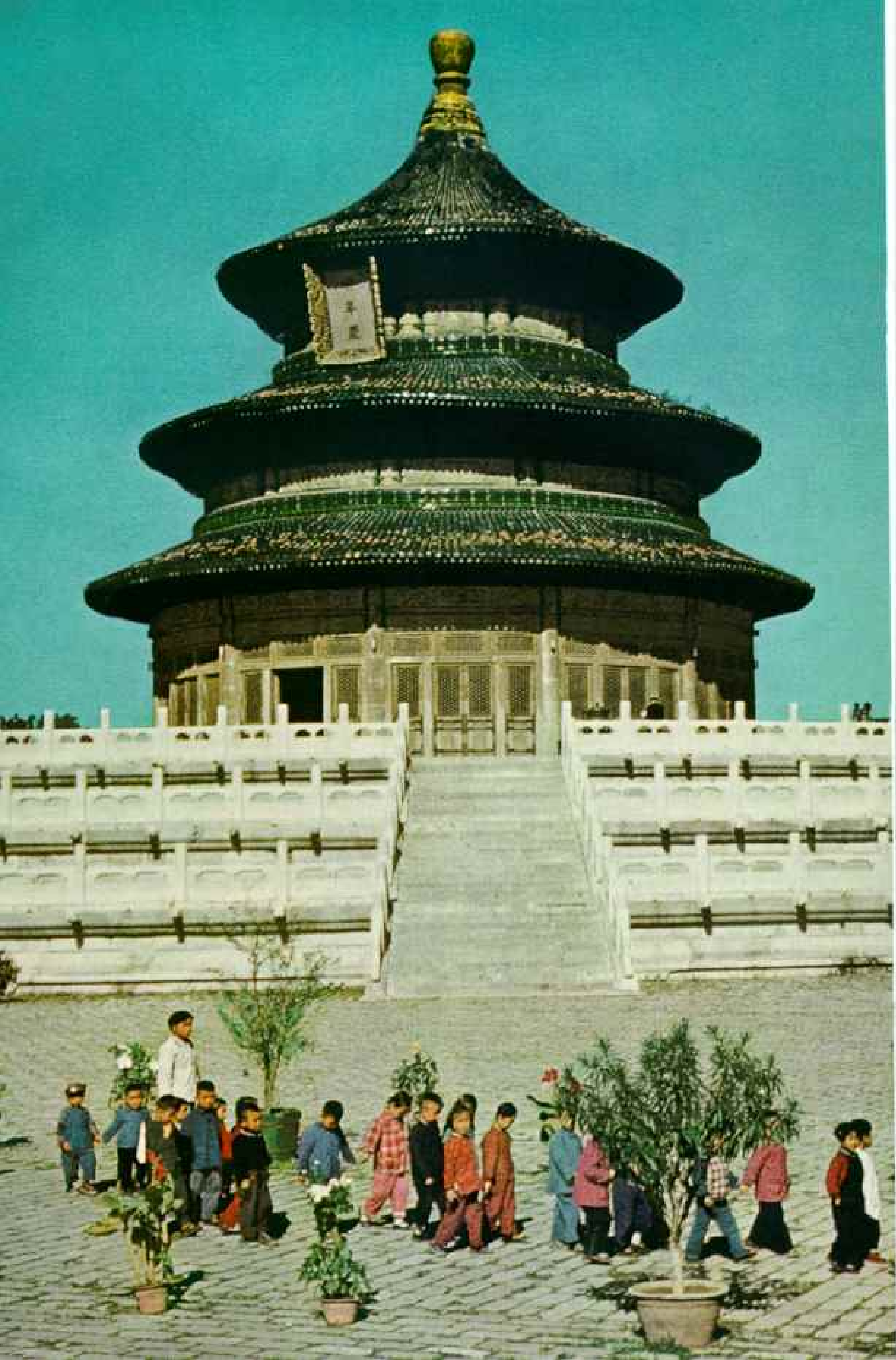
They were a fascinating part of the old Peking, those itinerant vendors. There was, for example, the melon-seed salesman. Chinese eat dried seeds much as we eat peanuts, cracking them between their teeth to extract the nutty kernel. And the melon-seed vendors beat a distinctive brass gong, chanting the while, "Easily opened! Oh so easily opened!" Unhappily, I never found them so.

There were the sellers of cloth, announcing their presence with leather drums. Blind fortunetellers sounding a plaintive note on a bamboo flute. Men with broad trays of dried fruits and nuts, clanging two brass bowls together. And barbers who twanged large tuning forks for their identifying sound.

(Continued on page 198)

Kindergarten Tots, Shepherded by a Teacher, Tour the Temple of Heaven

The Hall of Annual Prayer for Good Crops crowns a marble terrace in the Temple of Heaven, a broad compound in southern Peking. Here the emperors offered sacrifices and prayed for bountiful harvests. Flames swept the hall in 1889 when, say the Chinese, a thunderbolt struck a centipede that dared to desecrate it by crawling on the roof. Ten years later the shrine was rebuilt, using pillars of Oregon pine. The city's name, shown in yellow Chinese characters, means "northern capital."



北京

PEKING

BY BRIAN BRAKE

A PICTORIAL RECORD

MAGNUM

Propaganda poster dwarfs a real-life mother clutching her baby with one hand and a bag of vegetables with the other. The street-corner billboard pictures Mao Tse-tung, chairman of the Chinese Communist Party, leading the country's minority peoples. Posters and loud-speakers alike call for increased effort for Red China's "great leap forward."

A city of more than six million, Peking swarms with people in rather drab working attire. Most women work six days a week in offices or factories. On their days off, mothers with babies and shopping bags crowd the markets.

Photographer Brian Brake made these pictures last fall as the Communists celebrated 10 years in control of mainland China.

Red China—unrecognized by the United States—has repeatedly denied admittance to American reporters and photographers. As a New Zealander, Mr. Brake succeeded in obtaining a visa.

At 33, Mr. Brake has already contributed several memorable series of photographs to the NATIONAL GEOGRAPHIC, notably on Kashmir, Jerusalem, and the seldom-visited coast of southern Arabia.

Muscle-powered Pedicabs Speed Rice Past a New Government Building

Old and new mingle in Peking, center of an ancient culture and capital of Red China. The pagoda-type tower of the Nationalities' Cultural Palace (below) suggests the past; party slogans at the entrance proclaim the present. With much fanfare, it was opened last October; it faces the Street of Eternal Peace, a main east-west thoroughfare (page 212 and map, page 192). Hotel for National Minorities rises at left.

China's new masters have abolished the old-time ricksha on the ground that a man on foot degrades himself by pulling another. Oblivion threatens even the pedicabs, which now carry freight as well as passengers. Small cars of Chinese design are planned as eventual replacements for pedicabs. Motor traffic at present is light by American or European standards.

(Continued from page 193)

It was possible, in the days before the new regime, to get almost all the necessities of life without leaving the quiet of one's own compound. It would have been a shame, though, to spend too much time inside. Shopping in the city was too much fun to miss.

Even the names of the streets were promises: Jade Street, Embroidery Street, Lantern Street, and Silver Street. Who could resist a narrow lane known as Snuff Bottle Alley? And the products offered on each street were just what the name indicated.

Hosier's Marked by Six-foot Stockings

There were few show windows in those shops. Many of the façades were intricately carved and beautifully gilded. Some had symbols of what could be found inside: a huge shoe, a pipe four feet long, enormous buttons. And in front of one hosier's establishment a pair of felt stockings six feet from top to toe—a child's dream of the perfect receptacle for Santa Claus's offerings.

You bargained, of course—sometimes over a cup of fragrant jasmine tea. It was part of the ritual of life, and everyone enjoyed it. I doubt if present-day Peking has time for this sort of thing.

Certainly the Thieves' Market outside the Hatamen has suffered. There was a time when that famous bazaar opened at midnight and closed at dawn so that buyers and sellers could not see one another. And only a few years ago merchant and customer still slipped their hands up the loose sleeves of each other's robes and signaled prices with squeezes to frustrate curious onlookers.

My own shopping expeditions usually ended with tea at the Peking Hotel. The Communists weren't the first to bring tall buildings to Peking, nor modern ones. The Peking was six stories high and thoroughly up to date. The plumbing worked, and the service was impeccable. And in front of the building one could always find a group of Peking's most pleasant citizens, the ricksha boys.

You won't see any ricksha boys in these pictures. The Communists have banned them. It is undignified, they say, for one man to pull another in a cart.

Perhaps it is. There are people, on the other hand, who hold that no occupation is undignified if a man does it proudly and of his own free will. I know only this, that the ricksha boys of Peking were proud of their strength and of their jobs, and that they had as much human dignity as any group I have ever known. Some of them were my friends: my last dinner in Peking was in the home of a tall, blue-gowned man named Liu who had taken me about the city for years.

It was a simple meal of rice and vegetables and soup, and Liu's home consisted of only two rooms, but he and his wife and two children were a loving and happy family, and I think he would have fought anyone who told him he should be ashamed of his work.

I wonder, in fact, if Liu did not have more dignity in those days, doing a job of his choice and eating in his own home, than he may possess today, working where he is told, and sharing a communal mess where he is simply another unit among thousands.

Liu's meal was a simple one, but for those with money Peking offered a fantastic choice of restaurants. And the excellence of their kitchens was usually equaled by the floweriness of their names.

There was the famous Hou Te Fu—the restaurant of Unbounded Virtue and Happiness. One of its specialties was called "fire pot eggs"—a fluffy soufflé with thinly sliced lily bulbs suspended in its golden interior. Bear claws were also on the menu, but I never got around to trying them.

There were Moslem restaurants, too, where you cooked your own mutton over charcoal at the table, or boiled it in a bubbling caldron of soup before dipping it into a combination of a dozen sauces and spices. And most important, of course, the Peking duck.

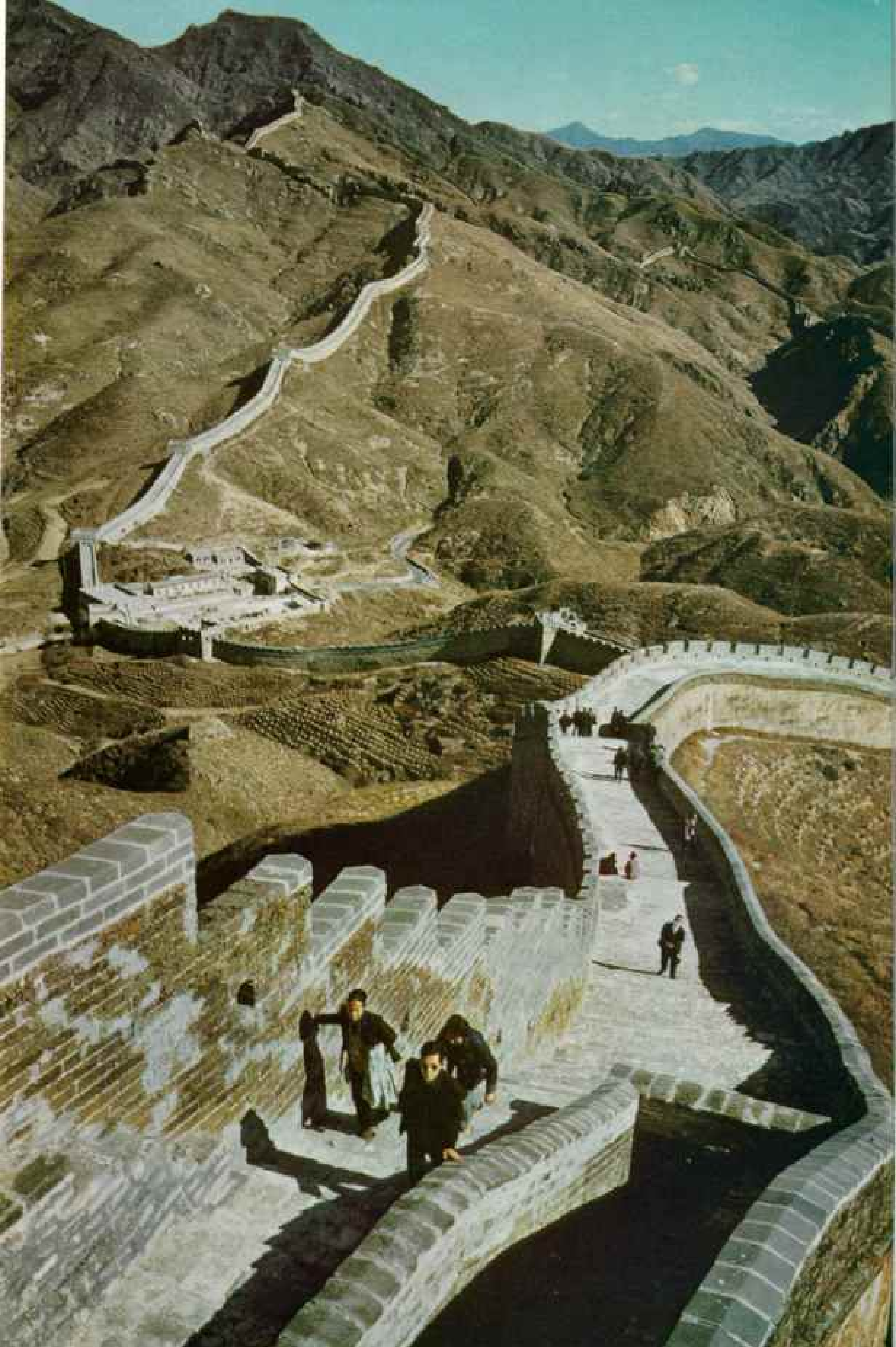
There was a famous eating place called the Ch'üan Chü Te—restaurant of Accumulated Virtue. It had been accumulating virtue—and reputation—since the reign of Ch'ien Lung in the late 18th century, and its tables were glossy from a million rubbings. The duck was a thing of beauty; first thin crisp slices of skin, dipped in sauce and wrapped with a small spring onion in a thin unleavened pancake, then the juicy meat, finally a fragrant soup.

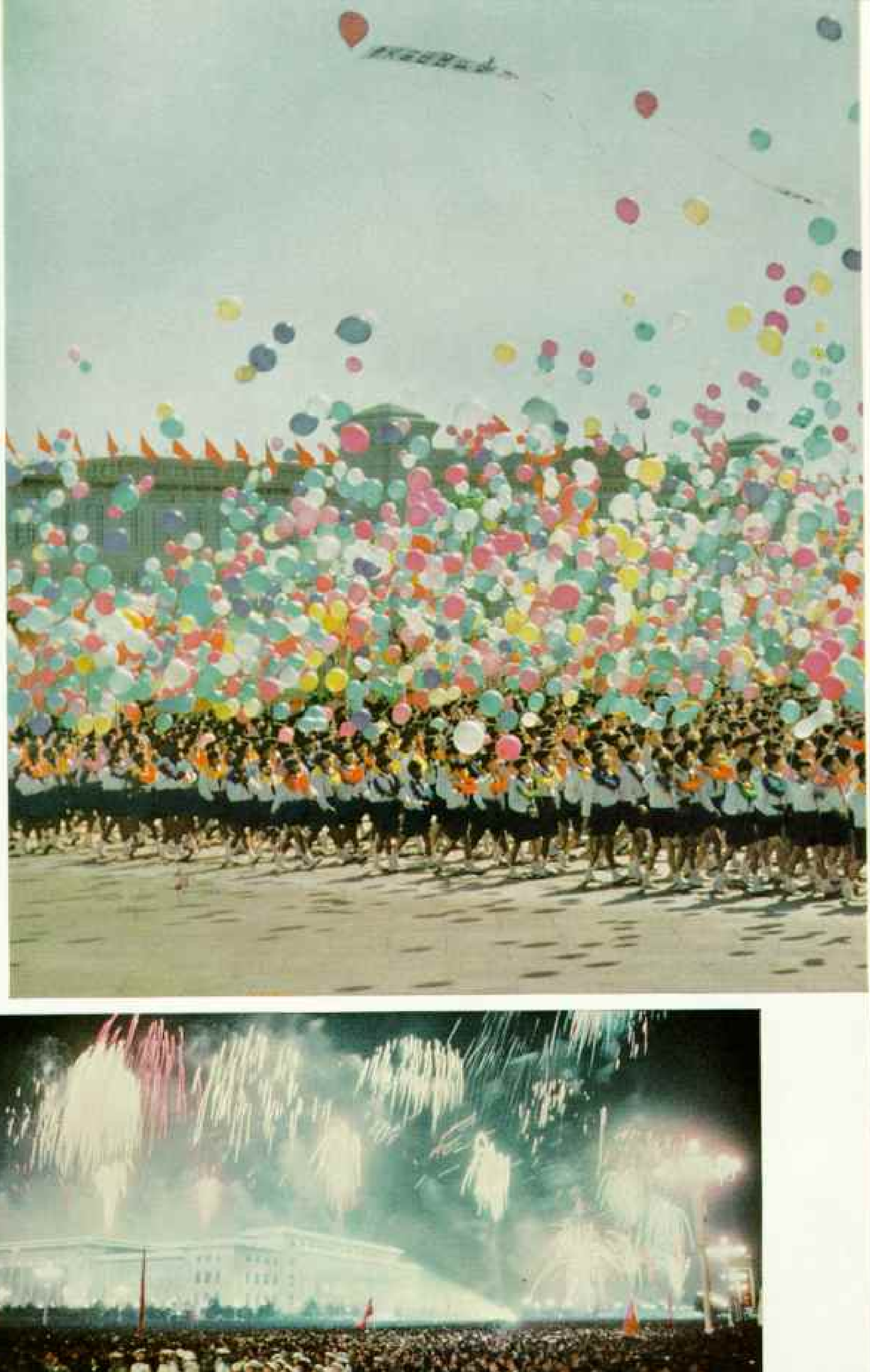
There were excellent Western-style restau-

(Continued on page 222)

China's Great Wall Stands as an Eternal Reminder of Danger From the North

Built 22 centuries ago as a defense against invaders, the wall remains a wonder of the world. Serpentlike, it winds from east to west across more than 1,500 miles of China. New bricks top this restored section squirming over Chuyungkuan Pass 35 miles northwest of Peking. Watchtowers strengthen the bastion.





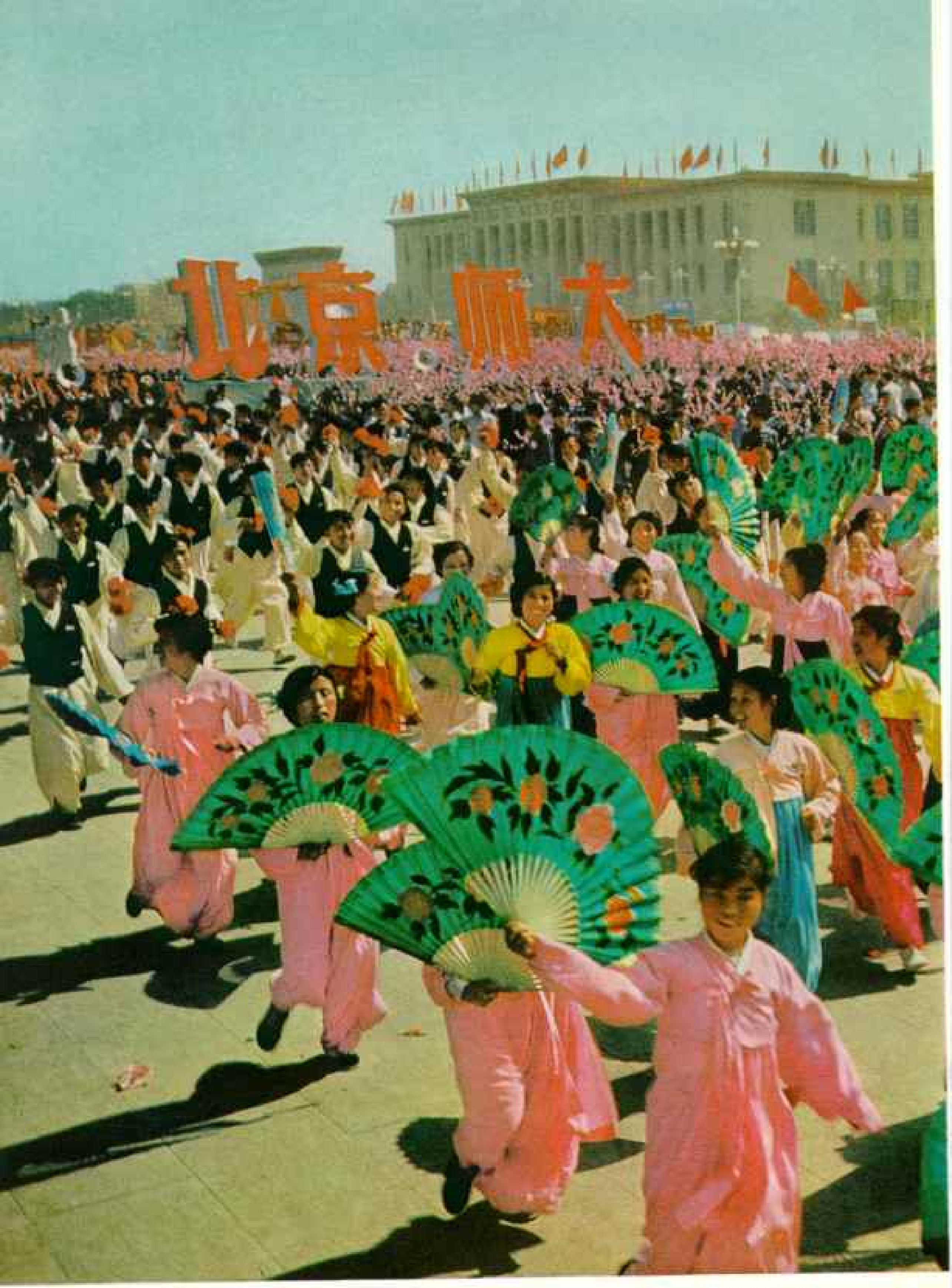
KODACHROMES BY BRIAN BRAKE, MAGNUM © NATIONAL GEOGRAPHIC SOCIETY

Marchers Loose a Bubble Bath of Balloons on Red China's Tenth Birthday

A parade on October 1, 1959, marked National Day, commemorating the founding of the People's Republic of China. More than a million persons swept through Tienanmen Square, Peking's equivalent of Moscow's Red Square, under the eyes of Soviet Premier Nikita Khrushchev and his host, Mao Tse-tung. Ascending balloons trail slogan-bearing streamers and a winged horse of papier-mâché (right). Flag-decked building houses the Chinese Revolutionary and Historical Museums.

Anniversary Rockets in Tienanmen Square Burst Above a Human Sea

The Chinese, whose ancestors invented fireworks, still thrill to shows like this. Floodlights illumine the Great Hall of the People. The building faces the museums (above) and the Tienanmen (Gate of Heavenly Peace), which gives the square its name. Communists made room for the vast concourse by pulling down two old walls.



Fan-waving, Drum-pounding Koreans Pass in Review on National Day

China's minorities, including Koreans, Mongols, Uiguts, and almost 50 other racial groups, make up less than a tenth of the estimated 687 million

population, which grows by at least 15 million a year. Parading past the museums, girls in front beat hourglass-shaped drums, whose far ends flare like trumpets to amplify the sound. Characters on standards at left identify students from a Peking teachers college.

Platoons of gymnasts mass in Red China's biggest bowl; Peking Workers' Studium, completed in 1959, seats 80,000

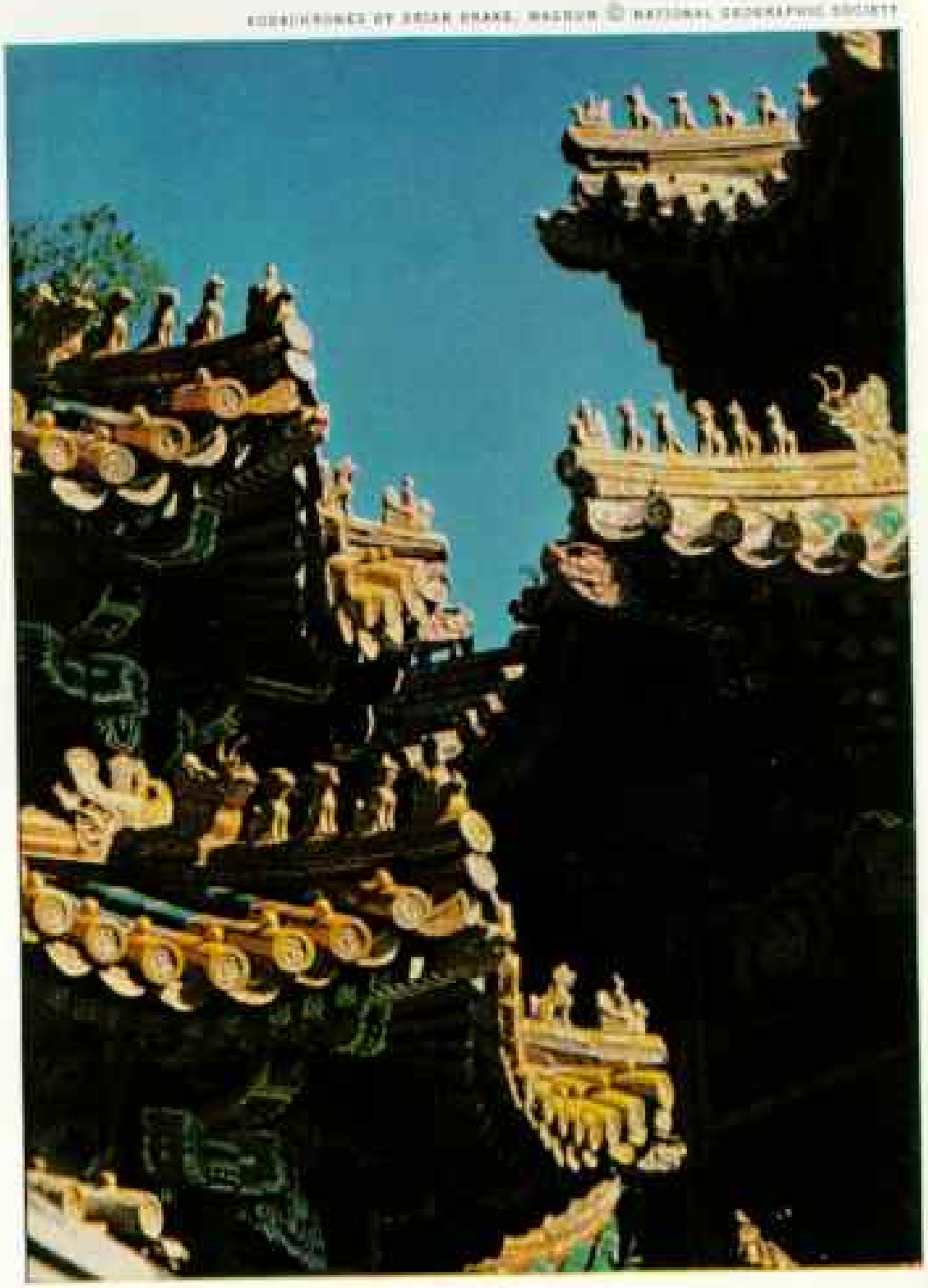
Girls above, boys below form a flower in the Peking Workers' Stadium. Petals open when the girls bend backward. Red flag atop the pyramid symbolizes socialism. Some 8,000 athletes gathered in September, 1959, to open the arena with a two-week-long national sports show.

Resembling semaphore signalers, a disciplined chorus of teen-age girls swings scarlet globes in time to music. Such spectacular calisthenics have become a customary part of many athletic meets. Virtually everyone belongs to one or more organizations based on age, residence, or occupation.

Tile Figures to Repel Demons Decorate Golden Roofs of the Imperial Palaces

Long years of Japanese occupation and civil strife left their mark on the five-century-old gates and pavilions of the Forbidden City. The Communist government has restored most of the structures to their original luster.

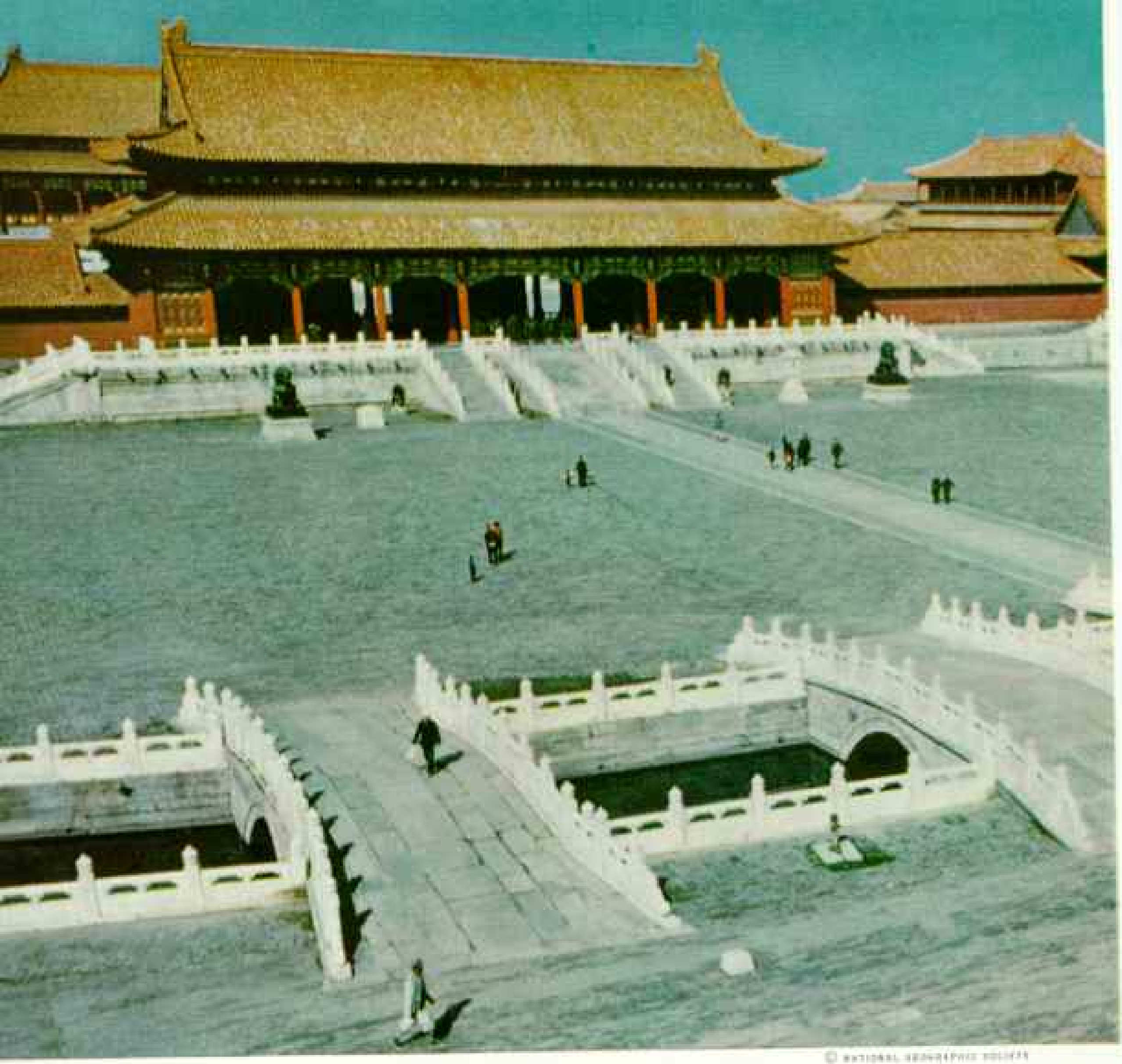
Figures on the eaves represent the entourage of Prince Min, a petty tyrant notorious for his cruelty. These intricate carvings contrast with the bold sweep of Peking's new buildings (opposite).



Vast floor and soaring balconies of the Great Hall of the People seat 10,000. Curving rows of desks hold earphones for simultaneous translation of speeches. Communism's huge red star decorates the 100-foot-high domed ceiling. Rushed to completion in 10 months, the hall provides a setting for operas, concerts, and political meetings.

Bearded elder with arms bent takes his morning exercise. Tradition dictates each movement in *T'ai-chi ch'üan*, a slow-motion drill of ancient origin. Devotees concentrate on maintaining perfect balance while flexing their muscles and shifting from one stylized position to another. Once performed only by older men, the practice is gaining favor with younger people.

China's rulers make a fetish of physical fitness. Twice a day loud-speakers call on everyone in shops, schools, and offices to stop work and execute setting-up exercises. "Train for 10 minutes every day," the people are told, "and you'll be able to serve the cause of socialism for 10 additional years."



Five Marble Bridges Span the Golden Water River in the Once Forbidden City

Mall crossing the cobbled courtyard leads to the Gate of Supreme Harmony, where the first Manchu emperor took his throne in 1644. Gates of Illustrious Virtue and United Harmony occupy the far corner. Emperors, who lived in this part of Peking, barred it to outsiders.

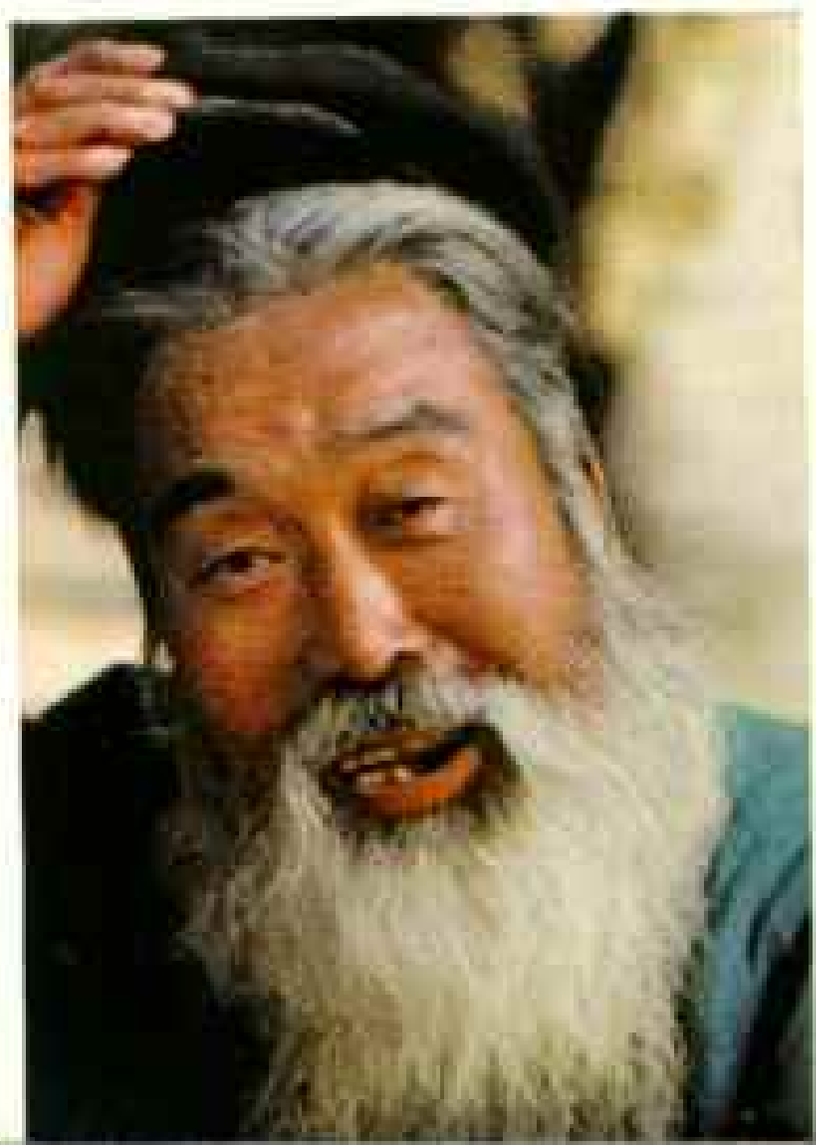
Gate of Heavenly Peace, an entrance to the imperial palaces, overlooks Tienanmen Square. Youths on a tour of the city carry knapsacks.

Gilded lioness guards a gate in the Forbidden City. This Ming dynasty creation fondles a cub with her paw.

New Public Buildings Rise Along the Street of Eternal Peace

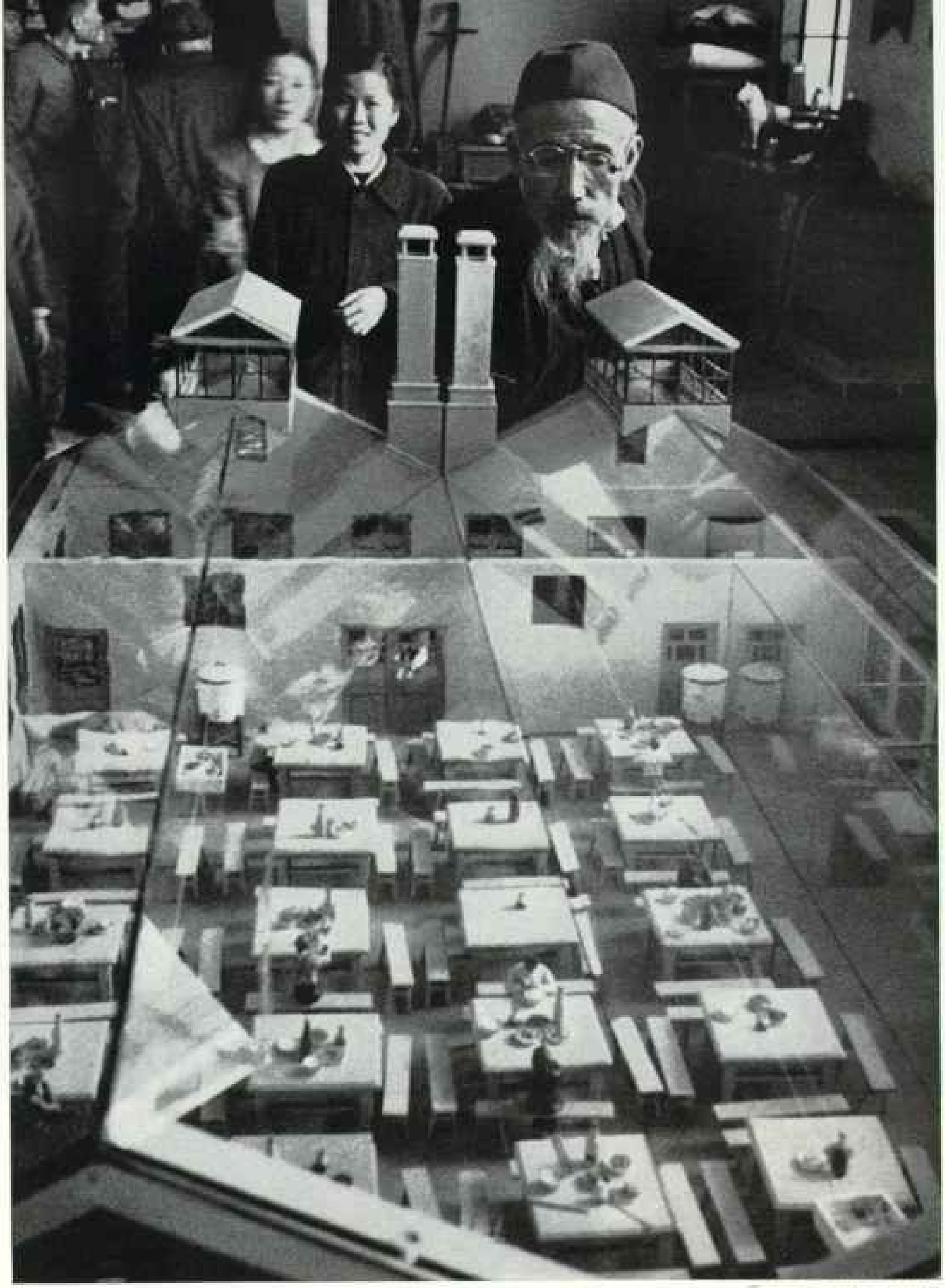
Custom formerly limited construction that topped the palace walls; until recently, few multistoried buildings broke the Peking skyline. Museums occupy the structure at left; the Great Hall of the People (page 200) faces it across Tienanmen Square. Chinese architects designed both.

New sidewalks border the avenue. Loud-speakers attached to the street lights blare music and speeches on holidays and other festive occasions. Gate of Heavenly Peace bulks at right; party chiefs review parades from its balcony.



Doffing his cap, an old man stops to talk with photographer Brake in Chungshan Park. Once a part of the Imperial Pleasure Gardens, the park honors the late Sun Yat-sen, who founded the Republic of China in 1912.

Like elephants marching trunk to tail, sightseeing members of a kindergarten class grip one another's clothing to prevent straggling. Chrysanthemums, a flower of Chinese origin, line the sidewalk.



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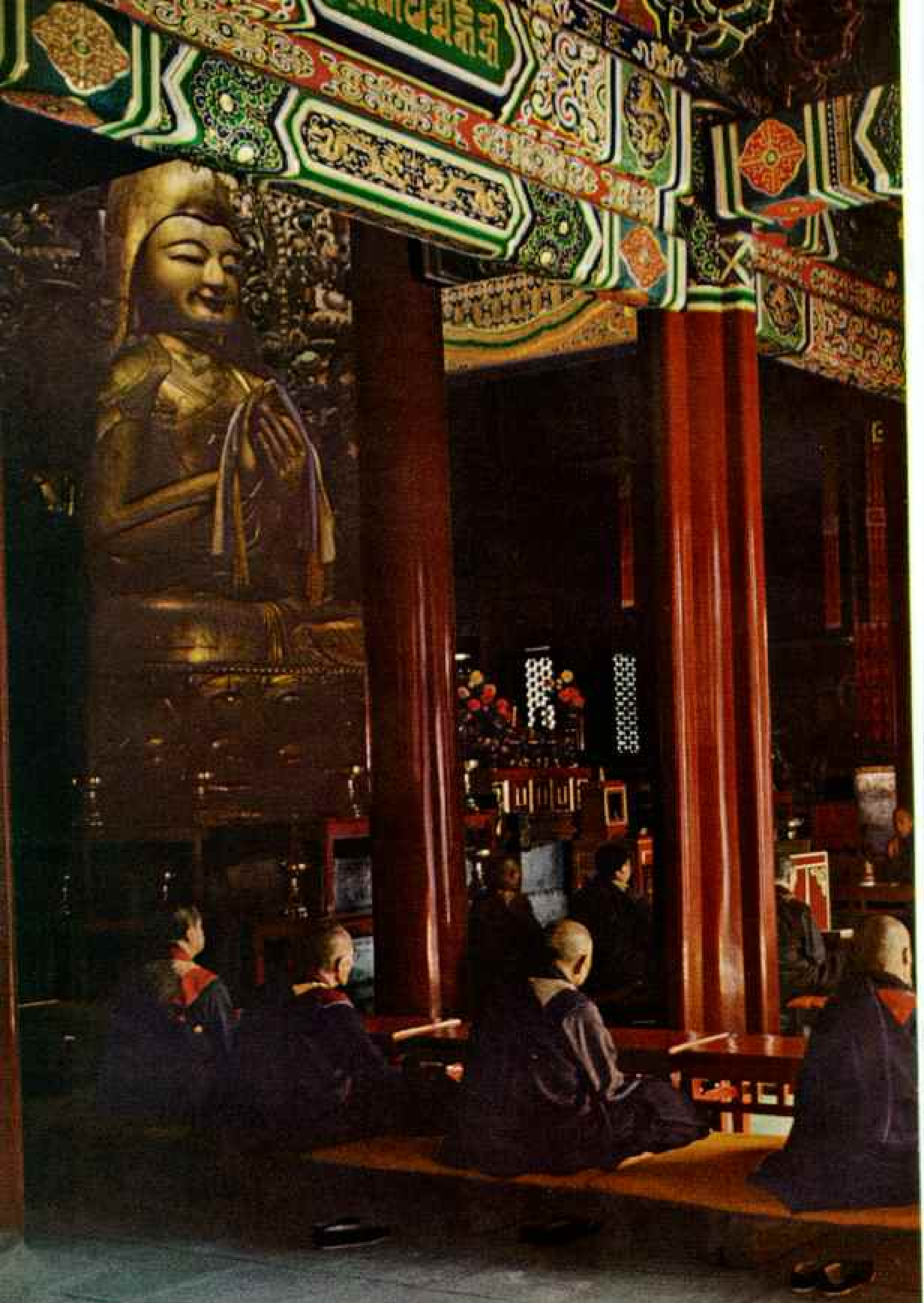
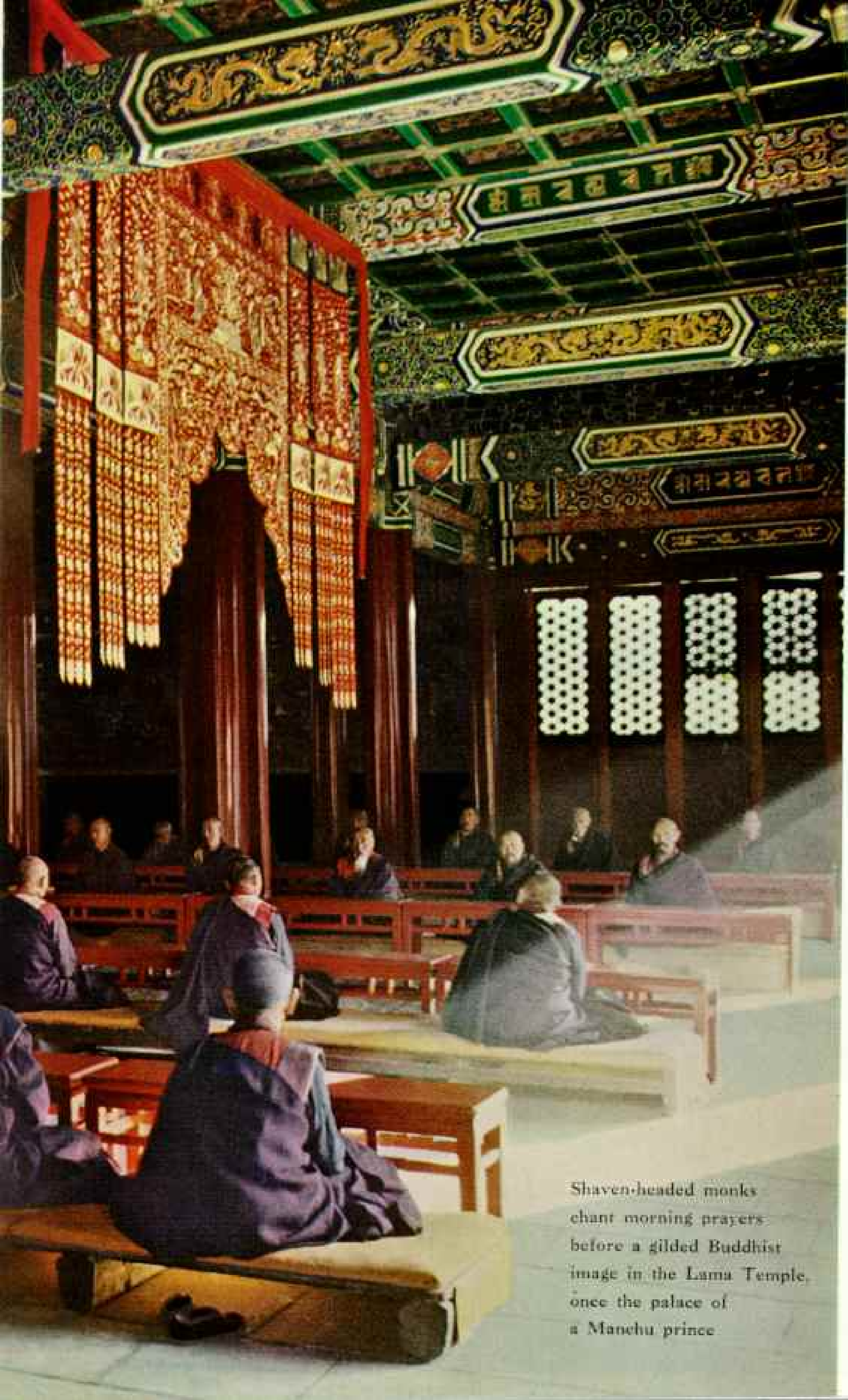
Model of a communal dining hall attracts an old man's gaze at the National Agricultural Exhibition Center. China's leaders pressure the people to join communes that combine farming, industry, and militia. Each commune is supposed to provide members with food, clothing, housing, education, and medicine. Children stay in nurseries while mothers work in fields.

Diner with chopsticks takes a big bite of *chiao-tzŭ*, ravioli-like pastry stuffed with vegetables and meat. Laborers, pedicab drivers, and merchants patronize this restaurant on Liulichang, a street with many antique stores. Foreign shoppers must content themselves with reproductions; the government forbids export of art treasures that are more than a century old.


共产党
万岁
十分钟五，十二分钟八，二十四分子弹！





Shaven-headed monks
chant morning prayers
before a gilded Buddhist
image in the Lama Temple,
once the palace of
a Manchu prince

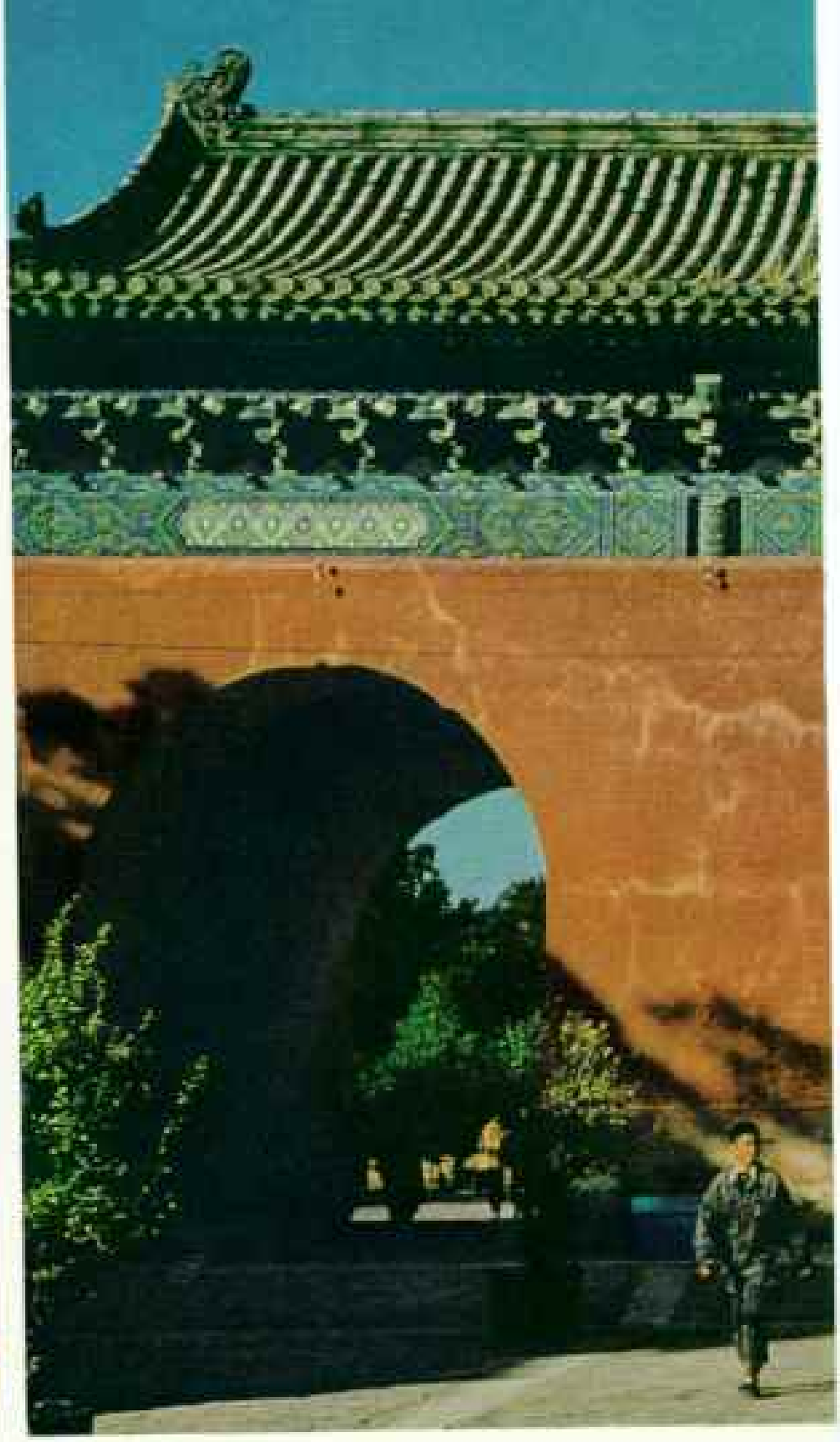
Cross-eyes glare from the head of a painted actor at the new People's Theater. Oil or egg white makes the paint gleam on stage. Falsetto singers and the cacophony of fiddle, drum, and gong enliven performances.

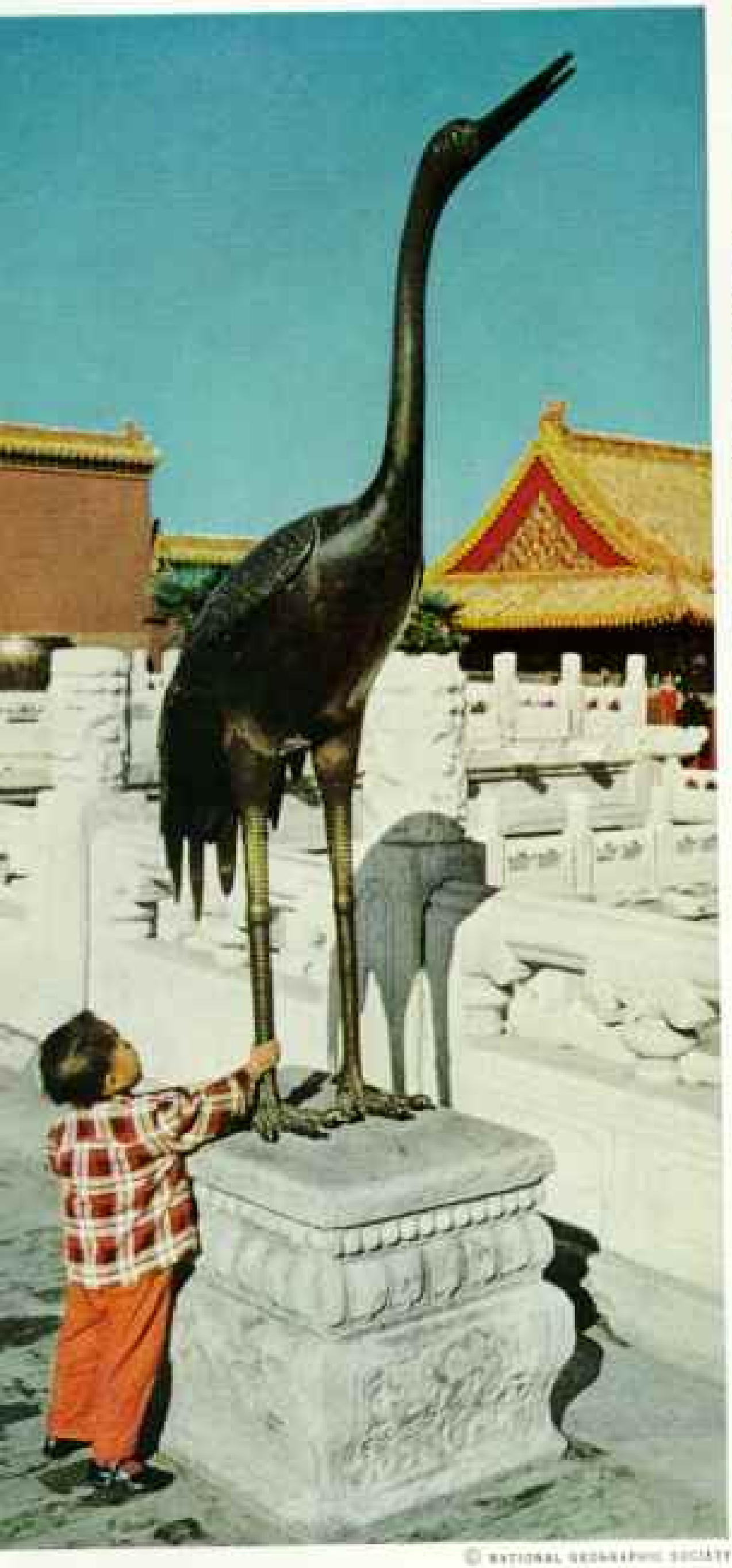
Iridescent Peihai Mirrors the White Dagoba

Nicknamed the Peppermint Bottle because of its shape, the Dagoba was built in 1652 to celebrate a visit by the Dalai Lama of Tibet. It crowns an artificial island in Peihai (North Sea), one of a chain of three lakes in the Imperial City.

Marble camels, men, and elephants line the road to the Ming Tombs. Legend holds that the sculptures were substitutes for sacrifices once offered at a lord's funeral. Sepulchers of 13 Ming emperors lie in an amphitheater 26 miles north of the city.

Triple arches pierce the Gate of Complete Virtue within the Temple of Heaven. Marble causeway leads to the gold-capped Hall of Annual Prayer for Good Crops (pages 194-5), which towers above its own guardian gate. Now a park, the Temple of Heaven occupies a walled compound in the Chinese City, near the Eternal Fixed Gate.





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Ming Dynasty Crane Stands Watch Over the Hall of Supreme Harmony

Palaces of the Forbidden City took shape in the 15th century under the eye of Yung Lo, third of the Ming emperors. Strengthening walls, deepening moats, and creating some of the city's stateliest monuments, Yung Lo transformed Peking from a provincial capital into a glittering metropolis.

To the Hall of Supreme Harmony came the emperors to receive the plaudits of courtiers on ceremonial occasions. Today exhibits of ancient art fill the pavilion.

Designed as an incense burner, the bronze crane symbolizes strength and longevity.

Cabbages tempt a shopper at a sidewalk market. These vegetables come from private gardens; other stalls sell produce grown on communal farms. Fixed prices discourage bargaining.

Men and women alike wear dark tunics and trousers. Red brightens children's garb.

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Pig-tailed Schoolgirl Learns Her A B C's by Practicing With Alphabet Cutouts

China's centuries-old and incredibly complex linguistic system is being changed. Written Chinese depends on about 40,000 word symbols, some requiring more than 20 brush strokes. Every character carries the same meaning anywhere in China, but provincial dialect determines pronunciation.

Convinced that the old writing retards education and hampers communication, the new rulers want to replace it with the Latin alphabet. Ultimately, the Communist government hopes, all China will read and write with letters instead of word symbols and speak the Mandarin dialect of Peking.

Some schools now teach romanized Chinese before taking up the traditional characters. The girl at left assembles cutout letters into the words pronounced by her teacher.

Lunar landscape overhangs the intent faces of students and workers at the Peking Planetarium.

(Continued from page 198)

rants, too. Within the high cool rooms of the dignified Peking Club they served a dessert called Peking Dust. Mention it to any old-time resident and his mouth will water. It was a purée of chestnuts, slathered with whipped cream and dotted with preserved fruit. If it is true that overweight shortens life, Peking Dust must have killed more foreigners than the Boxer Rebellion.

It was in the wide streets of Peking that I first decided that travel was to be my business. I was walking early one morning near the West Straight Gate, when I heard the deep sound of a bell and looked up to see my first caravan: great two-humped Bactrian camels, marching sedately one behind the other, their padded feet making a curious shh-ing sound. To me, at that moment, they spoke all the mystery and adventure that lay in Central Asia, and I knew that I must see it.

Caravans have come to Peking from the north and the west for thousands of years, and I am sure they still do. Invading armies have come from those directions, too, and this also may happen again. Brian Brake has brought back a magnificent picture of China's Great Wall, taken not far from Peking, and it reminds one of China's traditional fear and distrust of the tribes and nations that lie beyond its long reaches (page 199).

China today, by the Communists' own statistics, is experiencing a population explosion unmatched in history. The state is forcing resettlement of great masses of people. The vast underdeveloped areas of Sinkiang and Inner Mongolia are being vigorously attacked. Thus far there has been room. But the day may come when China demands more room for more millions and moves north and west to find it.

Food has always been China's greatest problem, but education is not far behind. The girl on this page, intent on her new Western-style letters, may be more important to her nation than the marble and tile and jade mementos of the T'ang and Ming dynasties. She will not grow up to know the life I knew in Peking, nor that of my Chinese friends. But her industry, and the eager intentness of the students and workers on the opposite page, mirror a China not to be taken lightly.

MAN'S DEEPEST

"DO YOU THINK we shall be able to make the dive?"

The voice of our faithful engineer, Giuseppe Ruono, was taut with anxiety. A 37-year-old Italian, he had already prepared the *Trieste* for diving 64 times, first in the Mediterranean and this year in the western Pacific off Guam. Now he was wondering whether it was not sheer madness for the bathyscaph to attempt to descend 36,000 feet—nearly seven miles—under existing conditions. In fact, I was wondering the same thing myself.

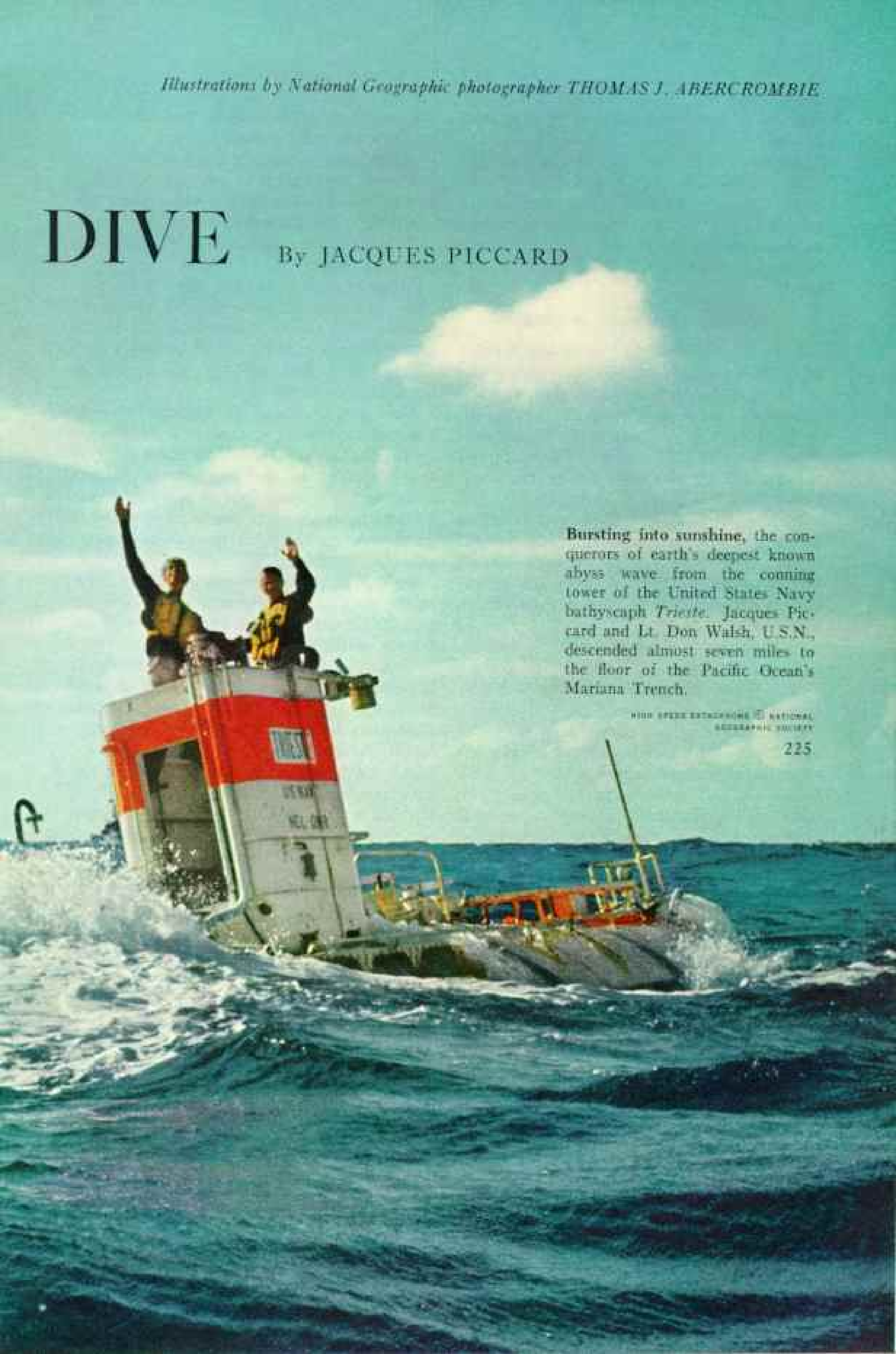
The date was January 23, 1960. The United States Navy's ocean-going tugboat *Wandank* had been towing the *Trieste* for four days; now we were some 220 miles from our base on Guam.

The sea had become rougher and rougher. At that moment waves were sweeping the bathyscaph's deck without ceasing, and we had just discovered that the surface telephone, which enabled the pilot to give his final instructions before the dive, had been torn away. The tachometer,

Illustrations by National Geographic photographer THOMAS J. ABERCROMBIE

DIVE

By JACQUES PICCARD



Bursting into sunshine, the conquerors of earth's deepest known abyss wave from the conning tower of the United States Navy bathyscaph *Trieste*. Jacques Piccard and Lt. Don Walsh, U.S.N., descended almost seven miles to the floor of the Pacific Ocean's Mariana Trench.

indicating speed of descent and ascent, had been completely demolished during the towing, though it rode eight feet above water level and had weathered more than 50 dives.

Another instrument, a vertical current meter, was partly broken and hanging miserably on its support. The bathyscaph looked like a victim of battle rather than an undersea laboratory about to explore the Mariana Trench—the deepest place in the oceans.

Torches Mark Scene of Dive

It was hardly daylight. A few dozen yards away on the water burned some flares which our escort destroyer had placed to show us the exact spot where the dive should begin. Indeed, the bottom had been carefully sounded. More than 800 TNT explosions had followed one another for two days before the Challenger Deep was marked (map, page 228).

All that work, those four days of laborious towing, the unavoidable fatigue that resulted for the crew—was it all to be lost? Should we risk months of delay because a few instruments—important, to be sure, but not vital—were lacking?

"I am going to check the main electric circuits in the sphere," I replied to Buono. "Then, if everything is in order, we shall dive immediately."

The main electric circuits control release of ballast. One of my father's basic ideas when he invented the bathyscaph was to hold the ballast—in this case mainly iron pellets—by means of electromagnets. Hence it is necessary merely to cut the current, an operation that is always possible, in order to lighten the bathyscaph and cause it to ascend automatically. The bathyscaph functions like a balloon in the sea, deriving its buoyancy from lighter-than-water gasoline instead of the balloon's lighter-than-air gas.

Don Walsh joined us on the bathyscaph's deck. Lieutenant Walsh, the U. S. Navy officer in charge of the *Trieste*, had already made six dives, the latest to 24,000 feet with me two weeks previously.

This dive we were making was to be decisive for Don as well as for me: If everything went as planned, he would take over as the bathyscaph's pilot, and I, having shown the *Trieste*'s capabilities to the utmost, would return to Switzerland and set to work constructing a new machine.

In the sphere the air was good—fresh and dry, thanks to the silica gel placed on board before our departure from Guam. This does not mean we were comfortable. The big gasoline-filled float above our spherical cabin was the plaything of the waves, and the whole machine was rocking hard.

Under these conditions the foremost desire of a cabin passenger is to penetrate as quickly as possible into the depths, which alone can shield him from the rolling waves.

I hurry up the ladder onto the deck and give final instructions to Buono.

"When I have closed the door," I tell him, "you may open the entrance-tube valves and proceed with normal operations. If, at the last moment, something doesn't go well, I shall turn the propellers, and you will know that we must give up the dive."

This simple code is to take the place of the surface telephone, destroyed by the sea during the towing. From the cabin I can turn the propellers, located on deck in Buono's sight, and halt operations if something goes wrong—for example, in the unlikely event of water entering the cabin through an improperly shut hatch.

As soon as the bathyscaph is entirely under water, the undersea telephone will go into action, and contact will be established with our friends on the surface.

Definitely the sea is not calming down. It is broad daylight now. A few hundred yards away the *Wandank* is rolling and pitching more than ever. Having released the bathyscaph, she now seems to be at loose ends.

A little farther away I see the *Lewis*, disappearing entirely every few moments behind the big waves. She is the destroyer escort assigned to assist us on the surface and to watch over the area during the dive.

Single Bolt Seals Bathyscaph Hatch

The sky is heavy, overcast. The weather is hot and humid. We are in the tropics, and the *Trieste*'s deck is constantly swept by the waves.

The moment does not lend itself to meditation. I go down into the cabin again, and the heavy steel hatch that will protect us from the sea is carefully closed. Indeed, a single bolt is all that is needed to close it hermetically. At the bottom, nearly 3,000 tons of water will see that the hatch remains closed!

Through the rear porthole we see water rising in the entrance tube, by which we came into the cabin. During the dive, this tube must be filled with water. With compressed air we shall blow it out when we reach the surface after the dive, thus clearing the passage to the deck and the open air.

Nine Hours of Tension Ended, Walsh and Piccard Leave the Bathyscaph

Spray-drenched and bone-tired, the explorers return to the *Wandank* aboard a rubber boat; the bathyscaph, already under tow, wallows in the background. In her first 17 months with the U.S. Navy, *Trieste* made 22 descents and three times shattered depth marks. Jacques Piccard's father, Auguste, designed the craft to plumb the depths just as his balloons once sailed the stratosphere.

A few moments later, all apparent motion of the cabin ceases: The dive is beginning. It is 8:23 a.m.

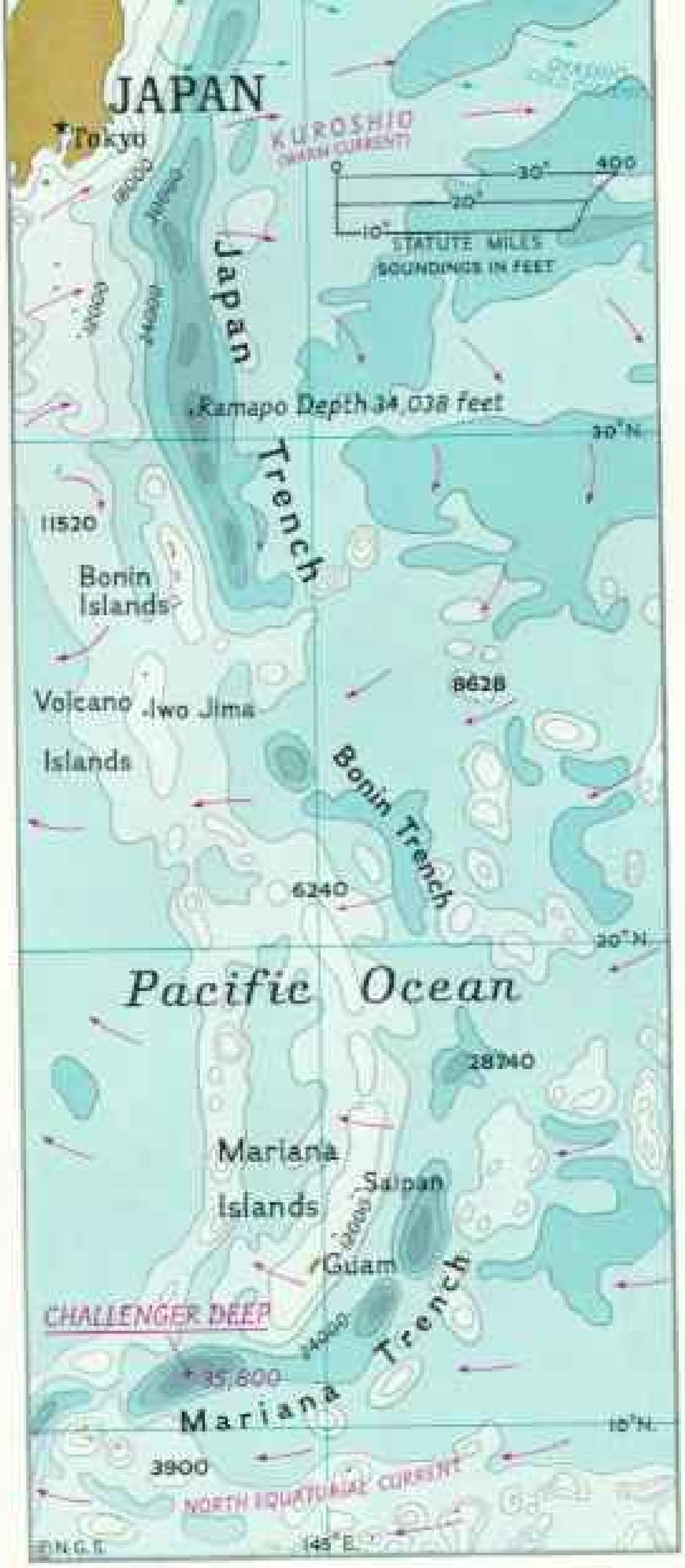
The buffeting waves, by covering the *Trieste*, have sent it into a region of eternal calm, an immense mysterious domain where the fish of the deeps open their avid eyes in the darkness, and where chilly waters are found only a few thousand feet from the eternally warm seas of the tropics.*

With a sigh of relief Walsh and I welcome the beginning of the descent. We think with compassion of those who will remain on the surface during the nine hours the dive is to last. They will not, as we shall, enjoy a calm, almost beneficent, day. They will be a prey to wind and sea, and to anxiety also, for the news they will receive from us will be brief.

The beginning of the dive was extremely slow. The bathyscaph had been very well balanced, and the first minutes of calm and respite allowed us to complete the necessary checks to make sure everything was in order.

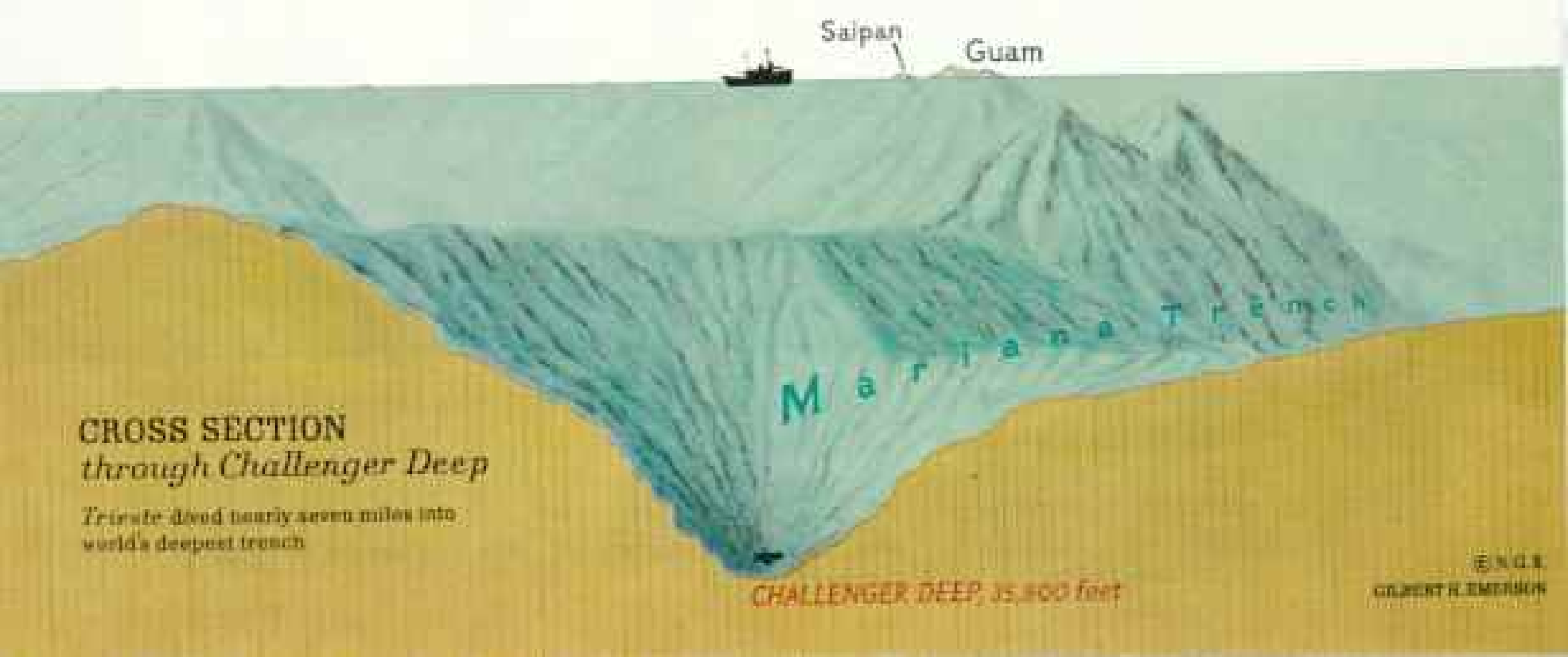
Ten minutes after leaving the surface, we were at a depth of only 300 feet. There the bathyscaph stopped of its own volition. We had reached a much colder layer of water,

* National Geographic accounts of other descents by bathyscaphe (as the French spell it) include: "Deep Diving by Bathyscaphe off Japan," January, 1960; "Four Years of Diving to the Bottom of the Sea," May, 1938; "Two and a Half Miles Down," July, 1954, all by Lt. Comdr. Georges S. Houot of the French Navy; and "Diving Through an Undersea Avalanche," April, 1955; and "To the Depths of the Sea by Bathyscaphe," July, 1954, by Capt. Jacques-Yves Cousteau.



Cradle of earthquakes, the western Pacific's chasms make their maximum dip in the Mariana Trench, a mile deeper than Mount Everest is high.

***Trieste* sank** into a valley's narrowing maw amid sea-washed mountains. Vertical dimension has been exaggerated for clarity.



and the relative weight of the craft with respect to the water had suddenly diminished, bringing the descent to a halt.

Here already we faced a dilemma: We could wait until the gasoline of the float cooled enough to enable the bathyscaph to resume the descent; but then we would lose precious time, and it was absolutely necessary to surface before nightfall. The other course was to release some gasoline; but that would mean sacrificing at the very beginning of the dive some of the precious liquid needed to lift us back to the surface.

Gasoline Released to Speed Descent

I had confidence in the calculations that had established the ballast-gasoline ratio for this dive. These had shown that we could safely release even the whole of our expendable gasoline—150 cubic feet. The remainder —more than 4,000 cubic feet—should be sufficient for our ascent.

I opened the gasoline valve, and a minute later the descent resumed. Another layer of cold water stopped the *Trieste* 35 feet farther down. I released a bit more gasoline. Five minutes later, at a depth of 425 feet, the *Trieste* came to a halt again. And again, seven minutes later, we stopped at a depth of 530 feet. This was the first time in my 65 dives in the *Trieste* that I had observed this phenomenon of repeated stratification.

At each of these stops Walsh watched very carefully a new electric thermometer that gave us the temperature of the water with great precision. In this way he was able to ascertain the very marked presence of what oceanographers call the thermocline. Each time, the bathyscaph rose and fell slightly, partly from the effects of internal waves.

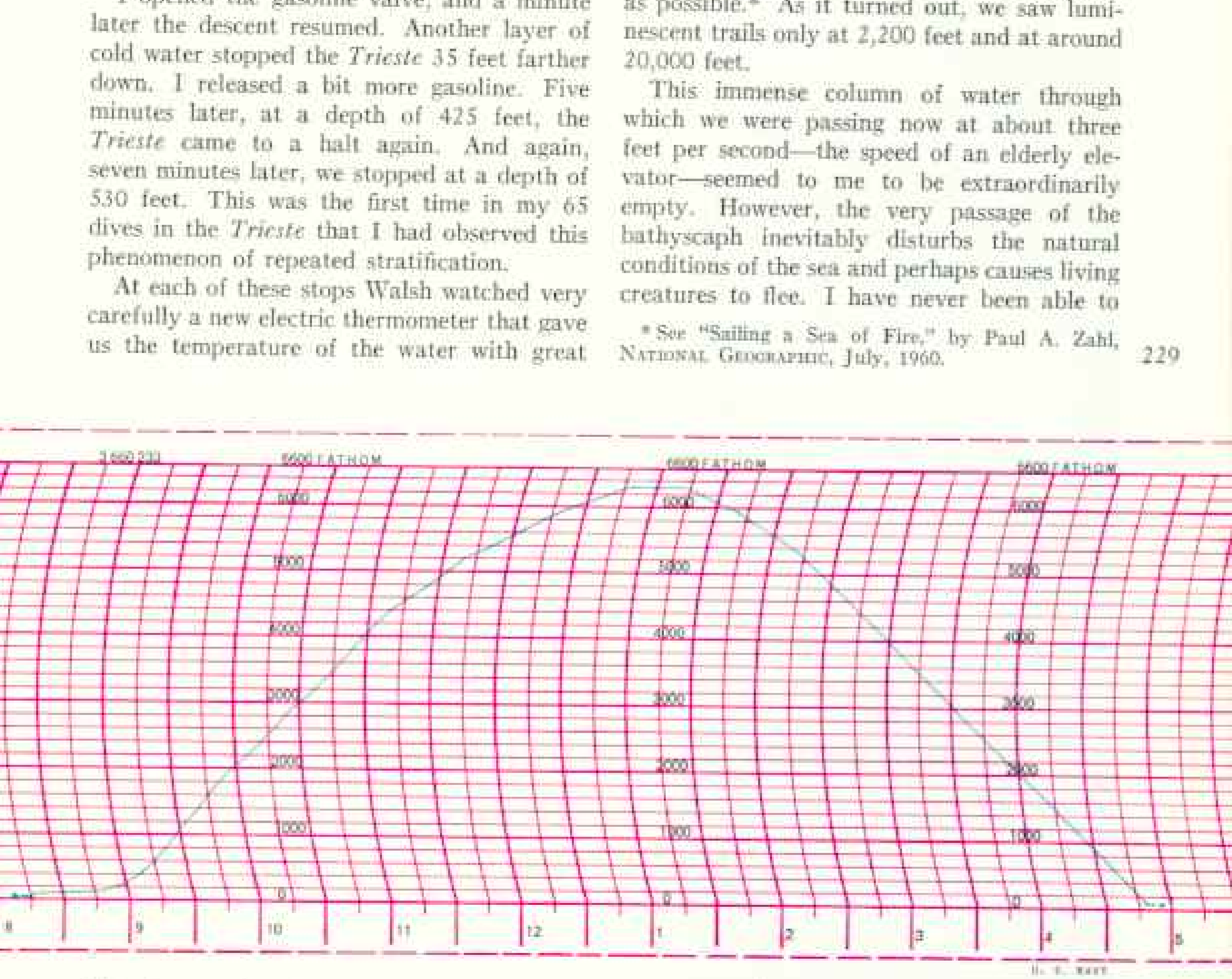
After traversing about 650 feet at an average speed of four inches per second, the *Trieste* finally decided to embark seriously on this dive into the enormous depths.

Because the gasoline of the float is more compressible than water, the freely entering sea water continually increases the weight of the bathyscaph during the descent. Thus, unless the pilot takes a hand, the speed increases also until the bottom is reached. But the pilot watches the speed and releases ballast to keep within the limits of safety.

Already it was dark, and shortly afterward the first traces of phosphorescent plankton appeared. We scarcely used our searchlights during the descent, because we wanted to observe bioluminescence of undersea life as much as possible.* As it turned out, we saw luminescent trails only at 2,200 feet and at around 20,000 feet.

This immense column of water through which we were passing now at about three feet per second—the speed of an elderly elevator—seemed to me to be extraordinarily empty. However, the very passage of the bathyscaph inevitably disturbs the natural conditions of the sea and perhaps causes living creatures to flee. I have never been able to

* See "Sailing a Sea of Fire," by Paul A. Zahl, National Geographic, July, 1960.



Historic recording by *Trieste*'s depth gauge shows fathoms vertically and hours horizontally. Calibrated for fresh water at the surface rather than for heavier salt water, the instrument registered 6,300 fathoms, or 37,800 feet. Scientists later corrected the reading to 35,800 feet.

perceive fish during a rapid descent. Even when the descent is very slow, it is rare to observe living forms other than plankton, or relatively primitive species.

Before the dive I had decided to allow the *Trieste* to descend at about three feet per second to 26,000 feet, then to reduce the speed to about two feet per second down to 30,000, and from there to descend at about one foot per second. Thus we should have time to slow the bathyscaph when the bottom appeared on our sonic depth finder.

Although we assumed that there would not be any violent undersea current to sweep us far off course, there was, nevertheless, a possibility that we might come down on a slope of the trench instead of on the floor, landing sooner than planned and perhaps striking a hard surface, even rocks.

Measuring and adjusting the bathyscaph's speed requires a constant check of the temperature of the water, the temperature of the gasoline, the amount of ballast released and the quantity still available, and, of course, the pressure and the exact time. In addition, it was advisable to check, among other things

Tricate Spotlights a Flatfish 7 Miles Down: an Artist's Conception

Nearing the ocean's unmapped floor, Piccard and Walsh switched on mercury-vapor lamps and peered out a forward port of clear plastic more than half a foot thick.

Suddenly Piccard spied a solelike fish, tentatively identified as *Chascanopsetta lugubris*. Though an entire ocean pressed down with a weight of 16,000 pounds to the square inch, the fish swam unconcernedly above the ivory-colored ooze. It proved that vertebrate life exists in the sea's greatest depths.

Trieste wears a shredded bow line that broke in rough seas during her tow from Guam (page 236). A cable trailing aft brakes descent as its weight slacks off on the sea floor; it also swings the vessel into the stream of any current. Propellers near the bow drive the craft when submerged, but battery power limits range to four miles. Two ballast containers projecting near the observers' steel sphere hold iron shot, which electromagnets drop to slow, stop, or lift the craft.

The bathyscaph starts down by flooding air tanks. If descent lags, the pilot can jettison part of the craft's 32,000 gallons of gasoline, a cargo that supplies buoyancy because it weighs less than water. Speed snowballs as the chill and increasing pressure of the deep compress the gasoline and admit sea water to the float. Delicate adjustments between ballast and lift enable the vessel to penetrate the depths the way a balloon explores the sky.

Twenty-seven feet of paper would have to be added to the bottom of the drawing on this page to show in true scale the distance between the *Wandank* and *Trieste* when the bathyscaph reached the bottom of the Challenger Deep. The two craft are depicted 500 feet apart.

—and to note down regularly—the oxygen dosage, the percentage of carbon dioxide, the humidity, and the temperature inside the cabin. Thus our nearly five hours of descent did not seem long to us.

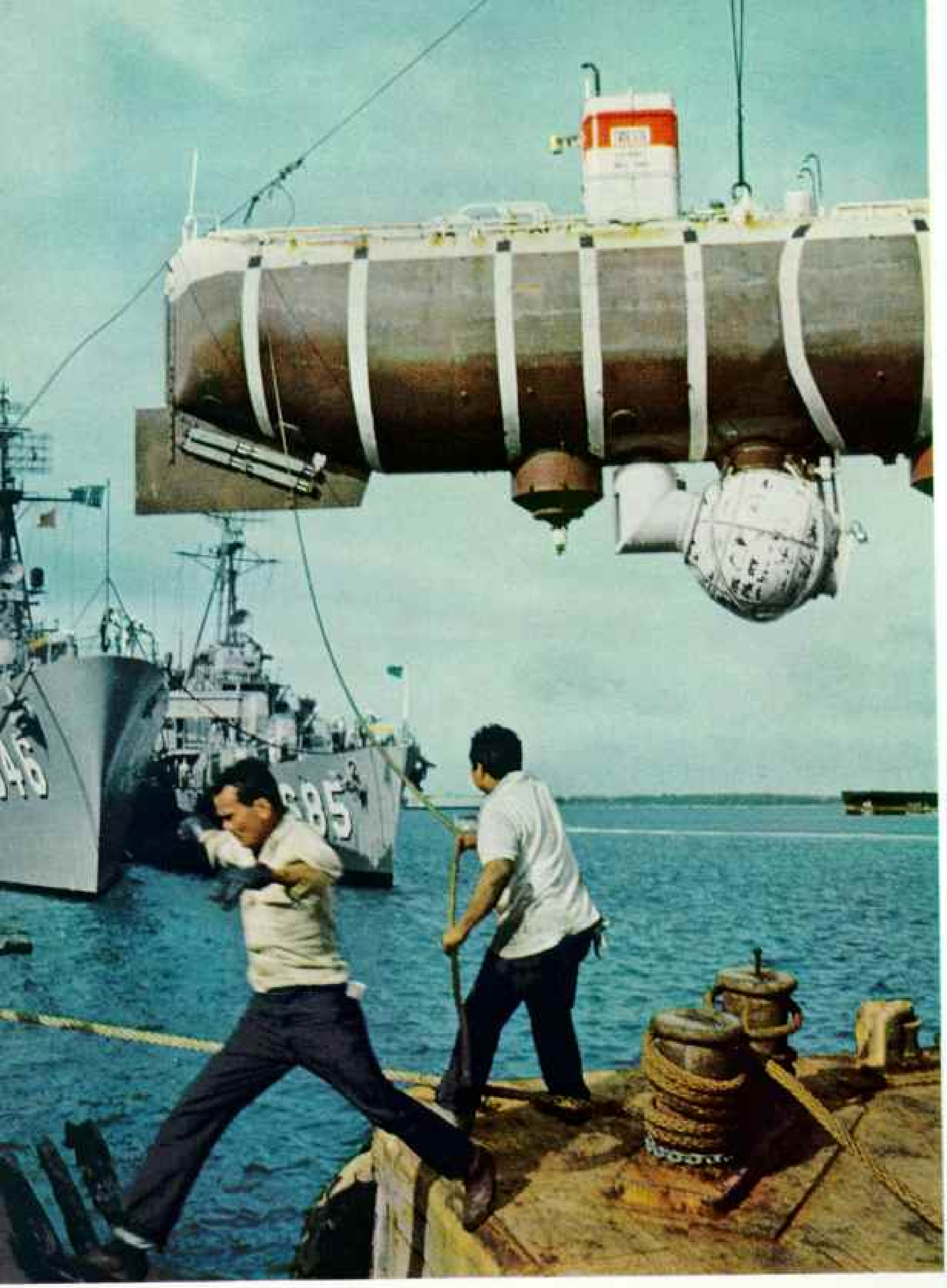
By a depth of 1,500 feet the darkness was total. Inside the cabin we had turned on only a small light, just sufficient for reading the instruments. The temperature of the water was falling, and the cabin began to feel cold.

"Say, Don, suppose we put on our dry clothing."

Walsh looked at me somewhat doubtfully. Not a tall man, he can move about easily in the cabin, while I should have to open the port to stretch my arms. Yet I have dived so often that I feel perfectly at home. Besides, I had the cabin made with a diameter of six feet four inches—almost my height.

According to our program we were to remain nine hours in the cabin practically without moving, seated on small stools. It was wise to take all possible precautions against the cold that awaited us farther down. Warm clothes had been placed in the cabin, and it

PAINTING BY NATIONAL GEOGRAPHIC ARTIST JOHN W. LEBBEUS



After the Record Dive, *Trieste* Swings on Cables at Apra Harbor, Guam

At maximum depth the passenger sphere, suspended like a bomber's belly turret, withstood the weight of five battleships. Contraction and expansion from pressure and temperature changes

PHOTOGRAPHS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS J. ABERCROMBIE © N. G. S.

during the dive made its paint peel. Stripes on the 58-foot float mark interconnecting gasoline compartments. The Navy destroyers *Edson* and *Picking* overlook the scene.

felt good to struggle into them, for we both had been drenched when we came aboard.

At 5,600 feet came a telephone call for me. An hour and a quarter had passed since the dive began. Thanks to an admirable apparatus built at the United States Navy Electronics Laboratory at San Diego, California, we had had sonic telephone contact with the surface from the outset. I asked Buono for information concerning final surface operations; he replied that everything had proceeded normally, in spite of the condition of the sea.

At 10,000 feet we had another good telephone conversation, this time with Lt. Lawrence Shumaker, then another at more than 13,000 feet. Walsh was at the telephone.

"Reception is still good," he said to me. "Can we maintain contact all the way?"

"It is difficult to tell," I replied. It would be necessary for the *Wandank* to remain almost vertically above us, not an easy operation in bad weather.

Up there on the surface, we know, the tugboat and the destroyer are keeping watch, a long fatiguing watch in the stormy sea, covered with great white crests as far as the horizon. Faithfully our friends far above watch the telephone, watch the radio, watch all around this mysterious point where a hundred pairs of eyes saw the *Trieste* swallowed up this morning. We know that up there—three miles above us—a whole surface team is ready to receive us when we ascend.

But for the moment we are going down. As we look through the porthole, we see passing, still at three feet per second, torrents of plankton-bearing water that seem to rise from the abyss as we approach the bottom. We pass successively those depths we reached during the preceding weeks: 18,600 feet, 24,000 feet.

"We are at a depth where no one has yet been," murmurs Walsh. Silently I acquiesce.

For a moment my thoughts return to the past. For the fourth time the *Trieste* is penetrating into virgin depths: once in 1953, again in 1959, twice in 1960. The *Trieste*, built to take man to any depth, has served its masters well. But we are not yet on the bottom.

At a depth of 26,000 feet our telephone is still able to intercept a conversation between our tugboat and the escort destroyer!

It is 1130 hours; we are following our diving plan exactly. Now I reduce speed; we have already dropped six tons of ballast.

Outside the water is magnificently limpid —no trace of life, no plankton. Switched on for an instant, the searchlight casts its rays deep down beneath the bathyscaph; it seems

as if nothing can stop this light. We are in the void, the void of the sea, which squeezes upon the wall of our sphere with nearly 150,000 tons.

Now we descend very slowly, about one foot per second. We have turned on the sonic depth finder, and from one moment to the next we expect to see the bottom appear. The searchlights are switched on again, and from time to time I let drop a little ballast. Time seems to move slowly.

Suddenly, at 32,500 feet, we are startled by a dull cracking sound from the bathyscaph. At the same moment a rather heavy shock makes the cabin tremble.

We look at each other.

"Have we touched bottom?" Walsh asks.

"I don't think so; the depth finder hasn't shown anything," I reply.

No, the *Trieste* continues to descend slowly, regularly. The bottom is still invisible. What should we do? Could we have encountered an undersea monster? On board everything seems normal, no change in the equilibrium of the bathyscaph. We continue descending steadily.

For a few minutes we stop everything on board that makes a noise: oxygen passing through the injector, humming of electronic instruments, everything. In the heavy silence we hear only tiny crackling sounds, like ants in an ant hill, little cracking sounds coming from everywhere, as if the water were being shattered by our passage. Could it be shrimps? Is the cabin's paint cracking? We do not know yet, but the descent itself is regular, reassuring.

"In my opinion," I say, "it isn't anything serious; we are not losing any gasoline. Let's go on and we'll see later."

"O.K.," Walsh replies laconically.

There are now a few traces of life in the water. I scarcely have time to observe them, but they seem to be jellyfish, very small. This is not a surprise, since we know that there is life, at least bacteria and even anemones, down to very great depths. The remaining question is whether there are fish.

We continue to descend, exceedingly slowly now. Our gasoline is still cooling, and, as more water enters the float because of the contraction of the gasoline, it makes us heavier and heavier. I feel as if these hundreds of gallons of water are passing into my veins.

***Trieste* gets an extra eye** as divers attach an auxiliary light to the passenger sphere before the dive. Cables within the porthole's protective rim connect batteries in the sphere to exposed lamps, electromagnets, motors, and other equipment. Tubes rising toward the deck admit fresh air to the sphere when the craft surfaces.

The telephone has gone silent. We are perhaps too deep? The descent is silent, slow, and our eyes pass from porthole to depth finder, from depth finder to porthole. We are very near the bottom; we should reach it at any moment . . . but we continue to descend.

At 1256 hours I say to Walsh, "Don, look. Here is the bottom on the depth finder."

"Finally," Don replies.

Yes, finally—the bottom, quite distinct on the depth finder, 300 feet below us. Those 300 feet were traversed in 10 minutes; and at 1306 hours the *Trieste*, in my sixty-fifth dive, made a perfect landing on a carpet of uniform ivory color, that the sea had laid down during the course of thousands of years.

Fish Meets Sphere on Bottom

Like a free balloon on a windless day, indifferent to the almost 200,000 tons of water pressing on the cabin from all sides, balanced to within an ounce or so on its wire guide rope, slowly, surely, in the name of science and humanity, the *Trieste* took possession of the abyss, the last extreme on our earth that remained to be conquered.

And to demonstrate well all the significance of this dive, nature would have it that the *Trieste* come down on the bottom a few feet from a fish, a true fish, joined in its unknown world by this monster of steel and gasoline and a powerful beam of light. Our fish was the instantaneous reply (after years of work!) to a question that thousands of oceanographers had been asking themselves for decades.

Slowly, very slowly, this fish—apparently of the sole family, about a foot long and half as wide—moved away from us, swimming half in the bottom ooze, and disappeared into the black night, the eternal night which was its domain (page 231).

Slowly also (Is everything slow, then, at the bottom of the sea?), Walsh held out his hand to me.

We remained on the bottom for 20 minutes. We took temperature measurements (about 38° F.), made measurements of a possible undersea current (none, apparently), and of radioactivity (no positive indication), and spent several minutes at the porthole. Once a shrimp swam peacefully in front of us.

As a matter of duty and to leave nothing undone, Don skeptically called the surface on the telephone:

"This is *Trieste* on the bottom, Challenger Deep. Six three zero zero fathoms. Over."

Suddenly I saw him give a start, and I was able to follow the telephone conversation.

"I hear you weakly but clearly. Please repeat the depth."

Don did so slowly. "Everything O.K." (What could go wrong?)

"Six three zero zero fathoms?"

"That is Charley." (In the seaman's jargon, Charley stands for "C" and means "correct.") "We will surface at 1700 hours," Don replied.

"Roger." (That is, "understood.")

Of course we had every reason to be pleased with this telephone conversation. On the surface our friends were reassured as to our fate, but, in particular, we had been able to perform a highly interesting experiment. The credit belonged to scientists who, after long and patient laboratory research, had succeeded in giving us a telephone unparalleled in the world. With their instrument, without wires or radio waves, we had established the first voice communication between the surface and the great depths of the ocean.

If I had the space here, I could mention in greater detail the names of all those to whom credit is really due for this dive: first of all, Prof. Auguste Piccard, my father, with whom I have had the privilege of working for many years.*

He not only invented the bathyscaph and set down its whole theory, but also, after years of research and laboratory experiments, built and tried two models of it himself.

Credit should also go to nations: Belgium, which supplied the funds for the first bathyscaph; Switzerland and Italy, which did the same for the *Trieste*; West Germany, which built our third submarine cabin; and finally the United States, which took over our work with the *Trieste*, and whose Navy organized Operation Nekton, of which this dive to a corrected depth of 35,800 feet was part.

Port Cracked by the Cold

"Can you switch on the rear searchlight?" Walsh asks.

"Certainly. There it is."

Don looks through the porthole. Three seconds later he leaves the viewing port.

"I know what happened, that noise, that jolt," he says quietly. "It was the big viewing port of the entry tube that cracked."

This big Plexiglas viewing port is subjected to no differences in pressure; it must have contracted more than its exterior steel frame allowed. Thanks to our rear searchlight, several cracks are clearly visible.

* See "Ballooning in the Stratosphere," by Auguste Piccard, NATIONAL GEOGRAPHIC, March, 1933.

Battering seas snapped the towline as the tug *Wandank* pulled *Trieste* toward Challenger Deep. The waves also wrenched off a vertical current meter and topside telephone that communicated with the sphere. Here Piccard (right) helps replace the cable. Giuseppe Buono, *Trieste*'s master mechanic, supports Lt. Lawrence Shumaker, at work in the shark-infested water.

BY KATACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS J. ABERCROMBIE

Trieste wallows helplessly as the crew closes in. Their rubber boat cannot damage the gasoline-laden float.

This little accident does not involve us in danger. But if these cracks do not close of themselves during the ascent, the tube may be difficult to empty. In that case, we may have some trouble getting out of the cabin. Perhaps we shall need to have divers install the spare window cover always carried aboard the towing vessel, but so far never needed.

For that prospect, especially in the heavy seas on the surface, we need daylight. Hence there is not a minute to lose. We do not regard with favor the chance of having to spend extra hours confined in this steel ball.

Besides, of the 30 minutes we intended to spend on the bottom, 20 have already elapsed. Regretfully we forego these last 10 minutes. We cast a final look upon this horizonless land, shining under the glow of our searchlights.

Ballast Creates a Submarine Dust Cloud

With my hand on the electric switch, I see through the porthole a stream of pellets pouring from one of the ballast silos and then sinking into sediment as soft as powdered talc. The impact produces an immense and shining cloud, first in front of us, then above us, and finally stretching out like a great spreading cumulus.

As we ascend, we traverse the cloud, rising above it as it disappears into the night that we restore to the abyss. This dust, I am sure, is made of the siliceous skeletons of diatoms that have died in the upper stratum of the sea and fallen slowly to the bottom. It will be hours, perhaps days, before it all returns to the bottom where it has lain, doubtless for centuries.

But once the bathyscaph has departed, the searchlights have disappeared, the water stirred by our passing has subsided, and the heat brought by our presence has dissipated, the immense liquid curtain will then close over this strange interlude: the sudden arrival of man in this cold, dark, mysterious world.

We were not, however, the first messengers from the surface. The creatures we had seen verified the long-assumed existence of undersea currents bringing oxygen down to the very bottom of the sea.

As yet we do not know the exact speed or size of these currents, but apparently there must be massive exchanges of water between the surface and the great depths. Thus we have one more reason for prudence in the much-discussed disposal of radioactive waste.

Our ascent proceeded without incident. We looked through the porthole a great deal, usually with searchlights switched on. But we had the same impression of emptiness that had struck us so forcefully during the descent.

Gradually our speed increased with the expansion of the gasoline in our buoyancy tank: one and a half feet per second in the beginning, about two and a half feet per second at 30,000 feet, about three feet per second at 20,000 feet, and about four feet per second at 10,000 feet.

Shortly before we reached the surface, the rate of ascent rose to five feet per second. Then our rise was slowed, just as foreseen, by warm water with a lower density. This layer increased the apparent weight of the bathyscaph by about a ton.

The *Trieste* behaved perfectly through the whole ascent: no vibration, no rolling, not a movement inside nor a jolt that might have betrayed our increasingly rapid rise. Only the instruments inside the cabin indicated that we were approaching the surface more and more swiftly. At about 3,300 feet there was a little bioluminescence in the water, and again still more at 2,000 feet.

It is cold in the cabin, around 40° F. at our feet, but now the gleam of daylight appears at the porthole. Sea dawn—this late afternoon daylight of January 23, 1960—begins to illuminate the interior of the cabin with its blue and pallid light.

Trieste Keeps Its Surfacing Schedule

The last few hundred yards are quickly traversed, and at 1656 hours, almost exactly our estimated time of arrival, the *Trieste* pierces the surface again—a surface that for thousands of years men regarded as the whole of the sea.

By daylight the cracks in our viewing port are quite visible; they do not seem serious. Nevertheless, in spite of our impatience to reach the open air, we quite slowly open our compressed air cylinders to expel water from the tube. If we release too strong a pressure, we risk bursting the Plexiglas into pieces.

The operation usually takes two or three minutes; today it requires nearly 15. But all goes well. I direct the release of air into the tube and tell Walsh how much to open the cylinders. He calls out the pressures that he reads on the two manometers, one for the cylinders and one for the entry tube.

"I think I see the water coming down," I say. "Yes, there is the level. We can get out without any help!" And, in fact, a quarter of an hour after reaching the surface, we were able to come out on the bathyscaph's deck,

KODACHROME BY JOHN E. FLETCHER, NATIONAL GEOGRAPHIC STAFF © N. G. S.

President Eisenhower Honors the Bathynauts at the White House

He holds a flag taken on the dive; another rests in National Geographic headquarters in Washington, D. C. Jacques Piccard wears the Navy's Distinguished Public Service Award, Lieutenant Walsh the Legion of Merit. Dr. Andreas Rechnitzer, scientific chief of the dives, received the Navy's Distinguished Civilian Service Award, and Lt. Lawrence Shumaker, assistant to Walsh, the Navy Commendation Ribbon with Metal Pendant.

into the afternoon air. The dive had ended.

Our first contact with the civilized part of the sea was not merely rough but violent. The wind was blowing even harder than in the morning; the waves were also heavier and higher. But weather was of little or no importance now.

Planes Give Divers a Noisy Greeting

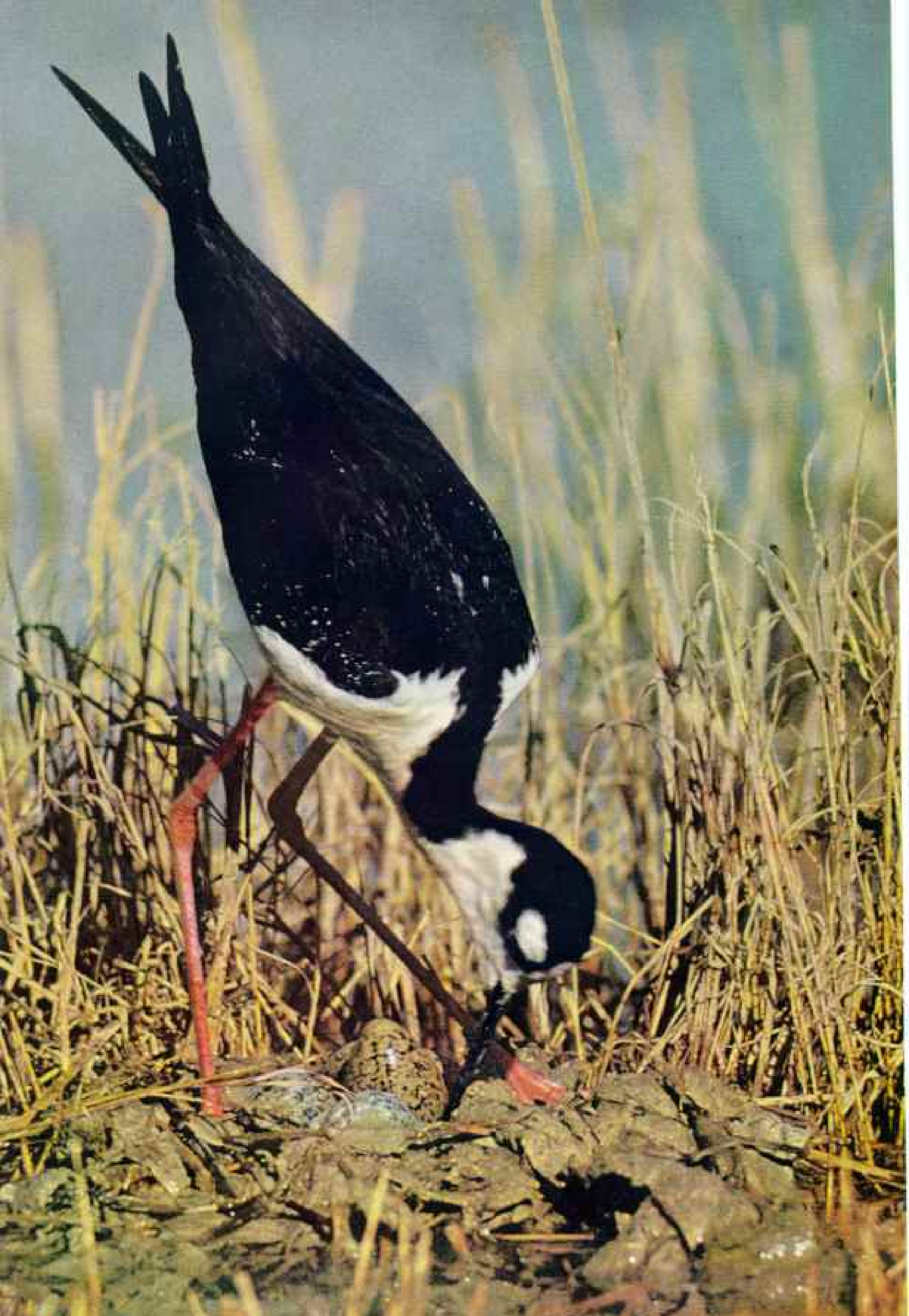
On reaching the *Trieste*'s deck, I had the impression of emerging in the middle of an air meet. Several Navy jets and a plane of the Guam Air Rescue unit were sailing around above us with an infernal racket, dipping their wings to greet us. A few miles away the *Lewis*, and behind her the *Wandank*, were approaching rapidly.

Suddenly I saw, a few yards from the bathyscaph and just behind the crest of a gigantic wave, a tiny black rubber boat loaded with four men—two sailors and two photographers.

Like a centipede in an avalanche of sand, the small boat glided down the flank of a wave and ascended almost vertically toward another crest. With all the speed its little engine could produce, it turned in a circle around us, going up and then down; and in the wind and the salt and the sea I heard the photographers plead: "Salute, do salute, please."

As ever, photographers!

But, indeed, we saluted gladly: not for posterity, to be sure, not for the photographers, but for the rediscovered sun and pure air, even for the wind and the waves that submerged us each instant. We had only one thought: profound gratitude for the success achieved, gratitude toward all those who had contributed to the success of this uncommon day.



A frail shore bird with 7-inch legs battles a flood to save its nest in a remarkable drama of the wild

The Dauntless Little Stilt

By FREDERICK KENT TRUSLOW

Kodachromes by the author

THIS IS THE STORY of a battle between a pair of small birds and an implacable enemy. It was not what you would call an important battle; in fact, except for me, nobody even knew it took place. Yet as a demonstration of courage, efficiency, and energy in a small package, it surpasses anything I have ever seen.

The black-necked stilt supports a dove-sized body on a pair of absurdly long legs. Its bill protrudes from its round head like a pair of toothpicks from a cherry. Not a heroic type at all; but a pair of these puny shore birds are the stars of this drama.

It happened at the Bear River Migratory Bird Refuge of the U. S. Fish and Wildlife Service—64,200 acres stretching over the marshy delta where the Bear River empties into Utah's Great Salt Lake. Forty miles of earthen dikes divide the area into vast shallow pools. Their glassy waters reflect the Promontory Mountains to the west and the abrupt crest of the Wasatch Range to the east.

The refuge is a place of striking beauty and of incredible bird life. It lies as a sort of crossroads in the flyways leading from Canada and the northern United States to the south and west. In early days birds literally darkened the skies above the marshes, and market hunters supplied tables from Chicago to San Francisco with ducks for $1.10 a dozen.

Even today birds by the hundreds of thousands breed or rest at the refuge, filling the

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Frantically building up one side of her nest in a race against rising water, a stilt tamps down leaves and twigs. Using her slender bill, she rolls the eggs to the high side of the mound, then builds up the other side. Jet-black wings contrast with snow-white underbody. Gleaming white spot on the head suggests a grotesque eye.

Father stilt (right) brings grass and leaves to his hard-working mate. Pink pipestem legs seem to bend backward, but the joint is actually the heel, not the knee.

Operation Egglift

BLACK-necked stilts normally lay their eggs on the ground near shallow pools. But gusty winds sweeping the vast Bear River refuge in Utah often blow the alkaline water out of the river marshes across the dry mud flats. Hidden in his blind, and with water rising around his feet, air with a babel of sounds day or night. Some 200 species have been recorded there.

Refuge biologist Jack Pickford Allen set me off on my stilt adventure when he rolled to a stop beside me in the bird sanctuary's patrol truck. It was a hot, still, cloudless day, and a long billowing streamer of dust trailed behind.

"Fred," he said, "I think I've found that black-necked stilts' nest you've been hoping to photograph."

Through the courtesy of refuge manager Vanez T. Wilson, I had been roaming the marshes for weeks, photographing wildlife for the NATIONAL GEOGRAPHIC and, among other things, trying to find a nesting pair of the little stilts. I had made pictures of killdeers, avocets, Canada geese, white-faced glossy ibises, snowy egrets, and many other birds in this extraordinary haven. But not a single stilts' nest had I found.

So with a feeling of excitement, and with the help of Fred Bolwahnn, assistant manager at the refuge, I got an aluminum skiff from the boathouse near the headquarters building. We loaded it into the truck and took off down a gravel road that topped a six-foot dike along the water's edge. After half a mile of driving, Allen pulled up.

"Over there," he pointed. "In those bunches of grass beside that shallow pool."

I could see two black-necked stilts fidgeting about nervously. With my binoculars I scanned the tufts around them, finally spotting a nest partly hidden in a clump of grass.

Eggs Unhatched, Parents Unconcerned

We unloaded the truck and launched the skiff. Then Allen and Bolwahnn drove off. As they left, a family of western grebes scuttled across the water, the young riding pickaback on their mother. Some Canada geese swam deliberately away, and coots chased each other about with their insane cacklings.

Thirty yards of poling brought me to the expanse of muddy tussocks and inches-deep pools that surrounded the spot where the stilts had their nest. When I approached, the

photographer Truslow watched this female and her mate elevate their nest 4½ inches by a process of stair-step building. This remarkable reaction of stilts to flood danger has been previously reported by ornithologists, but, as far as is known, it has never before been photographed in color.

birds were feeding a few yards from their nest, seemingly unconcerned.

I knew then that the stilts weren't far along in their nesting. If their young had been hatched, they would have put on a spectacular show to attract attention to themselves and away from the nest. They would have stalked into the open, bending and straightening their long legs suddenly so that their bodies bobbed up and down, breasts striking the water. Or they would have acted out a pitiful imitation of a broken wing.

West Wind Brings a Crisis

I pitched my canvas blind 18 feet from the nest and sat down on my folding stool to await developments. The flats stretched out before me as smooth as a billiard table, while along the dikes new hatches of insects rose and fell like billowing curtains. I ate my lunch, and, from the slit through which I had been watching the stilts, I could see the sky cloud over. A strong west wind built up, blowing from the direction of the water-filled marshes.

Suddenly one of the stilts ran and looked into the grass where the nest lay. Immediately its "pep, pep" calls rose in tone and volume to a startled "yip, yip, yip." Only then did I realize that my feet were wet, and I could well understand the birds' alarm.

Blown from the wide marshes by the wind, the water had been driven across the flats and now stood an inch and a half deep in my blind. From a rear peephole I could see that what had been a nearly dry mud flat when I arrived was now a broad lake. Worse, wind and water were still rising.

The two stilts studied their nest for a moment, then burst into frantic action. They rushed about within a circle 20 feet in diameter, centered on the nest. They pulled up small sticks and leaves from the mud as they ran, dropping the material where they had found it, freeing more and more twigs and leaves and strewing them about.

After 15 minutes of this frenzied dashing, the birds seemed satisfied with the amount of debris dislodged. The female ran to the nest

and rolled the eggs to one side (page 240). Then, as her mate hustled the material to her, she began to build up the level of the nest's other half.

In contrast to the original nest construction of fine grass and small stems, big muddy leaves now were crammed in, with just enough twigs inserted to bind the wet mass together and make the structure strong. Thus the cleared portion was raised about an inch higher than the part containing the eggs.

The mother stilt now hopped atop the elevated half of the nest. With her bill she reached down and behind each of the eggs in turn, and with incredible deftness rolled them up beside her (pages 242-3). That done, she started building up the lower half.

The male stilt, running with unbelievably long strides, brought in the building material from the perimeter of the circle first. Gradually the size of his working circle diminished. Then, when the area left extended only about

Daddy longlegs spears a muddy leaf to bulwark the nest. To save time, he tosses it over his shoulder to within reaching distance of his mate, then grabs another.

Impatiently awaiting material, mother leans out to seize a twig with her tweezer-like bill (below). Crisis over, she resumes incubating (opposite).

two feet from the nest, he changed his method of operation. Planting his feet well apart, he reached away from the nest as far as his neck would stretch. He picked up a leaf in his bill, retracted his head and body, and tossed the leaf over his shoulder toward the nest. Running time thus was cut to a minimum (opposite).

Flood-control Project Succeeds

So the frenzied building continued for an hour and a half, the birds just managing to keep the eggs above the level of the rising water. I marveled at their efficiency and wondered at the stamina of the frail-looking little creatures.

Altogether, four and a half inches were added to the height of the nest before the water stopped rising. When at last I came out of the blind, the nest top was still perilously close to the now-stationary flood level. With good intentions, but mistaken judgment, I thought the least I could do—in return for the pictures the stilts had given me—was to add to the margin of safety of their eggs.

I put three more inches onto the pile, being careful to keep the nest bowl and eggs on top. As I left the area, I was happy to see the female back on the nest incubating (below).

Two days later, however, some predator destroyed the eggs. Possibly the extra height I had added had made the nest too conspicuous; the stilts had known when to stop building. Call it one more lesson in how unwise it is to interfere with nature's processes.

The story has a happy ending, however. Within a week my stilts, recognizable by a dark stain on the breast of one, had built again. This time the nest was on a little embankment, safe from the water. There they hatched four youngsters. When I finally packed up my cameras before leaving the refuge, they were already dashing about on long stilt legs, just like their energetic parents.

Salzkammergut

AUSTRIA'S ALPINE PLAYGROUND

By BEVERLEY M. BOWIE

Illustrations by National Geographic photographer VOLKMAR WENTZEL

GOD, say the Austrians, labored six days to create the world. But on the seventh, in a purely holiday mood, he made the Salzkammergut.

This necklace of lakes east of musical Salzburg still retains a just-new air of happy improvisation—a vacationist's stage-set, complete with mountains topped by whipped cream, flower-bedecked toy villages, upland pastures where Heidi and her goats might still be wandering serenely.

I am writing this on the terrace of my tiny waterside inn near St. Wolfgang. Caught in the mirror of the lake, a paddle-wheel steamer flogs its silent, double-imaged way from St. Gilgen, pennants flying from forepeak and masthead, as prettily painted as a boat built for a bathtub.

Down on the dock my host, a hunter and game warden, is washing the hide of a roebuck he shot last night. Behind the inn, on a precipitous slope that mounts eventually to the

great Schafberg, a peasant and his wife rake hay and pitch it into a lopsided cart; their red-and-white oxen brace splayed feet and philosophically chew their cuds.

A kitten purrs like a machine gun at my feet, sniffing on my plate the skeleton of a fish I netted this morning; there is little to pass on. Whistling, a baker's boy in chef's cap and white apron rides up on his bike. A bag over his shoulder contains the day's fresh bread, long loaves sticking out like so many fat arrows from a quiver.

The sun has climbed now above the limestone peaks and spills its warmth across the checkered tablecloth. It was considerably chillier early this morning, when I stumbled out of bed to meet the fishmaster of St. Wolfgang, Nikolaus Höplinger, at his boathouse.

Höplinger, lean, barefoot, deeply tanned, bushy-browed, was accompanied by his 21-year-old son and a big collie. We stepped gingerly into his 30-foot, pea-pod-shaped boat, and Höplinger, steering with a paddle tucked under one arm, sent it skimming out onto the glass-calm waters.

At the first keg-float the fishmaster stopped, and his son began delicately to reel in, hand over hand, the net they had set the evening before.

As the webbing broke the surface, we could see several silvery *Reinanken* entangled by their gills.

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Fish nets veil a dirndl-clad *Fräulein* on the shore of the Attersee.

Sailboats on the Traunsee Dart Past an Island Castle

Knights in armor once clattered across the timbered bridge connecting the onion-domed Schloss Ort with the mainland. When Johann Ort, an archduke who renounced his title, disappeared at sea in 1891, he left his castle and artificial island to the community.

For almost 2,000 years, beginning in Roman times, the Traunsee and its outlet, the Traun River, served as arteries for Salzkammergut's salt trade. Between the 16th and 19th centuries boatmen rowed the processed salt down to Gmunden, on the north shore of the Traunsee, and the town flourished. Gmunden's boom began to fade in 1832, when a horse-drawn railway siphoned off part of the trade.

Today fishing boats and pleasure craft cleave the lake's azure waters. Every spring, on Corpus Christi Day, fishermen and farmers garland their boats with flowers for a colorful procession.

Lofty peaks, sapphire lakes, and green valleys beautify Austria's Salt Crown Lands, the Salzkammergut. Square above shows the area mapped on pages 246-7, which covers 40 miles from margin to margin. The painting inverts north and south lest mountains in the south block the view.

"Fall is the best time for fishing," said Höplinger. "Then I catch over a hundred fish a day. In summer the steamers and motorboats make too much noise, and the fish stay down on the bottom where it's quiet."

Fishing Rights Traded Like Farms

He sculled over to a new net. We were virtually alone, and I soon found out why. Over the generations, Höplinger's family had bought up the fishing rights for about three-quarters of the lake's area, rights as precisely demarcated and marketable as acreage ashore. Now he had enough to assure himself a stable yield and a modest income.

We hauled in net after net as the gray dawn reddened; the mist around the mountains cleared, and the church bells rang out over the water. Höplinger consulted a big silver turnip watch with Roman numerals.

"All right. Seven o'clock. Time for your breakfast."

We turned toward St. Wolfgang, and, when we were within 50 yards of the boathouse, the collie leaped joyously overboard and beat us ashore. Up at the fishmaster's house, beneath a gnarled apple tree, Höplinger cleaned some of the catch in an old stone trough and handed me two of the best.

"Have them broil the reinanken and boil the *Saibling* in vinegar, with a little seasoning. I think you'll like them."

I did.

Appetite, they say, is the best cook, but an indispensable ingredient is leisure. And that is what the Austrians supply in lavish volume in the Salzkammergut. They are in no rush; why should you be?

There are, heaven knows, plenty of things to "do" in this well-endowed country. But those who come here seem free of any fever to do them. One of the most common and reassuring sights in the Salzkammergut is the spectacle of an Austrian family enjoying its vacation: father lies under a tree, a stein within reach; mother plays with a baby sprawled on the grass; children paddle idly in the shallows.

Nobody is trying to set any records. Nobody feels any compulsion to take in 25 famous attractions of the region by supper-time. Nobody intends to exhaust himself by swimming across the lake and back to prove his manhood. Nobody even cares unduly about cooking his skin medium rare.

Nor are the local inhabitants fretting day and night over new schemes to fleece the tourist. I have driven often the full circumference of the 12-mile-long Attersee—surely the most sweetly entrancing lakeshore road in the world—and never seen a billboard, a neon light, a gaudy hotel. A meadow filled with campers, yes; a quiet pension here and there; a discreet, well-mannered inn. But no restless crowds, no chains of cars bumper to bumper.

Not that the Salzkammergut is unappreciated. Hardly. In July and August a man without reservations must search diligently from village to village to find a bed. But, somehow, the Austrians and their guests have a gift for fading unobtrusively into the landscape, and even the occasional crowds along the little esplanades and in the most popular garden restaurants appear so relaxed as not to exert much pressure on each other or their surroundings.

Visitors are, indeed, something relatively new for the Salzkammergut. Old as its towns are, they still possess a curiously shut-away

Editor's Note: This warm description of Austria's Salzkammergut is the last work from the pen of the NATIONAL GEOGRAPHIC's late Assistant Editor Beverley M. Bowie. Mr. Bowie died in November, 1958, after returning from an overseas assignment that resulted in memorable articles on Austria, the trained horses of Vienna, Prince Philip's travels, and this nostalgic view of a European vacationland. Although he wrote in the full knowledge that he suffered from a fatal disease, his article reflects the quiet humor that glowed as steadily as his courage.

KODACHROME BY VOLKMAR WENTZEL © NATIONAL GEOGRAPHIC SOCIETY

Gosausee dreams in shadow beneath the glittering Dachstein

and virginal air, and for good reason: For centuries the Salzkammergut was virtually off limits to other Austrians.

Salzkammergut means "Salt Crown Lands." Before even the Celts and the Romans had invaded these valleys, men were mining salt in caverns hacked out of the high mountains. By medieval times, salt production had become a close-fisted government monopoly, a rich source of revenue—as long as smuggling could be kept under control.

To prevent any illegal traffic, the authorities simply bottled up the whole area. Travelers had to have permits to enter; the peasants were dissuaded effectively from carefree wandering. Not until the mid-19th century, when the young Emperor, Franz Josef, discovered the delights of Bad Ischl's waters and moved his summer court there, was the Salzkammergut thrown open to outsiders.

Even then, large sectors of it remained *verboten*. A prodigious hunter, the Emperor sequestered thousands of acres as his private reserve, and woe betide the poacher nabbed in its carefully tended glades. The coming of the Republic in 1918 broke the imperial grip on these forests, but most of them remain even today delightfully free of habitation, a great green mantle linking lake to lake.

St. Wolfgang Portrayed in Operetta

So neat, so tiny, so perfectly placed are most of the Salzkammergut's towns that they appear almost theatrical, and the most theatrical of all is St. Wolfgang. The lowering bulk of the Schafberg threatens to crowd the village into the water, but the steep-gabled houses cling desperately to their little shelf of land and huddle against the mountain's flank. The cobbled twisted streets dip up and down like goat tracks beneath the overhanging, rose-wreathed eaves.

If St. Wolfgang smacks of the stage, it comes by the association honestly: *White Horse Inn*, one of Austria's most successful light operas of the 1930's, was set here in the village. The plot, indeed, revolves happily about an affair between a handsome headwaiter and the inn's buxom proprietress and is full of jolly snatches about life on the old Wolfgangsee.

I went down one summer evening to the Weisses Rössl to investigate both the operetta and the *Lungenbraten*. The proprietress, alas, was no longer in residence, and the chorus of apple-cheeked *Mädchen* had fled. But I sat on a balcony projected above the lake and listened while a captive tenor obligingly rip-

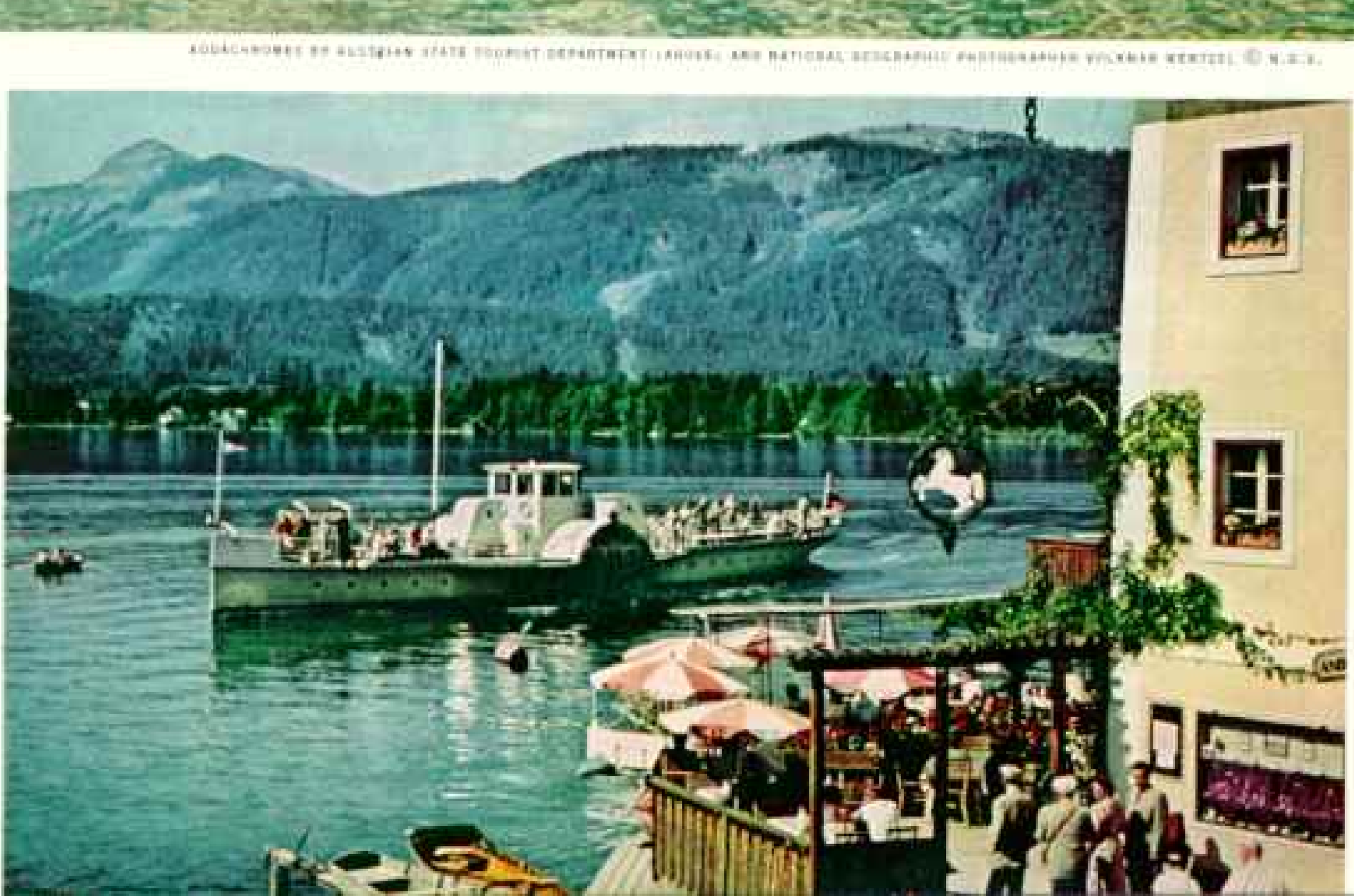
Festive St. Wolfgang Wets Its Feet in the Wolfgangsee

On sunny days patrons of the balconied White Horse Inn dine beneath umbrellas at the lakeside terrace. *White Horse Inn*, an operetta set in the hostelry, charmed Europe in the 1930's and enhanced St. Wolfgang's reputation as a pleasure resort.

Bell tower overhangs the 15th-century parish church. The brooding Schafberg soars in the center.

Franz Josef I, a diesel-driven paddle-wheeler, churns past the inn on its way down the Wolfgangsee from St. Gilgen (page 268). Foothills of the Zwölferhorn loom across the lake.

ILLUSTRATIONS BY RUSSIAN STATE TOURIST DEPARTMENT (ABOVE) AND NATIONAL GEOGRAPHIC PHOTOGRAPHER VOLKMAR WENTZEL © N.G.S.



pled through the score. It was rather gay. The moon came up, a high-prowed skiff made for the far shore, and an echo of the chief refrain floated back to us from the cheery paddlers.

By day St. Wolfgang tends to be thronged with sightseers who have come not only to hoist a few glasses on lakeside terraces and to chug up the Schafberg on the rack-and-pinion railway, but also to admire the fabulous cembra-pine altarpiece by Michael Pacher in the pilgrim church (page 267).

This Gothic masterpiece of 1471-81 is stamped with such authority that it survived the wholesale house cleaning that marked the baroque period in Austria, when nearly every vestige of the medieval was swept aside or disguised as "old hat." Its gilt and pigment have been rubbed into the wood so deftly that, in the words of one visitor, they are "like the memory of color once seen."

Solitude Lies on the Eisenaueralm

Earnest and devout, the tourists gather like bees before Pacher's work. But it is possible to escape their hum. In fact, one of the pleasantest aspects of the Salzkammergut is the ease with which one can achieve solitude. Photographer Kurt Wentzel and I found it one afternoon by the simple device of climbing a mountain.

Leaving the Wolfgangsee, we pushed up a lumber road to the Schwarzensee. A dark stand of timber led off to the right, and we followed it along a steep ridge for several miles. The road dwindled to a trail, climbed beside a black icy brook, and then emerged into an upland meadow—the Eisenaueralm.

Above us reared the grayish massif of the Schafberg, seen from its eastern face. On the meadow itself were scattered three low-roofed huts, embedded in the boulder-strewn pasture as if they had grown from it. A herd of dun cows, as wraithlike as deer, grazed under the firs, their bells calling to one another in tones of thin beaten silver.

We walked over to the farthest chalet, a rough-and-ready inn, and ordered cheese and ale, sitting in the late sunshine that slanted over the mountain wall. On the whole plateau nothing moved but, almost imperceptibly, the cows. There was, in fact, little up here to take in except peace. But there was a lot of that.

The hutkeeper, a stout fellow with a Chaplinesque mustache, turned out to have been burgomaster of St. Gilgen under the American occupation forces.*

"We got along fine," he said ponderously. "*Ja*. A very pleasant relationship."

The sun dipped behind the Schafberg, and a sudden chill ran across the valley. "Much game up here?" I asked.

"Plenty of deer. Chamois, too, and stags. Even eagles. So many eagles, in fact, that we can shoot them freely. With rifles, you understand, not shotguns. More sporting."

An hour or so later we retraced our way through the meadow and down the trail, keeping an eye out for eagles and, for that matter, unicorns. In such dark and magical woods, we felt, a unicorn would seem no more out of place than a squirrel.

While not many visitors have had very good luck with unicorns, the villagers around Mondsee are quite proud of their dragon. Over the lake looms a monstrous twin-toothed crag called the Drachenwand, and it is on this cliff that Austria's last dragon, they say, once had his lair.

The two red dots glowing from the peak after dark are the twin crags caught by the sun's dying rays; but to me they were the eyes of the watchful dragon, alert till dawn against the coming of another Siegfried.

The origin of Mondsee's name is obscured by legend. Six miles long and a mile wide, the lake offers the warmest swimming of any in the Salzkammergut, and on a sunny day its fringes are dotted with Austrians, face up, floating on rafts, rubber tubes, or their own buoyant avoirdupois. Farther out, sailboats scud swiftly along before the uncertain Alpine gusts.

"Let Him Carve Himself a Wife"

Kurt and I wandered into the town of Mondsee one Sunday morning as the local band was parading—oom-pah! oom-pah!—along the waterfront, followed by a delighted taggle of small boys, dachshunds, and nursemaids. The red-and-white banners of Austria fluttered in the breeze. Steam launches disgorged holidaymakers from across the lake. Families sat in shirt-sleeved ease in the garden cafes and smiled at the passing show.

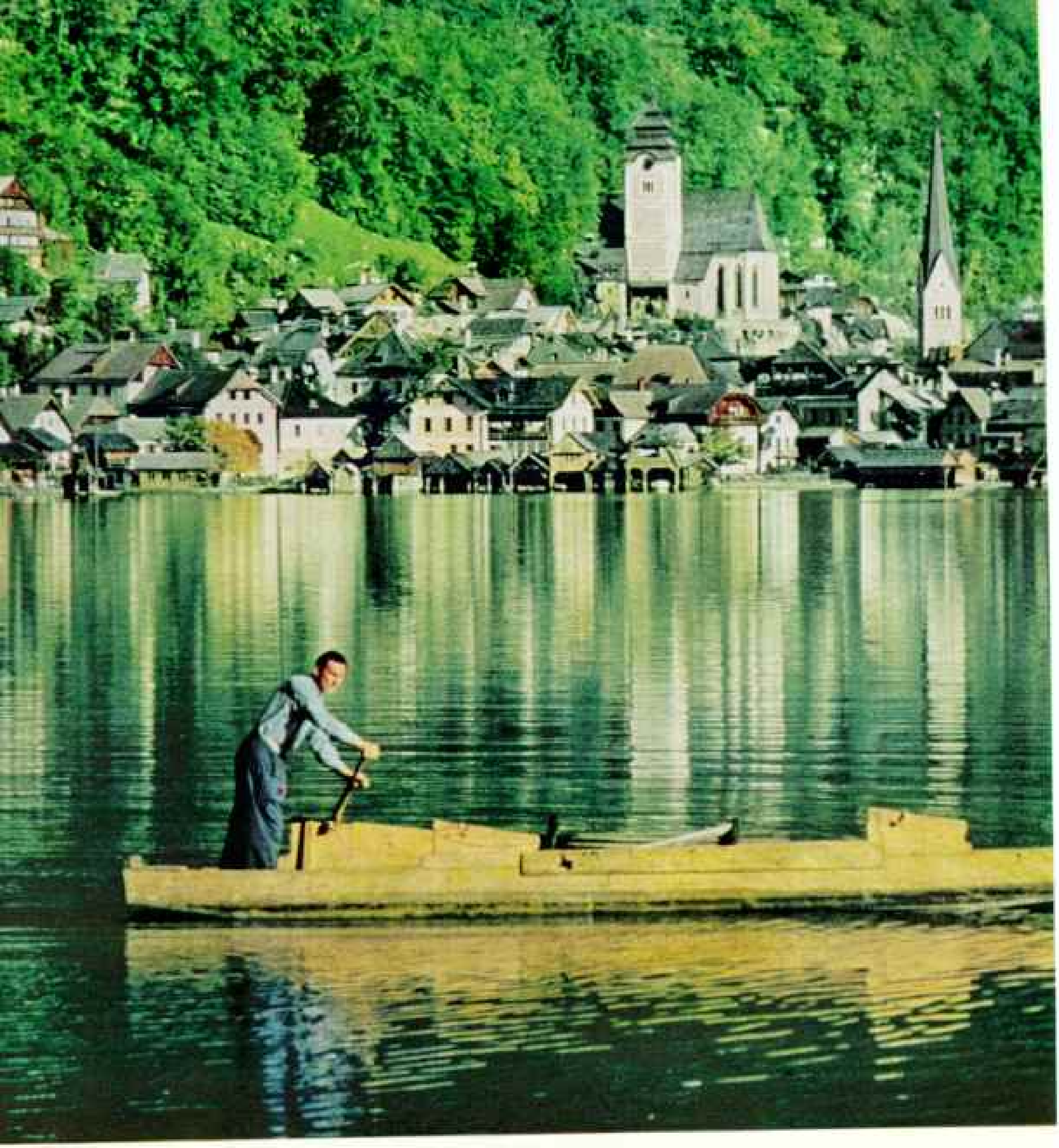
We found a milk bar adjoining a little factory and settled down. The factory made Mondsee cheese, an especially soft and creamy

* For earlier accounts of a nation's postwar rebirth, see "Building a New Austria," also by Mr. Bowie, National Geographic, February, 1959; and "Occupied Austria, Outpost of Democracy," by George W. Long, June, 1951.

Galaxy of Sparks Heralds a Creation in Iron

Blacksmith Mathias Meindl upholds a four-century family tradition of fine work in wrought iron. In his 13th-century smithy, now part of a filling station in St. Gilgen, master and apprentice forge an iron grille for the crypt of the National Cathedral in Washington, D. C.

Wood carver's magic enthralls young visitors. Johann Mairhofer of Zell am Moos fashions religious figures and festival masks, an occupation that originated with spring rituals in pagan days. A collection of Salzkammergut folk art gives his house the air of a museum. Green tiles face his oven. Here he fashions a jovial festival mask.



concoction, and we sat in the sun under some trees and spread it liberally on crackers, bread, and face.

Later we drove a few miles north to Zell am Moos and the home of a wood carver, Johann Mairhofer. He emerged gnomelike from his collection of peasant tools—baking paddles, cider presses, cabbage cutters, threshing machines—to show us his own creations. Christmas crèches there were, and grotesque theatrical masks (page 255).

Mairhofer seemed happy at his work, but single. This fact appeared outrageous to one of his friends, a refugee from the Banat in Romania.

"He is forty already," she expostulated. "I tell him, if he can't find a woman, he should carve himself one!" Mairhofer merely snorted and turned back to his knives and chisels. "There are not many of the traditional masks left," he said. "I make these so that they won't be forgotten. Mine are used in the processions and folk festivals and plays around here, and they seem to be effective; they're in the old spirit."

A short skip over the hill lies the Attersee,

Mountain and Lake Squeeze Hallstatt; Men Have Mined Its Salt for 4,000 Years

Neolithic tribesmen were the first to exploit the salt deposits above the shores of the Hallstättersee. Bronze and Iron Age people, ancient Romans, and medieval Christians continued to work the mines, which lie on the Salzberg, thousands of feet above the lake. Salt contributes to Hallstatt's economy to this day.

Linked by stairways, houses cling to stone terraces on the mountain (page 260).

a lake given more elbowroom by the mountains than most in the Salzkammergut; a generous shelf along the shore for its full circumference permits more than a dozen villages to coexist in comfort. Near one of these—Kammer—I encountered an odd high school. Its student body was composed wholly of Hungarians. The boys came from Austria's refugee camps, determined not to let exile retard their academic advance.

The director, a genial, round-jowled Benedictine priest in a gray flannel suit, showed me around proudly. Boys were scrubbing down their bedroom floors, setting table, building a kayak, catching up on their homework. Their plant was meager and makeshift—a decrepit inn on a small cove—but it looked good to them, and they were pitching in with a will.

Many of the students had their names down for immigration to the United States or Canada, and Kurt and I were greeted as if we symbolized both hope and frustration. For, as we knew, America after a brave beginning had temporarily shut down the inflow of refugees to a trickle each month, and other nations had

followed suit. We had met elsewhere in Austria a few young Freedom Fighters who, embittered by long detention, spoke half seriously of returning to Red-ruled Hungary.

Here in the high school, at least, there was no such talk; the boys were too busy with algebra and English and German. Time enough to worry about a career and a country later on.

Empress Made Gmunden Fashionable

Edging eastward, we crossed the high ridges dividing the Attersee and the Traunsee, past big rough-hewn chalets gay with geraniums, past languorous ox teams, past children perched on wobbly, fragrant hay wagons, and dropped down into festive Gmunden. This northernmost of the Traunsee resorts wears a proud, imposing face, and for good reason.

From medieval days Gmunden, gateway on the great salt route, waxed rich on its salt tax. As the big barges moved down the Traun River from Hallstatt through Bad Ischl and Ebensee, and then moved north to the Danube, Gmunden levied its transshipment fees and imposts and counted the easy profits.

Later came the Empress Maria Theresa and her court. This fantastically energetic woman, remembered by history for her gaiety and lavish hospitality, built a baroque mansion on Gmunden's hills and chivied her retinue into doing the same. For generations thereafter, Austria's aristocrats, artists, and musicians flocked to Gmunden to saunter along the shaded esplanade, to watch the swans gliding over the Traunsee, to nibble at the Hotel Schwan's renowned delicacy: vanilla ice cream carved in a swan's likeness, its beak a candied orange peel.

Memories of a Vanished Era Linger in Zauner's Coffee Shop at Bad Ischl

Once a haunt of aristocracy, Zauner's now tempts plebeian palates as well. Guests relax over a breakfast of *Zaunerkipferln*, almond buns relished by Emperor Franz Josef. Peter Aster, one of the Emperor's professional hunters, sits in the far corner. Baron Hermann Sterneck, a patron for 40 years, reads his Salzburg daily paper.

Pastry sculptors in Zauner's sugar bakery fashion gastronomic masterpieces

Gabled Vine-clad Houses Bask in Hallstatt's Brief Morning Sun

In winter the Salzberg's precipitous slopes mask most of the sunshine. Even in midsummer, dusk mantles Hallstatt by four o'clock in the afternoon. Traffic on the town's single narrow street goes one way 17 minutes at a time, then reverses direction; two traffic lights control the flow. These cars occupy one of the town's few parking spaces, the central square. Votive column in the square, erected in 1744, honors the Trinity.

Wrought-iron birds spout water, Mozart plays his violin, and girls braid each other's hair at the fountain in St. Gilgen's square. Gasthof zur Post, still a tavern, accommodated travelers in stagecoach days.

Johannes Brahms circulated here in Gmunden among the ladies of fashion, not as the bowlered, bearded old man with a cigar that music students call to mind, but as the dreamy Byronic youth he once was, poetic and slender.

Piano Prompts an Informal Concert

I rummaged one afternoon through Gmunden's collection of Brahms mementos, housed in a crotchety little building overlooking the lake. Everything is there, from the composer's toothbrush to his father's horn. Most important, the museum

holds his piano, a Bösendorfer still in good condition.

My companion, a concert pianist, could not resist. He plumped down in Brahms's place and launched forthwith into the Second Concerto in B-flat Major. The music rolled out sharp and clear through the open casements: the swans preening themselves below paid no attention, but the museum guard in his smock and *Lederhosen* leaned happily against the door and murmured: "*Sehr schön!* How very nice . . . ."

From the window I had seen across the water an onion-domed castle on a tiny island, and presently we drove over toward it: Schloss Ort, a 17th-century jewel rising like a chalice from the Traunsee (page 248). A stout timbered bridge 140 yards long led out to it from the shore, so constructed that it could support knights in armor, yet easily be fired if invaders appeared. In fact, Maria Theresa is said to have tested it one night and proved it could be destroyed in half an hour.

Gmunden is still known for its well-glazed pottery, rather Italianate in design; a local factory links successfully modern methods and traditional forms. But the Traunsee region smells more of water than of earth; and fish,

not crockery, are its emblem. For centuries the men have sculled out in the lee of their snow-streaked mountains and spread their nets for trout and char.

At Traunkirchen you can visit a boatyard where the same family has been producing the shovel-prowed Traunsee skiff for 700 years. Even the pulpit in the local church is carved, wondrously, in the form of a boat, with a silvery cedar net hanging over the side, fish and shells enmeshed in its wooden cords (page 266). And I heard of fishermen, bound to customs lost in the dim past, who still sacrifice the finest trout in the day's catch to gods so ancient they have no name.

Emperor Disliked Horseless Carriages

More urbane by far is Bad Ischl, Emperor Franz Josef's summer capital. The court is gone, but the Kurhaus, the concert pavilions, the elegant parks, the dignified hotels remain, and even the Emperor has not altogether faded away. His hunting lodge presides over the River Traun's west bank; his bronze effigy in gaiters and shooting jacket surmounts a fallen stag in a glade near by; and his crusty memory survives in the minds of many an elderly Austrian dozing in the sun and dreaming of the "*guten alten Zeiten*"—the good old times.

To the last, Franz Josef clung to the tried and true. He never set foot in an automobile except once—and regretted that exception: King Edward VII of Great Britain took him motoring and tried to nudge him into jettisoning his alliance with Germany. He made one extracurricular "companion" last all his married life; guides will point out to you the little villa of Frau Katharina Schratt, the Viennese actress, to which he withdrew discreetly nearly every day from his lodge.

He had one sport—hunting—and devoted himself to it with single-minded intensity. His lodge, indeed, is as much a mortuary of Austrian animals as it is a residence; the skulls of 2,056 chamois decorate its walls, accompanied by a bear and two boars. And they were but a fraction of his bag: During his 70 years of rampage in the woods, the Emperor dispatched no less than 50,556 head of game, including vast hordes of rabbits and pheasants.

Relics From Hallstatt's Misty Past Absorb an Archeologist

Dr. Friedrich Morton, curator of the Hallstatt Museum, shows a Bronze Age safety pin to a visitor. Bracelets, dagger, and another pin lie on the table. Beaked vessel came from an Iron Age grave. Urns on the right were made six centuries before Christ.

His greatest act of slaughter, however, was quite unpremeditated. For it was in his drab Spartan study at the lodge that he sat down one morning to pen the imperial ultimatum to Serbia which detonated World War I. With a stroke, in effect, Franz Josef wiped out his own dynasty, millions of soldiers and civilians, and the whole social fabric of the Continent.

Such solemn notes echo oddly in Bad Ischl, a town more in tune with its own composer, Franz Lehár, who wrote *The Merry Widow* and similar confectionery. Lehár lived here in the heyday of his international fame, and anyone now may explore his house and feast his eyes upon the ponderous Edwardian curios with which he delighted to surround himself.

Pastry for Royalty

A relic that has stood better the test of time is Zauner's, a pastry shop whose clientele is less patrician than it used to be, but whose gastronomic reputation is as solid as ever (pages 258-9). Sitting at a table once a favorite of the Prince of Wales and attacking a *Zauner Torte* (a crisp concoction of flaky chocolate), I chatted with the present proprietor, Richard Kurth.

"We've been here on the same spot for 125 years," he told me, "and we haven't changed much. Franz Josef could walk in here today and feel at home. You know, we used to send him a cake for his breakfast every morning at 5 a.m.—a *Gugelhupf*, a sort of pound cake with raisins. . . . We still get royalty, by the way. Queen Frederika of Greece comes every year; the Queen of Belgium used to drop in now and then."

At Kurth's invitation I toured his ambrosial kitchens where scores of busy artists were whipping up enough cookies and cakes and candies to undermine the diets of half of Austria. I tasted freely of *Zaunerkipferln*, brownish croissants sprayed with almonds; *Rouladen* garnished with woodland strawberries;

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Guide and visitors toboggan down a log banister in a shaft of Hallstatt's salt mines. Rope along the trough brakes their descent near the end of the ride. Connected galleries probe the recesses of the Salzberg for some 25 miles. Now extracted in the form of brine, the salt flows through pipes to dehydrating centers.

and the famous *Oblaten*, wafers light as air, yet delicately lined with butter. On one shelf stood a foot-high gemsbok, or antelope, molded of chocolate, antlers and all; it would have made, I thought, a proud addition to the Emperor's collection.

The River Traun ascends from Bad Ischl to Lauffen, a swift, impetuous stream. The Romans were the first to try to tame it, anxious as they were to float salt rafts from the mines upstream. Later, in the 17th century, the Austrians devised means of damming the head of the river, collecting a flotilla of barges;

and then washing the lot of them down on the flood crest.

The day I first drove through Lauffen the river was being turned to another purpose: kayak racing. At this bend in the Traun the water roars down a series of rock steps, foams through a sort of natural chute, and spills out into quieter depths.

The task of each contestant in turn, competing against a stop watch, was to flail down the rapids, turn completely about, and thread through a "gate" suspended over the white spume, and then run the zigzag gantlet of a thicket of slalom poles.

It was furious work. The Traun gave ground only grudgingly, and paddler after paddler spun across the finish line gasping like a gaffed fish. The crowd on the bank in front of Lauffen's tall 17th-century houses cheered and clapped. Not to be denied all the fun of participation, swimmers from time to time slipped into the stream and, with a few lazy strokes, whirled like greased otters down the course after the kayakers.

Sea Once Covered Salzkammergut

Salt, which formerly traveled this same route, now flows as brine by pipeline to dehydration plants. Underground chambers in the salt mountains are blasted open, the lump salt removed and sold for the use of cattle, and the cleared area flooded. As the water becomes saturated with salt, it is drained off and evaporated, and the process is repeated again and again.

The Salzkammergut's deposits were laid down about 180 million years ago, when a shallow sea covered the whole area between Bohemia and the central Alps. Old mine tunnels show that men—probably Illyrian settlers—were working the salt plugs as early

Water-carved Whale Swallows Jonahs in the Dachstein Ice Caves

Honeycombing some five miles of Dachstein's interior, the ice caverns are among the largest of Europe's underground complexes. The galleries and chambers contain frozen cataracts and grotesque forms sculptured from ice. Frosty shapes, such as this whale's gaping gullet, change slowly but surely.

Wooden steps and ladders aid the visitor, and subtle electric lights suffuse the glassy walls with a soft glow. This guide explores a passage off a chamber known as the Chapel. In summer the caves maintain an average temperature of 49°F.

as 900 B.C. Later came the Celts and Romans. Toward the end of the Middle Ages, in the testy words attributed to Count Rudolf of Habsburg, the mines had become a choice tidbit for "every helmeted dog in Europe to snap at."

More than a million pounds of salt are still drained from these galleries every year, but salt is no longer as great a source of income to the Salzkammergut as those who come to see it mined. I became one of these spectators on an afternoon in July.

Mountain Hollowed Out Like a Hive

We had been hoisted by cable car straight over the spruce tops of Hallstatt to a foothold on the side of the Salzberg, or Salt Mountain. From here we hiked in the strong sunshine up a steep half-mile trail to the mine mouth. As a middle-aged writer loaded down with a pencil and a sheet of notepaper (folded twice), I was glad to stop halfway along beside an icy brook and bathe my forehead.

Changing to overalls and caps at headquarters, we left the light of day and plunged into an oval head-high shaft dripping with saline moisture and as black as the inside of a billiard ball. The tiny carbide lamps carried by every fifth member of our contingent seemed only to emphasize the darkness.

We stumbled eventually into a circular traffic junction where a large illuminated map was hung. From this we learned something of the disposition of salt deposits in the Salzkammergut, and from our learned guide we derived a picture of our own mountain as a vast honeycomb of interconnected galleries about 25 miles long and covering a vertical cross section half a mile high, with as many as twelve different working levels.

To descend from one level to another, we climbed in groups of 10 astride a sort of double banister rail and shot suddenly down into the gloom like a human toboggan, winding up with a thump at the bottom as the lead man tightened the grip of his heavy gloves on the rope alongside the slide and braked us to a halt (page 263).

From level to damp level we groped our way, sucking on bits of rock salt scrounged along the tunnel and inspecting the tools and processes evolved by the industry to bring a little savor to the world's table. Then, after

Disciples Pull In Wooden Fishes With a Wooden Net Around Traunkirchen's Boat-shaped Pulpit

Carved by an 18th-century artist, the pulpit enacts the miracle of the draught of fishes (Luke 5: 1-11). Saints John and James draw in the silvery net. Below the canopy St. Peter adores Christ. The topmost figure, St. Francis Xavier, attests the influence here of the Jesuits.

Gothic angels sing from a musical score, part of the Michael Pacher altarpiece in the parish church at St. Wolfgang. The winged altar is a masterpiece of 15th-century German art.

Cable Cars Dance on Air Between St. Gilgen and the Zwölferhorn

A magnificent view rewards sightseers for the dizzy ride to the Zwölferhorn's summit. Here the Wolfgangsee spreads out below them. Eibenburg

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Pass, notching the wooded ridge at center, shows the way to the Mondsee (Moon Lake), warmest of the Salzkammergut lakes. The village of Pichl whitens a corner of the Mondsee. Distant valley of Wangauer River cuts across the Kulmspitz and exposes the hills of Upper Austria.

HIGH SPEED EKTACHROME © NATIONAL GEOGRAPHIC SOCIETY

Melodies emerge from bottles. Water flows through the trough, turning a paddle wheel. Cams activate the hammers, tapping out the scale determined by shape and size of the bottles. Lazi Farragh, a young Hungarian refugee, listens to the tinkling music near Gössl, on the Grundlsee.

about an hour of playing troglodyte, we mounted a tiny train, rocketed down shafts whose walls nearly brushed our elbows, and eventually burst forth into the absurdly brilliant afternoon, eyes blinking.

It had been an adventure; but I could hardly claim it as unique. Emperor Maximilian of Austria, I read later, had visited the mines in 1504.

Since before recorded time miners have explored the Salzberg, settling first near their tunnels some 3,000 feet up its towering sides. Prehistoric galleries have been found in Hallstatt's mine, preserving for archeologists the ancient diggers' tools of bronze and iron.

The earliest comers were hunters pursuing deer which sought the salty water springing from the mountain. Then followed Bronze and Iron Age tribesmen, who left their skeletons and burial urns. Some 2,000 of their graves have been excavated to uncover swords, daggers, arrowheads, earthenware, jewelry of bronze and iron, and even a few gold pieces next to the ancient bones. Indeed, this wealth of historical remains has given the name of Hallstatt to the first half of the Iron Age.

Relics of the Hallstatt Period (about 900-400 B.C.) crowd the village's museum. In this tiny, jam-packed, lead-paned little eyrie above the town, Dr. Friedrich Morton, the institution's curator, will be happy to show you a full range of Hallstattiana, from skulls to wooden cradles, from ancient tools to stuffed animals and 18th-century birthing chairs, from salt-boat paddles to old zithers (page 262).

Space is at a premium anywhere in Hallstatt. Even the dead have only 10-year rights to the local graveyard; at the end of that time, their bones are removed to the charnel house. The village's single street is hemmed in so tightly by tall sharp-gabled houses that traffic is strictly one way—17 minutes in one direction, then 17 in the other. Such a ring of mountains overshadows the place that for two months of winter most of its homes get no direct sunshine at all (page 260).

Kurt Wentzel and I wound our tortuous way through Hallstatt one morning and pushed on along the lake to the banks of the upper

Traun River. A cable car swung us breathtakingly up over wooded ravines to a crag halfway up the mountain, and from there we panted on foot to the entrance to the Dachstein Ice Caves (page 264).

Caves Glow With Subtle Lighting

One of the largest underground complexes in Europe, undiscovered until 1910, these limestone caverns burrow within the mountain for a good five miles. For an hour we tramped up and down from hall to hall in air chilly and dank, ice underfoot and a constant drip from the glassy roof overhead.

Perhaps the pleasantest aspect of the caves is the adult manner of their presentation. They are lighted subtly and effectively, but there's no resorting to colored bulbs. The spectacular ice formations are not labeled with dreary coyness the "Devil's Footstool" or the "Witch's Toothbrush." The guides convey a great deal of serious geological information without resort to congealed wisecracks and bright patter.

Most of the ice is renewed freshly by winter's hand each year, and, at its best, it flows in soft, lustrous waves of great beauty. At the right season—early spring—the vaulted chamber called the Chapel, with its carved organ and its suggestion of pipes, is quite unearthly.

Caves put to another purpose can be seen a little farther eastward, at Altausseersee. In the salt galleries of the Steinberg the Nazis, toward the end of the war, began stowing away like guilty squirrels much of the art treasure looted from the rest of Europe—works by Vermeer and the Van Eycks, Michelangelo, Bruegel, and Titian. As Hitler moved toward his apocalypse in the bunkers of Berlin, orders came to place bombs in each cavern and stand ready to detonate them.

The bombs were placed, but never exploded. The miners, determined not to have their place of business ruined, secretly removed them. The salt—and incidentally a large part of the world's aesthetic heritage—was saved.

The more abiding assets of this area, however, are its lakes, not only the Altausseersee but the Grundlsee, the Toplitzsee, and the Kammersee—each one tucked higher than the last in the enfolding mountains. Most romantic, perhaps, is the Toplitzsee, where in the 1840's Archduke Johann met the postmaster's daughter, Anna Plochl. The royal heart went down like a wet souffle at the sight of

Milkmaid on the high meadows of the Königsbergeralm cleans her pails in a trough. During the short Alpine summer she tends her cows in solitude.

KODACHROMES (ABOVE AND OPPOSITE, LOWER) AND HIGH SPEED EKTACHROME © NATIONAL GEOGRAPHIC SOCIETY

her: any ambitions he held to ascend his father's throne went out the chalet window; and over every obstacle he married her. With that, Johann all but vanished from history.

Royal Secret Lost at Sea

The archduke's great-nephew, Johann Salvator, is remembered for quite another reason. At the hunting lodge of Mayerling one winter's morning were found the bodies of Crown Prince Rudolf, heir to Austria's throne, and his inamorata, little Marie Vetsera. Who killed whom, and why, are questions that have perplexed and delighted dramatists ever since.

But it may be that Johann Salvator knew the answer. For they say that the Emperor entrusted him with a casket containing the essential clue, and sent him into retirement.

At all events, Johann Salvator renounced his title, adopted the name of Johann Ort, and lived not too unhappily in water-girt Schloss Ort near Gmunden (page 248). Years later, he acquired a windjammer, the *Santa Margherita*, put to sea, and disappeared mysteriously and forever. Whatever secrets he had received, he kept.

Farm woman's cheery face greets the morning sun on a mountainside plot.

Hunter to an archduke, Wolfgang Kopper of Strobl wears his forester's hat and stag-horn buttons. He smokes a carved pipe.

A Santa Claus with real whiskers, Josef Putz lives at Bad Ischl, summer capital of the Emperor Franz Josef.

If Johann Ort had been free to roam the Salzkammergut incognito, doubtless he would have repaired often to the remote but striking Gosausee, that black, brooding lake high up on the flank of the Dachstein Glacier. It is a place for dreams and darkling reminiscences (page 251).

Kurt Wentzel and I wandered about it one afternoon and drank from its languid beauty until the valley was bathed in shadow and only the peaks had kept their rose. Then we went down through the forests of fir to a comfortable square-hewn farmstead and asked a night's lodging.

By candlelight the lady of the house—a spry and cheerful grandmother in a sky-blue dirndl and bare feet—led us upstairs. Crampons, rope, and ice ax hung on the wall. The broad pine floor boards were scrubbed white and smooth.

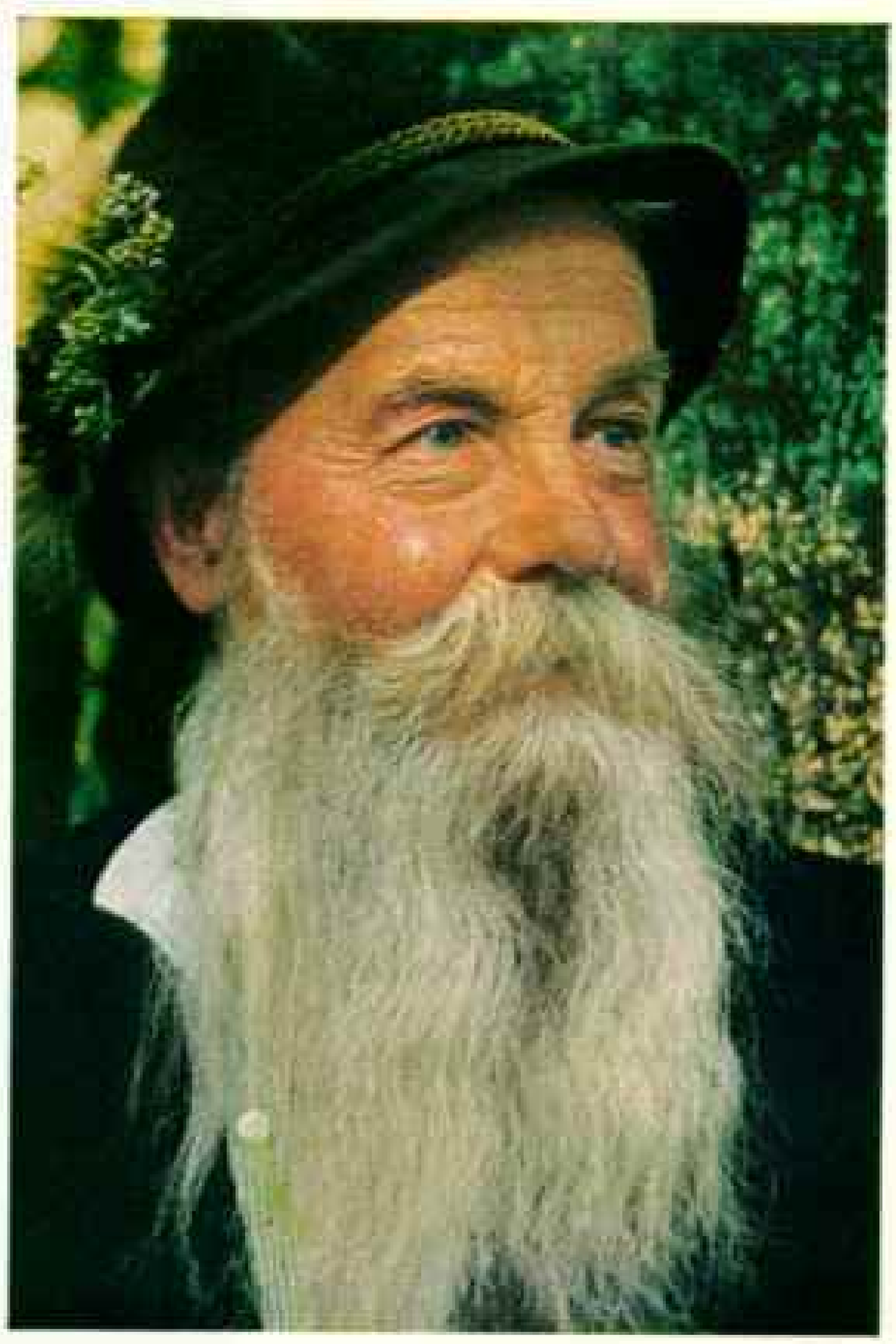
Cackles Silence an Eager Rooster

Our windows gave over a small orchard. At the head of the valley, blocking it massively, stretched the jagged barrier of the Gosaukamm, bleached gray in the moonlight; and into our room swept a night wind with teeth honed by the glacier itself. We burrowed under our billowing feather quilts.

Reveille was blown prematurely by an overeager rooster. Outraged, Kurt sprang to the vine-shrouded window and gave vent to a cacophony of henlike cackles that soon had the cock staggering around the barnyard, befuddled and mute. His morale appeared to be shattered, and we never heard him crow again.

Kurt pattered back to his bed radiant with achievement. "Well, at least I shut him up," he declared.

I withdrew my head from beneath the



pillow. "I'm not at all sure," I said, "that it was the better of two evils."

At any rate, we were both thoroughly awake by now. Clumping downstairs, we washed at the springhouse, sloshing the icy water liberally over ourselves, and then sat down on benches in the early morning sun beneath a small arbor. Presently our landlady appeared with "ox eyes" (a pair of fried eggs), rolls, and fresh butter.

Young as the day still was, she had already milked the goats and cows, swept the house with her twig broom, and fed the chickens. Chafing to get at her real chores—the south meadow needed mowing—she could be persuaded by Kurt only with difficulty to pause long enough to have her portrait taken (page 272).

That is one kind of accommodation you can find in Salzkammergut, and not the least pleasant. But it is equally possible to subside into the lap of considerable luxury.

We met such a contrast at Schloss Fuschl. This elegant hostelry, whose foundations date from the 12th century, once served as the hunting lodge of the archbishops of Salzburg, a very worldly crew who gave the good things of life their earnest appreciation. It was equally esteemed by the late Herr von Ribbentrop, Germany's foreign minister. He took it over at the start of the war and threw many a flamboyant party on its lofty terraces. Hitler, Mussolini, and Count Ciano were among his many guests.

The castle rises sheer from the blue lake, a square yellow tower relieved of austerity by its shutters in gay chevrons of red and white. A shelf hacked from a stony ledge provides a kind of flying bridge on which to drink one's chocolate for breakfast or tea at tiffin time. Far below, bathers can lie on the boathouse dock and absorb the sun.

I sat on the balcony of my room one afternoon and looked down over a gently sloping meadow where a family was engaged in playing *Federball*, a sort of informal badminton. Their delighted spurts of hilarity mingled agreeably with the distant drone of a motorboat and the occasional splash and shout of an intrepid diver: The water of the Fuschlsee is cold enough to keep a trout quite comfortable.

I had been watching the players for some time before it dawned on me that I was witness

Horse and ox, strangely matched, pull summer's last load

to something I had seen many times before and yet not quite understood, something peculiarly Austrian, peculiarly well adapted to the mood of the whole Salzkammergut.

For the "feather-ballers" were using no net and no lines. They were keeping no score, registering no little triumphs of service or volley. They were simply knocking the shuttlecock back and forth for as long as it seemed fun, doubling up with laughter when someone missed a shot, hitting left-handed, right-handed, or two-handed as the mood struck them.

There was no way to tell who was "winning." I could only conclude that everyone was winning.

And that, I decided, is the simple secret of those who come to enjoy the tranquil pleasures of the Salzkammergut: Nobody tries very hard. And everybody wins.

of hay past the village of Loibichl. A boy in *Lederhosen* leads them

Knocking

In his relentless quest for more living space, man has reduced the grizzly bear population of the United States, exclusive of Alaska, to between 500 and 1,000 animals. Your National Geographic Society, through a grant from its Committee for Research and Exploration, is participating in a study that uses humane new techniques to capture and mark grizzlies for observation. The aim: to give conservationists the knowledge they need to save the huge bears from ultimate extinction. Here biologists Frank and John Craighead report on the first exciting season of "Operation Grizzly Bear."

Out Grizzly Bears

FOR THEIR OWN GOOD

By FRANK and JOHN CRAIGHEAD *Photographs by the authors*

THE BOLT of the large-caliber rifle clicked shut. In the light of a powerful flashlight, I sighted on the neck of a grizzly cub and pulled the trigger. The cub whirled. His mother sprang to his side. But the cub neither dropped nor staggered. He merely brushed against his mother's front legs, paused under the reassuring protection of her powerful neck, then moved on. Had I overshot?

Hardly, for I had heard John's assurance, "Nice shot." And now Maurice Hornocker's light beam came to rest on a dart hanging from the cub's neck. It had just injected a powerful drug. We shot to capture, not to kill.

Seconds ticked by as we watched for signs that the drug was taking effect. Two minutes by the watch: The cub sensed that all was not well. Rising to his hind legs, he pawed at his mother's shoulder.

Three minutes: The cub lay down. The big female grizzly spun around, stood upright, stared fixedly at us. Then she dropped to all fours again and led the faltering cub to the edge of a steep creek bank. The cub stopped at the brink and looked back. A flutter of his eyes, a tremble in his legs, and he staggered down to the stream. He wavered there as the drug took full effect. Then he crumpled and tumbled into the black water.

We knew what had to be done. Unless we got to him, and quickly, the cub would drown. But could we make the rescue at night? Would the sow let us get near him? Having watched the drug's effect on bears nearly 15 times his weight, we knew that within a few minutes the cub would not be able to move his legs

"When releasing grizzlies," Frank Craighead advises, "point them away from you." This groggy 90-pound cub has just been shot with a hypodermic dart containing a muscle-relaxing drug. Measured, tattooed, and tagged, he now struggles vigorously for freedom. Last summer the Craighead brothers and their colleagues launched a long-range study of the grizzlies by marking 27 in Yellowstone National Park.

Naturalists Peering Into a Trap Find a Drugged Grizzly Still on Her Feet

One of the world's most powerful predators, the grizzly fought men on favorable terms until the advent of the modern repeating rifle in the 1850's. Today scientists try to save him from extinction. Using a trap made from a steel culvert, the Craighead party baited it with bacon, honey, and pineapple juice. Firing a gas-operated rifle, Maurice Hornocker (left) has just shot a drug-loaded syringe into a trapped bear. Looking through peepholes, he and Wesley Woodgerd meet the gaze of the ruffled sow (opposite).

to swim, or even hold up his head. These characteristic effects of succinylcholine chloride, a powerful muscle relaxant, make it ideal for immobilizing grizzlies. But now it had created a potentially dangerous dilemma.

We reacted as a team. John and Maurice waved their lights and yelled to scare off the mother. She disappeared into the darkness — but how far would she go?

Bear Saved in a Risky Rescue

While John's light stabbed the darkness, Maurice's beam played over the rough ground in front of me as I raced down to the cub. I caught the glint of a high-powered rifle barrel swinging in unison with John's light. I hoped he would not need to use it.

Plunging waist-deep into the cold water, I caught the cub by the scruff of the neck, with the other hand grabbed hide and hair and rump. In a continuing motion I pivoted, swinging him up and around.

He was not yet completely immobilized, and, as I climbed the embankment, I had to hold 50 quivering pounds of bear at arm's length to avoid his claws. Convulsively, he let out a bawl, a cross between the bellow of a range cow and the baa of a frightened sheep.

The mother bear might be anywhere in the darkness around us. Knowing she could cover ground as fast as a horse, I redoubled my efforts to reach the partial safety of our vehicle. At the rear of our panel truck other hands took over, pushing the cub into a cage and slamming the door shut.

The engine roared to life and the truck lurched forward. The swinging headlights reflected two burning coals—the amber eyes of the big sow bear moving fast, but too late.

The hunt was a success. We had literally snatched a cub from a mother grizzly. Tomorrow we would mark him with colored plastic streamers and numbered eartags. We would return him to his mother, and he would join a growing number of marked bears. He would become a recognizable individual of known age in the grizzly bear population, one we might later frequently identify and observe.

KODACHROMES BY FRANK AND JOHN CRAIGHEAD © NATIONAL GEOGRAPHIC SOCIETY

We were in Yellowstone National Park, newly embarked on the initial stages of a long-range investigation of the grizzly bear. By learning more about his habits and behavior, we hoped to help ensure the survival of this fast-disappearing carnivore.

We needed to learn more about the movements of grizzly bears, the size and character of their ranges; about population structure and numbers, breeding age and frequency of breeding, litter size at birth, and infant mortality. We wanted to study their condition during the deep sleep of winter, to determine their average life span, and many other things.

What Good Is a Grizzly?

From our Fifty-Pound Cub (we gave many of our grizzlies nicknames), we might learn when a bear leaves his mother, when he first sires a family, how far he wanders. These facts would all add to our basic knowledge of grizzly bears and help in managing and preserving the remaining grizzly populations.

But what good is a grizzly? Why spend time and research money to save an animal? Such questions are always thrown up to conservationists, whether they are trying to save grizzly bears or whooping cranes.

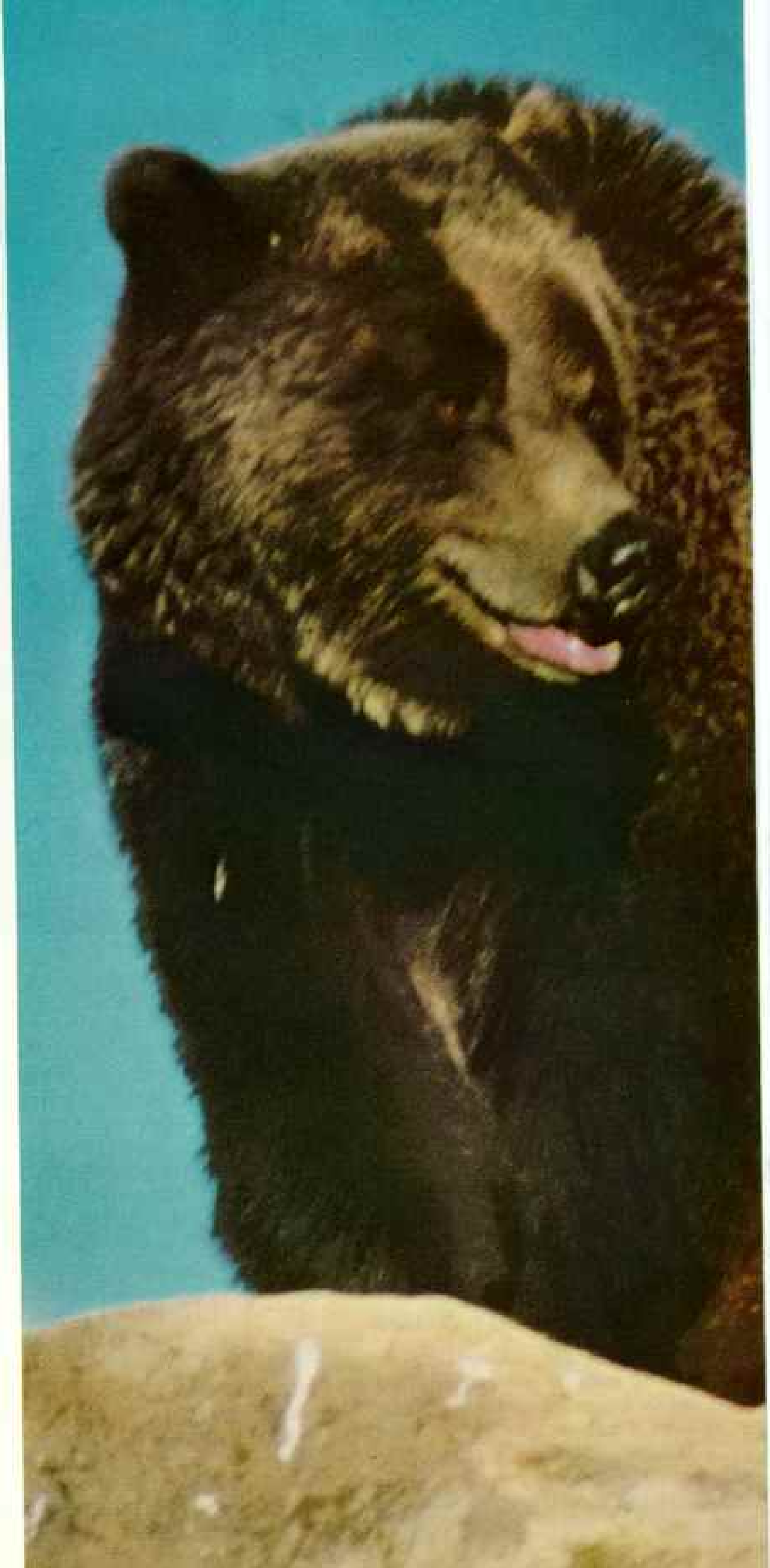
The subject came up for discussion one night at our cabin in Yellowstone Park. Sitting quietly beyond the light of our Coleman lantern, my brother John's 12-year-old daughter Karen listened to the question and then spoke up in a matter-of-fact way:

"We want to save the grizzly because when he's gone, he's gone forever, and we can't make another one."

Here was the simple answer.

No animal species other than man has ever been known to exterminate another. But man's list is long. Do we possess the right to annihilate a fellow creature?

We sent to oblivion the passenger pigeon, the Carolina parakeet, the great auk, and the heath hen. What would we now give to bring them back and thus soothe our conscience?



Cubs View the World From the Security of Mamma's Side

A contemporary of the mastodon and saber-toothed tiger, the grizzly has roamed North America for a million years. His ability to recover from seemingly mortal wounds awed Western Indians, who believed he had supernatural powers.

Unmolested, the grizzly rarely attacked man but, if wounded or startled, charged frighteningly. The hunters who denuded the West of furs mistrusted and slaughtered him. Ranchers drove him from their ranges and offered bounties for his hide. Farms and towns shrank the wilds that provided his food.

Small, infrequent litters add to the threat of extinction. Sows do not bear until their third or fourth year, then mate only every other summer, it is thought. Cubs normally arrive in pairs, sometimes in ones or threes, rarely in fours.

In her winter den the female gives birth to blind and toothless young, scarcely bigger than skinned squirrels. From her stored body fats, the sow nourishes herself and her cubs. By the time spring entices her out three or four months later, the cubs are furry butterballs, toddling uncertainly into the strange world beyond the den.

These sucklings look out across a feeding area in Yellowstone Park. The authors' telephoto lens caught them 100 feet from the camera.

Nearly 400 pounds of sow grizzly lie helpless in Yellowstone Park. Three and a half minutes earlier the men shot an immobilizing dose of Sucostrin into her. Now John Craighead, holding a leg, and Maurice Hornocker drag her from the trap for tagging. Their helper is Harry Reynolds, Jr., a park ranger's son. Though powerless to bite or lift her paws, the drugged bear probably feels hands gripping her, hears voices, and detects the scent of her temporary masters. Soon she will revive unharmed, growling and snapping.

Claws on a grizzly's forepaw can slash an enemy mortally, but the animal uses them more often for digging out ground squirrels and mice. In quest of such prey, bears can give a meadow the appearance of a plowed field.

Western Indians prized grizzly-claw necklaces as badges of valor.

A great deal, I believe. The simple truth of Karen's answer gave meaning to our efforts.

Perhaps the largest concentration of protected grizzlies is in Yellowstone National Park. Because of this, and with the encouragement and aid of Superintendent Lemuel Garrison and the staff of the National Park Service, we began there.

The grizzly is fast being exterminated wherever he is unprotected, or where there is no extensive wilderness. Montana probably has more unprotected bears left than any other State except Alaska (map, page 286). So it was only natural that the Montana Cooperative Wildlife Research Unit, at Missoula, should undertake this research. This unit is supported by the Bureau of Sport Fisheries and Wildlife, of which John, the unit leader, is an employee, and by the Wildlife Management Institute, the Montana Fish and Game Department, and Montana State University.

For funds we also turned to our friends of the National Geographic Society, for whom we have written so many articles in the past.* The result was a generous grant—our first—from The Society's Committee for Research and Exploration.

While we planned our project, John looked for a graduate student with the necessary outdoor training and physical and educational qualifications. He found him in Maurice Hornocker, who is now working for his master's degree. Wesley Woodgerd, a biologist for the Montana Fish and Game Department, was the fourth member of our team.

Plastic Strips Become Identity Cards

To learn about individual grizzlies and to gather knowledge on their way of life, we would have to mark bears so they could be positively identified at a long distance. This meant that we must immobilize these formidable animals long enough to mark them.

Would the recently developed projectile syringe gun be effective on grizzlies? What drug could be used to immobilize them safely, and with what dosages? Would the tough vinyl ear markers successfully used on geese, mountain sheep, elk, and other wildlife be suitable for grizzlies? Might they not tear out such markers? How would other bears react to these colored plastic tapes?

These were only a few of the problems and questions that confronted us during our first season. We were well on our way to solving them by the time we captured the Fifty-Pound Cub. When we released him next day, he took off at full speed, crossed a stream without breaking stride, and sprinted another 300 yards before stopping—and then only momentarily to glance back. When he disappeared from sight, a raven was diving at him, either just to heckle him or perhaps to see if that red ear marker was something to eat.

Several days later we observed the cub reunited with his mother. If she disapproved of the colorful markers, she made no attempt to remove them.

Ticklish Tests Determine Dosage

But at first we had to experiment with drug dosages. One day I put my eye to the peephole of our grizzly trap, fashioned from a length of metal culvert (page 278). Inside I saw a fierce-faced grizzly. He lunged toward me, and I jumped back to avoid the long, lethal claws that flashed out through the opening. Then I stepped around to look in another hole. "He'll go 450 pounds," I said.

Now we hitched the trailer-trap to the car, pulled it to level ground, and weighed trap and bear on our portable scales.

Two careful readings showed that the bear weighed 520 pounds. With a graduated syringe Maurice measured out 150 milligrams of Sucostrin (a brand of succinylcholine chloride), or about one milligram for every three and a half pounds of body weight. He now squeezed the drug into the front end of the hypodermic dart and added sterile water to fill the chamber.

In the rear chamber John had placed the ingredients of an expanding gas—a tablet and a liquid—separated by a simple valve that would open when the dart was fired. After the projectile reached its mark, the gas would force the drug through the needle tip and into the bear. The loaded dart was fired from the rifle by a charge of carbon dioxide. We normally shot at distances of less than 50 feet.

This was our fourteenth grizzly. Starting with minimum doses, we had found that one milligram of Sucostrin to five pounds of body weight would not effectively immobilize grizzlies. One to three we had found satisfactory, but was it optimum? Would a reduction to one to three and a half be equally effective?

John poked the gun through a peephole and pulled the trigger. The needle appeared

*Frank and John Craighead made their first NATIONAL GEOGRAPHIC appearance in 1937. Among their more recent articles for the magazine have been "Wildlife Adventuring in Jackson Hole," January, 1956, and "Bright Dyes Reveal Secrets of Canada Geese," December, 1957.

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Watch out for that left! A quarter-ton bear raises a forepaw as taggers finish their task. Most grizzlies recovered in 16 to 20 minutes, but one big fellow got up in 7. Hornocker completes a tattoo under the lifted limb; John Craighead measures a hind foot. Their alertness shows respect for the bear's surprising agility. Pines close by offer retreat should he revive too quickly, for long claws and great bulk prevent the grizzly from climbing trees, as the black bear does.

Hornocker attaches a plastic streamer to the ear of a slack-jawed captive. Sixty-four color combinations permit visual identification from afar. Looping through slits in the tough ear, the streamers swing like gypsy earrings.

to bother the grizzly no more than a tetanus shot would trouble a human. Huge, powerful, he glared at us, seemingly confident. Then his eyelids fluttered, the challenge left his eyes, and his head slumped forward on his chest. In one minute he was down—and out.

To act so fast, the drug must have entered a vein. The average time required was four minutes. Maurice prodded bruin's jaws with a stick but elicited no response.

Wes Woodgerd wound up the heavy steel door; then, tugging in unison, we slowly pulled the bear out of the trap and into the open. John had pliers, punch, eartags, disinfectant, and an emergency syringe of drug laid out.

Working rapidly, he and Maurice snapped a metal eartag in place and recorded the number. Through a small slit in the ear they looped a strip of red plastic. Between the open ends of the loop they laid a white strip, also plastic, and fastened both together with brass rivets. Using this method, we could tag bears with more than 60 color combinations.

Wes had been measuring the foot pads and over-all length, but our tasks were not going off on schedule. The bear was constantly growling and moving spasmodically (opposite). A tremor would go through him as he vainly tried to gain his feet. It was like working over dynamite with a damp fuse.

Bruin Needs a Second Shot

Quickly we rolled the grizzly over to tag his other ear and tattoo him under the front leg for further identification. With a growl, he tried to regain control of the terrific force that had always served him. The effort brought him to a near-sitting position. Then he dropped back. He was clearly underdosed.

Wes reached for the hypodermic and gave him an additional shot in a rear quarter. We waited for the drug to take effect, but once again the massive bear struggled to gain a sitting position. Muscles rippled and flowed beneath his glossy hide. We backed off as he went down. Now surely we would see a change.

He struggled to rise again and gained his feet. Wobbling, he moved toward us. Glancing back, I saw his step become firmer. Mine became faster. Then I was suddenly inside the car and so were the others. I can't remember holding a door open for anyone, and I am sure no one politely held one for me.

As the grizzly passed by, heading for the timber, he turned for a last puzzled look back. The sun struck the single plastic marker in his left ear; an incomplete job, but one marker would do.

"It looks as if three and a half to one wasn't enough," I said. Maurice nodded agreement.

"No," he said, "and next time we jab one with the hypo, better not in the rear end. That needle just didn't get through the fat."

Sucostrin is a curare-like drug which produces relaxation by preventing nerve impulses from reaching the skeletal muscles. To be effective, it must get quickly—but not too quickly—into the bloodstream.

All the grizzlies could feel, hear, see, and smell us as we handled them and rolled them over to be measured and tagged. Sucostrin does not impair sensory perception.

Was the experience of helplessly submitting to this indignity so distasteful that we would find it more difficult to work with the bears a second or third time? We wondered.

Then one of the Yellowstone Park rangers who had helped us popped the question we had already asked ourselves many times:

"If these grizzlies," asked Bob Howe, "know what's going on and who's doing it, what's

Liberated cub regards his captors with curiosity but seems unaware of his new ear ornament. A few grizzlies charged after reviving, forcing the taggers to scurry out of reach.

HAUNTS OF THE GRIZZLY BEAR

The grizzly's domain once stretched from Kansas to California and southward into Mexico. Today fewer than 1,000 survive south of Canada, and these have retreated to the high Rockies.

A rifle that means life instead of death to wild creatures immobilizes a grizzly with no more pain than the prick of a needle. Inspired by primitive blow guns, it employs a flying syringe propelled by a charge of carbon dioxide.

The dartlike missile empties its load of anesthetic, vaccine, antibiotic, or tranquilizer into the animal, then falls off. Handlers may safely treat a circus tiger with a toothache, an elephant on a rampage, or a zoo's expectant hippopotamus.

The idea for the rifle sprang from Georgia conservationists who wished to shift some deer from coastal islands to the mainland. Biologists and gunsmiths combined to produce a successful working model; now the equipment is sold throughout the world. The biggest buyers: ranchers.

Here John Craighead reaches for a rifle while Hornocker fills a syringe dart. The party shot seven bears on the run; others they trapped, then drugged.

Metal eartags, plastic streamers, stapler, tattooing ink, and stamper clutter the floor boards.

going to happen to you fellows if you meet one of these silvertips again along some lonely trail when he isn't drugged?"

"Bob, we've got that all worked out," I said. "Each time we handle a grizzly, we slip into ranger jackets and put on ranger hats."

"Joking aside, though," said John, "most of these grizzlies just want to get away from us as fast as they can. They don't seem angry, just puzzled and bewildered."

Our observations of marked bears to date, fortunately, indicate that they don't remember or associate us with an unpleasant experience.

In one case we'll concede that a grudge would be justified. Our target bear was one of a group. Feeling the dart's sting, he assumed that one of his chums had taken a swipe at him. Without further ado he proceeded to give his unfortunate companion a sound cuffing before the drug took effect. If that innocent bystander of a bear recalls us with disfavor, we can't really blame him.

Shot Eight Times, Bear Still Fights

Ever since these North American bears have been known to civilized man, and before that to the Indians, they have gained a fearful reputation—for attacking when provoked, and for standing up to terrible punishment from bows and arrows or rifles. Like many other predators, they normally reveal a complaisant, even gentle nature, but stimulated, they can change instantly into ruthless killers.

Explorer Samuel Hearne first came across "the skin of an enormous grizzled Bear" in 1771 in the Canadian Arctic, and Lewis and Clark wrote the first extensive account of experiences with grizzlies on their journey to the Pacific.

Lewis called them brown or white bears, to distinguish them from the black bear. The name "grizzly," and the sometimes used "silvertip," derive from the white or gray hair tips common in this species.

In his journal Lewis wrote that grizzlies became so troublesome he did not like "to send one man alone on an errand of any kind." On one occasion six of the expedition's hunters fired at least eight rifle balls into a grizzly. Still the animal scattered his tormentors, chased two of them into a river, and was swimming toward one when a final shot in the head killed him.

In 1825, Hugh Glass, one of William Ashley's mountain men of the Rockies, came suddenly upon a great "white" bear and was dreadfully bitten and mauled. His comrades dressed the man's wounds but were unable to move him. They spent five more fearful days in Indian country; then, expecting Glass to die, they abandoned him, taking his gun and gear. Astonishingly, Glass survived. Some accounts of the story say that he "crawled" nearly 100 miles to Fort Kiowa on the Missouri River, urged on by a will to live and a passion for revenge.

Whatever the facts, his superhuman effort made him a legend of the West and added a page to the grizzly's reputation.

Such experiences were not uncommon in the days of the explorers, and attacks by grizzlies are still reported today. Small wonder, then, that the beast earned the scientific name of *Ursus horribilis*.

Dave Condon, former chief naturalist in Yellowstone Park, for many years a stalwart apologist for the grizzly, barely escaped the unprovoked attack of a huge bear he had observed at close range many times. Telling about it later, Dave said that in those seconds before he reached his car, with the bear at his heels, he learned more respect for grizzly bears than in all his earlier years in the park.

Such modern experiences point up one need to learn all we can about managing the grizzly. For the areas where he lives are visited by more and more people each year, and the risks of man-bear encounters increase.

The greatest dangers we ourselves learned to avoid while working with grizzlies were carelessness and complacency. The bears' seemingly slow movements are really rapid, and their usually even temper is deceptive.

Trap Keeps Men In, Bears Out

So far we had been on the outside of the trap looking in. Now we decided to get inside the trap and look out at the bears.

The idea had been germinating all summer. What safer spot from which to shoot pictures as well as to make close-up observations? If the bears couldn't break out of the trap, they couldn't break in. The worst they might do would be to turn us over.

We maneuvered the trap to a streambank where bear trails converged and baited the area to attract grizzlies. At sunset John and I crawled inside the metal cylinder with our cameras, dropping the heavy steel door almost, but not quite, shut. We wanted to be able to get out if necessary.

Soon after dark the dim shape of the first bear materialized on the far bank of the stream.

Mother Raises Triplets With No Help From Father

Male grizzlies shun family life. In fact, a mother views the meandering boar with suspicion. If convinced that he threatens her cubs, she charges him without hesitation.

These litter mates differ in coloring. Gray, tan, and black tones relieve the grizzly's basic dark brown.

During his 20 to 30 years of life, a grizzly consumes diverse foods ranging from ants to beached whales. He relishes meat, fresh or carrion, but devours considerably more vegetation. To break his winter fast, he begins daintily on new grass, grazing as contentedly as a cow.

This mother surrounds her cubs with a tender care that lessens in their second summer. Having mated again, the sow drives off her yearlings. Her slaps may send them reeling. On their own now, they start to fend for themselves.

The raven at left invited himself to feed on scraps from a grizzly meal.

Then others appeared. After cleaning up the scattered "come-ons" of bacon and meat, however, they had trouble locating the main bait, which their nostrils told them was right under their noses. And so it was, but well hidden (page 290).

It was fascinating but exasperating work. We strained our eyes to make out the ghostly forms moving in the darkness around us. Revealed in the light of our flash were some wonderful pictures that remained unborn, for it was hard to coordinate our efforts.

Just then a tremor ran through the trap. A bear had collided with our steel tube, and we rocked violently.

John flicked on the light. A black nose was intruding through a hole at my elbow.

I controlled an impulse to punch it and, instead, moved to kick the block from under the partially raised door. Bruin could, if he tried, raise the door and join us.

But the bear didn't want to be inside with us any more than we wanted him to be. The nose disappeared, and the startled bear hit the water at a gallop, scattering the other bears who had just succeeded in snatching the bait. I tripped the camera on this final flurry.

"That should be a good one!" John said.

"Yes," I answered, trying to meet his enthusiasm. This wasn't the time to mention that in all the excitement I had aimed the camera more at the sky than at the bears.

Grizzly's Gallop Inspires Awe

As the summer drew to a close, we began to plot observations of our marked bears, half of them males, half females.

We freed most of our grizzlies where we trapped them; others we carried 25 to 35 miles and released. Most of them came back, some within two or three days. Others seemed satisfied with their change of location.

Traveling such distances over rough country is routine for the grizzly. It may well be that there are few of Yellowstone's wonders—scattered over 3,471 square miles—that they do not see in a lifetime. We hope to find out the facts about bears as travelers. The area

PHOTOGRAPHS BY FRANK AND JOHN CRISCULLO © NATIONAL GEOGRAPHIC SOCIETY

they need to roam may determine whether they can survive in a world where humanity will continue to crowd them.

The grizzly moves at a fast walk, carrying his head low. When he is alerted, his head comes up and he travels at a trot; full speed is an awe-inspiring gallop.

One evening I was standing just off the Lake-Canyon highway when, out of the semi-darkness, there suddenly appeared a close-ranked bank of seven grizzlies moving at a gallop. Heading almost directly for me, they gave the impression of irresistible power, like an onrushing train.

Catching my scent, they raised their heads, veered to the right, and broke ranks only slightly as they crossed the highway and dropped down a 40-foot bank. They took this obstacle in a cloud of dust and a spray of water as they hit the stream below.

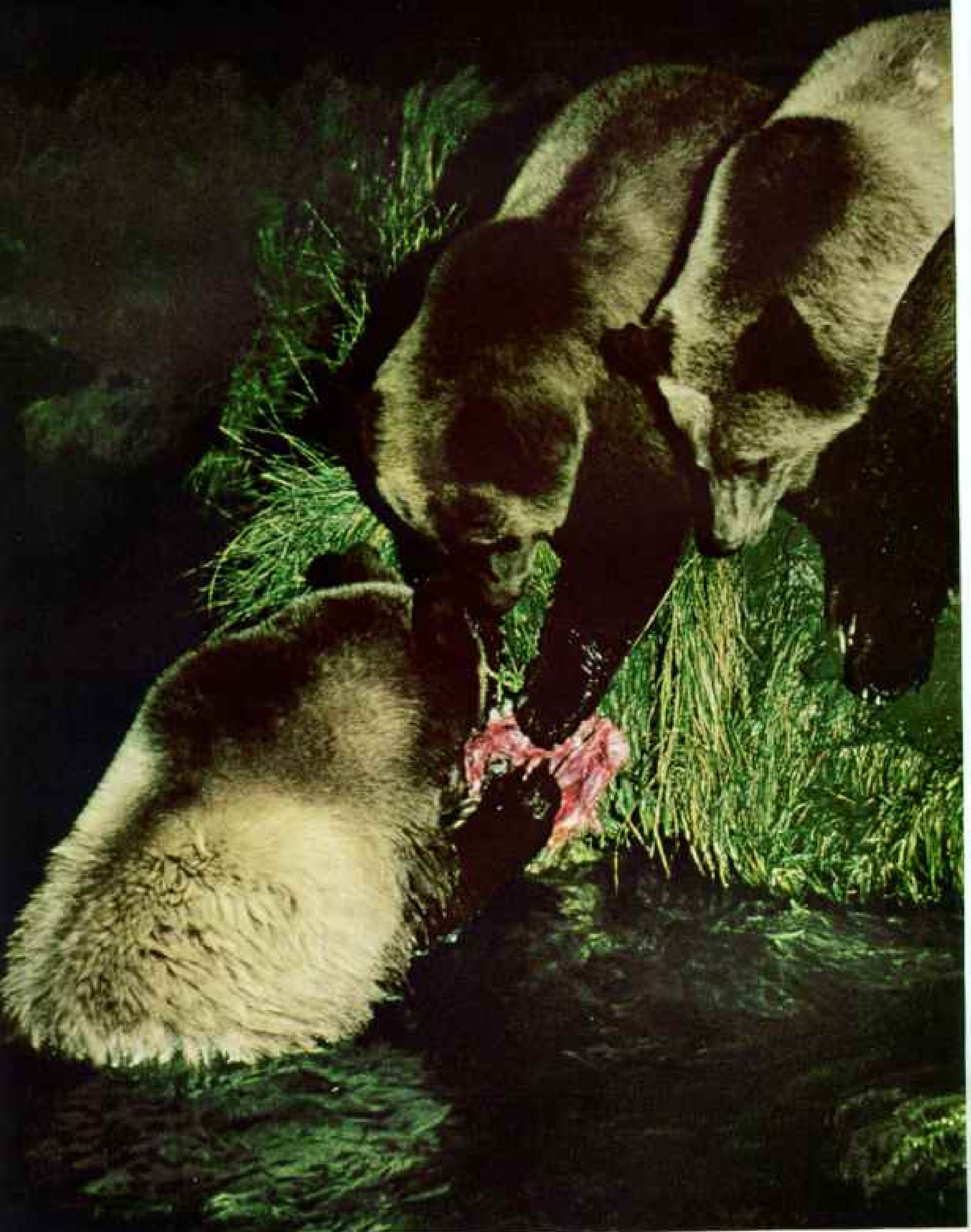
I doubt if a horse could cross such terrain, certainly not at this breakneck speed. They rolled along at a gallop until their dark forms merged into the background.

By the time the aspens were turning yellow, reports on marked grizzlies were trickling in from fishermen, campers, hikers, and park rangers. By pinpointing these observations and our own, we should, in time, be able to plot the size and extent of individual bear ranges. Over the years, sightings of marked grizzlies should also reveal the nature of seasonal movements and journeys in search of food or mates.

Analyzing our counts made during the first summer enabled us to estimate a population of 150 silvertips in Yellowstone Park. The proportion of marked and unmarked bears seen in future years should provide a still more accurate census of the grizzlies.

Bear Shadowboxes With Own Breath

Winter had blanketed Yellowstone when I trudged up Mount Washburn and found what I had been seeking—grizzly tracks in the snow. After about an hour I came upon a packed spot where he had stopped to rest. The view was breath-taking. I lingered



The Night Shift Goes to Work: Young Bears Seize a Photographer's Bait

Lacking keen sight, the grizzly follows his sensitive nose to many a feast. The Craigheads anchored fresh meat under a riverbank for this flash picture. Grizzlies stage few serious fights over food, but amorous boars battle viciously over a sow. Often the victor is too exhausted to claim his prize.

awhile, though probably not for the same reason that bruin had paused here; a grizzly's eyesight is not good at long distances.

Envisioning him sitting there, attuned to the smells, sounds, and sights of his beautiful domain, brought to my mind another engaging picture of grizzly activity I had witnessed just the evening before.

A young bear, fascinated by the jets of his own breath in the crisp air, had stood on his hind legs and struck at the moving vapor trails, first with one paw and then the other. Bears are sometimes much like humans, and this one looked like a man shadowboxing—and enjoying it.

Through one short round he punched at—but never connected with—what must have seemed a very tangible object. Then his behavior changed. Curiosity gave way to suspicion, and suspicion to fear. He dropped down from his man pose to all fours and, now a bear, tried to run away from his own breath.

Bear trap becomes a blind for night photography. After baiting the area, the naturalists entered the trap. Soon grunts and sniffs filled the darkness. Maurice Hornocker beams a flashlight through a peephole; Frank Craighead readies his camera to make the picture opposite. They carried the revolver to warn off any furry intruder, but never had to use it.

Trail Leads to Winter Den

Following farther the erratic grizzly trail, I entered a dense cluster of stunted firs where the snow had already accumulated to a depth of several feet. Here, in a secluded spot darkened by drooping fir boughs above and to the sides, closed by the mountain slope to the rear, the bear had dug and trampled the snow. The winter snows would pile up 20 feet or more—a protective blanket under which a bear could sleep warm and well.

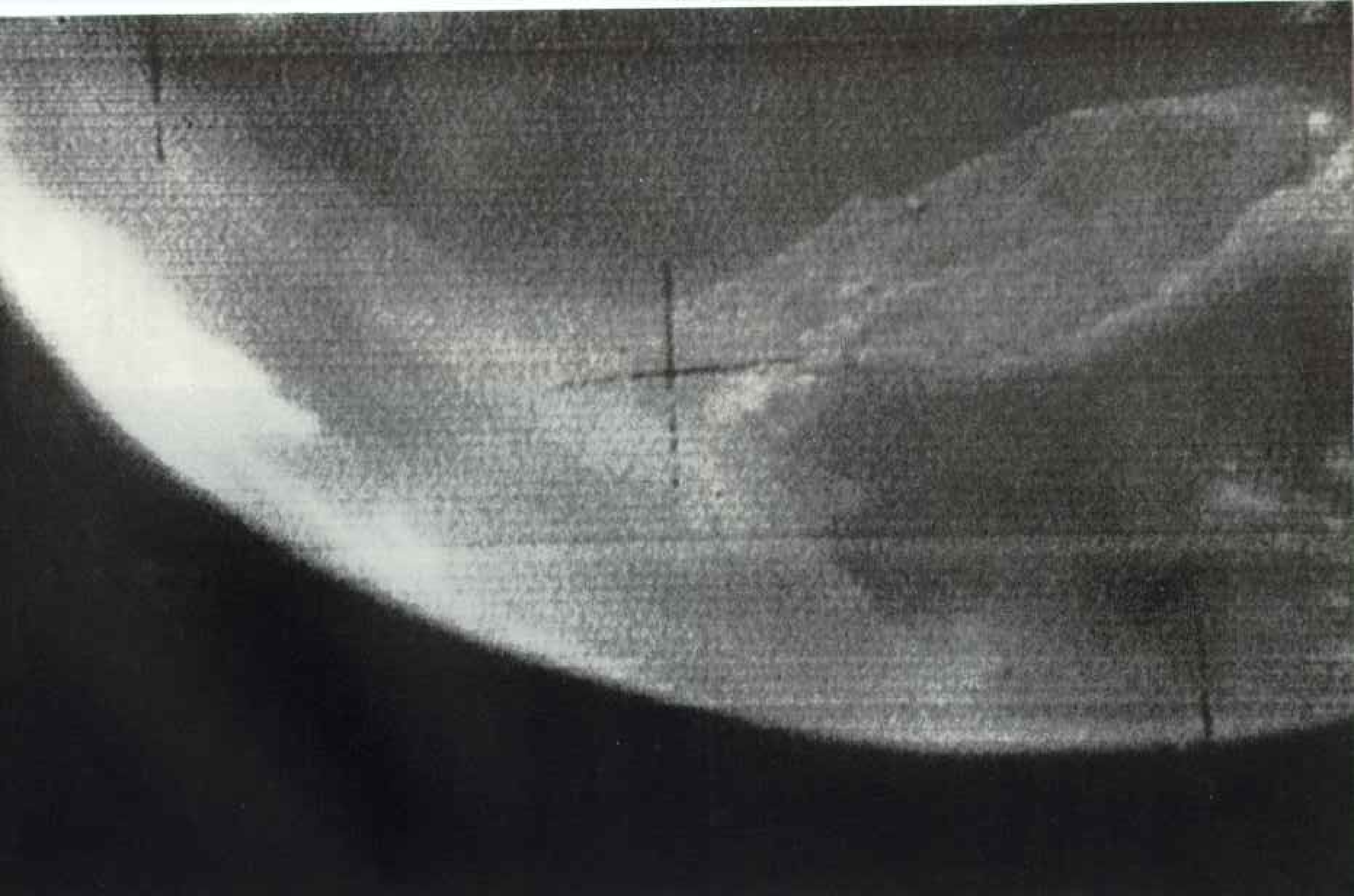
Actually, bears do not hibernate in the truest sense. That is, they exhibit no striking drop in body temperature with the accompanying marked decrease in breathing and pulse rate. They do go into a dormant state but maintain a temperature considerably above that of their immediate environment. It is in this condition that sows give birth to their cubs, which may weigh about 24 ounces.

Could this be a possible winter lair, I wondered, and was this bear looking it over and selecting it for later retirement? The answer to this, as to so many other questions, would have to wait for another year. This summer we were just starting.

But if our plans developed as we hoped, John and I with our team would not only mark more bears next summer. We might even attach miniaturized transmitters to some. Through a radio signal we could track them in their late fall wanderings.

Already, the shooting of a marked bear 50 air miles from where we had trapped it, and many miles outside Yellowstone, has verified something we have long suspected: that protected bears are sometimes killed when they wander beyond the park.

Our scientific approach will certainly bring us more information next year. But chance, too, will play a part. Research is like that. And so are grizzlies.



Our Earth as a Satellite Sees It

By W. G. STROUD

Head, Meteorology Branch
Goddard Space Flight Center, NASA

The scientist who directed the development and launching of Tiros I, *NASA's historic weather satellite, tells of its exciting discoveries and its successors' promising future*

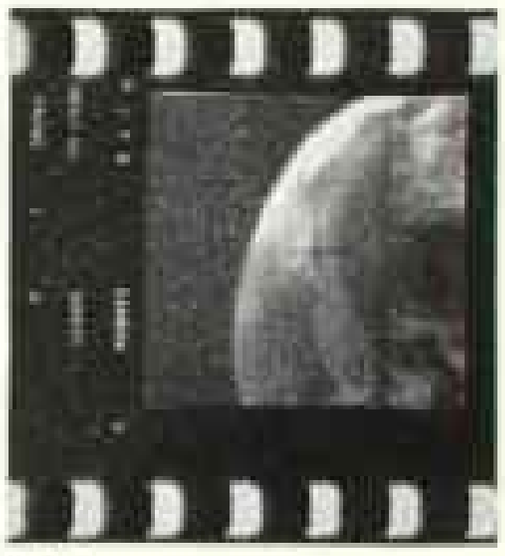
THE WORLD has had its picture taken. For the first time in the millions of centuries that our planet has been whirling around the sun, we can see our home as it looks from a tiny companion in space. A man-made satellite, circling some 450 miles overhead, has photographed us not once but thousands of times.

Such spectacular panoramas as the view of Florida on the opposite page show our planet—its continents and seas, its clouds and storms—as never before seen by man except in his imagination.

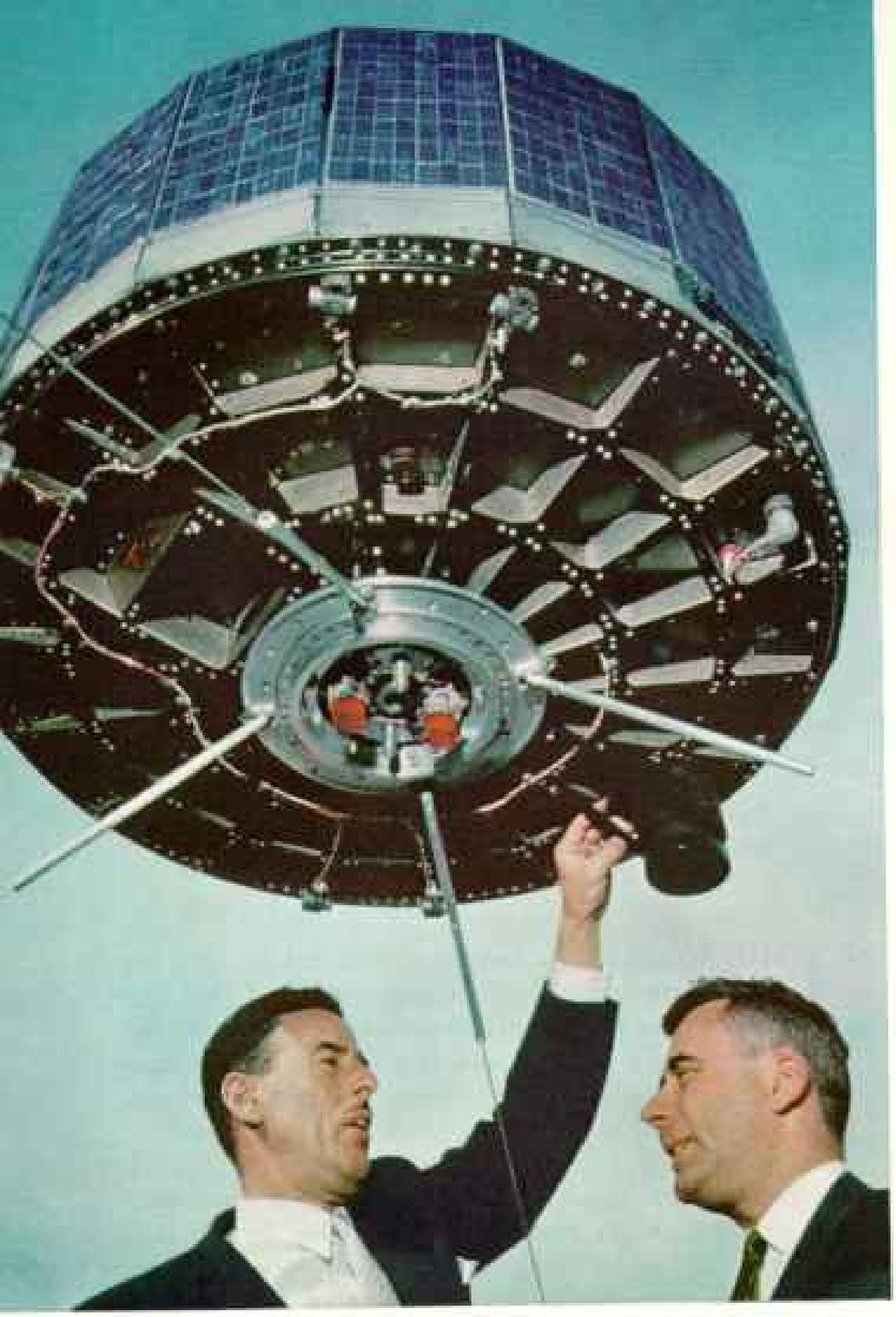
Streaking around the earth at almost five miles a second, the American experimental weather satellite *Tiros I* (Television and Infra-Red Observation Satellite) has sent us an enormous number of pictures since its launching on April 1; its two television cameras have snapped them as rapidly as one every 30 seconds. The 264-pound "hatbox" satellite has also reported continuously on its position, internal temperatures, angle to the sun, and even the condition of its instruments.

Spinning lazily on its axis, *Tiros* circles the globe once

Photographed from 450 miles in the sky, Florida takes shape on the globe. Shoals fringe the Gulf coast and the Bahamas (lower right). Cape Canaveral, launching site of *Tiros I*, juts into the Atlantic. Clouds to the north bathe the Great Smokies. The 35-mm. original at right, shown actual size, was received by a station that ordered the satellite to turn on its signal, then automatically recorded frame number, orbit, sun angle, and the camera used (page 297).



NASA



Tiros, Perched on the Nose of Its Rocket, Roars Off for the Heavens

Here, seconds after blast-off, the 90-foot, three-stage Thor-Able lifts majestically from its pad at Cape Canaveral. The umbilical tower, last link with earth, topples amid fire and vapor. Plastic shroud at the rocket's tip protects the satellite during the ascent, then falls away to expose the solar cells at left.

Cells that convert solar energy into battery power glisten from the sides of the 264-pound satellite. Its four antennas have flashed thousands of television images since *Tiros* took off.

Adjusting the lens of the satellite's wide-angle camera is Herbert Butler of the United States Army Signal Research and Development Laboratory, Fort Monmouth, New Jersey, where many of *Tiros*'s television pictures have been received. Sidney Sternberg (right) represents RCA, which designed the satellite for the National Aeronautics and Space Administration.

ROBERTSON (LEFT) BY NATIONAL GEOGRAPHIC PHOTOGRAPHER W. L. WRIGHT; SATELLITE BY NASA © N.G.S.

every 100 minutes. Thanks largely to a rocket guidance system developed by Bell Telephone Laboratories, its orbit varies only slightly from a perfect circle—as of its launching date the most precise achieved by any satellite.

Thus *Tiros I*, the United States' eighteenth satellite in orbit around the earth, became man's first weather eye in the sky. The brains controlling the eye acted through two data acquisition sites—one at Fort Monmouth, New Jersey, the other at Kaena Point, Hawaii.

Pictures Stored by Tape Recorder

When the satellite flashed within range of one of these stations to begin another photo-taking orbit, an engineer gave it a spate of prearranged orders. Via radio, he could tell *Tiros* when to start its next sequence of 32 pictures—perhaps as it whizzed over Africa 15 minutes later—and which of its television cameras to use. Its orders memorized electronically, the satellite spun on its way.

Precisely at the 15-minute mark, over Africa, its camera began snapping; but *Tiros* was then too far from either data site to transmit pictures directly—as it did when photographing within range of a station. Instead, a tape recorder automatically stored the views as they were snapped at 30-second intervals. On its return passage the engineer issued another order, and the satellite dutifully beamed the photographs to the station.

Of *Tiros*'s two TV cameras, one—fitted with a wide-angle lens—focused upon a vast area three times as large as France; the other scanned in greater detail a square 100 miles by 100 miles. Each camera, about the size of a water glass and weighing only two pounds, peered at the earth through a picture tube narrower than a man's finger.

Whenever I was in a data station during *Tiros*'s 10-minute passage, excitement among

Kuril Islands dot the foreground; Hokkaido lies at lower left as *Tiros* sweeps across the Pacific, taking pictures to be stored in its memory for broadcast later. Dense clouds swathe eastern Siberia.

Land white as snow, sea dark as ink: a view of the Middle East. Just as on a map, the Omani peninsula all but pinches off the Persian Gulf from the nearer Gulf of Oman. Clouds veil Iran (right center); sunlight brightens the Arabian Peninsula.

NATIONAL GEOGRAPHIC PHOTOGRAPHER W. O. [illegible]

Tension Grows as *Tiros I* Approaches Fort Monmouth With a New Cargo of Pictures

Within the control room of the New Jersey read-out station, the console operator gives instructions to the mammoth antenna that will pick up signals from the satellite on its swift passage from horizon to horizon. Technician at rear clasps his earphones, listening for the first beep-beep-beep from space.

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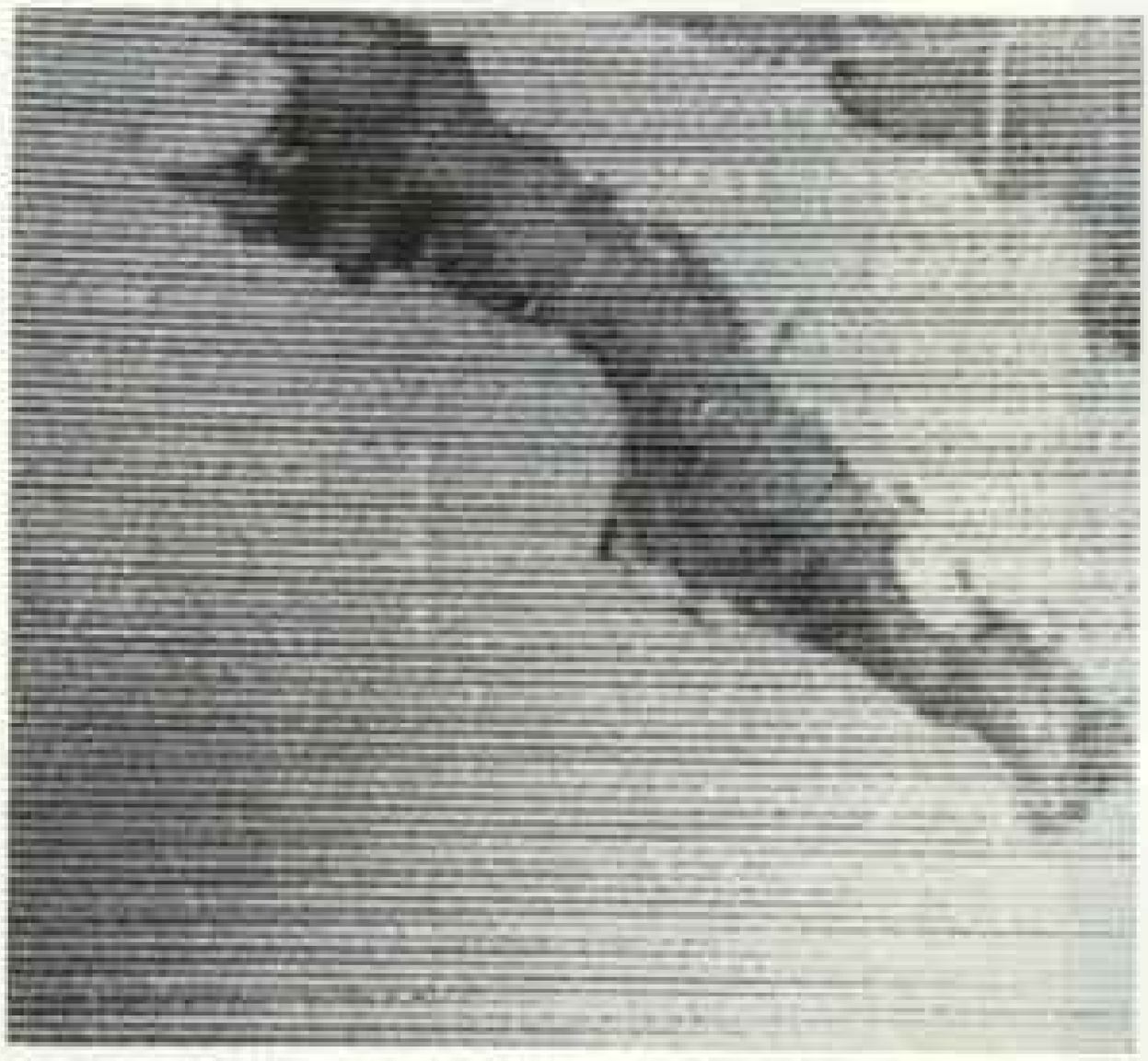
String of cirrus clouds drifting across Sudan indicates the presence of a paralleling jet stream farther north (page 302). Speeds up to 175 knots have been recorded for these elusive high-altitude winds.

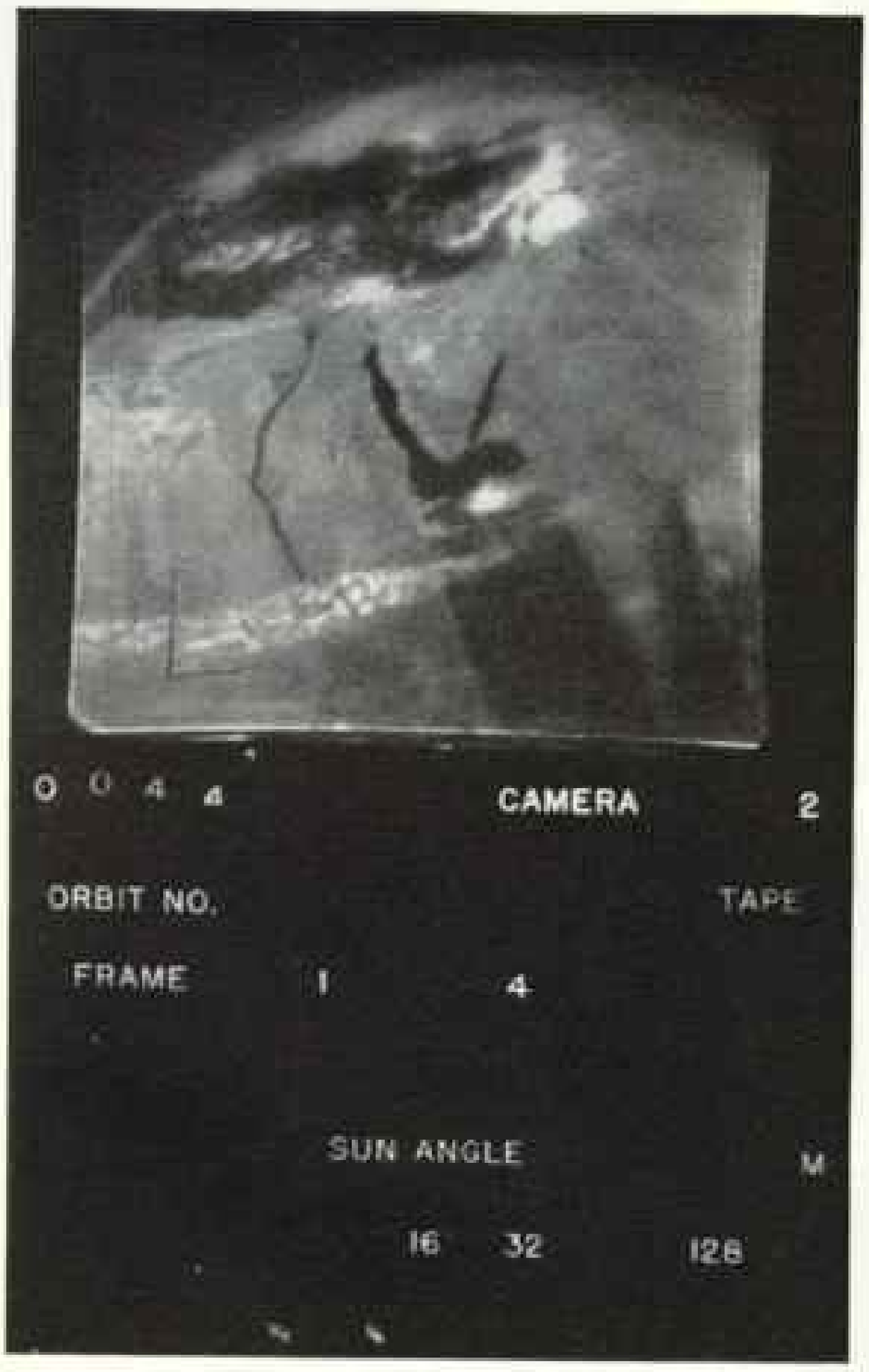
Winding north across Egypt, the Nile empties into the black Mediterranean. The Red Sea forks into the Gulfs of Suez and Aqaba; a faint line knifing between Africa and the Sinai Peninsula marks the Suez Canal.

Coded data show that camera 2 (wide angle) took frame 5 (1 plus 4), stored it on tape, and, on *Tiros*'s 44th orbit, beamed it to "M," or Fort Monmouth.



Bathed in April sunshine, Lower California poses for the eye in the sky. Two random clouds drift across its southern tip. Gulf of California, winter playground of fishermen and yachtsmen, separates the 800-mile-long peninsula from mainland Mexico.

Hook of land identifies Cap Blanc, a western tip of Africa. Here the Spanish Sahara borders French Mauritania some 150 miles south of the Tropic of Cancer. Clouds form white patches above the Atlantic.



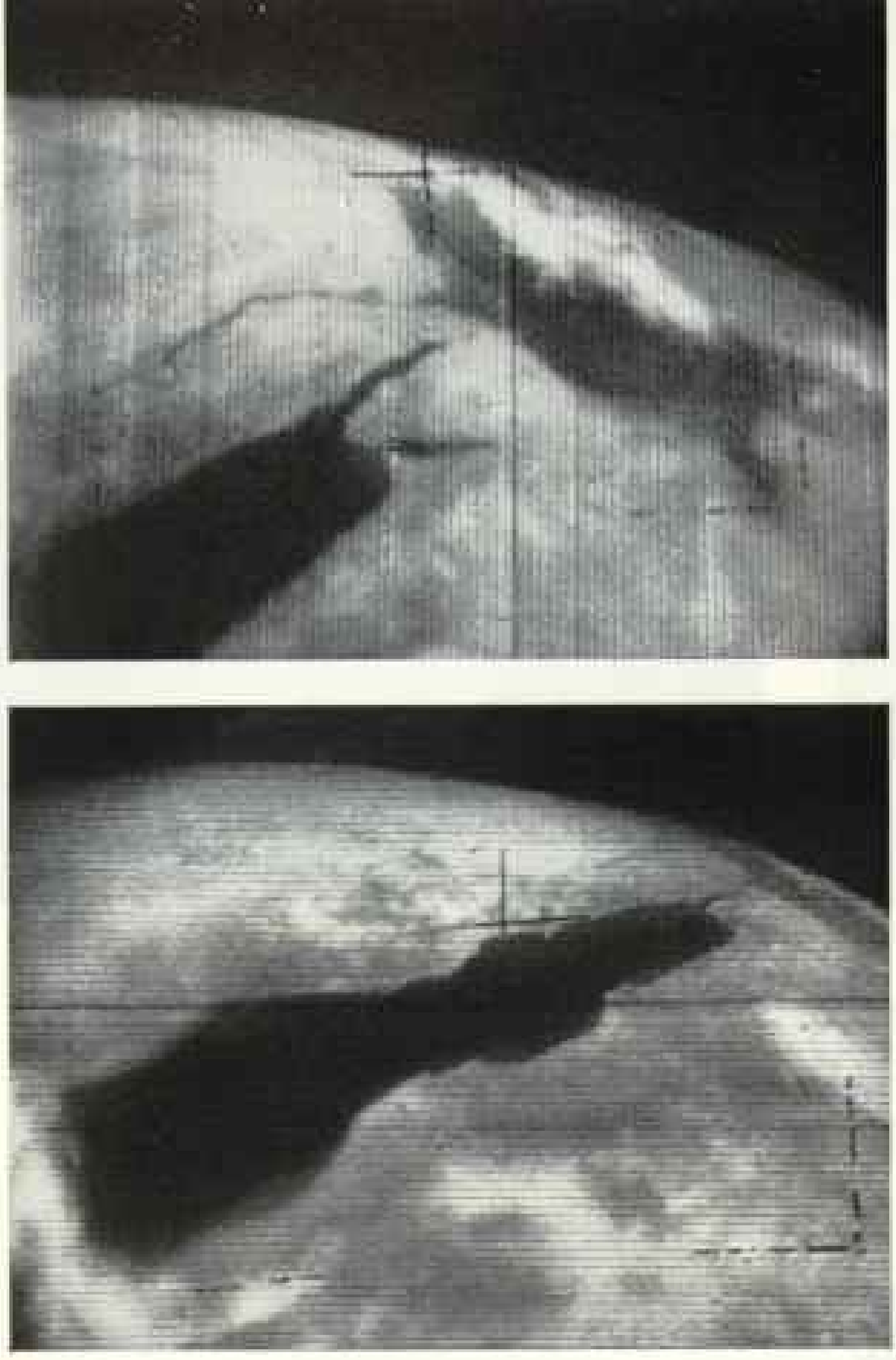
the engineers mounted steadily as "the bird" approached. A giant 60-foot antenna shaped like a dish locked in on the satellite and tracked it across the sky. A bubble of signals flowed in, the ground equipment unscrambled them, and—in the familiar manner of a home TV set—"wrote" the pictures on the face of a screen, where a 35-mm. camera automatically photographed them.

In these pictures the maps we studied in our school days seem to come alive. The continents assume their familiar shapes; on page 299 the whole of Italy sprawls before us, the toe of its famous boot apparently poised to kick a cloud-shrouded Sicily into North Africa. The valley of the Nile, where ancient wonders sleep, twists like a dark snake beneath the modern wonder of *Tiros I*'s wide-angle stare (left).

Though the satellite was amazingly versatile, it could not change its line of vision, as you can by moving your head or eyes. Spin-stabilized like a gyroscope, its axis—and its cameras—pointed always in a single direction. As *Tiros I* orbited, there were times when the lenses looked out into space.

Solar cells—9,300 of them—spangled the satellite's sides and top. Converting the sun's rays into electrical energy, the cells furnished the lifeblood of *Tiros*'s instruments. But the career of an instrumented satellite on the

(*Continued on page 302*)



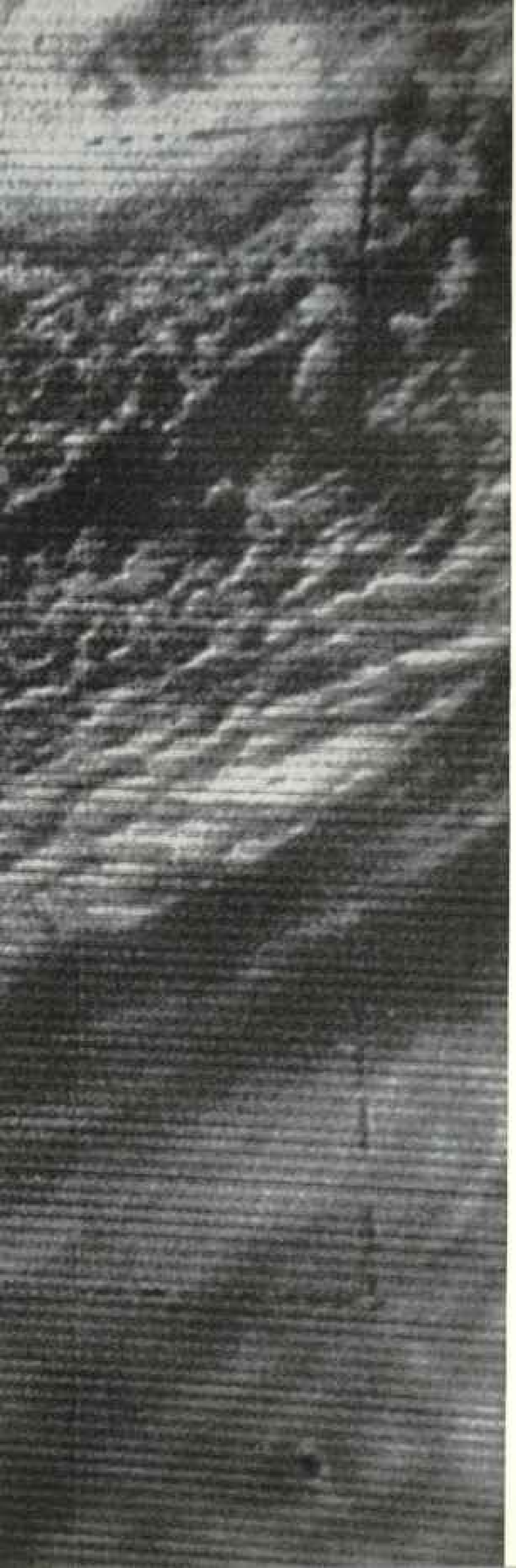
As the satellite spins through space, rotating 10 times a minute, the earth appears to turn dizzily beneath it. Arcing southward above the Red Sea, *Tiros* caught this dramatic sequence in five minutes. Clicking automatically every 30 seconds, and covering 140 miles between pictures, the camera registered a two-thirds overlap between photographs, allowing meteorologists to trace shifts in cloud patterns. This sequence, selected from a series of 52 televised images, shows (from top to bottom) the first, fifth, seventh, and eleventh exposures.

Top picture shows the triangular Sinai Peninsula linking the cloud-shrouded Mediterranean and the dark oblong of the Red Sea. In the bottom frame *Tiros* has streaked 1,500 miles and looks at the southern edge of Arabia and the protruding headland of East Africa.

Etna

Italy's toe aims a kick at Sicily. Orbiting above the Mediterranean, *Tiros* caught this dramatic scene that ranges from Africa on the left to the Greek island of Corfu (lower right).

This view of the globe precisely matches *Tiros*'s altitude, position, and camera coverage when it made the extraordinary picture above. To simulate the satellite's 450-mile-high look at our 8,000-mile-diameter planet, National Geographic cartographers placed a pinhole camera 2¼ inches above the 40-inch globe—an exact ratio.



NATIONAL GEOGRAPHIC PHOTOGRAPHER BARRY C. BISHOP (ABOVE) AND NASA

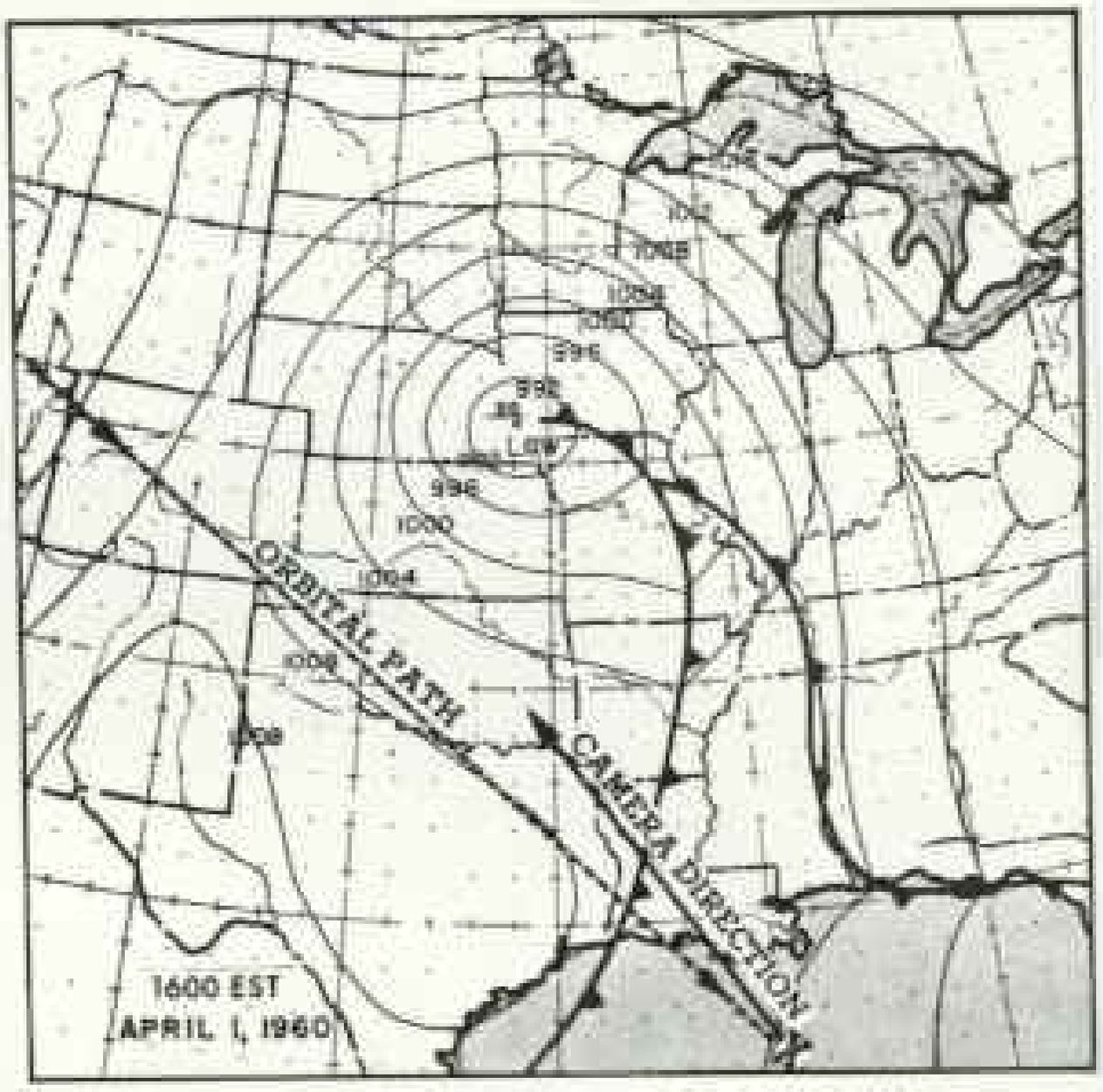
Overlapping photographs show continuous 4,000-mile strips of the globe as seen by *Tiros*. Each series, representing 32 consecutive views, stretches from northwest Spain to central Africa.

Dr. Sigmund Fritz (left), Lester F. Hubert, and other scientists of the U.S. Weather Bureau's satellite section prepared for the *Tiros* project by intensive study of rocket-made photographs of small areas of the earth.

A Dying Storm Slowly Pinwheels Across the Pacific

Tiros revealed to meteorologists that temperate-zone storms, like their tropical kin, often whirl in spirals. This cyclone swirls across 1,000 miles of the Pacific. Its blustery center, the white patch at the upper right, lies between Hawaii and the west coast of the United States.

The storm is in its dying phase. Clear areas of the earth's surface show as black spaces between the spiraling clouds.



Clouds Over the Central United States Match Their Weather-map Portrait

Like a swan, the cloud formation swims in the sky with its head above Nebraska and body over the Mississippi Valley. Cold, dry Canadian air forms the black wedge knifing in from the left. On the map, the low-pressure area corresponds to the swan's head; the heavy black lines of a cold front simulate the bird's body.

hostile edge of space is pitifully short. Lengthy, unremitting exposure to the blazing sunlight could quite literally cook it, a key component could break down and silence it, or the annual orbit of the earth around the sun could throw it into prolonged shadow, causing its storage batteries to run down.

Future weather explorers, however, will be largely free of these disabilities. Some will boast infrared scanners capable of taking pictures in the dark; others will eye the earth constantly, turning very slowly to adjust their viewing axis. Once orbited over the poles, such satellites could keep weather developments in all parts of the world under surveillance. And, from an orbit 22,000 miles above the Equator, a single camera could continuously view one-third of the earth.

New World Opens for Weathermen

Meanwhile, for meteorologists, *Tiros I* is uncovering a spectacular new facet of their science. Cloud formations are the chief quarry of its cameras, and these show up on film with remarkable clarity. On an early pass a thin trail of clouds scudding across Sudan and the Red Sea (page 297) suggested a jet stream farther north. A check of conventional weather measurements for the same day verified the presence of the elusive high-altitude wind current.

Time after time, in frame after frame, all sizes and complexities of storm areas appeared: A typhoon took shape off New Zealand, a cyclone in the Indian Ocean. Highly organized cloud patterns spiraled turbulently across 1,000 miles of the Pacific. Spiral formations, in fact, march through the pictures like a recurrent theme; ultimately they may provide us with a key to the life cycles of storms.

Scientists are still strangers in this curious, unmapped world of the topside of the sky. Extensive study and analysis, however, will enable meteorologists to relate these new observations to our present understanding of the earth's weather. And someday the knowledge gleaned from satellites such as *Tiros I* will permit man to live at greater ease with the elements.

"The weatherman," says Dr. Morris Tepper, Chief of NASA's Meteorological Satellite Programs, "has been like the proverbial blind man who tries to describe an elephant by feeling its trunk. Now, for the first time, his eyes are being opened to a view of the entire animal."

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COVER: *Grizzly and cubs, whose ancestors knew the mastodon, face the threat of extinction* (page 288).

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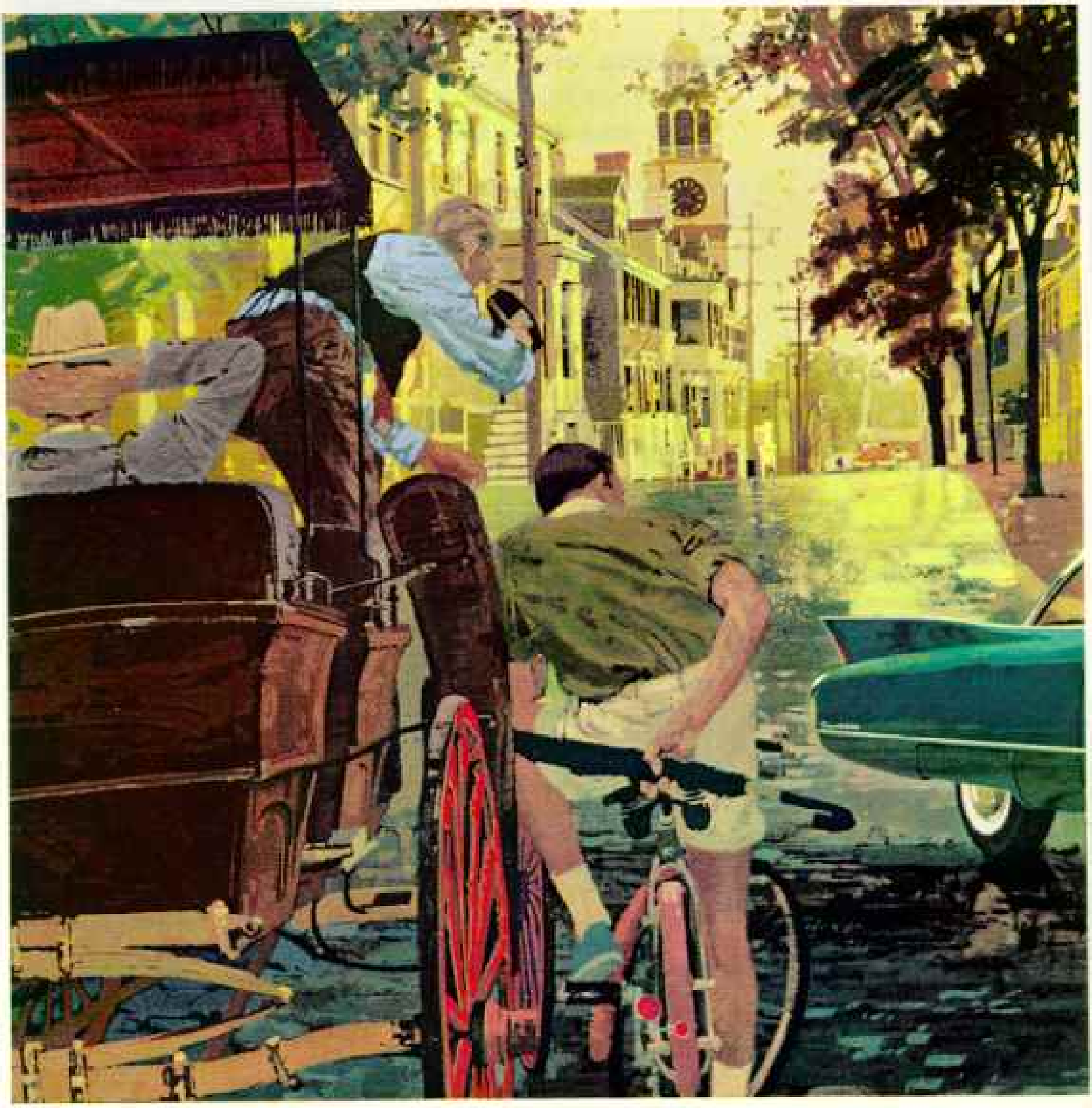

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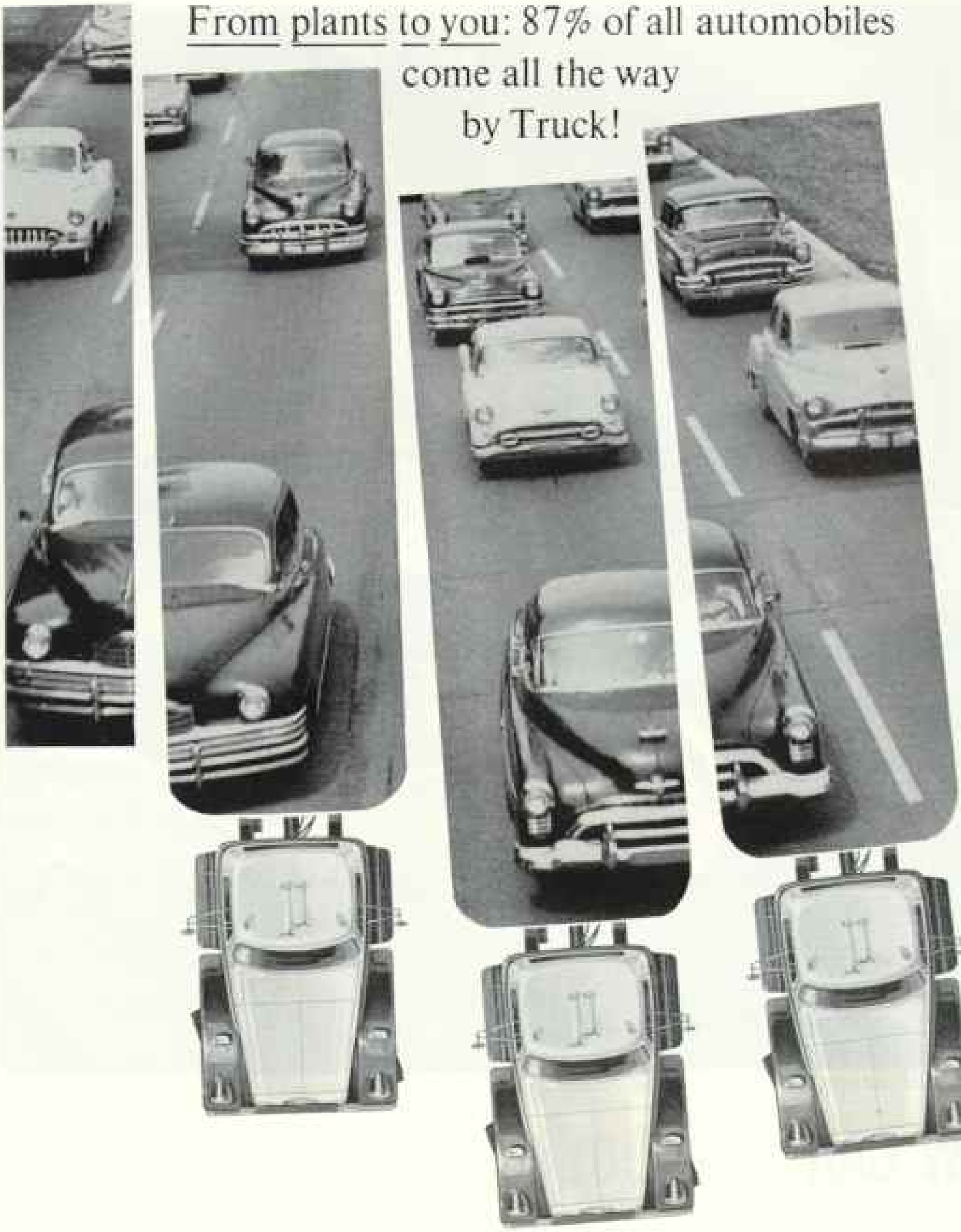

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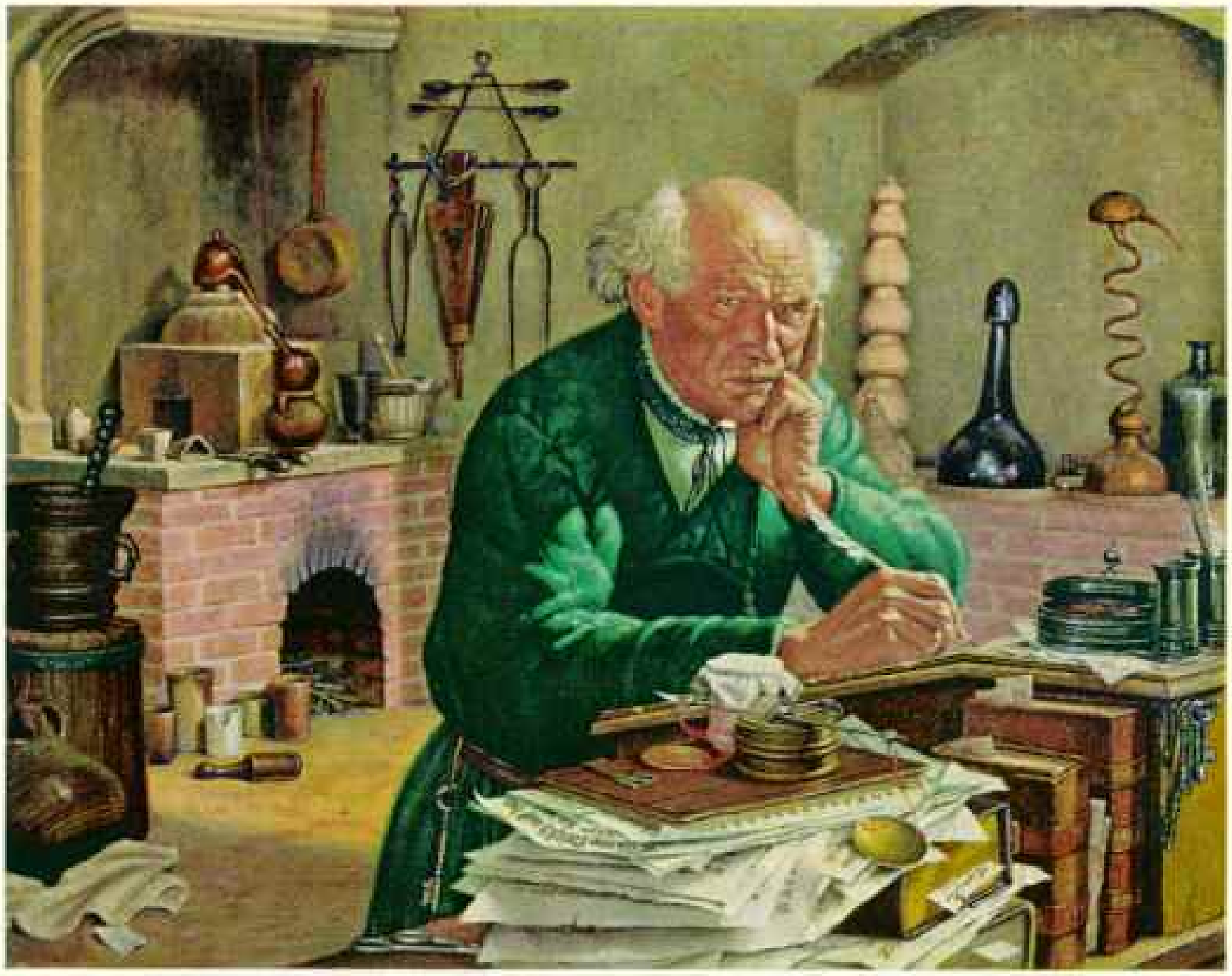

PARACELSUS—Stormy Petrel of Medicine—one of a series of original oil paintings commissioned by Parke-Davis.

Great Moments in Medicine

In the Renaissance laboratories of the Swiss-born Paracelsus (1493-1541) were produced many things: chemicals, complex medicines, medical writings, mysticism, and abusive attacks upon medical colleagues, religionists, and politicians. A controversial figure, he was forced to move frequently and travel widely. His contributions, however, were important. He helped guide medical men away from the mistakes of Galen and Avicenna; directed their thoughts toward rational research; and advocated the use of pure chemicals in medical practice.

While crude by our modern standards, Paracelsus' efforts pointed the way toward today's highly advanced and diversified development of pure drug products for medicinal use. The superstitious speculations of the Renaissance have been replaced by science in medical practice today.

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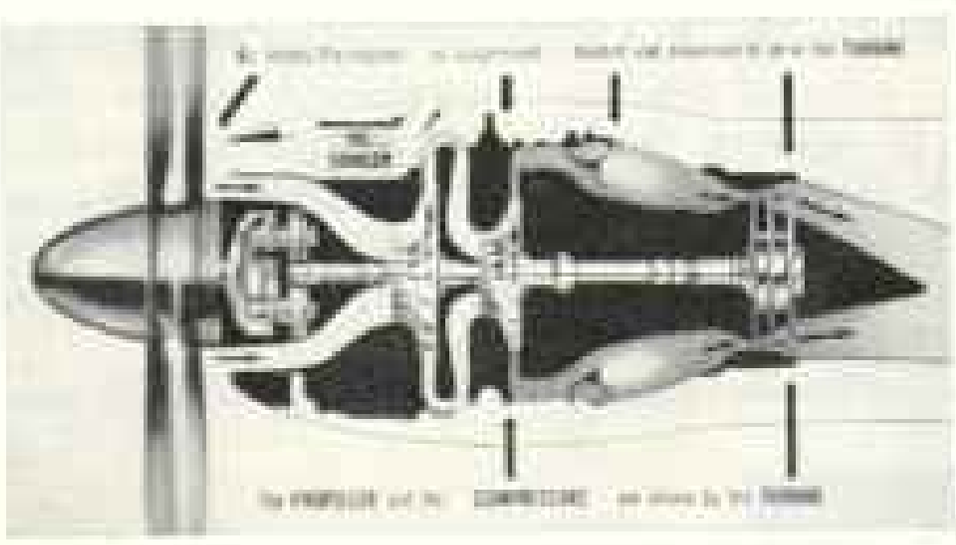

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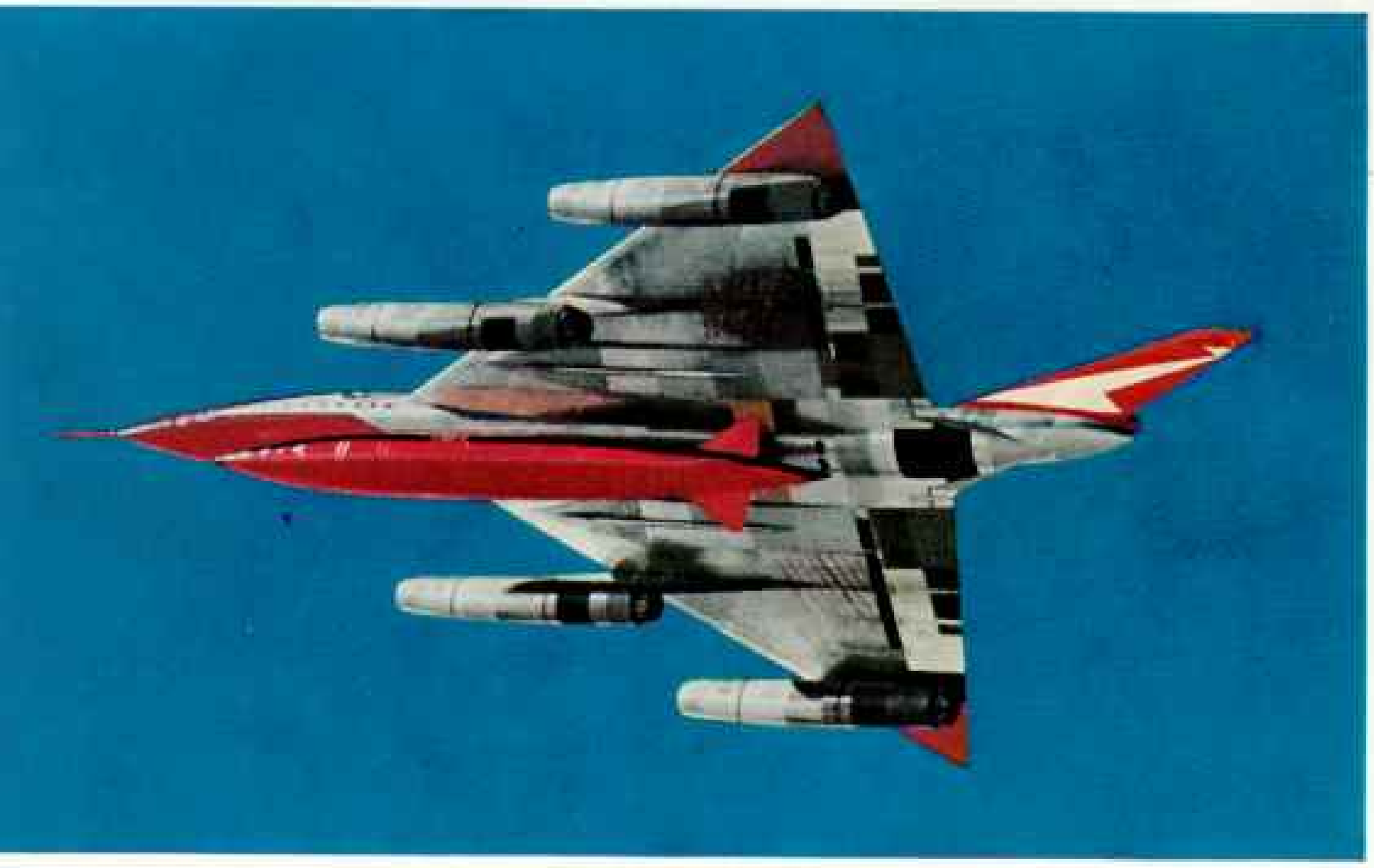

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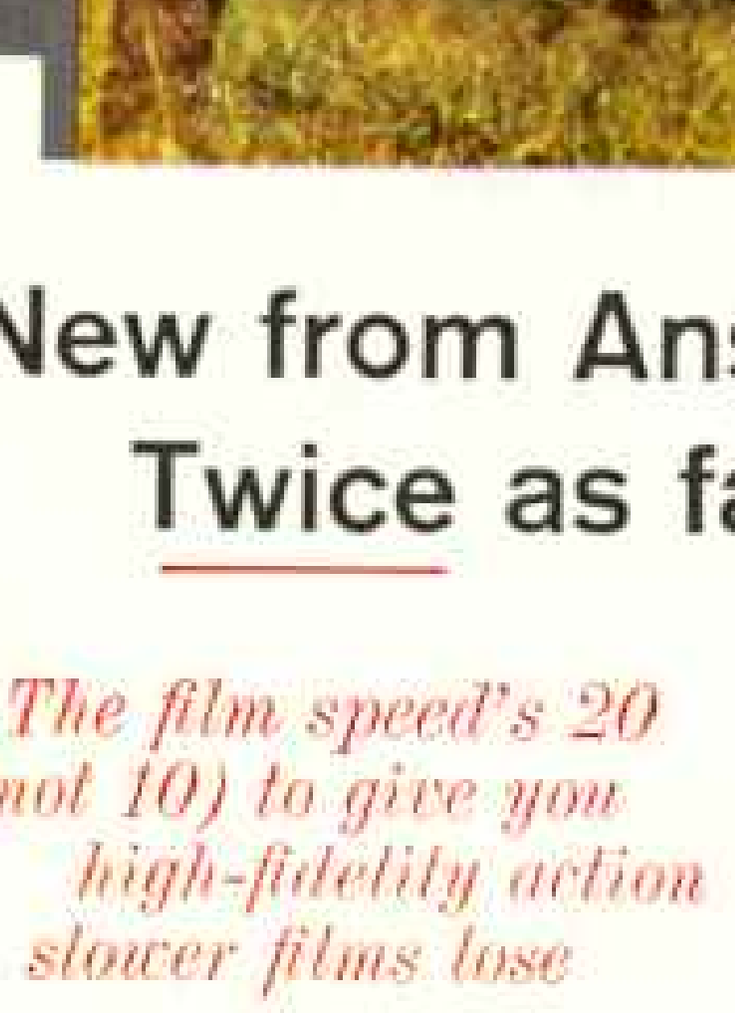

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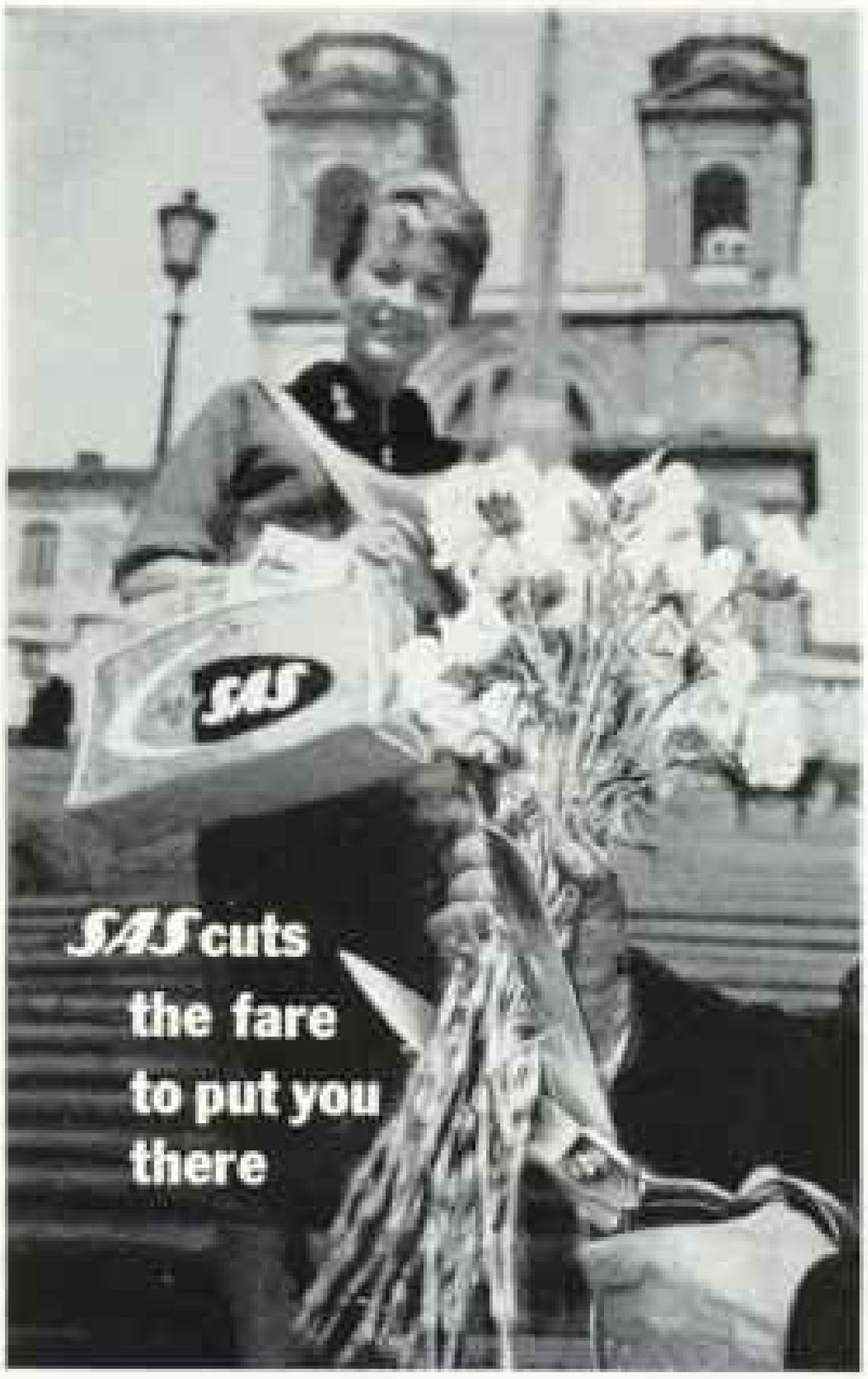

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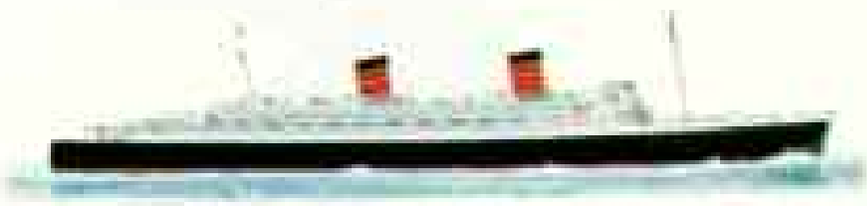

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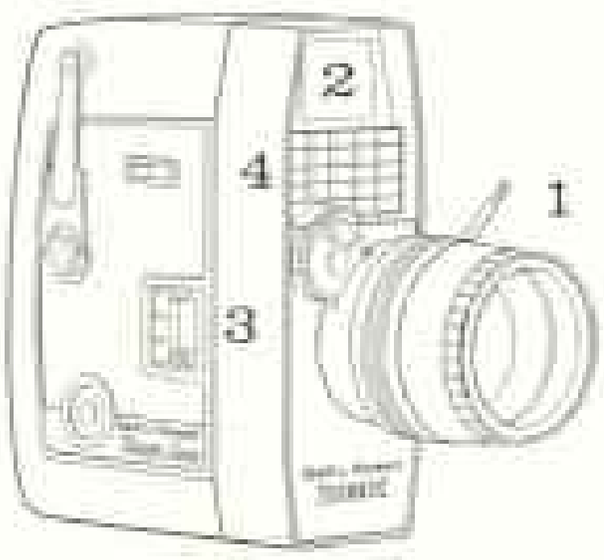

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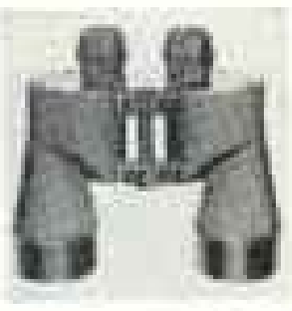

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