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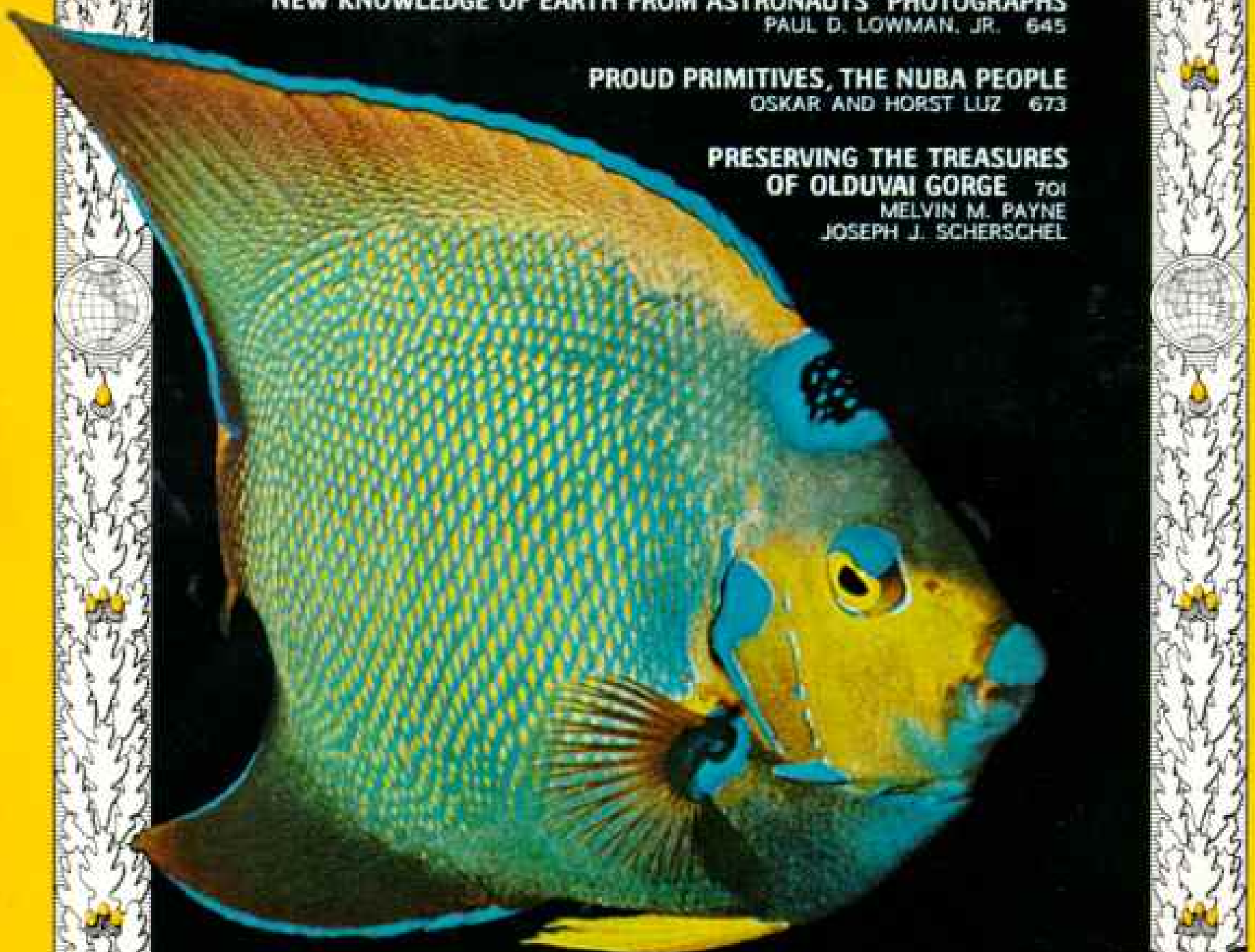

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NATIONAL GEOGRAPHIC

The Living White House

By LONNELLE AIKMAN
National Geographic Senior Staff

PRESIDENT Calvin Coolidge went out for a walk one day with a Senator from Missouri. On their return to the white-pillared Executive Mansion, the Senator said facetiously, "I wonder who lives here."

"Nobody," replied Mr. Coolidge. "They just come and go!"

HARPER'S WEEKLY, 1865

The remark was only half true. For 166 years now, Presidents and their families have moved in and out of the Government's 18-acre estate in the heart of Washington. Yet whether their stay was short or long, the men, women, and children who made up that very human cavalcade have truly lived here, with laughter or tears, hope and pride such as other citizens feel. Indeed, it is this personal and domestic life, carried on in the fierce glare of national affairs, that gives the White House its fascinating dual character.

No matter how casual the occasion, there is always a kind of mystery and enchantment in going behind the scenes here, as I have had occasion to do as a reporter and guest during the last four administrations.*

Earlier this year I spent a morning with

*Mrs. Aikman recounted some of her earlier impressions of the Executive Mansion in "Inside the White House," NATIONAL GEOGRAPHIC, January, 1961.

Time out from war: A devoted father, Abraham Lincoln reads to his beloved son Tad. When another son, Willie, succumbed to a fever in the White House, the Civil War President grieved, "It is hard, hard, hard to have him die!" Yet through it all he carried the burdens of leading a Nation torn by strife. It has always been so, in this house of two parts—the everlasting care of public power mixed with private agonies, personal joys.

President Johnson's two daughters—Lynda Bird, then 21, and Luci Baines, 18. While we sipped soft drinks in the big, cheerful solarium off the third floor, the girls spoke frankly of the drawbacks that go with the glamor of living in the White House. They looked as pretty and carefree as the girls next door. But it's not easy to relax when the whole country follows one's every move, and a Secret Service man makes every date a threesome.

"Your dates always get in the paper," sighed Lynda. "Then the one you didn't take knows all about where you went and what you did. And sometimes everything gets mixed up. A reporter once phoned my college roommate to check a rumor that I had run off to Mexico to get married. And I was sitting right there all the time!"

Luci frowned when I recalled the time she wore a blond wig to a Marquette University prom with Patrick J. Nugent, the young man she later married (page 636).

"The stories made it seem as if I were doing something bizarre," she said, "when all I wanted was to be myself."

Lynda Tours White House Unrecognized

The conversation reminded me of President Wilson's daughters, Margaret and Eleanor, who, hiding their faces behind veils, took a sightseeing bus past the White House and pleaded in vain with the driver to let them go in and see the President's daughters.

"Did you ever feel like doing that?" I asked Lynda.

"I *did* it," she said. "I put on a trench coat and joined a public tour of the house. Nobody recognized me."

Lynda has a prized doll collection, gathered over the years, which she showed me in a room down the hall where little John F. Kennedy, Jr., used to play.

But the solarium, I learned, was Luci's special project. She had planned and worked on it all—the maple and pine furniture slip-covered in gay yellow and orange; the soft-drink bar and stools, bought at a bargain. Her collection of odd mugs stood on wall shelves, near a bookcase made from timbers removed during the Coolidge reconstruction of the White House attic in 1927.

Suddenly the President's daughter reached into a small refrigerator and brought out a huge preserved frog—a specimen from her biology class at the nursing school of Georgetown University. Holding it up before my dazed eyes, she rattled off Latin names for all its muscles.

Luci's teen-age hideaway has brought pleasure to many White House families. It began as the Coolidges' wicker-furnished, radio-equipped "sky parlor," added over the South Portico in the remodeling of the attic. Here Mrs.

"Feast of cleverness and wit," Julia Grant said of life in the White House. Here before a state dinner President and Mrs. Lyndon B. Johnson escort honored guest Ludwig Erhard, Chancellor of West Germany. Lynda Bird Johnson, following, walks past Vice President and Mrs. Hubert H. Humphrey. For this December visit, after-dinner music began with "O Tannenbaum," a bow to Germany's Yuletide contribution, the Christmas tree.

Coolidge came to sew and open her mail, and here the whole family often found privacy and relaxation.

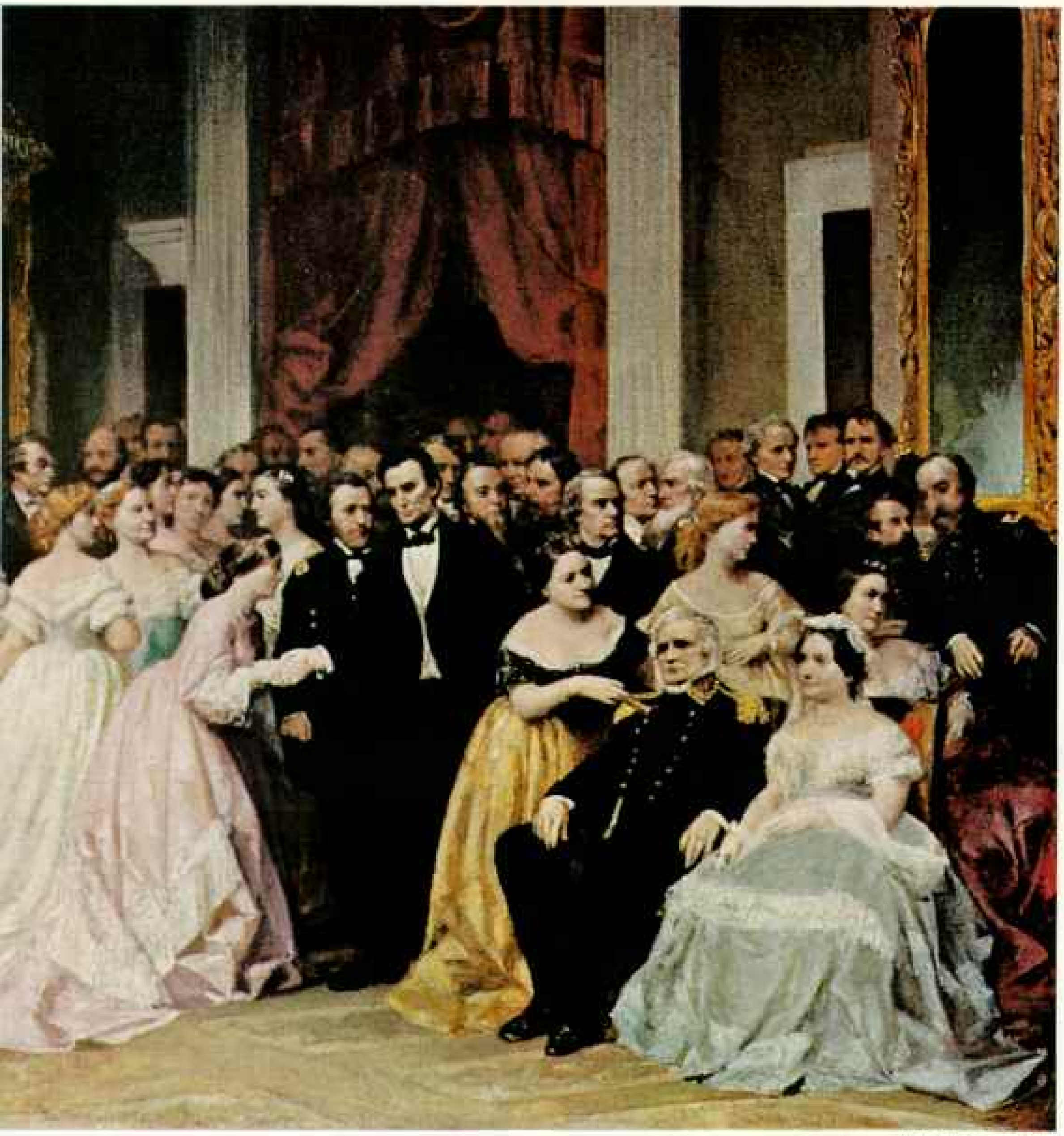
President and Mrs. Eisenhower liked to play bridge with friends in this solarium. By then television had been added to radio, and in a new kitchenette the President himself might prepare a beef stew for close friends.

In this same bright, airy room, three years ago, five-year-old Caroline Kennedy last attended a school conducted in the White House. Distinguished visitors drew the delighted attention of Caroline and her classmates—children of Kennedy staff members and friends (page 605). One such occasion came in October, 1962, when troops paraded on the south lawn to honor the visiting Algerian Prime Minister, Ahmed Ben Bella. Watching from their grandstand balcony, the children gaily mimicked the marchers and echoed military orders given below, to the amusement of assembled dignitaries.

History Haunts the Halls

From cellar to solarium, the big house at 1600 Pennsylvania Avenue has a thousand and one memories of the American story and the men and their families who lived it.

In this house, great and lesser Presidents have made fateful decisions that shaped the country's growth and character. To it, decade after decade, have come national and world



WHITE HOUSE COLLECTION

Politicians, military men, and social lions swarmed to Mary Lincoln's weekly receptions, despite criticism of her extravagance. Here, in a painting attributed to Francis B. Carpenter, President Lincoln greets his new commanding general's wife, Mrs. Ulysses S. Grant, introduced by her husband. The artist crowded his scene with famous men, many of them not actually there. Former President James Buchanan, seated at left, talks with Secretary of State William H. Seward; the Union armies' top generals, William T. Sherman, Philip H. Sheridan, and George B. McClellan, stand behind Seward. Gen. Winfield Scott—"Old Fuss and Feathers"—sits with Mrs. Lincoln, right; behind her, Gens. Alfred H. Terry and George G. Meade. Secretary of War Edwin M. Stanton peers above the President's shoulder, next to clean-shaven Vice President Andrew Johnson.

Mrs. John F. Kennedy, compiling the first White House guidebook, wanted to include the painting, then hanging in the Corcoran Gallery of Art in Washington. Its owner, Winslow Carlton of New York City, asked NATIONAL GEOGRAPHIC's Assistant Illustrations Editor Robert L. Breeden if he thought Mrs. Kennedy would like the painting for the White House. Assured that she would, Mr. Carlton donated the work of art; it now hangs in the Treaty Room. "I think it is almost our most exciting contribution so far!" Mrs. Kennedy wrote Mr. Breeden.

leaders to confer with the Chief of State and enjoy his and his First Lady's hospitality.

On days when the Presidential family was away and the tourists had departed, I have walked the building's quiet corridors and fancied I could hear bygone waltzes and polkas, echoes of political arguments, and hushed voices at state funerals when a country and a family mourned together.

No other state residence in the world has known so many personal and national milestones, or so many peaceable changes of master, in so short a space of time.* None has so directly reflected the domestic attitudes—even household styles—of its people. For not only have Americans repeatedly raised a new leader to this peak of power and prestige in an unbroken chain of elections since the Republic's founding, they have put into the Nation's "First Home" a man and his family who, by democratic extension, represent every home and family.

Every event in the First Family's life becomes an occasion of national interest. Such an event was the wedding on August 6, 1966,

*A memorable series of five articles, "Profiles of the Presidents," by Harvard University historian Frank Freidel, appeared in NATIONAL GEOGRAPHIC between November, 1964, and January, 1966. Now in book form, they comprise the first of the Society's new Special Publications, available at $4.25 a copy, postpaid.

EDWARD CLARK

Goodbye and good wishes. President and Mrs. Dwight D. Eisenhower bid farewell to the White House staff.

Mrs. Grover Cleveland, on parting, said, "Take good care of all the furniture. . . . We are coming back." And they did, four years later. When the Clevelands left for good, Frances "wept as if her heart would break," the Chief Usher observed. She cried not for the Presidency, but for the home where she had come "practically a girl, and was now leaving a mature woman."

EDWARD CLARK, DAYBOOKS (BELOW); BY JIM BRITTELL ©

Peaceful transition: Republican Eisenhower talks with his Democratic successor, John F. Kennedy, on Inauguration Day. Shortly, the new Chief Executive spoke to the Nation: "We observe today not a victory of party, but a celebration of freedom—symbolizing an end, as well as a beginning—signifying renewal, as well as change."

At his Inaugural parade, Kennedy—youngest elected President—reviews one of the Nation's oldest militia units, the Connecticut Governor's Foot Guard.

PENNSYLVANIA RAILROAD, COURTESY SMITHSONIAN INSTITUTION

"**President's Palace,**" as citizens called it, rises under the eye of George Washington, left, and architect James Hoban in this painting by N. C. Wyeth. Difficulty in obtaining money for Federal buildings slowed construction of the home. A project to raise funds by selling off Government property for building lots in the new city proved unsuccessful, and Washington proposed limiting the size of the mansion. Nearly eight years in building, the White House was still unfinished when its first resident, John Adams, moved in during the fall of 1800—only four months before his term ended.

Last hours of office saw John Adams hard at work signing official commissions. Uncomfortable in the mansion, Mrs. Adams complained of no bells to summon servants, not enough wood for fires to fight the dampness that provoked "daily agues," and "not a single apartment finished." Yet she gave an elegant public reception on New Year's Day, 1801, and left convinced that "... this House is built for ages to come."

of Luci Johnson to Patrick Nugent of Waukegan, Illinois, in the National Shrine of the Immaculate Conception in Washington.

"Luci has firm ideas," Mrs. Johnson had said to me earlier. "She is inviting people who've been close to her all her life, her teachers, schoolmates, and friends from 18 to 80. We want it as personal and sentimental as possible for her and the family."

And so it managed to be, though the guest list came to 700, including friends, relatives, and much of Washington officialdom.

The pretty young bridesmaids, in petal-pink dresses, stood like tall, slim flowers during the solemn Nuptial Mass, the first Roman Catholic wedding for a President's daughter.

In a cloud of white, the black-haired, blue-eyed bride suddenly stopped on her way back up the aisle with her new husband. Swooping down at one of the pews, she swiftly kissed her father's former Senate colleague, Senator Everett M. Dirksen of Illinois, who had refused to be daunted by a fractured hip and had stumped up the church steps on crutches.

The friendly informality carried over to the receiving line in the Blue Room at the White House reception. There the wedding party, headed by the President, greeted friends and officials with an enthusiasm seldom seen in that formal chamber. The Johnson family cook, Zephyr Wright, warmly embraced the bride, and the bridegroom embraced the cook.

Such details were observed by millions, for no President's daughter can escape history on her wedding day, especially in the electronic age of instant communication. Half a dozen still cameras discreetly hidden in the church recorded the ceremony. On the south lawn, and for a brief time in the state rooms of the White House, batteries of television and other cameras pictured the reception.

15 Official White House Weddings

Luci Johnson's wedding dress will go into history alongside the elaborately ruffled, hoop-skirted, and bustle-draped gowns worn by other Presidents' daughters whose weddings enliven annals of the White House. In youth and charm she will stand beside teen-aged Maria Monroe, Elizabeth Tyler, and Nellie Grant, whose marriages there in 1820, 1842, and 1874 made national news in their day.

Her reception will be compared with those held in the White House by other fathers of the bride, such as Theodore Roosevelt in 1906, when his dashing Alice married Congressman Nicholas Longworth of Ohio, later Speaker of the House (page 637). Woodrow Wilson gave away two daughters within six months. In 1913 Jessie Wilson married a young law professor, Francis B. Sayre; in 1914 Eleanor became the wife of Secretary of the Treasury William G. McAdoo.

So far, the White House has seen 15 official

PAINTING BY NATIONAL GEOGRAPHIC ARTIST LISA BIGANZOLI © N. G. S.

weddings, including two for Presidential friends. Nobody knows how many unofficial weddings there may have been in the days when the public could wander in at will. More than one couple boasted of having brought a preacher and Bible for a brief ceremony.

Appropriately, it was that famous hostess Dolley Madison, wife of President James Madison, who launched the first White House marriage here, in 1812. Her widowed sister, Lucy Payne Washington, was the bride, and the "estimable & amiable" Supreme Court Justice Thomas Todd was the bridegroom.

The mansion has seen only one wedding of a President's son. In 1828 young John Adams, son of John Quincy Adams and grandson of the first President to live in the White House, took as his bride his pretty cousin Mary Catherine Hellen. It was a gala event for the staid Adams household. Even the President put aside the problems of a bitter campaign year to dance the Virginia reel.

Three Presidents were married while in office. Two of these, widowers John Tyler and Woodrow Wilson, whose first wives both had died during their terms of office, arranged simple second ceremonies elsewhere. Bachelor Grover Cleveland thus became, on June 2, 1886, the only President to be wed against a glamorous White House backdrop.

Press Invades President's Privacy

"I want my marriage to be a quiet one," Cleveland had confided to his sister Mary, "and am determined that the American Sovereigns [the public] shall not interfere with a thing so purely personal to me."

The American Sovereigns, however, felt otherwise. When the news leaked out that the 49-year-old President was engaged to beautiful 21-year-old Frances Folsom, the country seethed with congratulations and criticism. Newspapers published reams on the couple's activities. On the slightest provocation, orchestras struck up wedding marches and an air from Gilbert and Sullivan's *The Mikado*, "He's Going to Marry Yum-Yum."

On the appointed evening, the ceremony went off with decorum. Guests included only a few close friends, relatives, and officials, each of whom had received a hand-written invitation from the President (page 635).

But the setting turned out to be as elaborate as a Victorian valentine. All four state reception rooms and the dining hall were filled with plants and flowers. Blossoms wreathed marble pillars, mirrors, and fireplaces. White satin boxes held "dream cake."

The British are coming! Though enemy cannon boom nearby during the War of 1812, indomitable Dolley Madison refuses to leave the White House without ensuring the safety of the Gilbert Stuart painting of George Washington (page 611). Dolley played hostess for two Presidents: James Madison and his predecessor, widower Thomas Jefferson. Even after her husband's death, Dolley reigned as queen of Washington society. Her wit and warmth charmed 11 Presidents, from Washington to Polk.

"Destructive majesty of the flames," a British officer wrote of the blazing Executive Mansion. Redcoats put it to the torch on the night of August 24, 1814—but not before they had helped themselves to food and wine left on the dining table during the hasty retreat of the household staff. Only a violent summer storm saved the White House from complete destruction. Starting with a blackened shell, architect James Hoban oversaw a three-year reconstruction.

The whole city joined in the celebration, church bells ringing, steam whistles blowing, and guns booming a salute. Then the Clevelands changed into travel clothes, set out for a honeymoon at Deer Park, Maryland—and their worst public ordeal began.

Reporters and photographers trailed them to the resort, where newsmen trained spyglasses on the cottage door. When summer vacationists multiplied, the President and his bride found they were "needed" back at the White House.

"Oh, those ghouls of the press!" Cleveland later exploded during an otherwise sedate speech at Harvard University.

Americans have always shown an intense proprietary interest in the man to whom they can offer no higher honor, greater power, or tougher job. In turn, the President is always conscious of his responsibility to, and his dependence upon, all the people.

"No man is fit to hold the position of President of the United States," said Theodore

ENGRAVING FROM "OUR COUNTRY" BY BENSON J. LOSSING (OPPOSITE ABOVE); PAINTING BY LESLIE SAALBURG, COURTESY THIS WEEK MAGAZINE

Roosevelt, "unless . . . he feels that he represents no party but the people as a whole."

Popular Presidents like Thomas Jefferson, Andrew Jackson, and both Roosevelts drew strength from this identity with the people in carrying out new and far-reaching policies. In return Americans look to the White House for a sense of direction, such as flowed from the liberal ideas of Jefferson, the lusty democracy of Jackson and T.R., and the contagious confidence of Franklin D. Roosevelt fighting the depression in fireside broadcasts.

It is no wonder that F.D.R. once said, "I never forget that I live in a house owned by the American people," or that two million tourists a year now visit the President's home. Rain or shine, Tuesday through Saturday,

they stand in long lines outside the high iron fence, just to walk through the building.

The White House tour offers a journey into history. Early American furnishings recall the house when it was young. Its walls display a remarkable collection of portraits of Presidents and their wives. Depicted with 19th-century sideburns or corkscrew curls, in knee breeches or crinoline gowns, on up to modern dress, these are the men and women who lived under this roof. Each bore the mark of the experience. Each left an enduring record in stone and story.

George Washington, though he never slept here, chose the building's site and approved its graceful Georgian design (page 600). Thus he, too, left something of himself and his time —giving the future "President's House," as city planner Pierre Charles L'Enfant envisioned, "the sumptuousness of a palace . . . and the agreeableness of [a] country seat."

First Tenants of a Drafty "Castle"

The buff sandstone structure, later called the White House, was still damp and unfinished when John and Abigail Adams moved into it in the raw November of 1800.

With only four months left in Adams's one term, their stay was unhappy and uncomfortable. Unhappy, because the conservative Federalist President had been defeated by Jefferson's party, whose "radical" views he feared. Uncomfortable, as Mrs. Adams's letters made clear, because of missing household

PHOTOGRAPHER GEORGE F. MOBLEY © N.G.S./UNITED PRESS INTERNATIONAL (PRINTS)

British invade again—peacefully. To the skirl of bagpipes and beat of drums, men of the Black Watch, Royal Highland Regiment, parade across the south lawn before President and Mrs. John F. Kennedy (opposite, above) and 1,700 underprivileged Washington youngsters.

Other outdoor ceremonies enlivened the education of 5-year-old Caroline Kennedy and her classmates who attended school in the solarium on the third floor. Faces pressed to a window (above), they watch the President pin the National Aeronautics and Space Administration's Distinguished Service Medal on Astronaut L. Gordon Cooper.

necessities, such as lamps, bells, and firewood to heat her drafty "castle."

Since she had "not the least fence, yard, or other convenience, without," Abigail hung the Presidential laundry to dry in what is now the formal gold-draped East Room.

Yet the Adamses gave the mansion a proud start. Mrs. Adams dispensed hospitality in the village Capital with as much dignity as that of Europe's royal courts. The President performed his duties with typical integrity. Carved today on the mantel of the State Dining Room are these lines from a letter he wrote to his wife after his first night in the house: "I pray Heaven to bestow the best of Blessings on this House and all that shall hereafter inhabit it. May none but honest and wise men ever rule under this roof."

Mansion Grows Under a Lonely President

In 1801 President Jefferson came to the White House, a lonely widower still grieving for the loss of his wife Martha 19 years before.

Occasionally his married daughters, Martha and Maria, would bring their families for a visit, filling the house with noise and cheer. In 1806 Martha Jefferson Randolph gave birth here to a boy, her eighth child and the first baby born in the Executive Mansion.

But mostly the President remained alone, busy with the big problems of a small new Nation, reading his books, playing his violin, and serving little dinners in the room later used as the Green Parlor. To avoid eavesdropping waiters, he devised revolving trays built into the walls to move courses in and out.

Jefferson also found time to add other conveniences to the house described in a daily newspaper of the time as "big enough for two emperors, one pope, and the grand lama." Gradually, low wings sprouted, as at his own Virginia home, Monticello.* Their arcaded fronts hid servants' quarters, stable, wine cellar, and ice, meat, and chicken houses.

For eight years the White House had no First Lady. Then President Madison's wife arrived with a reputation for glamor and energy. As the wife of Jefferson's Secretary of State, Dolley Madison had often helped the President as hostess. Once when she was away, Jefferson and his private secretary agreed they felt like "two mice in a church."

Statuesque Dolley, whose bright turbans added to her height, adored her small, studious husband. He thought her perfect. At

(Continued on page 611)

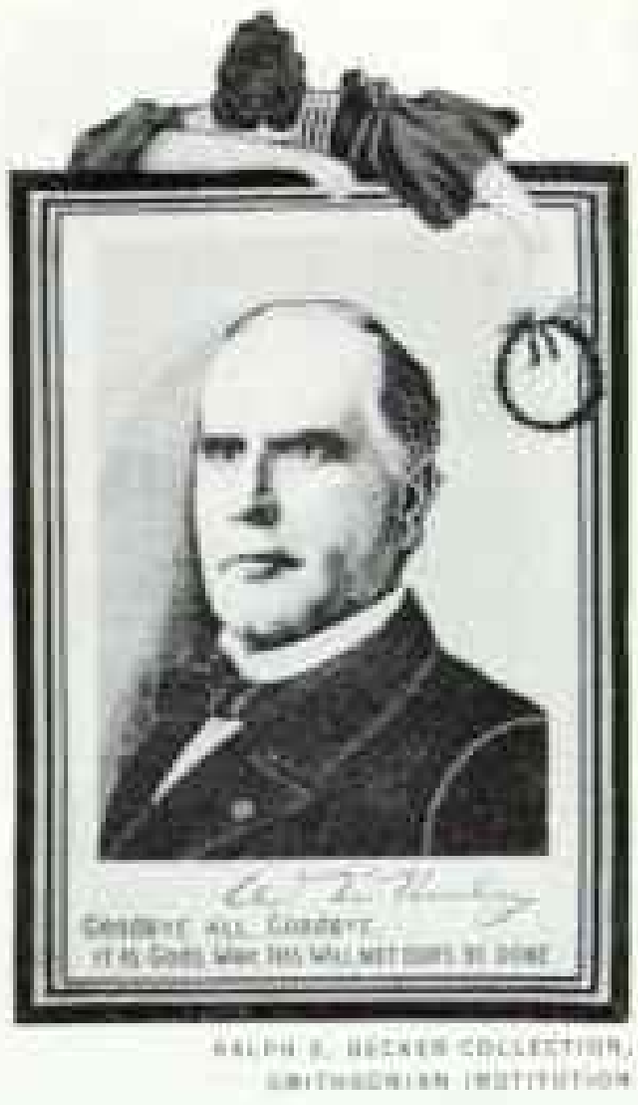
*See "Mr. Jefferson's Monticello," by Joseph Judge, NATIONAL GEOGRAPHIC, September, 1966.

Dark hours of grief

EIGHT PRESIDENTS have died in office, four by the hands of assassins. Cut down at the moment of Civil War victory, Abraham Lincoln slumped in his box at Ford's Theatre, mortally wounded by John Wilkes Booth. Mourners displayed this eight-inch ribbon in their windows. On June 30, 1881, President James A. Garfield listened to Lincoln's son Robert, Secretary of War, tell of his father's assassination. Two days later Garfield himself fell from a bullet fired by Charles Guiteau, a deranged office-seeker. For weeks, doctors, wife, and nurse (with fan) kept vigil by his White House bedside. Hoping to speed recovery, they moved him to Elberon, New Jersey, where he died.

Once again, in 1901, the country lost a Chief Executive to gunfire: William McKinley, shot by anarchist Leon Czolgosz. The Nation, personified as a woman, weeps on McKinley's mourning ribbon. "The rainbow of Hope is out of the sky . . ." wrote sorrowing Indian chiefs. "Tears wet the ground of the tepees. . . . The Great Chief of the Nation is dead. Farewell! Farewell! Farewell!"

The whole world felt the shock when John F. Kennedy died by an assassin's bullets on November 22, 1963. Flying to Washington, national leaders marched in the funeral procession, paying



RALPH E. BECKER COLLECTION, SMITHSONIAN INSTITUTION

honor to both man and country. From left: President Heinrich Lübke, West Germany; President Charles de Gaulle, France; Queen Frederika, Greece; Chancellor Ludwig Erhard, Germany; King Baudouin, Belgium; Emperor Haile Selassie I, Ethiopia; President Diosdado Macapagal, Philippines; President Chung Hee Park, South Korea.

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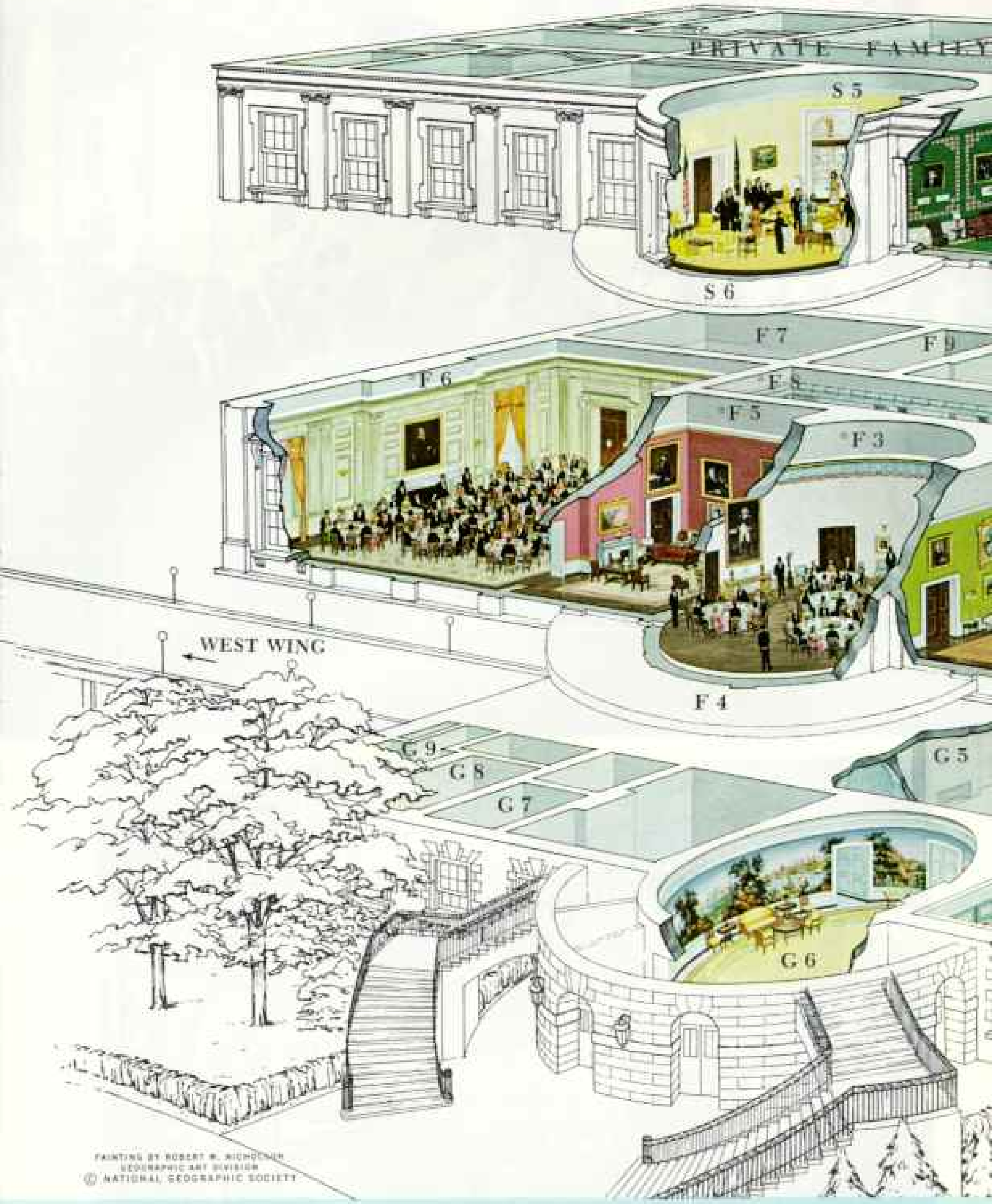
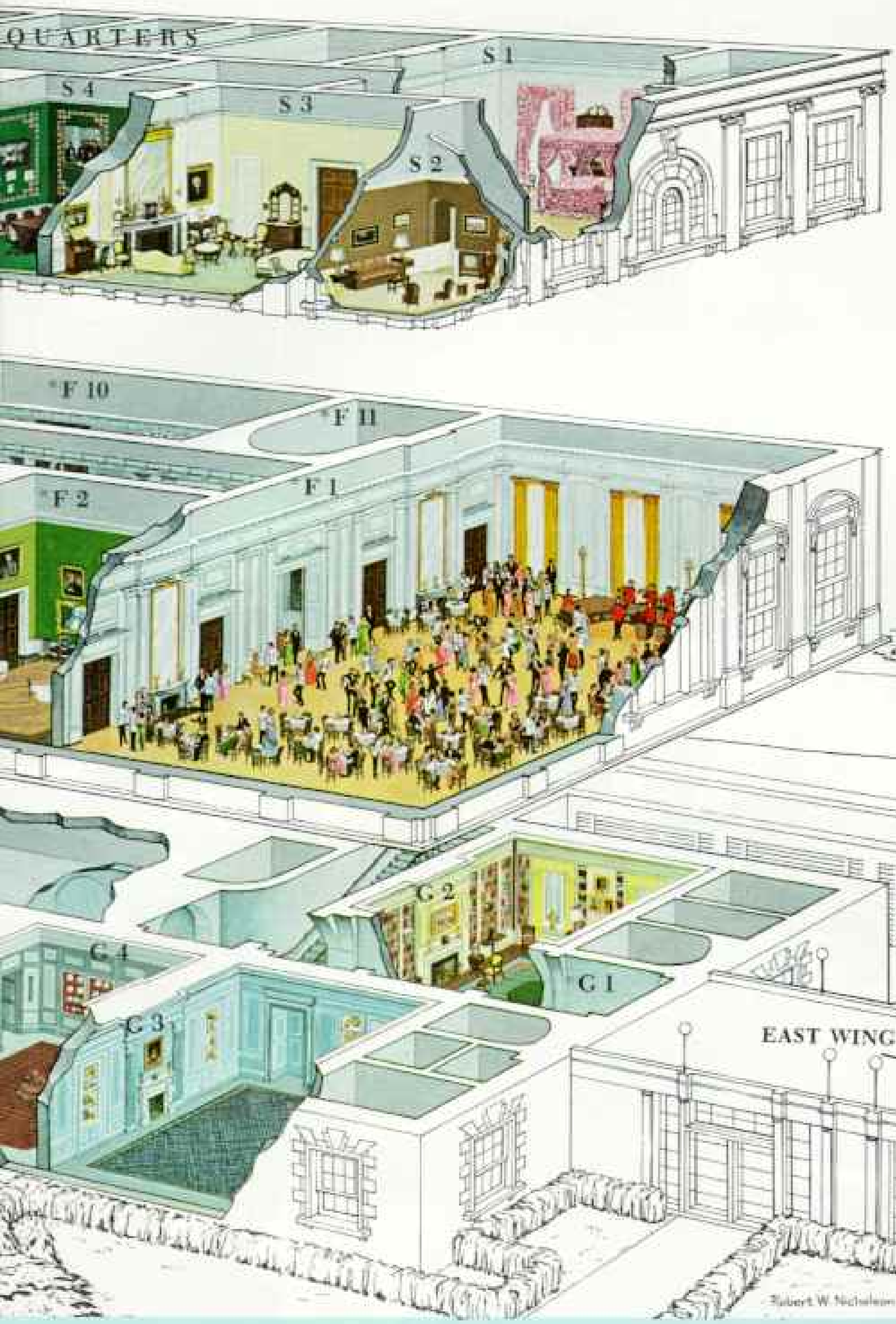


A CUTAWAY VIEW *of the White House, with the South Portico in the foreground.* *An *asterisk marks rooms open to the public.*

Ground Floor

*G 1 Vaulted-arch Corridor
G 2 Library
G 3 Vermeil Room
G 4 China Room
G 5 Curator's Office
G 6 Diplomatic Reception Room
G 7 Physician
G 8 Clinic
G 9 Housekeeper



First Floor

*F 1 East Room
*F 2 Green Room
*F 3 Blue Room
F 4 South Portico
*F 5 Red Room
*F 6 State Dining Room
F 7 Family Dining Room
*F 8 Cross Hall
F 9 Ushers' Office
*F 10 Entrance Hall
*F 11 Main Stairway

Second Floor

S 1 Queens' Bedroom
S 2 Lincoln Sitting Room
S 3 Lincoln Bedroom
S 4 Treaty Room
S 5 Yellow Oval Room
S 6 Truman Balcony

gay parties, they served in lavish fashion.

Then came the War of 1812. In a sultry mid-August two years later, British ships landed invasion troops in nearby Maryland. President Madison, with most of his Cabinet, galloped off to join the militia at Bladensburg, facing enemy fire on August 24.

Mrs. Madison remained behind to pack up state papers. From the White House roof she watched for her husband's return, occasionally adding to a letter to her sister.

"I am still here within sound of the cannon!" she wrote at three o'clock. "Two messengers, covered with dust, come to bid me fly, but I wait for him."

British Leave a Blackened Ruin

Fleeing friends finally persuaded Mrs. Madison to leave. But first she rescued the Gilbert Stuart portrait of George Washington you see today in the East Room.

How the painting was removed has long been argued. Dolley herself reported that it would have had to be unscrewed from the wall, a process "too tedious for these perilous moments; I have ordered the frame to be broken, and the canvas taken out; it is done."

The Madisons never again slept in the mansion. That night the British occupied Washington and set fire to this and other Government buildings (pages 602-3). When they left, the house was a blackened shell.

Reconstruction took three years, while the Madisons lived first in one, then another temporary Presidential home.

Even after James Monroe succeeded to the Presidency in 1817, months passed before he and his family moved into the house, now painted gleaming white for the first time.

The public had to wait until the traditional New Year's reception to inspect the restoration. Then all agreed that it was worth the delay, and that the Monroes' fine furniture and bric-a-brac, custom made in France, did credit to the "Palace," as the French artisans had called it.

Still to come were the originally planned North and South Porticoes. President Monroe completed the colonnaded semicircular south entrance in 1824—thirty-two years after the building's cornerstone was laid.

Looking back, one can see in the piecemeal growth of the White House a symbol of the Nation's expansion. In fact, the Presidents themselves reflected it.

James Monroe was the last of the Europe-facing members of the "Virginia Dynasty," founded by George Washington. John Quincy Adams of Massachusetts, who followed, was the last link with the old Federalist party.

Like his father, quiet, serious John Quincy found his single term a bitter experience, as a restless, exuberant people turned to more dashing figures offering the promise of the boundless West. Yet, again like his father, the younger Adams, with his wife Louisa, made the best of things.

The sixth President set up a strict routine. He rose at dawn, took a long walk or a swim in the Potomac, then returned to read his Bible before the day's work began.

He relaxed in his garden, whose progress he faithfully recorded in his diary. Sometimes he played billiards in the evening—a diversion for which critics excoriated him as a corrupter of youth.

Mrs. Adams played the harp and wrote French verse. She made a gracious hostess, and both the President and his wife took pleasure in an unusual hobby—raising silkworms.

Celebration Nearly Wrecks the House

But the Adamses' tenure merely marked an interlude. In the election of 1828, the triumphant West put its own man, Andrew Jackson, in the Washington saddle.

Jackson's followers, pouring into town for the Inaugural of the "People's President," took over with frontier gusto. After the Capitol ceremony, the crowd surged on to the White House, where men in muddy boots stood on silk sofas and broke china and glasses to get at food and drink.

"Ladies fainted, men were seen with bloody noses," wrote one eyewitness. The President, driven against the wall, escaped by a back

International teen-agers swing in the East Room. Youngsters from Pakistan to Peru—250 sons and daughters of Washington's Diplomatic Corps—throw themselves into the latest American dances at a dinner party on June 18, 1965, with Luci Johnson as hostess. Mrs. John Quincy Adams introduced dancing to the East Room in 1828. Julia Gardiner Tyler shocked Washington in 1844 when she dared to glide to the "immoral" waltz and to bounce to a new craze, the polka, called "half an Indian dance and half waltz."

PHOTOGRAPH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JOSEPH J. SCHERSCHEL © N.G.S.

WASHINGTONIANA DIVISION, DISTRICT OF COLUMBIA PUBLIC LIBRARY

Upstairs hall doubles as a living room in a mansion that is also a museum and often crowded with sightseers. In the early 1890's Mrs. Benjamin Harrison decorated the room with velvet, fringe, and ferns (above). Unsuccessful in her campaign for a new Presidential home, she refurbished the Executive Mansion from attic to basement, adding bathrooms, fresh paint, and electric light, then a novelty in Washington. Stair and railing disappeared during a later renovation. Here in the same room, now bright with chintz and brocade, Mrs. Johnson serves tea to wives of newly arrived ambassadors.

door. He spent the night at Gadsby's hotel, labeled the "Wigwam" by the irreverent.

Conflict roiled "Old Hickory's" eight years. The first President born in a log cabin, he fought the moneyed interests and States Righters. He also carried to a draw a "Petticoat War" to force the wives of Government officials to receive the gossip-tarnished daughter of a local innkeeper, Peggy O'Neale Eaton, wife of his Secretary of War.

The President's defense of pretty Peggy had its roots in his own grief and fury over the death, soon after his election, of his much loved wife Rachel. He blamed her fatal heart attack on campaign foes who had revived the scandal of her uncertain divorce at the time of their marriage 38 years before. "May God Almighty forgive her murderers as I know she forgave them," he said. "I never can."

At the White House Jackson surrounded himself with visiting nieces and nephews. Rachel's nephew, Andrew Jackson Donelson, stayed on as the President's secretary. His wife Emily acted as official hostess, and three of their children were born here.

Uncle Andrew presided over the whole menage, one guest said, with "the dignity of the patriarch, monarch, and Indian chief." Jackson refurbished the White House handsomely with funds voted by a friendly Congress. In Rachel's memory he planted magnolias still standing on the south lawn. And he built the massive 12-column North Portico, since used as the mansion's ceremonial entrance.

White House Is Never Finished

Thus finally, in 1830, the President's home stood essentially as you see it today. The portraits of the first seven men who made it so hang today in the oval Blue Room. But the White House is never really finished, any

EXTACHROME BY JOSEPH J. SCHERSCHEL © NATIONAL GEOGRAPHIC SOCIETY

more than is the Nation. Other Presidents and other times added to both.

The thin, intense face of James K. Polk, looking out from the main stairwell, reminds history students that it was this Executive who pushed the U. S. flag to the Pacific.

"The merest tangible fraction of a President," someone called small, hard-working Polk, who begrudged every moment away from his desk. Here he pored over papers on the Mexican War, California statehood, and the partition of the Northwest with Britain.

Both the President and his stately, strait-laced wife Sarah, who helped him as private secretary, considered all diversions frivolous. They banned card-playing, dancing, wine—even light refreshments at receptions.

On leaving, however, they could relish the fulfillment of Polk's campaign promises—to serve one term, and in it to see the country stretch from ocean to ocean.

It remained for Abraham Lincoln, coming on 12 years later, to keep the great, ambitious whole from flying apart.

Most of our memories of the Civil War President picture him as bowed under its burdens, or grieving over the death of his boy Willie, or struck down at the time of victory.

"I think of Lincoln," Theodore Roosevelt would write, "shambling, homely, with his strong, sad, deeply-furrowed face. . . . I see him in the different rooms and in the halls. . . ."

But there was also Lincoln the tender husband, proud of his wife's quick wit, excusing her temper and extravagance, protecting her from malicious gossip that she was a Southern sympathizer, or even a spy.

There was Lincoln the indulgent father, enjoying the antics of mischievous Tad, and adoring cheerful, affectionate little Willie.

And still another Lincoln, of the homespun jest. He liked to tell of two Quakeresses

discussing the war. One said that Jeff Davis would win because he "is a praying man."

"And so is Abraham a praying man."

"Yes, but the Lord will think Abraham is joking."

The Civil War brought hordes of people to see President Lincoln: Union generals, contractors for war supplies, soldiers' wives and mothers—and always office seekers. This "throng continued and increased . . . intercepting the President on his way to meals," wrote a cousin of Mrs. Lincoln.

All through the years, White House families have shared their home with the public in varying degrees. Before 1902, when Theodore Roosevelt built the West Wing for the executive offices, the President's living and working quarters occupied opposite sides of the second floor. His family had to either use the back way or join the main stairway's procession of Cabinet officers, tradesmen, clerks, job hunters, and anyone else who wanted to take his problem to the summit.

President Tyler's doors were so open, reported touring British novelist Charles Dickens in 1842, that no one answered the bell. He therefore "walked without further ceremony through the rooms . . . as divers other gentlemen (mostly with their hats on . . .) were doing very leisurely."

Post-Civil War Presidents faced changing problems in their second-floor offices. Andrew Johnson met the challenge of his impeachment trial. Ulysses S. Grant struggled courageously

Offstage in his bedroom, Lyndon Johnson eats a quick breakfast before his Inauguration, January 20, 1965. A dramatic and hectic day begins for President and Mrs. Johnson: the solemn swearing-in at the Capitol, the Inaugural speech, reviewing the three-hour-long parade in front of the White House, and joining thousands of well-wishers at five evening balls.

but helplessly against financial panic and corrupt speculators. William McKinley sadly recommended war with Spain, then had the pleasure of witnessing the peace protocol signed here in his Cabinet Room.

The Clevelands: "We Are Coming Back"

As a growing Nation required a larger executive staff, First Families made the best of cramped space and lack of privacy. Some wives, like semi-invalid Ida McKinley, spent much of their time behind closed doors.

In contrast, young and active Frances Cleveland enjoyed being mistress of the house so much that she hated to leave at the end of her husband's first term in 1889.

"Take good care of all the furniture and ornaments . . ." she said to a houseman. "We are coming back."

The prophecy came true four years later. Six months after that, the Cleveland's second daughter, Esther, was born in an upstairs bedroom—the only President's child ever born in the White House.

Most crowded, perhaps, was the four-generation family of President and Mrs. Benjamin Harrison. It included their son and his wife, their daughter and her husband, three grandchildren, and Mrs. Harrison's father.

"The whole family's been a show since Mr. Harrison was elected," complained his wife. "If there's any privacy to be found in the White House, I propose to find it and preserve it." It turned out that Mrs. Harrison made the effort, not for herself, but, as she put it in an interview, "to see the family of the [future] President provided for properly. . . ."

She called in architects, who drew up plans for three possible solutions: a separate residence, with the original used for work and entertaining; an elaborate extension on four sides, enclosing a court and fountain; or an addition of wings for offices and guest suites.

Congress rejected Mrs. Harrison's projects. It did vote her a $35,000 consolation prize, however, with which to fix up the old place. And the furor raised played its part in later decisions to build the attractive West and East Wings, now so essential.

With the physical separation of home and office, 20th-century Presidents at last had a place all their own. No family needed it more than did that of Theodore and Edith Carow Roosevelt—the first to enjoy it. The six Roosevelt children practiced their father's motto, "the Strenuous Life," as exuberantly as did their father—a dynamo in everything from sports to politics.

Roosevelt's eldest daughter Alice—by his first wife, who had died after childbirth—was 17 when the family moved in. She became the liveliest debutante and most headlined bride of her generation.

"I can do one of two things," the President said when newspapers broadcast the antics

War weighed heavily on President McKinley, here dictating to secretary J. A. Porter. His wife, though an invalid, gave him strength, believing him "far more than a perfect man. He is divine." But he wept at the prospect of armed conflict with Spain.

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Strain lines the face of Franklin D. Roosevelt as he signs the Declaration of War after Japan attacked Pearl Harbor, December 7, 1941. The President wears a mourning band for his mother, who had died three months earlier.

President and successor: Harry S Truman presents General Eisenhower with his fifth Distinguished Service Medal before his Army retirement in 1952.

UNITED STATES ARMY

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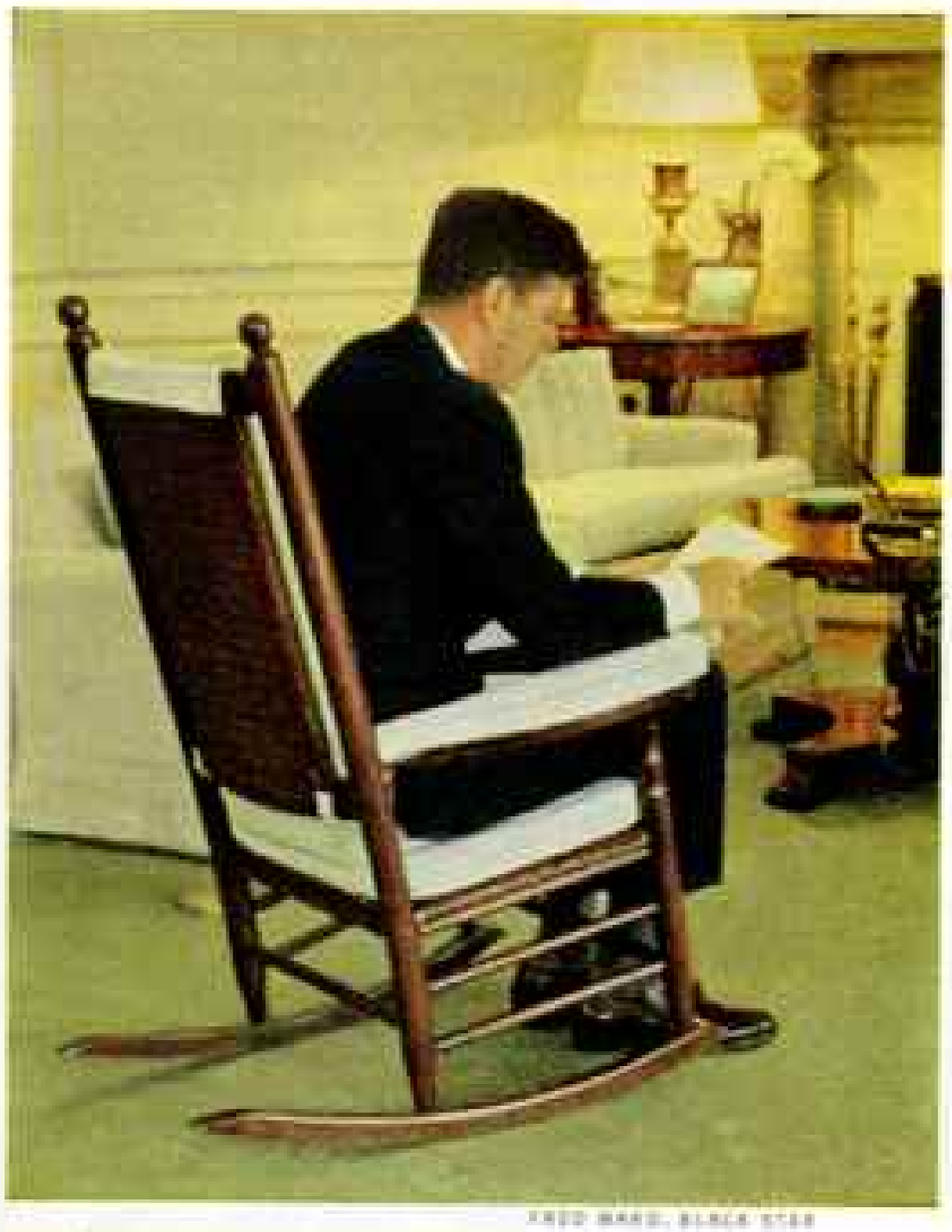

FRED WARD, BLACK STAR

Back injured when his PT boat was cut in two by a Japanese destroyer in 1943, President Kennedy favored a padded rocking chair. Here he studies a report in his office.

of "Princess Alice." "I can be President of the United States, or I can control Alice."

Meantime the younger children, three to fourteen years old, cheerfully made the house their playground. On stilts, bicycles, and roller skates, they raced one another across the waxed floors. Big kitchen trays made fine sleds for tobogganing down the stairs. Speeding in his toy wagon, Quentin, the youngest, rammed the full-length portrait of Mrs. Rutherford B. Hayes, leaving a hole.

House Has Held Many a Menagerie

The White House has always been famous for children and pets. Jefferson trained a mockingbird to peck fruit from his lips and to hop up the stairs after him. Lincoln bought his youngest boy Tad a pair of goats at $5 each. He got his money's worth in amusement when the youngster hitched the animals to a kitchen chair and drove his unlikely rig through the East Room, to the consternation of a group of visiting ladies from Boston.

Of all the menageries that passed through the mansion, however, the collection of the first Roosevelts was the most exciting. Underfoot, inside and out, were raccoons, rabbits, guinea pigs, rats, turtles, snakes, parrots, pigs, dogs, cats, a badger, a bear, and a calico pony named Algonquin. When Archie had the measles, his brothers escorted Algonquin upstairs in the new elevator to cheer the patient.

Edith Roosevelt presided over her tumultuous household with characteristic calm, grace, and efficiency. Having disposed of the former office clutter, and replaced the McKinleys' heavy Victorian furnishings with lighter, brighter effects, she went on to manage her social duties as easily as she handled her rambunctious family.

In writing of the Roosevelt regime, the President's aide, Archie Butt, summed up Mrs. Roosevelt's genius in one phrase—"seven years . . . without ever having made a mistake."

From the ebullient Roosevelts with their New York City background to the energetic Johnsons of the open Texas spaces, each new family has colored the White House with its own personality, tastes, and times.

The much-traveled President and Mrs. William Howard Taft introduced an Oriental look with possessions brought from Malacañang Palace in Manila, where Taft had served as the first American Civil Governor of the Philippines. Entertaining took on a tropical flavor, with tables and chairs set out on the terraces and Chinese lanterns bobbing in summer breezes.

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Circus giant George Augur holds midgets Harry and Gracie Doll.

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Chiefs of the Sioux Nation flank President Calvin Coolidge.

Democracy's open house

MIDGETS AND MONARCHS, performers and pilots, scientists and suffragettes, Indians and evangelists: they all come to meet the President of the United States. Hawaii's King Kalakaua visited Ulysses S. Grant, first to receive a ruling monarch. Suffragettes camped on Woodrow Wilson's doorstep for years, until women received the vote in 1920. A giant from Ringling Bros. and Barnum & Bailey Circus brought two pint-size friends to see Warren G. Harding, who also greeted the co-discoverer of radium, Madame Curie, and the athletic evangelist Billy Sunday. Coolidge's poker face rivaled those of Sioux chiefs. Hoover recognized woman's role in the Air Age when he presented the National Geographic Society's Gold Medal to Amelia Earhart. The Franklin Roosevelts entertained the first British rulers to visit the former colonies and, like Truman and Eisenhower, invited leaders from Europe and Asia. The Kennedys' great interest in the arts brought cellist Pablo Casals to the White House for the first time since 1904, when he had played for Teddy Roosevelt.

WIDE WORLD

Madame Curie walks with President Harding.

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Mrs. Kennedy and Pablo Casals

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Britain's Queen Elizabeth, wife of George VI, and Mrs. Eleanor Roosevelt

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King David Kalakaua of Hawaii

MANUSCRIPTS DIVISION, LIBRARY OF CONGRESS

Suffragettes with college banners agitate for the vote.

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Evangelist Billy Sunday

WIDE WORLD

President Eisenhower greets Jawaharlal Nehru, Prime Minister of India.

HARRIS & EWING

Britain's Winston Churchill

HARRIS & EWING

General de Gaulle with President Truman

ACME

Hoover and Amelia Earhart

Helen Taft was enchanted with the flowers from the mansion's greenhouses. Remembering the beauty of Manila's Luneta Park, she had the first cherry trees planted along the Potomac's Tidal Basin—thereby inspiring the gift of thousands more from Tokyo's mayor.

A cow called Pauline browsed placidly on the White House lawn. But it was the end of one era and the start of another. Pauline was the last cow kept here for milking, and the Tafts the first Presidential family to use an automobile.

Wilson Faces Tragedy and War

Woodrow Wilson transformed the house to fit the interests of the college professor he once had been. The first Mrs. Wilson, a born homemaker with a flair for gardening and art, planted roses on the grounds and turned the upstairs oval sitting room into a retreat for books, paintings, and music.

Before Ellen Wilson's fatal illness, the President spent idyllic evenings in this room with his wife and daughters, Margaret, Jessie, and Eleanor. Sometimes he read aloud to his admiring womenfolk, or joined the girls in singing at the old piano.

At such times Wilson the scholar showed a side that only intimates knew—a talent for mimicry, funny stories, and limericks. One of his favorites ended:

But my face—I don't mind it,
For I am behind it,
It's the people in front that I jar.

With his wife's death and war in Europe, gaiety disappeared from the White House. The President shook off the depression of his bereavement only when he met and married a vivacious widow, Edith Bolling Galt.

But life moved on in tragic sequence for the man who first "kept us out of war," then plunged into it to make "the world safe for democracy." He finally collapsed from a stroke in the midst of his gallant, futile campaign for the League of Nations.

Confined to the White House and often to bed, Wilson saw few outsiders before leaving forever the home where he had known so much joy and grief. In his last 17 months of

Diplomatic dialogue or friendly reminiscence—White House dining tables bear both. In the Family Dining Room (right), Mr. Johnson drops in on a dinner for close Texas friends invited for a week at the White House while sightseeing in Washington. His former secretary Mary Rather sits at right with her niece Nancy and the President's daughter Lynda.

At an official luncheon (below) in the President's Dining Room on the second floor, British Prime Minister Harold Wilson and U. S. Secretary of State Dean Rusk sit at the President's right, British Ambassador Sir Patrick Dean at his left. On the walls their countrymen are portrayed locked in battle during the American Revolution.

PHOTOGRAPHS BY NATIONAL GEOGRAPHIC PHOTOGRAPHERS JOSEPH J. SCHERSCHEL (ABOVE) AND JAMES P. BLAIR © N.G.S.

Glittering flowers bloom in the sky above the White House during a ten-minute round of fireworks for King Faisal of Saudi Arabia. The display followed a dinner for the monarch last June.

office, devoted Edith protected him from strain by screening callers and state papers.

Mrs. Wilson later said she had acted only as an intermediary for official business. Critics used stronger words; some called her "Mrs. President," as John Adams's opponents had dubbed his politically minded wife.

Gaiety Returns With Harding

Into the White House in 1921 moved genial Warren G. Harding of Ohio—onetime editor, publisher, lieutenant governor, and Senator. He called his wife Florence "the Duchess," a term that revealed something of the relation between the easygoing President and his strong-willed wife, who said proudly, "I have only one real hobby—my husband!"

What the country needed, candidate Harding had said, was "not heroics but healing; not nostrums but normalcy." The phrases seemed to apply also to the mansion's new life.

After the gloom of Wilson's last months, sunshine and pleasure reigned. The gates swung wide again to tourists, who sometimes found themselves welcomed, to their surprise, by the First Lady herself.

Mrs. Harding played her piano in the chintz-decorated upstairs living room. At concerts, the Marine Band echoed her favorite song, "The End of a Perfect Day."

The President practiced golf shots on the south lawn, teaching his pet Airedale, Laddie Boy, to race back with the balls.

The Hardings revived the usual official entertaining. They held many private parties, huge garden affairs, and special dinners for visiting foreign statesmen.

Then suddenly it was all over.

In July, 1923, amid rumors of trouble in Government departments, President and Mrs.

PHOTOGRAPHS BY JOSEPH J. SCHERSCHEL (ABOVE) AND JAMES P. BLAIR © NATIONAL GEOGRAPHIC SOCIETY

First White House Festival of the Arts in 1965 welcomed 400 artists, writers, composers, actors, musicians, and patrons; here they dine on the south lawn. Since Abigail Adams installed the first piano, the arts have been an integral part of White House life. Authors Washington Irving and Charles Dickens visited the mansion. Millard Fillmore entertained the Swedish Nightingale, Jenny Lind, and the Polish pianist Paderewski played for Woodrow Wilson.

Harding had traveled to Alaska to attend the opening of the Alaska Railroad. On the return trip the President suffered a heart attack, and died in San Francisco while Mrs. Harding was quietly reading to him in their hotel room. On August 7, in the abruptly stilled White House, the body of Warren Harding lay in state in the East Room.

Earlier, the President had said to a confidant, "I have no trouble with my enemies. . . . But my . . . friends . . . they're the ones that keep me walking the floors nights." Now he would never feel the scandals soon to erupt over the malfeasance of colleagues he had trusted too well.

Late that night, Mrs. Harding and a close friend went down the great marble stairway and into the dimly lighted East Room. Describing the experience long after, her friend told how the widow picked out "a small bouquet of country flowers, of daisies and nasturtiums" and put it on the casket. "No one can hurt you now, Warren," she heard Mrs. Harding say.

Puritan in the Roaring Twenties

Calvin Coolidge became the sixth Vice President to enter the White House by the death of a President.

The first four—John Tyler, Millard Fillmore, Andrew Johnson, and Chester Arthur—served only the unfinished terms of their predecessors. None gripped the country's imagination; none gained wide support.

Then Theodore Roosevelt and Coolidge broke the pattern (as would Harry Truman and Lyndon Johnson in the future).

Both T. R. and "Silent Cal" grew into legends. Yet no two men were ever less alike, or led more different lives in this house.

If Americans had admired Roosevelt's dash in holding Japanese and Chinese wrestling matches in the East Room, they enjoyed no less the dry humor of the rock-ribbed New Englander of many anecdotes. They liked, for instance, the story a guest told of the President pouring coffee and cream into his saucer at one of his early-morning breakfasts for Congressmen. As his guests stared, and some followed suit, Mr. Coolidge picked up the saucer and put it on the floor for his dog.

At the height of the Roaring Twenties, many felt more secure with a Chief Executive who believed in being early to bed, early to rise; who chose clothes for his wife, watched the bills, and kept an eye on the kitchen to make sure leftovers were used.

Laconic Coolidge could not be enticed into small talk, even at a state dinner for loquacious Queen Marie of Rumania, or one that honored shy Charles Lindbergh after his historic flight to Paris.

On such occasions, the President's wife, Grace Goodhue Coolidge, would fill the gap with warm, gracious chatter. Indeed, her sparkling enthusiasm for everything made her a perfect foil for a poker-faced spouse.

President Loses His Son

Tragedy struck the Coolidges, however, during the campaign summer of 1924. Their younger son, Calvin, Jr., died of blood poisoning caused by a toe blister rubbed while playing tennis on the south grounds.

"When he went," Mr. Coolidge wrote in his *Autobiography*, "the power and the glory of the Presidency went with him."

Taking over in the calm of lingering "Coolidge prosperity," Herbert Hoover and his wife Lou Henry began with verve.

Mrs. Hoover redecorated the family rooms and made a show place of one by adding copies of original Monroe furniture. She used the broad central second-floor corridor for extra living rooms, installing palms there and an aviary in which caged songbirds twittered.

Even greater globe-trotters in private life than the Tafts, the Hoovers filled their quarters with art objects and rare volumes on the Orient, geology, and sociology. Both spoke several languages, and at parties sometimes exchanged quiet remarks in Chinese.

President and Mrs. Hoover started their social life with an Inaugural luncheon for 1,800 people. They often invited several thousand to a reception, holding 14 such functions in one season. State dinners for official Washington multiplied. In fact, the Hoovers seldom ate without guests. Mrs. Hoover might preside at two afternoon teas, one for Congressional wives, another for Girl Scouts, an organization in which she had long been a leader.

Mr. Hoover held frequent breakfast conferences with department heads, who came to be called his "Medicine Ball Cabinet," because for a bit of exercise they first tossed the big ball back and forth on the lawn.

But Hoover entertainment (for most of which the wealthy couple paid personally) did not mean lack of compassion when hard times followed the 1929 stock-market crash.

Depression Brings the New Deal

Behind the Quaker President stretched a long record of service to his country in welfare work at home and abroad. As the depression deepened, he labored long hours in his private office—the room where Lincoln had signed the Emancipation Proclamation.

"The President hardly took enough time to eat," a member of the domestic staff wrote in her memoirs. "All the servants . . . made bets on how long it would take. . . . They would come back saying 'Nine minutes, fifteen seconds,' or whatever. . . ."

In his 1932 campaign, Mr. Hoover explained his plan to meet the depression by aid to states, businesses, and farm groups. He did not believe that any government could fulfill what he called "frivolous promises" to give jobs directly to ten million unemployed.

Most Americans disagreed, said the election returns. For the next 12 years and 40 days, the White House under Franklin Roosevelt would become the center of the New

Lining up for royalty, guests meet Britain's Princess Margaret and Lord Snowdon in the East Room. President Johnson presents Assistant Secretary of State John Leddy to the Princess. When Margaret's great-grandfather, Edward VII, visited the White House in 1860 while Prince of Wales, "the whole affair was a botch," one paper said. "A motley crowd. . . hurried pell-mell, in a disorderly and mobbish manner" to meet the Prince.

President and Princess lead the dancing. The Earl of Snowdon with Mrs. Johnson and Ambassador Sir Patrick Dean and Lady Dean join in. The evening climaxed the Johnsons' 31st wedding anniversary, November 17, 1965, prompting the President to tell Lord Snowdon: "Two things are necessary to keep one's wife happy. First, let her think she is having her way. And second, let her have it."

Deal, and the home of a First Lady who made history around the world.

The four terms of F.D.R. turned out to be only one of the ways in which the Roosevelt clan blithely broke precedents.

Never before had a President arrived in a wheel chair (the result of polio 12 years earlier), and never before or since has anybody led such far-reaching battles from one.

The President's equally vigorous wife, Anna Eleanor, was a Roosevelt by birth and a niece of Theodore Roosevelt, who had given her away at her wedding. She shocked the servants by helping butlers serve at the Inaugural buffet lunch. She startled them again by running the elevator and carrying books during the move into the White House.

Within days Eleanor Roosevelt had reorganized the house and arranged the family furniture with a casual look of country-estate

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

"**You have claimed our heart,**" said Lyndon Johnson to Princess Margaret in his after-dinner remarks. Johnson state dinners feature four courses, in contrast to the 29-course, three-hour banquets of Ulysses S. Grant.

The mantel carving behind the President carries John Adams's famous prayer for the White House (page 606).

The President sits here. Plates selected by the Trumans, flatware copied from silver-gilt purchased by James Monroe, and crystal chosen by Jacqueline Kennedy circle tables for ten scattered about the State Dining Room. Gold table settings became a campaign issue in 1840, contributing to Martin Van Buren's defeat at the hands of "simple frontiersman" William Henry Harrison.

comfort. Then she took off as her husband's "eyes and ears" on the first of the wide-ranging trips that would earn her the Indian name, "Princess of Many Trails."

Through depression and war, the White House rocked with activities, bulged with colleagues and guests—"Brain Trusters," prime ministers and displaced royalty, students, labor leaders, poets and playwrights. Visiting Roosevelt children and grandchildren added to the turmoil, as 11 more grandchildren joined "Sistie" and "Buzzie" (pages 638-9).

The President had broken his last precedent—by re-election to a fourth term—when cerebral hemorrhage struck on April 12, 1945, at Warm Springs, Georgia. Once more a funeral train rolled on to Washington through weeping crowds, and a President's body lay in a darkened East Room.

Typifying the Nation's grief, a letter from a small Midwestern boy enclosed a few flowers from his garden. "I am sorry I can't come to the funeral," he wrote.

Man From Independence Takes Over

Everybody agreed, when the Truman trio arrived, that the Roosevelt regime would be a hard act to follow. The new President, his wife Bess, and their 21-year-old daughter Margaret solved the problem by being themselves—a spunky, close-knit family from Independence, Missouri.

Mrs. Truman redecorated with pastel shades and cretonnes. She brought her own cook to prepare such homey foods as hot biscuits and cornbread with sorghum molasses.

Although she preferred the company of old friends (like the members of her former Independence bridge club), she served as First Lady with dignity and charm—and a touch of doggedness. I have a vivid memory of her square shoulders and firm stride as she and the President walked down the red-carpeted hall to greet guests at the six official receptions I attended as a reporter one season.

In the same forthright spirit, Margaret Truman attended George Washington University and graduated with an A.B. degree before embarking on a musical career.

But it was peppery Harry Truman who made history by meeting great issues head on. In the house where McKinley wept over the Spanish-American War, President Truman took the awesome responsibility of using the atomic bomb to hasten victory over Japan. He put the weight of the Presidency behind the United Nations and the Marshall Plan.

He won a second term—confounding pundits—aided a controversial balcony to the South Portico, and persuaded Congress to rebuild the literally tottering White House.

Swift and skilled hands bone squab for the Princess Margaret dinner. Until the 1850's, fireplaces served for cooking. President Millard Fillmore installed a stove and personally taught the disgruntled cook to work the drafts.

During the massive reconstruction between 1949 and '52, the Trumans lived in Blair House across the street. They moved back into a magnificently improved Executive Mansion just in time for a visit from the Netherlands' Queen Juliana and Prince Bernhard.

In January, 1953, the house had a new tenant—World War II hero Dwight D. Eisenhower. President Eisenhower became the tenth general to reach the Nation's top civilian post. His wife Mamie (for Mary) had already packed their bags some 30 times in 36 years.

"Strangely," she wrote in the January, 1961,

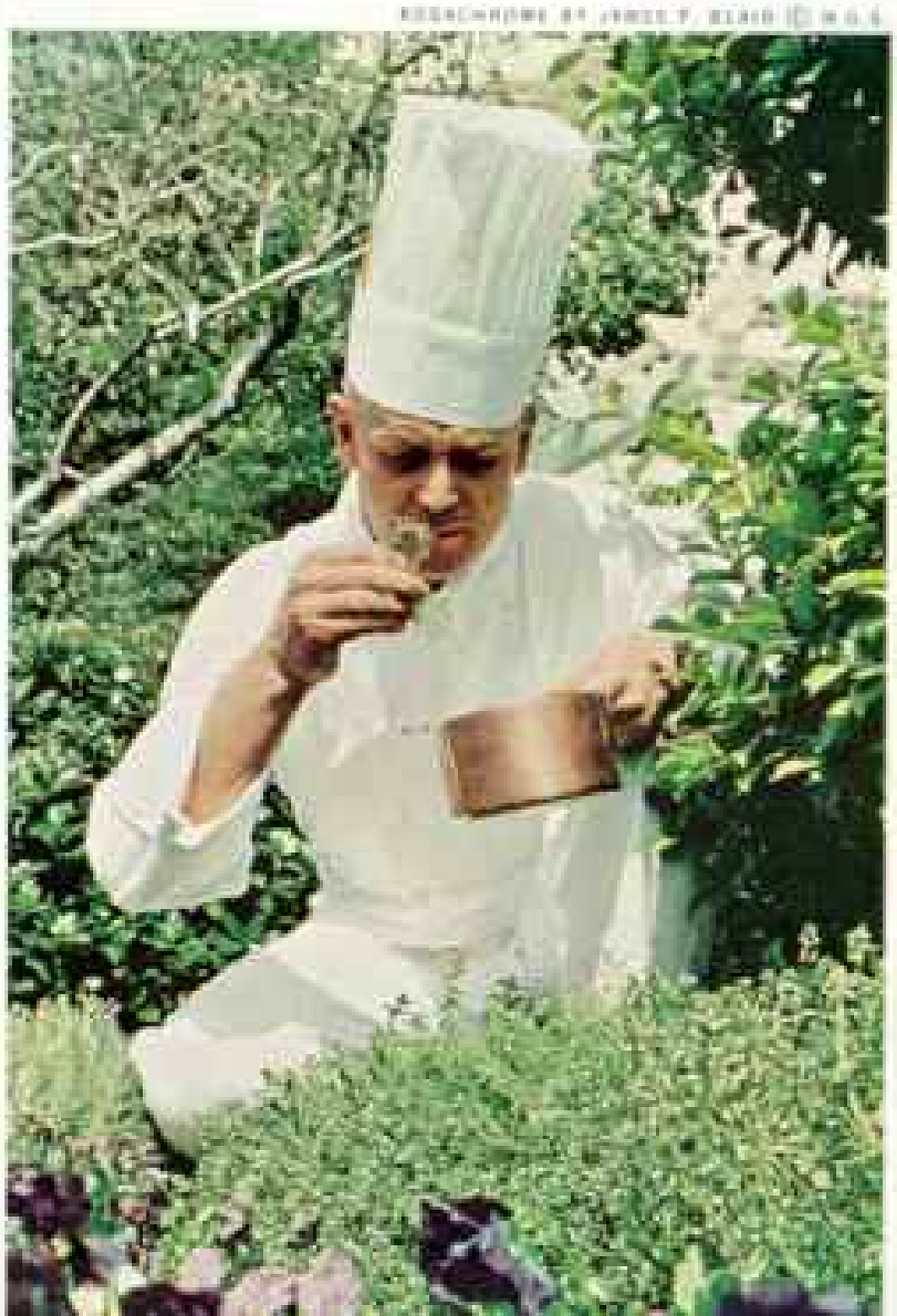
Fresh sprig of thyme, picked by White House chef Henry Haller, comes from a herbary in the Jacqueline Kennedy Garden. In the past, a grape arbor, a vegetable garden—even a cow—supplied mansion larders.

GEOGRAPHIC as they were leaving after eight years, "my husband and I have lived in this home longer than in any other."

Mrs. Eisenhower loved frills and furbelows, perfume and pink. "Mamie pink" swept the Nation and dominated slip covers and even rugs in the President's residence.

"We made up pink flowers in pink vases," a gardener of the time told me, "and sent up sweetheart roses every day."

The Eisenhowers liked being homebodies, perhaps because of past travels. They enjoyed TV, movies, and having a few friends in for cards and talk. The President practiced painting and golf; his putting green on the south grounds still survives. Both he and Mrs.



Tulips and linden trees pattern the Jacqueline Kennedy Garden. The Kennedys planned the traditional 18th-century American garden for the use of Presidents' wives. Mrs. Johnson oversaw its completion, its dedication (below), and a reception for sponsors (above).

"**Proud possession** of all Americans," President Johnson called the mansion when he established the Committee for the Preservation of the White House —a body concerned with protecting its old treasures and acquiring new ones. In the Yellow Oval Room, members consult with Mrs. Johnson and Chairman George Hartzog, Director of the National Park Service, at her side. At this meeting, the committee drew up a "most wanted" list, headed by portraits of John Adams and James Madison. Earlier the group acquired "The Mosquito Net" by John Singer Sargent, the painting at upper center. Rembrandt Peale's "George Washington" hangs over the mantel.

DETAILING (ABOVE) BY JAMES P. BLAIR, RESEARCHED BY JOSEPH J. SCHERSCHEL © N.G.S.

Eisenhower reveled in visits by their grandchildren, a boy and three girls, who found the mansion and lawns a fine playground.

The youngsters called their youthful grandmother "Mimi." And a revealing story tells of the time someone asked the boy his name.

"Dwight David Eisenhower," he replied.

"Then who's that?" probed the questioner, pointing to the President.

"That's Ike," said the boy.

New Family Brings Flair of Youth

With the next family came another of those striking changes in pace that mark the White House story. The photogenic John F. Kennedys—the dark-haired wife with unerring style, the vibrant, witty President, and their small children, Caroline and John, Jr.—quickly touched the hearts and minds of the Nation.

John Kennedy, at 43, came in as America's youngest elected President, and the first Roman Catholic. Jacqueline Kennedy, at 31, was not the youngest First Lady—she just seemed so. Frances Cleveland had been under 22, Julia Tyler only 24.

With her soft voice and hesitant charm, Mrs. Kennedy appeared a princess in an enchanted castle. Her flair for the best in ballet, drama, symphony—and jazz—lent excellence and gaiety to official functions. Kennedy parties included such talented guests as Lincoln biographer Carl Sandburg, Spanish cellist Pablo Casals, pioneer astronauts, and 49 Nobel Prize-winners all at once.

Soon after moving in, Mrs. Kennedy invited 200 women writers on White House subjects to a buffet lunch in the East Room. Looking across spring flowers decorating small tables, she told us of her project to acquire beautiful, authentic furnishings.

Sophisticated and primitive, dancers of two worlds perform in the East Room. The Harkness Ballet of New York inaugurates, on September 29, 1965, a new portable stage, designed to blend with the pilastered ballroom. The lowest crystal pendant of the chandelier above the dancers has been removed as a potential hazard.

With red and black masks, painted bodies, and tall crowns, warriors of the Mescalero Apache tribe rout evil spirits. An "Evening of American Indian Art" honors the President of the Republic of Upper Volta.

PHOTOGRAPHED BY NATIONAL GEOGRAPHIC PHOTOGRAPHERS JOSEPH J. SCHERSCHEL (ABOVE) AND B. ANTHONY STEWART © N.G.S.

We could soon see the results in many antique treasures returned to the White House by public-spirited donors. A year later Mrs. Kennedy took 60 million television viewers on a guided tour of the mansion.

Mrs. Kennedy was less successful in protecting her lively children from the public eye. What editor could resist a story on Caroline's pet pony Macaroni, or how she offered Prime Minister Nehru of India a rose for his buttonhole? What news photographer would miss a shot of little John climbing aboard the President's helicopter to see Daddy and Mommy off to the airport?

Such a picture was made just before a flight to Texas. When John's mother came home, before dawn on November 23, 1963, it was with the body of her slain husband.

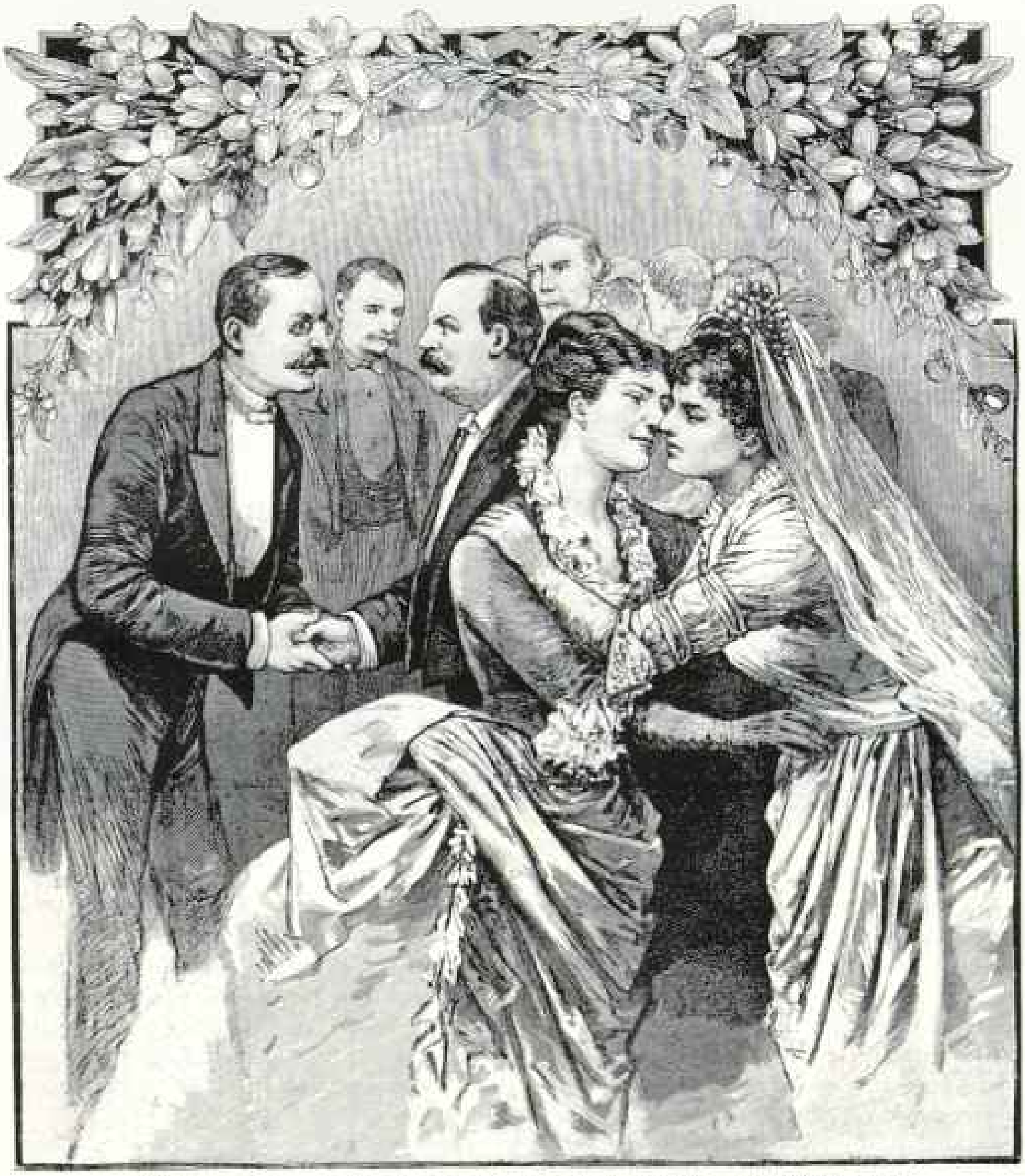
That same evening, in the silent, black-shrouded East Room, I moved with other reporters slowly past the flag-draped casket. Flickering candles at its four corners outlined the stern faces of the honor guard, chosen from the Armed Forces.*

Above, crape bands subdued the light of the three chandeliers installed by Theodore Roosevelt in 1902. Portraits of George and

*The world's tribute to President Kennedy at his state funeral was commemorated in "The Last Full Measure," by Melville Bell Grosvenor, GEOGRAPHIC, March, 1964.

FRANK LESLIE'S
ILLUSTRATED
NEWSPAPER

No. 1,603.—Vol. LXII.] NEW YORK—FOR THE WEEK ENDING JUNE 12, 1886. [Price, 10 Cents.



WASHINGTON, D. C.—THE WEDDING AT THE WHITE HOUSE, JUNE 2ND—THE MOTHER'S KISS.
From a Sketch by C. Jay Taylor.—See Page 634.

"Blushing like the morn beneath her misty veil," a reporter described Frances Folsom in *Frank Leslie's Illustrated Newspaper*. Orange blossoms arch above the 21-year-old bride of President Grover Cleveland, her mother, and the groom.

Martha Washington looked down on the eighth President to die in office.

It was not pleasant to reflect that of the eight—William Harrison, Zachary Taylor, Abraham Lincoln, James Garfield, William McKinley, Warren Harding, Franklin Roosevelt, and John Kennedy—four perished at the hands of assassins.

In this same room, not long before, I had watched John and Jacqueline Kennedy circulate smilingly among guests at a diplomatic reception. The scarlet-coated Marine Band played lilting music, and the new ambassadors from Switzerland and Guinea made diplomatic history by presenting credentials to a President at a social function.

President Kennedy left us not only such light-hearted innovations, but some of the most eloquent lines in political literature. Yet remembering the famous Kennedy wit, I think of a last, light remark, made while awaiting his wife before a Fort Worth breakfast on the fateful November 22, 1963.

"Mrs. Kennedy is organizing herself," he explained. "It takes longer, but of course she looks better than we do when she does it."

Two hours after the Kennedy tragedy at Dallas, Vice President Johnson took the oath of office in the plane that would return him to the Capital. "A great nation must move on," he said in an early speech.

Since then, the White House has been used for official activities as never before. Not only the West Wing office and Cabinet Room, but the residence itself offers symbolic settings for launching national projects and enunciating national aims.

Mansion a Stage and Forum

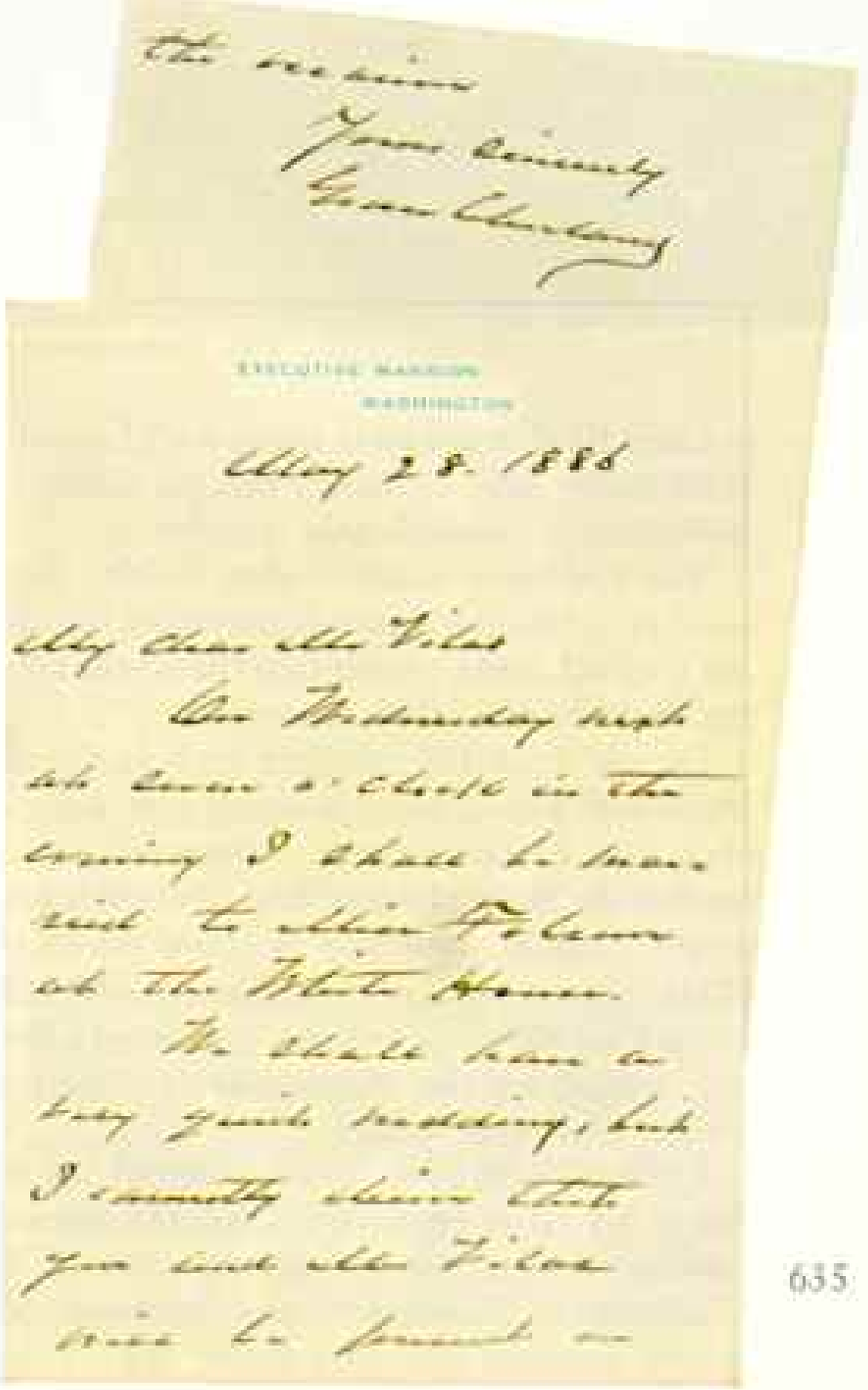
Frequently the East Room or sun-flooded Rose Garden is chosen for a press conference or the swearing-in of Presidential appointees. Here, while TV cameras whir and reporters take notes, President Johnson signs favorite bills, awards medals to astronauts and war heroes, and briefs Congressmen and others on anything from military spending to the plight of American Indians.

At the President's side on such occasions may stand Lady Bird (the nickname since childhood for Claudia Taylor) Johnson. But more likely the First Lady has her own projects in the Red, Green, or Blue Rooms, or upstairs in the Yellow Oval Room.

As Mr. Johnson once said in a husbandly grumble, "Whenever I try to take a nap, there

SMITHSONIAN INSTITUTION (ABOVE); WISCONSIN STATE HISTORICAL SOCIETY

Cake to dream on—a slice from the Cleveland-Folsom wedding supper, encased in satin and boxed in lace—went home with the guests. Autographs of the bride and bridegroom were slipped under satin bows that tied the boxes. John Philip Sousa led the Marine Band before and after the ceremony. Grover Cleveland, only President to be married in the White House, wrote the invitations himself to a handful of intimate friends and family. The note to Postmaster General and Mrs. William F. Vilas (right) bears the letterhead "Executive Mansion." Theodore Roosevelt changed the name on official stationery to "White House" in 1902.



EKTACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHERS DEAN CONGER AND JAMES P. BLAIR © N.G.S.

is Lady Bird in the next room with Laurance Rockefeller and 80 ladies talking about the daffodils on Pennsylvania Avenue."

The President was referring to Mrs. Johnson's program to encourage citizens to beautify the Capital, and by extension the whole country. But she has other interests.

On one crowded morning such as Eleanor Roosevelt knew, Mrs. Johnson met with six civic and welfare groups. Afterward she attended the Senate Ladies' Red Cross luncheon at the Capitol, returned to serve tea to the White House Library Committee, and finally, at an East Room ceremony, presented a literary award to the distinguished American writer Thornton Wilder.

I talked with Mrs. Johnson about her full life as we sat alone on Mr. Truman's balcony, looking toward an entrancing vista of the Washington Monument and Jefferson Memorial outlined against a dusky sky.

"My deep interest in working for a more beautiful America goes back to the time I first walked in the piney woods of east Texas," she said. "I also feel very close to Project Head Start. This idea of helping needy preschool children catch up with more fortunate ones was born in the East Room. It grew out of a conference between many people—officials of the War on Poverty and volunteers from all over the country.

"I wanted to help, thinking of my own children," she said. "To me, they are the pulse and heartbeat of the White House."

Social Life Reflects Nation's Dignity

It has never been easy to separate official business from social activities at the Executive Mansion. Certainly it was not just for pleasure that President Adams in 1801 gave a feast "to Indian kings and aristocrats," as he recorded in a letter.

Confectioner's dream, an eight-foot cake, challenges petite Luci Johnson Nugent. When the bride failed to cut through the icing even with the help of her husband Patrick, her father gave a hand. First President's daughter to be married in Washington since Eleanor Wilson McAdoo in 1914, Luci added a new note of nuptial history: the only daughter of a Chief Executive to be wed as a Roman Catholic.

Sixty years earlier Alice Roosevelt, who attended the Johnson-Nugent reception (below), married Nicholas Longworth in the White House East Room. At her own reception "Princess Alice," as the Nation dubbed her, used a White House military aide's sword to slice her wedding cake. Resplendent in white satin and silver brocade (right), she marches to the altar on the arm of her father, Theodore Roosevelt.

NEW YORK JOURNAL AND AMERICAN, LIBRARY OF CONGRESS

President Monroe had reason to return to protocol and ceremony after Jefferson's and Dolley Madison's informal ways. The author of the Monroe Doctrine needed to impress Europe's diplomats—and masters—with the pride and power of his fast-growing country.

Indeed, every President has conducted his required official entertaining along three lines: his own wishes, the Nation's needs, and his countrymen's point of view. Some ran into trouble on one or another score.

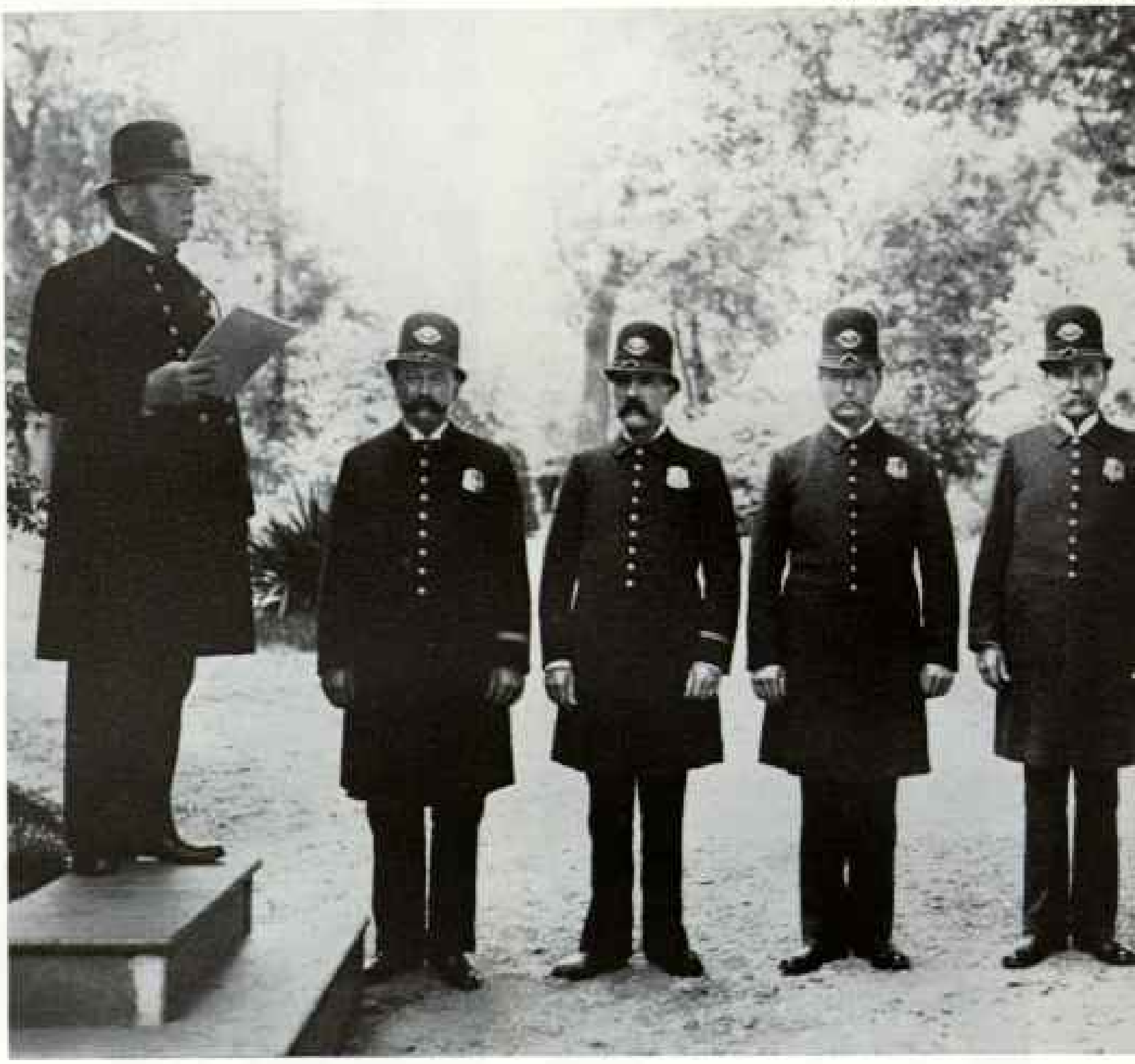
Martin Van Buren lost a second term in 1840 when opponents accused him of eating on gold plates with gold utensils. He served French dishes, charged one Congressman, instead of solid American "hog and hominy, fried meat and gravy, [with] hard cider."

In the Victorian era, President and Mrs. Rutherford B. Hayes basked in public favor as teetotalers. Though thirsty guests called the First Lady "Lemonade Lucy," and joked that water flowed like wine at her sedate parties, the couple's wide popularity showed how well they met the day's moral code.

Today, as in the past three years, the White House social mood reflects the warmth and hospitality of its Texas tenants.

"We are a gregarious family," Mrs. Johnson told me. "My husband has been in public life thirty years, and has many close friends here. We like dinners for eight or ten in the Family Dining Room, and good talk later."

Yet for all the informality that is a Johnson trademark, there is no lack of brilliance at state affairs (pages 594-5 and 624-7). President and Mrs. Johnson have held dozens of formal dinners for presidents, princesses, and prime ministers, from India to Costa Rica, Malagasy to Britain. They also have presided, separately or together, at hundreds of smaller events for businessmen, publishers, mayors, governors, and career women.



With playful touch of youth, grandchildren brightened White House days of older Presidents. Benjamin Harrison adored his namesake, Benjamin Harrison McKee, called "Baby McKee," and presented him with a pet goat, "His Whiskers." Here the boy takes cousin Marthena Harrison for a ride. His uncle, Russell Harrison, holds Mary McKee's hand. Anna Eleanor Dall and her brother Curtis, nicknamed "Sistie" and "Buzzie" (right), snowball each other while living with grandfather Franklin D. Roosevelt.

Last year, some 400 actors, sculptors, painters, authors, musicians, and patrons of the arts had their turn at a 12-hour-long White House Festival of the Arts (pages 622-3).

"I sometimes think," said Mrs. Johnson, "that life here is one big seminar."

It takes superb facilities and a well-trained staff to feed 5,000 reception guests or serve as many as 200 four-course state dinners.

These the White House has: a kitchen with the mixing and cooking devices of a good hotel, a walk-in freezer, wine cellar, and portable ovens to carry food where needed (pages 628-9).

When I last saw the chef in action, he was preparing for a June reception for U.N. delegates. The tables were spread with cherry tomatoes, shrimp in aspic, and other colorful hors d'oeuvres.

On hand for morning roll call, Archie and Quentin Roosevelt line up with the White House Police. A member of Quentin's "White House Gang" described the group as "frightfully short on reverence. There was none we were afraid to ape and mimic—not even TR."

Showing off for Daddy, 18-month-old John F. Kennedy, Jr., prances about the Chief Executive's office a few weeks after learning to walk.

KODACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER GEORGE F. MOBLEY © N.G.S.

"Every day I bless President Truman for the reconstruction that made this house strong enough to withstand the feet of millions of tourists," Mrs. Johnson said, "and for the conveniences and comforts we ourselves enjoy."

It wasn't always so. "Hell itself couldn't warm that corner," Jackson complained in the days before a furnace was installed.

It was not until Millard Fillmore's time that a kitchen range replaced the old open fireplace for cooking. Then the President had to consult the model at the Patent Office to show his cook how to use it.

The first modern kitchen was set up only in the 1930's, after the Franklin Roosevelts found the old one a dark, dilapidated area of wood-drain sinks and wood-lined iceboxes.

Now, finally, the President's House is truly "built for ages to come," as Abigail Adams said. Each year, gifts and purchases of valuable furniture, art, and ornaments add to its beauty.

Echoes of Another Day

At a ceremony held in the East Room last February, Mrs. Johnson formally accepted the late Douglas Chandor's painting of Eleanor Roosevelt. Before an audience of

Tide of tots pours over the south lawn for the 1963 Easter-egg roll, an annual custom close to a century old. Adults may attend only if accompanied by a child.

Magic of a real bugle awes a young Arab. The Old Guard Fife and Drum Corps, in colonial costume, entertains for Diplomatic Corps youngsters at the White House.

Another walk in space! Bonnie White takes a giant step, flung into the White House pool by her father, Col. Edward H. White II, first American to venture outside a capsule in orbit. Edward H. White III, right, and Patrick McDivitt, son of White's space partner Maj. James A. McDivitt, wait for the splash. Children of the Nation gave their pennies to build the pool for Franklin D. Roosevelt, crippled by polio.

Retouched by James P. Blair (upper) and Joseph J. Scherschel © N.G.S.

Roosevelt offspring, relatives, friends and colleagues, Mrs. Johnson announced that the Eleanor Roosevelt likeness would hang "in the great hall of the State Floor where all the people who come through will see it, because all the people were her concern."

Then actress Mary Fickett, who had played Mrs. Roosevelt in the stage production of *Sunrise at Campobello*, read excerpts from the former First Lady's autobiographical writings, imitating the high, clear voice that we who were present remembered well.

"It was eerie," President Roosevelt's longtime secretary, Grace Tully, said to me later.

A BOOK-LENGTH version of "The Living White House" will be ready in November. The 144-page soft-cover volume is the latest in a series produced as a public service by the National Geographic Society in cooperation with the White House Historical Association. Proceeds aid the association in acquiring and restoring historic furnishings for the Executive Mansion.

Copies may be ordered from the White House Historical Association, Dept. 6A, 1634 Eye Street NW, Washington, D. C. 20006, for $1 each, plus 25¢ for postage.

Pyramid of light proclaims a hope for peace. The National Christmas Tree, a tradition that began with Calvin Coolidge in 1923, soars from the Ellipse. In holiday spirit, Luci Johnson last year welcomed 150 needy youngsters to a White House party, complete with toys and Santa Claus. When Andrew Jackson gave a Yuletide party 130 years earlier, his young guests pelted one another with starched cotton "snowballs." On another Christmas, Tad Lincoln trooped a gang of hungry urchins to the kitchen door; the President ordered food for all.

EXTACHROME (BELOW) AND KODACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JOSEPH J. SCHERSCHEL © N.G.S.

"It seemed just as if Mrs. Roosevelt were back in this room, speaking to us."

To those who live in the White House, the weight of history must often come crushing down. I once asked Luci Johnson how she felt at the age of 16, when her family moved in.

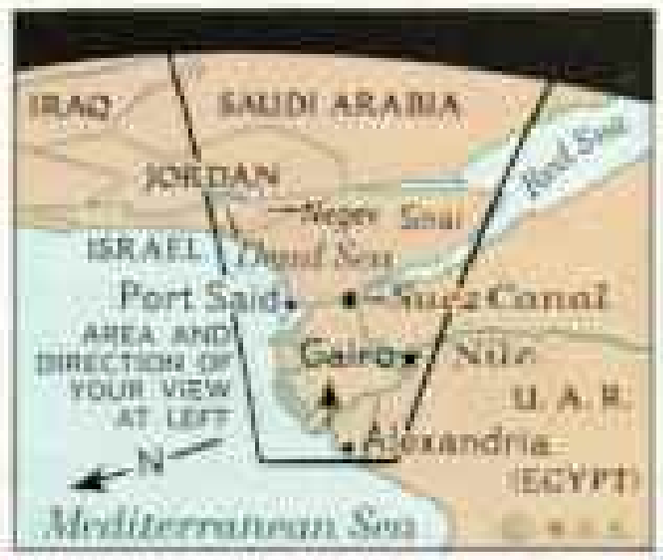
"The place was like a museum, with all those old historic possessions," she said. "My heart just dropped when I saw the row of Catlin's Indian paintings on the family wall."

Later, however, she read of George Catlin's adventures among tribes of the early West. Sketchbook in hand, he met hostile Indians, but never one, he wrote, who "betrayed me, struck me a blow, or stole from me."

"I came to love the Indian paintings," Luci said. "Gradually I felt more at home here. I even began seeing the portraits of past Presidents as if they were a family album."

And so they are. Not only for the privileged few, but for all Americans, these portraits represent our own family gallery, and this house our country's ancestral home.

THE END



BIBLE LANDS

Early heartland of civilization bares its anatomy to Astronauts James A. McDivitt and Edward H. White as they fly 115 miles above in Gemini 4. In Egypt's funnel-shaped delta—fleetingly taken by McDivitt for a giant lava flow—crowd 27,500,000 people, nourished by the splayed veins of the River Nile. Neither pilot could spot the Pyramids (left), near Cairo in the funnel's throat. Beyond Suez, the Sinai desert shows pale as bleached bone, while across the Israeli border in the Negev, left center, gardens bloom from the sands. In this 1,000-mile view, water—precious as blood—divides sere from sown. Such portraits from space give scientists a fresh look at world geography.

LARGE EKTACHROME BY NASA;
EKTACHROME BY JAMES L. STANFIELD © N.G.S.

The Earth From Orbit

Color photographs by American astronauts yield new knowledge of man's home planet

By PAUL D. LOWMAN, JR.

I see beyond the range of sight,
New earths and skies and seas around.

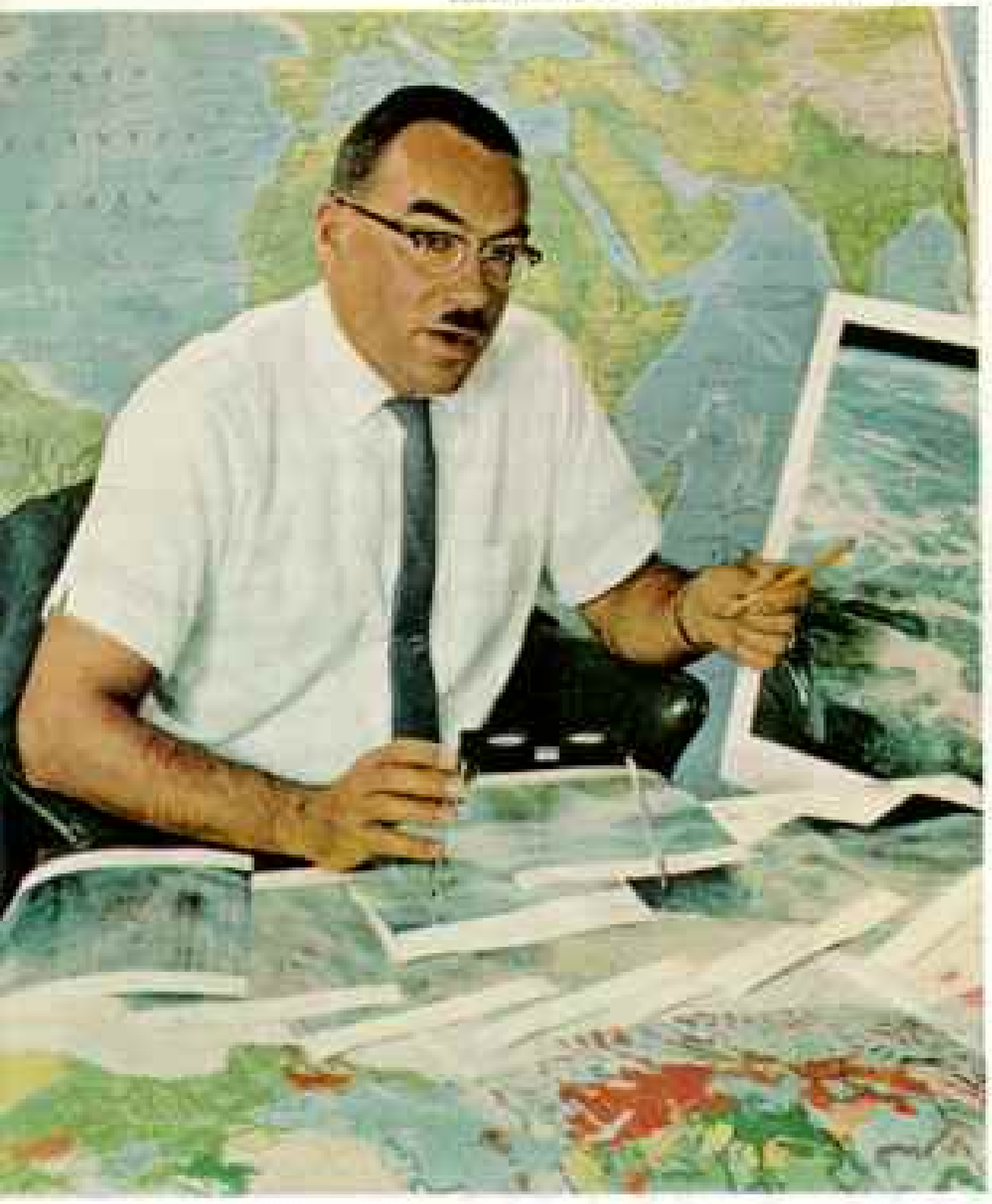
HENRY DAVID THOREAU, "INSPIRATION"

THOREAU'S WORDS hold special meaning for that small band of astronauts who have flown into space. The most exhilarating experience of these privileged travelers—aside from the visceral excitement of launch and re-entry—has been the unfamiliar view of our world from a striking and awe-inspiring new perspective.

An astronaut, from more than a hundred miles high, does indeed see beyond the range of ordinary mortals—and he does see earth and sky and sea in a totally new way. As he floats over jungle and desert, mountain and sea, he views the magnificently unfolding panorama far below as though it were a map suddenly come to life.

But the landmarks seem strangely different. During the flight of Gemini 4, Command Pilot James McDivitt had difficulty finding El Paso, Texas, even though he had flown over it hundreds of times in planes. Maps show El Paso on a sharply defined blue line, the Rio Grande. But instead of a blue line, McDivitt saw a broad checkered band, the irrigated farms of the river valley.

Similarly, as McDivitt and his partner, Ed White, approached the vista shown in their photograph on these two pages, McDivitt thought momentarily that the dark bluish triangle was an immense field of lava. Then he recognized that what he had taken for lava was the farm-rich delta of the Nile (lower center), jutting into the Mediterranean on one



The Author: As an aerospace technician at NASA's Goddard Space Flight Center, Greenbelt, Maryland, Dr. Lowman, 40, a geologist, directs terrain photography on Gemini flights. In pre-launch sessions he briefs the astronauts on techniques and film and on what pictures will be most useful to science. A Ph.D. from the University of Colorado, he also conducts studies in lunar geology.

hand, wedged into lifeless desert on the other.

Their remarkable photograph—one of about 1,000 taken by Mercury and Gemini pilots—spans a good thousand miles of the Near East and holds useful lessons in geography for the thoughtful viewer. With dramatic simplicity, it reveals the importance of the availability of water in the life of man, explaining why 95 percent of Egypt's millions today live crowded into this tiny irrigated corner of their land, and why this fertile delta was one of the earliest cradles of civilization.

Scientist Asks for Space Pictures

I first became aware of the scientific value of space photography (or hyperaltitude photography) when Dr. Paul Merifield, then at the University of Colorado, showed me a picture of Morocco's Anti Atlas Mountains in the NATIONAL GEOGRAPHIC for February, 1962.

The photograph had been taken by an automatic camera in the first Mercury spacecraft to orbit the earth, on the unmanned flight of September, 1961. This single picture reveals major geologic features, such as folded mountain belts and complex sand dune fields, over tens of thousands of square miles.

Dr. Merifield suggested that I request more such photography during the Mercury project. I did, and within a few months I was at Cape Canaveral briefing Astronauts Walter Schirra and Gordon Cooper. Much of my work since then has been directing terrain photography for Mercury and Gemini.

As a geologist, I find the astronauts' photographs full of excitement and discovery; the selection shown with this article is especially impressive. Taken from an altitude some twenty times as high as men normally reach on jet flights, the pictures allow scientists to hold the world at arm's length, to see things much more clearly than ever before.

These space photographs offer a number of major scientific advantages. First and most obvious, each space picture covers an immense area. In some cases the scientist can see for the first time whole mountain ranges, river basins, or weather systems. He can see large geological features, such as volcanic fields or fault zones, that are imperfectly known from aircraft or surface observations, or that may even have eluded man's eye up to now.

A conventional air photograph may cover 10 square miles. But a space photograph, such as any one of those making up the Colorado River mosaic on pages 649-51, shows more than 6,000 square miles in useful detail. Only 600 pictures on this scale would be needed to cover the entire United States, and only 9,600 to cover the land area of earth.

Why not just make mosaics of aerial photographs? Because such a mosaic covering 6,000 square miles would measure about 23 feet square, hardly convenient to work with. Even if rephotographed and reduced in size, the patchwork-quilt appearance would obscure important details of tone, texture, and shape. Dodging, the process of removing the patchy appearance, would make the problem worse by eliminating delicate tones and colors needed for interpretation. Thus, only photographs from space can provide a true view of large areas of earth's surface.

The speed of the Gemini satellites, which circle the globe in 90 minutes, suggests a second advantage: We can photograph widely separated points instantaneously, or within a very short time. With such shots as that of west Texas (page 666), where a long finger of rain-darkened earth spreads across the landscape, a geographer can see soil-moisture

(Continued inside foldout, page 649)

AMERICAN SOUTHWEST

Bare-knuckled ranges grip the lush, irrigated oases of southern California and Arizona: Imperial Valley, foreground; Gila River Valley, center right; and Colorado River Valley, mid-center, the last fed by waters impounded by Parker and Davis Dams, farther left. The 35-mile-long Salton Sea sits like a gemstone amid the Imperial's fields (below). A hundred miles high, the nose of Gemini 5, carrying Astronauts Gordon Cooper and Charles Conrad, pokes into picture at lower left.

Veil of sand softens the ribbed crust of the Colorado Desert. The dark-topped Chocolate Mountains rise sharply just beyond the Imperial Valley.

Plume of smoke from a copper smelter, extreme right center, footnotes the area's mining industry. Canopy of altocumulus and altostratus clouds conceals much of Arizona and western New Mexico.

Here, as in most of the Gemini photographs, the earth shows predominantly blue—a point often emphasized by astronauts returning from space flights.

EKTACHROME BY NASA, KODACHROME (BELOW) BY THOMAS MORIA © N.G.S.

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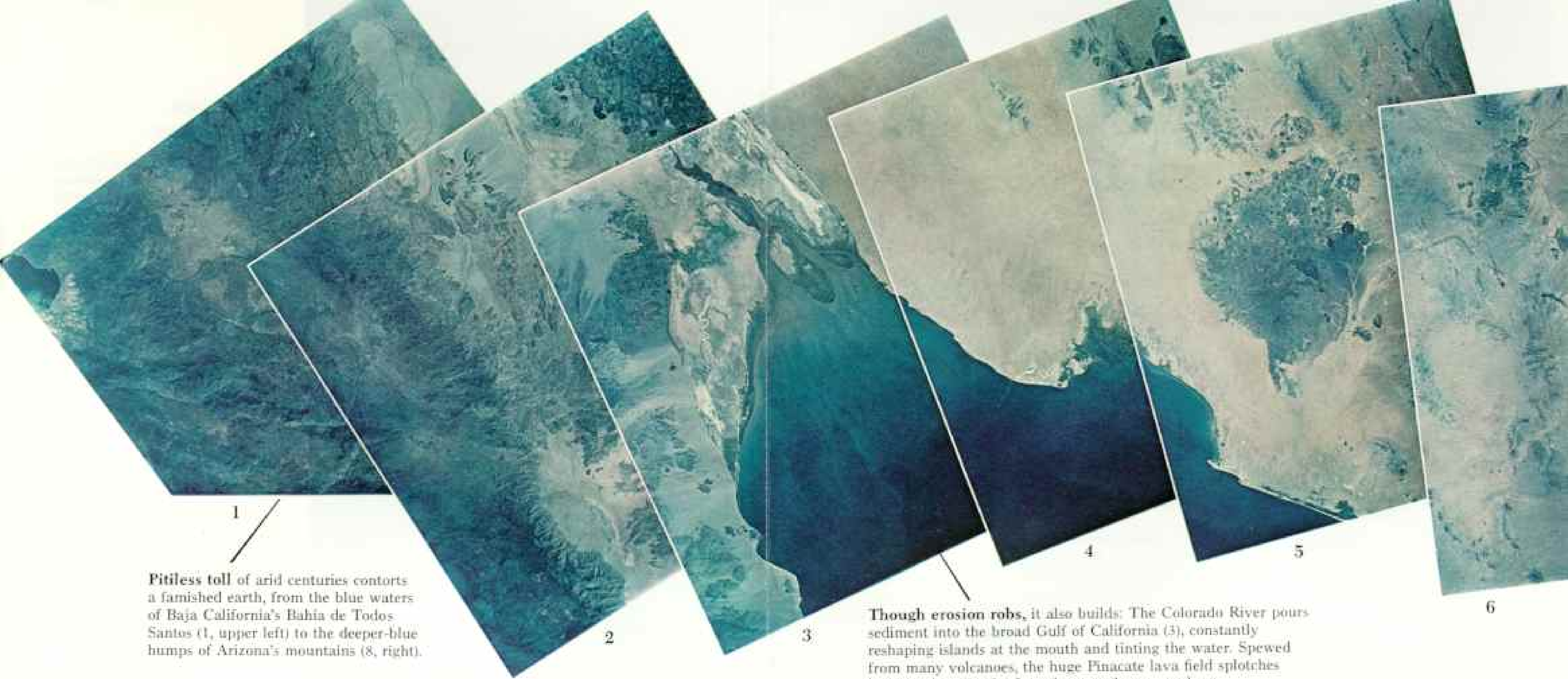


Pitiless toll of arid centuries contorts a famished earth, from the blue waters of Baja California's Bahía de Todos Santos (1, upper left) to the deeper-blue humps of Arizona's mountains (8, right).

Though erosion robs, it also builds: The Colorado River pours sediment into the broad Gulf of California (3), constantly reshaping islands at the mouth and tinting the water. Spewed from many volcanoes, the huge Pinacate lava field splotches light sands (5) in the first photograph ever to show the feature in its entirety.

Mexico-Arizona: a 400-mile sweep

conditions over several thousand square miles at the same moment. Such coverage would be extremely hard to obtain with any practical number of aircraft-borne cameras, because by the time the last part of the area had been photographed, conditions in the first part would have changed.

Another advantage of satellite speed is the ability to keep the world under nearly continuous observation. The Geminis, for instance, roughly retrace their paths over earth every 16 revolutions, or about every 24 hours. Thus they can repeat, very rapidly, their photographic coverage.

With this unique ability, we should be able to monitor surface conditions that change continually: breakups of ice that endanger shipping, spread of forest fires, shifting areas of snow cover. I personally am looking forward to a series of photographs showing springtime green gradually spreading north across North America, but this will require more elaborate equipment and longer flights than we now have.

An orbiting spacecraft can ignore barriers to conventional aerial photography, such as bad weather and national boundaries. Satellites can easily photograph such remote areas as the central Sahara (pages 658-9), the Himalayas, and western China (pages 664-5), which are difficult or impossible to shoot from planes.

Satellite Photography Breaks No Law

The question of national boundaries, incidentally, has received much thought by specialists in space law. Earth photography from above the atmosphere is now considered entirely legal. Resolution 1721, passed in 1961 by the United Nations General Assembly, declares that space is free for exploration and use by all nations, and cannot be claimed by one country.

A final advantage of space photography lies in its extremely wide range of scales. Conventional air photographs generally run from a scale of 1-to-5,000 (that is, one inch on the photograph equals 5,000 inches on the ground) up to 1-to-60,000. Cameras in spacecraft can achieve this same range with telephoto lenses, and they can go on up to scales of 1-to-several million. The pictures with this article, in the areas directly below the spacecraft, are about 1-to-2,500,000.

Small wonder, then, that scientists in many disciplines—geology, geography, oceanography, cartography, meteorology, forestry—are eagerly studying the new space photographs.

Already we have a more accurate concept of the world's geology, a more objective picture of the earth's broad features. We are beginning to chart inaccessible areas and to refine our present geological maps. Scientists at Canada's McGill University, for example, have made a detailed analysis of Mercury 4 photographs of North Africa, developing a new atlas of the Sahara that shows many previously unknown features. The U. S. Geological Survey has changed its charts of Antarctica to remove a mountain group formerly thought to be in the Kohler Range, and to shift 10,200-foot Mount Siple 45 miles west.

In the Sierra Carizarillo, southwest of Columbus, New Mexico, Gemini pictures reveal a huge and geologically young volcanic field that is shown on the latest geological map of North America, published just last year, as only a small and very old area.

Similarly, Gemini 4 photographs very clearly show Mexico's Agua Blanca fault zone (an irregular line running horizontally across pictures 1 and 2 of the mosaic above). Yet this 75-mile-long geological structure had not been identified in more than a century of study, and was not even discovered until aerial reconnaissance picked it up only a decade ago. The boundaries of Mexico's Pinacate volcanic field (seen so sharply in the same mosaic as the large dark blotch in picture 5 to the right of the Colorado River mouth) were not shown on maps as recently as 1960.

The study of land forms in desert regions benefits especially from space photography, since Gemini passes regularly across many of the world's great deserts—Africa's Sahara, Australia's Great Sandy, and America's

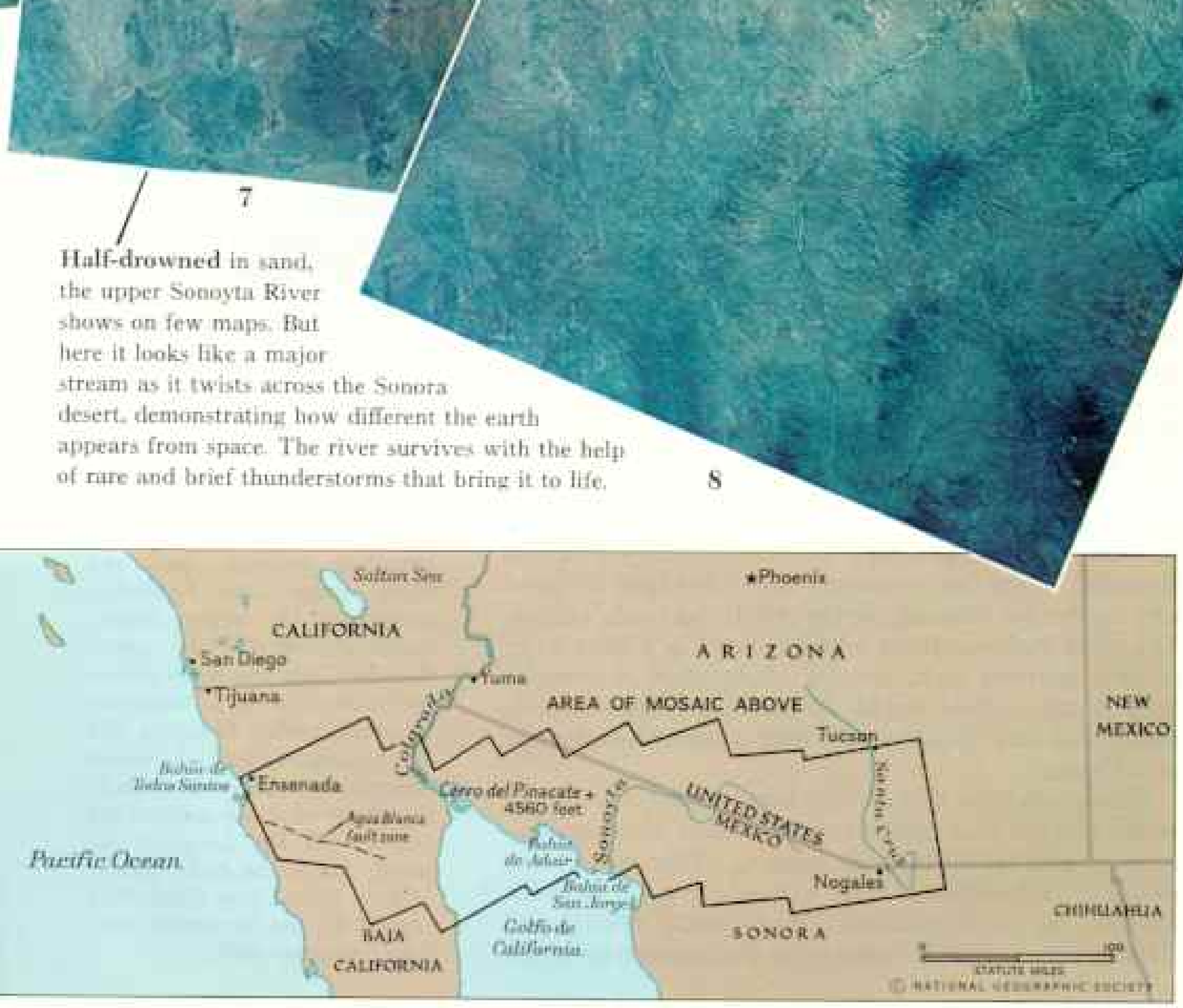
Pathfinder through mountains, the Santa Cruz River (8) pushes north toward Tucson, Arizona, cutting a route for the Southern Pacific Railroad and U.S. Highway 89. Command Pilot McDivitt held Gemini 4 in vertical position to enable White to shoot the terrain face-on and capture many details that a profile portrait would have lost. To compose this mosaic, he snapped a frame every five seconds. Variations in camera angle cause the last two pictures to tilt in relation to the areas as they actually align on the map.

EXTACHROMES BY NASA

7

Half-drowned in sand, the upper Sonoyta River shows on few maps. But here it looks like a major stream as it twists across the Sonora desert, demonstrating how different the earth appears from space. The river survives with the help of rare and brief thunderstorms that bring it to life.

8



Mojave, among others. Some of the regional structures in these remote areas would require many years to decipher by ground methods—for example, the eroded fractures and huge lava flows in Niger's Aïr Mountains (pages 658-9), which lie in the part of the Sahara traversed by Victor Englebert in his salt caravan article in NATIONAL GEOGRAPHIC for November, 1965.

Pictures such as that of central Algeria and of Walvis Bay on the coast of South-West Africa (pages 658-9) tell much about how sand dunes form, evolve, and move—things which we understand very imperfectly so far. Seldom does one see a more striking natural pattern than that of the enormous *seif* dunes near Walvis Bay—200-foot waves of sand that parallel the prevailing winds for as much as a hundred miles, in lines so straight as to suggest man-made structures. One scientist has suggested that these dunes may be analogous to the Martian "canals."

Space photographs may throw new light on the theory of continental drift, which holds that the continents have moved slowly to their present positions, like drifting ice floes. The western coastline of Africa and the eastern coastline of South America, as a case in point, could fit together like pieces of a jigsaw puzzle, suggesting that these continents were once one but have since separated. If this is true, there should be considerable similarity in the structural patterns of the ancient Precambrian rocks of the coastal regions of the two continents.

Pictures like that of Walvis Bay, which show far more geologic detail than maps even though the scale is actually smaller, may help prove or disprove this theory.

An Aggressive Stream Can "Pirate" Water

The geographer finds much of interest in the extraordinarily barren and remote region of the Arabian Peninsula (page 660). The fantastically intricate pattern of the great Wādī Ḥaḍramawt shows how much control geologic structure has over drainage. Sharp-eyed readers will detect, in the top center of the picture, several valleys crossed by another valley. This is an example of incipient "stream piracy," in which one stream, cutting a path more rapidly than others, slashes across them and diverts their waters.

A photograph such as that of west Texas (page 666) holds substantial interest because—unlike the uninhabited areas shown in this series—it reveals much evidence of man. The checkerboard pattern obviously indicates farmland, while the apparently undivided land at upper left, too dry for farming, serves chiefly for cattle raising. The great Permian Basin oil field shows as a faint array of dots (extreme right center). Many other man-made features are visible—roads, the Midland-Odessa airport, and even a dark blob of smoke from a carbon-black plant near Odessa.

The oceans have traditionally been studied on or in the water. But the oceanographer now foresees many applications of pictures made from satellites. They reveal such things as distribution of river sediment in gulfs, as in the photographs of the Colorado River (pages 649-50) and Yangtze River mouths (page 662); the topography of the

EXTACHROME BY NASA; KODACHROME (ABOVE) BY DEAN CONGER © N.G.S.

SOUTHEAST FLORIDA

Cotton-boll clouds shadow the toe of Florida and camouflage its largest lake—Okeechobee, center. Thunderheads, building up over the Everglades, loosed torrents of wind-lashed rain later in the day. Surf outlines the boundary between land and ocean. From Cape Kennedy's arrowhead tip, upper center, astronauts speed into space; Gemini 5, from which this picture was made, lifted off 27 hours and 18 orbits earlier. Dangling like an elongated earring, the island playground of Miami Beach sells the glitter of a sun-sprayed sea (above). Off Key Largo, to the south, the underwater beauty of John Pennekamp Coral Reef State Park can be sensed even from 140 miles aloft.

BAHAMAS AND FLORIDA KEYS

Tongue of the Ocean (lower left in large picture) licks the furrowed edge of the shallow Great Bahama Bank: a view from Gemini 5, passing 140 miles up. In the mile-deep trough the United States Navy frequently stages antisubmarine war games. For more carefree play, yachtsmen on a schooner (left) pit skills against wind. Budding thunderheads drift over Exuma Sound, center, lying amid ridges that make up the Bahama Islands.

Sun-silvered waters wash the Keys (below) as Gemini 4's McDivitt and White ride 120 miles above the island chain that divides Florida Bay, left, from the Straits of Florida.

DAYACHROMES BY NASA (ABOVE) BY JAMES L. STANFIELD © N.G.S.

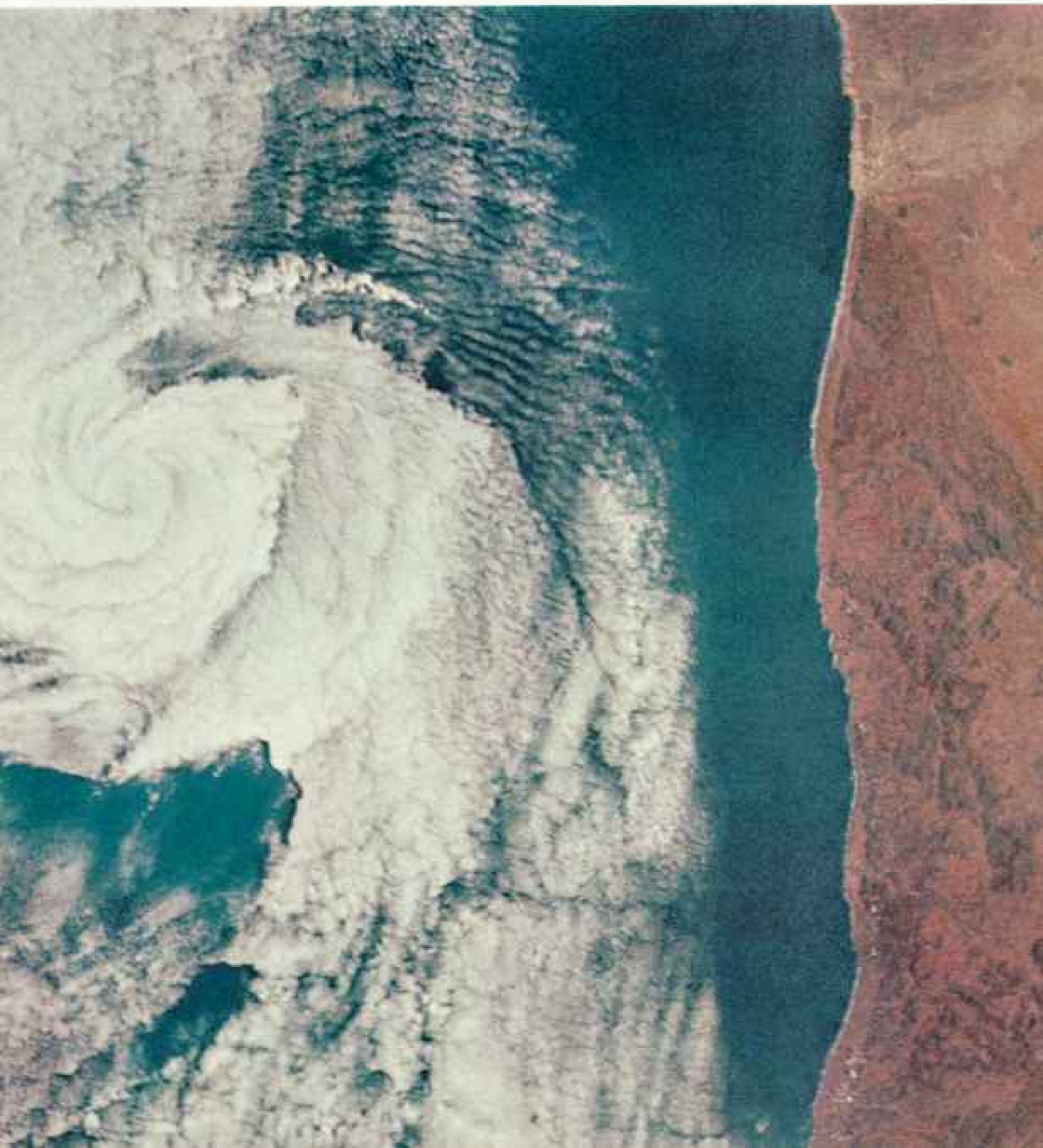
sea floor, as in the Bahamas (preceding pages); even the distribution and temperature of ocean currents when shown on infra-red film.

Since there often is a correlation between water color and depth (the darker, the deeper), space pictures provide a rough check of hydrographic charts. They can help locate unmapped shoals. And sudden changes in underwater topography, such as new channels which may be cut overnight by severe hurricanes, can be detected with pictures like that of the Tongue of the Ocean in the Bahamas.

Hydrology, the study of the movement and distribution of water, becomes more and more important as water shortages hit heavily populated areas. Space photography promises to be useful even in this field.

Films Monitor Snow and Flood

The speed of satellites, combined with their vast coverage, may permit a running inventory of water tied up in snow. In the photographs we can distinguish seasonal snow from glaciers and permanent snow fields, and we can even estimate snow depth. Thus periodic photography of snow-covered regions, along



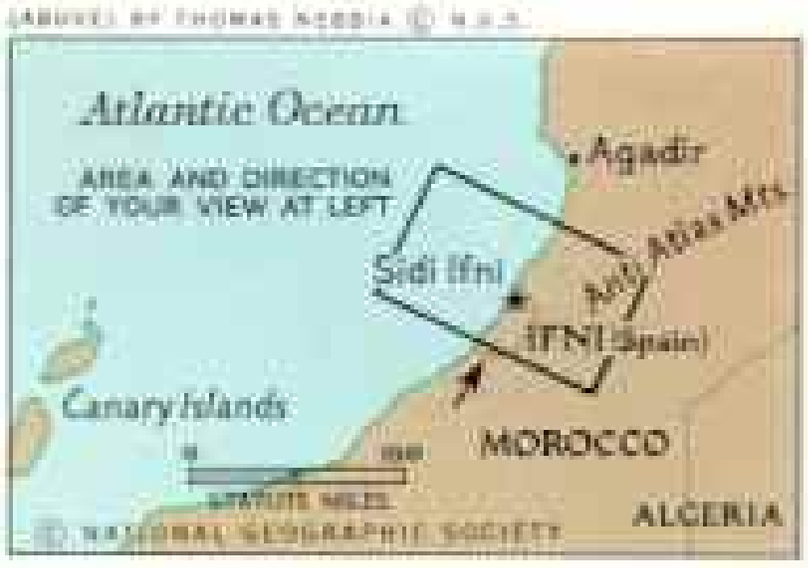
with surface measurements, can make possible highly accurate predictions of spring runoff. Such predictions are vital in flood control and the distribution of irrigation water in areas such as the Rocky Mountains.

Large dam projects, involving flooding of river valleys for hundreds of miles upstream, can draw significantly on hyperaltitude photographs. These show at a glance entire drainage basins, with vegetation, habitation, and potential bridge sites that must be taken into account by engineers planning reservoirs.

A close look at the Sudan picture on page 661 will show, in the right-hand corners, plumes of smoke blowing from forest fires. Many of the astronauts have reported seeing such fires. Imagine the value of pictures like this to the forester in spotting outbreaks of fire, measuring the spread, and assessing damage. Similarly, by noting the change in vegetation color, he can detect the onset of timber disease. With refined techniques, he may in time be able to make continent-wide inventories of timber resources.

Such a capability would be especially useful to many nations that have come into being

EKTACHROME BY NASA, KODACHROME (ABOVE) BY THOMAS NEBBIA © N.G.S.



MOROCCO AND IFNI

Whirlpool of wind and cloud gathers off the brick-red coast of Morocco and its neighbor, the tiny Spanish territory of Ifni. Northeast winds paralleling the Anti Atlas Mountains rush offshore with enough force to swirl the stratocumulus clouds over the Atlantic Ocean into a vortex. Twirls and zigzags of Anti Atlas ridges at right show erosion's effects on folded sedimentary rock.

In Casablanca, Morocco's famed port, a member of the royal guard stands watch (*above*).

1

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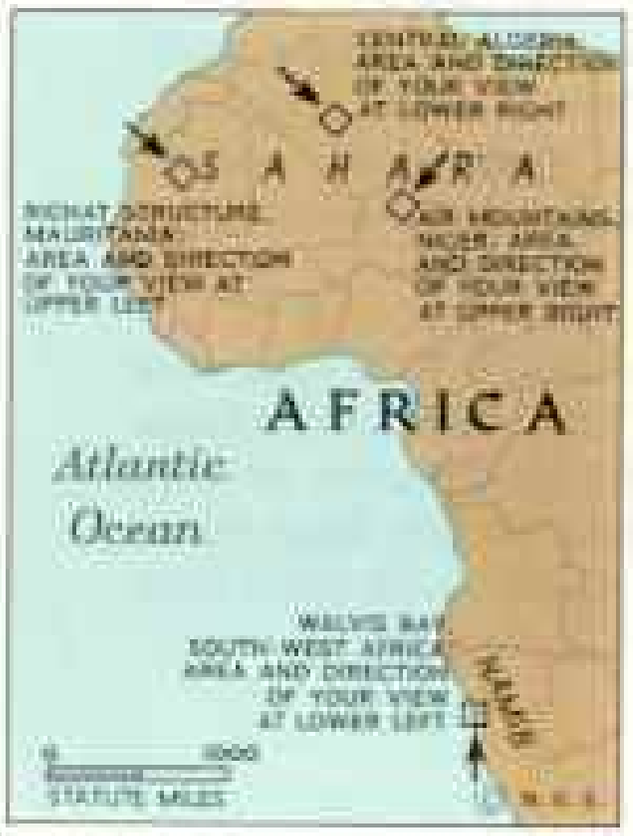
SERE FACE OF AFRICAN DESERTS



Giant bull's-eye in Mauritania, the Richat Structure (1) may have been born of a meteorite's impact; erosion produced its concentric ridges.

Lava flows, probably from fissures, pancake the Aïr Mountains of Niger (2).

Wavelike *seif* dunes (3), some 200 feet high and 100 miles long, ripple through the Namib Desert near Walvis Bay on the coast of South-West Africa. The pink-hued sands hide unknown fortunes in diamonds.

Sahara dunes in Algeria (4, upper left) resemble pitched tents. Playas, dry lake beds crusted with salt, pock the arid land.

since World War II. They find that independence brings problems, such as the need to develop independent economies. This means locating and using natural resources—timber, for example.

Another possible application, especially in North Africa, lies in planning transcontinental communication lines. With a photograph like that of central Algeria (left, 4), engineers can pick out promising routes for railroads and highways.

For such purposes, orbital photographs may be more useful than maps, because they can show many different aspects of a wide area of the earth at a glance.

It happens that most space photographs so far have been taken over the developing countries in Africa, Asia, and South America, because the tilted paths of manned U. S. spacecraft swing only 32° above and below the Equator. Thus, many of the first applications of the world's most advanced technology may be to backward areas.

Mid-ocean Typhoon Charted From Space

Although the weatherman has his own hyperaltitude photography in the black-and-white television output of Tiros and Nimbus satellites,* he finds the color and sharper detail of astronaut photography useful in tracing weather patterns. And for spotting hurricanes and typhoons, the quick eye of an astronaut may give much faster warning than a televised picture that must be interpreted. In August, 1965, Astronauts Cooper and Conrad reported Typhoon Doreen in mid-Pacific. Nobody else knew precisely where the storm was. The San Francisco weather bureau, armed with this information, immediately issued a warning to sea and air traffic.

Eventually other kinds of sensors will supplement the camera film. As an example, radar can penetrate clouds, vegetation, and even soil to give the geologist a picture of underlying bedrock. Infrared images can reveal crop blights not visible to the eye; for pollution studies they can detect smoke coming from industrial sources.

And the eye, of course, will always add its information to that of the camera. How useful it can be was dramatically demonstrated by Gordon Cooper, whose 22-orbit flight in May, 1963, produced the most valuable pictures of Project Mercury.

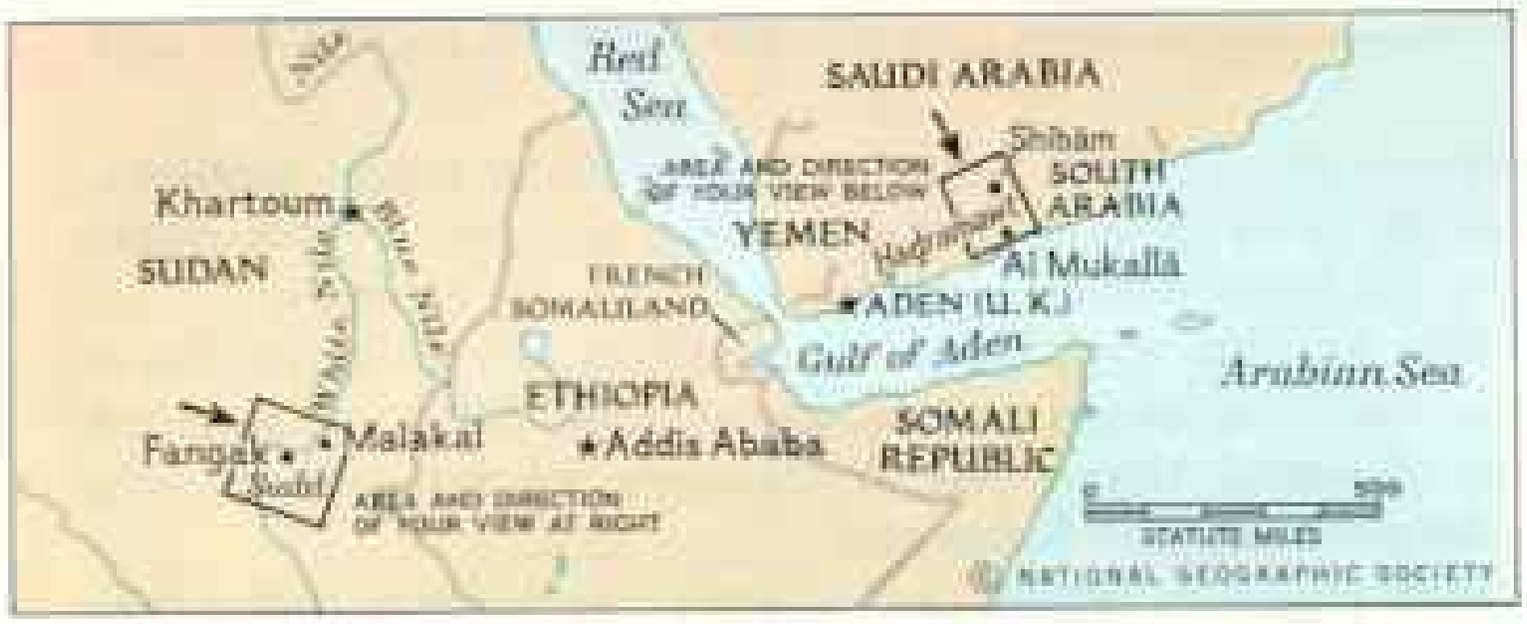
Cooper has a nearly photographic memory for colors and shapes,

*Extraordinary pictures made by Tiros I appeared in NATIONAL GEOGRAPHIC in August, 1960, and two sweeping views from Nimbus I in February, 1965.

SUDAN AND SOUTH ARABIA

Sun spotlights a watery maze (right) of the White Nile: Sudan's Sudd, a 400-mile-wide swamp. Smoke wafts above forest fires at upper and lower right. On the drier coast, women bundle against stinging sands (left).

Dry canyons choked with sand etch a pattern like branches of a dead tree across the arid Ḥaḍramawt plateau in South Arabia. In the huge Wādī Ḥaḍramawt, center, seven-story mud skyscrapers of Shibām rise unseen.



which proved valuable in interpreting his pictures. He also has unusually sharp vision —20/12 instead of the normal 20/20—enabling him to pick out many small objects on earth. His visual observations on his return aroused a vigorous controversy for a time.

"I could detect individual houses," he reported, "in the low-humidity and cloudless areas such as the Himalayas, the Tibetan plain, and the southwestern desert of the United States. I saw several individual houses with smoke coming from the chimneys in the high country around the Himalayas. . . . I saw what I took to be a vehicle along a road . . . in the Arizona-west Texas area.

"I saw a steam locomotive by seeing the smoke first; then I noted the object moving along what was apparently a track. . . . I also saw the wake of a boat in a large river in the Burma-India area."

See such objects 100-odd miles away with the unaided eye? Nonsense, insisted some scientists. A few suggested that prolonged weightlessness somehow enhances eyesight; others said it produces hallucinations.

But a thorough investigation in the border region where Cooper said he saw a vehicle revealed that a white-topped border-patrol truck had driven along a lonely road at just the time and place Cooper had reported.

To settle the question further, Dr. S. Q. Duntley, principal investigator for the Gemini visual-acuity experiments, devised an ingenious test for the Gemini astronauts.

The National Geographic Society was asked to make an exhaustive analysis of a number of sites to find flat test areas with a minimum of cloud cover and vegetation. The search produced two highly suitable sites—

(Continued on page 669)

MAINLAND CHINA

ENLARGEMENT BY NASA; MOSAIC PHOTO (CENTER RIGHT) BY W. ROBERT MOORE © N.G.S.

Pale rouge of sediment paints the mouth of the Yangtze (opposite)—highway of junks—and so changes its islands that this picture outdates maps only two years old. Pouring into the East China Sea, the silt builds the Great Yangtze Bank. Teeming Shanghai straddles the Huang-P'u River cutting the peninsula, center.

China's water gate to North Viet Nam, the Gulf of Tonkin (top) serves for transporting war supplies. The pink thumb of the Luichow Peninsula presses against the head of the gulf.

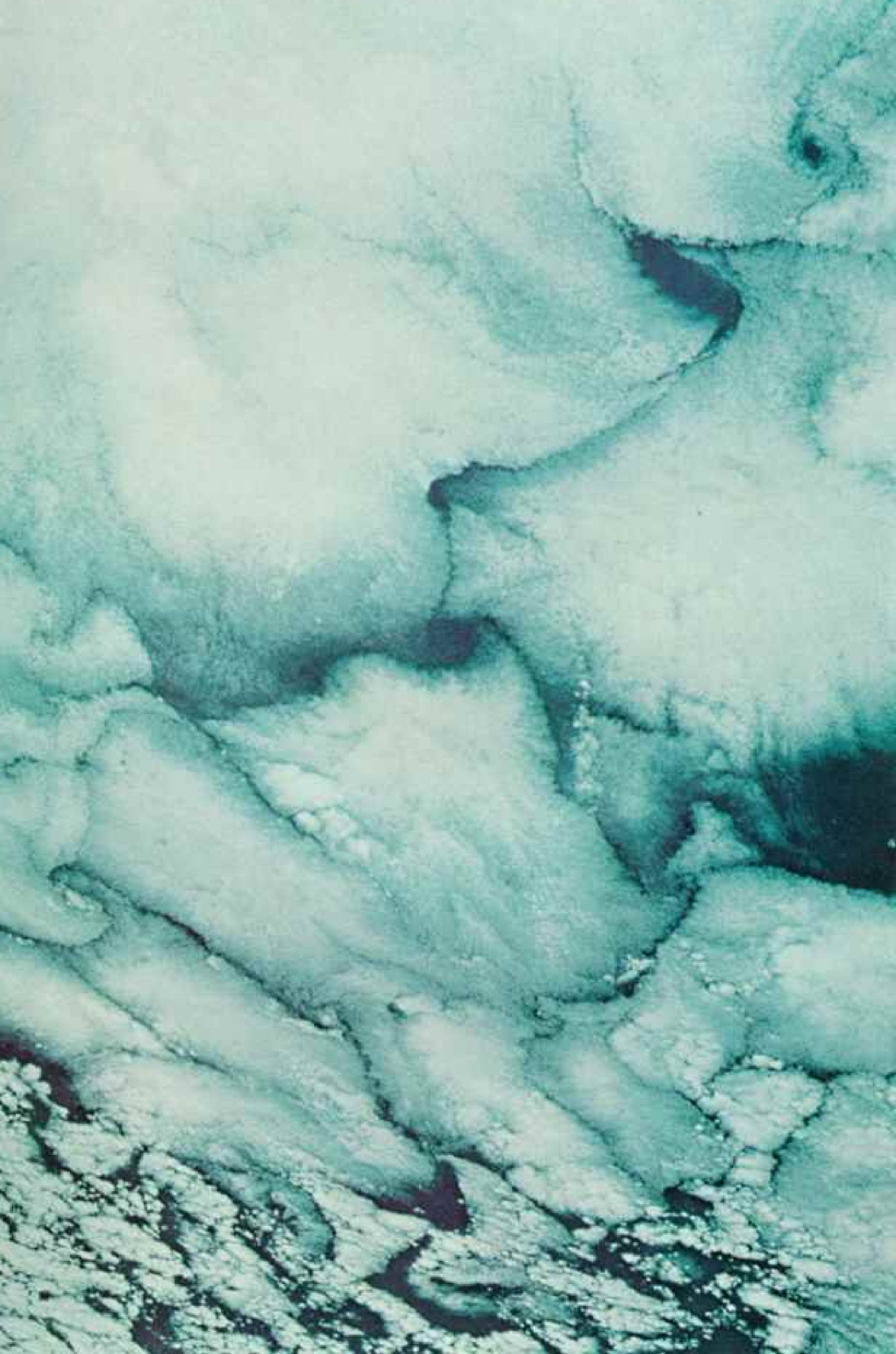
Wild ridges and rivers, valleys and peaks lie northwest of Chungking. Light vegetation appears to cover these heavily eroded ridges. Cultivated slopes, upper right, flank the new town of Ch'iao-ko-a-ma.

EXTACHROMES BY NASA

WEATHER BRINGS A DAILY MIRACLE

Finger of rain-soaked soil stabs a dry plain in oil-rich west Texas. A Gemini 4 photograph shows how thunderstorms had doused some areas, while not a trace fell nearby. To a sharp eye, the scene teems with life: Rectangles of worked land mark a patchwork of ranches, lower right and center; a highway links thriving Odessa and Midland, above center at right; and the Pecos River cuts across cotton-growing country at upper right.

Shingles of cellular clouds, each so big that no photograph from earth or aircraft ever showed more than one, roof the western Pacific.



ANDES AND LAKE TITICACA

Snow-wigged giants of the Andes, South America's longest and loftiest mountain range, march at left center beside Bolivia's Altiplano and Lake Titicaca, at 12,506 feet the world's highest navigable lake. Fish from these waters supply the stall of an Indian vendor (above). Like a huge chocolate drop, a plug of volcanic rock looms on the shore at the Peruvian border. The camera looks southward to Lake Poopó, top center, and salt flats, upper right. At twilight, the sun's slanting rays cast a sheen over the blue-robed land.

one near Laredo, in Texas, and one near Carnarvon, in Western Australia.

At both sites, large white markers, measuring from about 150 to 600 feet long, were laid out in various patterns. Dr. Duntley asked the astronauts on both Gemini 5 and Gemini 7 to find and describe the targets.

Pilots on each flight saw many of the markers and described their patterns. Moreover, eye tests before, during, and after the flights revealed no change in visual ability. As Dr. Duntley said, the experiments indicated that Cooper saw what he said he saw.

Later observations by Gemini pilots added further confirmation. Ed White, after the flight of Gemini 4 in June, 1965,* reported:

"The thing that impressed me was the clarity with which you could see objects down there. You could see roads and wakes of ships very clearly. . . . Sydney [Australia] looked like a fine spiderweb of light."

Conrad said that on most passes across southern California he could see airliners coming into Los Angeles.

Earth Appears Blue From Space

Three major observations run through astronaut reports: The sky in space is black; the world has an unexpectedly high degree of cloud cover; and the earth is a blue planet.

"During the day, the earth has a predominantly bluish cast," Cooper reported. "I found that green showed up very little. Water looked very blue, and heavy forest looked blue-green. The only really distinctive green showed up in the high Tibetan area. Some high lakes were a bright emerald green. . . ."

The blueness of earth does show up in many of the photographs in this series. But one must keep in mind that film, aided by a haze filter, does not always see the same colors as the eye, and that at different times atmospheric conditions create different color qualities. Thus the beautiful China view on pages 664-5 seems to show less of the characteristic blue of photography from space, perhaps because the green has been accentuated by the filter and the thin blanket of air between the camera and this high mountain-ridged area.

As a scientific tool, photography of earth from space is in its infancy. Its very earliest beginnings go back only two decades, to the pictures taken by captured V-2 rockets fired from White Sands Proving Ground, New Mexico, shortly after the end of World War II.†

*See "America's 6,000-Mile Walk in Space," NATIONAL GEOGRAPHIC, September, 1965.

†NATIONAL GEOGRAPHIC presented the best of these pictures in "Seeing the Earth From 80 Miles Up," by Clyde T. Holliday, in the October, 1950, issue.

Better pictures were taken from altitudes as high as 158 miles by the Navy's Viking rockets in 1954 and 1955, but they were shot at such oblique angles that they gave little useful geological information.

Television from space began in 1960 with the first of the successful Tiros weather satellites. These were followed in 1964 and 1966 by the far more advanced Nimbus satellites. Together they have produced well over a million pictures. Nimbus circles the globe in a polar orbit, so each day it sees the entire 197 million square miles of earth rotating beneath it. A single Nimbus photograph covers a million square miles.

Oddly enough, these pictures from altitudes of 250 to 600 miles reveal very little evidence of civilization. From that high up, you cannot see New York City, or Los Angeles, or Tokyo. Even the world's longest bridges and the most elaborate networks of highways fail to appear in these photographs taken by unmanned satellites and televised to earth. Indeed, except for three items—a jet contrail, a single highway cut through Tennessee forest land, and a geometric pattern of snow-filled logging swaths in Canada—no clues in the 27,000 pictures taken by the first Nimbus suggest man's presence on earth.

This is one reason for scientists' caution in interpreting the Mariner 4 photographs of Mars. A similar probe of earth by hypothetical Martians might provide little evidence of life, and none at all of intelligent beings.

Future manned space flights will test new films, different types of cameras, and new radar and infra-red scanning devices. Such flights will enable astronauts to see and photograph earth from a wide range of distances, all the way out to the moon, a quarter of a million miles away. Already, an unmanned U. S. satellite has given us the first portrait of our earth as a planet in space—the historic picture taken last August 23 while Lunar Orbiter circled the moon.

THE END

WESTERN AUSTRALIA

"I can see it!" exulted Astronaut Schirra on spying the Carnarvon tracking station on the delta of the Gascoyne River at lower left. Approaching Australia, where the kangaroo roams (left), Gemini 6 flies over pencil-thin islands in the mouth of Shark Bay and smaller Denham Sound.

Perth, 500 miles south, turned on all its lights to welcome John Glenn on his historic space venture in 1962—America's first manned orbital flight.

PHOTOGRAPHS BY NASA, KODACHROME (LEFT) BY ROBERT F. SISSON

Proud Primitives, the Nuba People

By OSKAR LUZ
Photographs by HORST LUZ

Suffering for beauty: Blood trickles from the freshly scarred back of a stoic 15-year-old girl of the Masakin Qisar, a Nuba tribe.

KODACHROME © N.G.S.

"Three rows across the left shoulder is one of the most loved designs," the author reports. "Below lies the heart! The love life—happiness with a man—is thus made favorable." These, and additional cuts, rubbed with saliva and sesame oil, will form a pattern of welts like those covering the entire back of the woman at left—the finery of a naked people.

Sudan limits access to the area, but Mr. Luz received special permission to record its unique customs before they disappear through contact with civilization.

TOWARD EVENING it grew cooler, and Tesse sat down on a flat stone at the edge of the tobacco patch. She was ready for the ordeal that would enhance her beauty.

The pain? The girl's serenity denied all dread of it, and the presence of white-skinned strangers, who would witness the cutting and scarring of her body, seemed not to ruffle her composure.

We who had come to Tesse's village from faraway Germany agreed that cicatrization could only gild the lily, for nature had made the young lady comely, bright-eyed, and graceful as a doe. At 15 she was as attractive as she need ever be. But to the tribespeople of the Nuba Mountains in central Sudan, a girl without scars is unthinkable.

Tesse was a budding beauty of the Negroid tribe called Masakin Qisar—the "Short Masakin." (Almost within rifleshot live the Masakin Tiwal, the "Tall Masakin.") Among these happy and spirited people, who normally wear no clothes, skin decoration is an invariable concession to vanity.

Tesse already bore blisterlike scars from earlier cosmetic surgery. Traditional embossing patterned her arms, breasts, and stomach. Now she would receive three rows of cuts that would produce bumplike welts upon her left shoulder. This additional stippling would allow Tesse to walk with new pride as a young lady almost grown up.

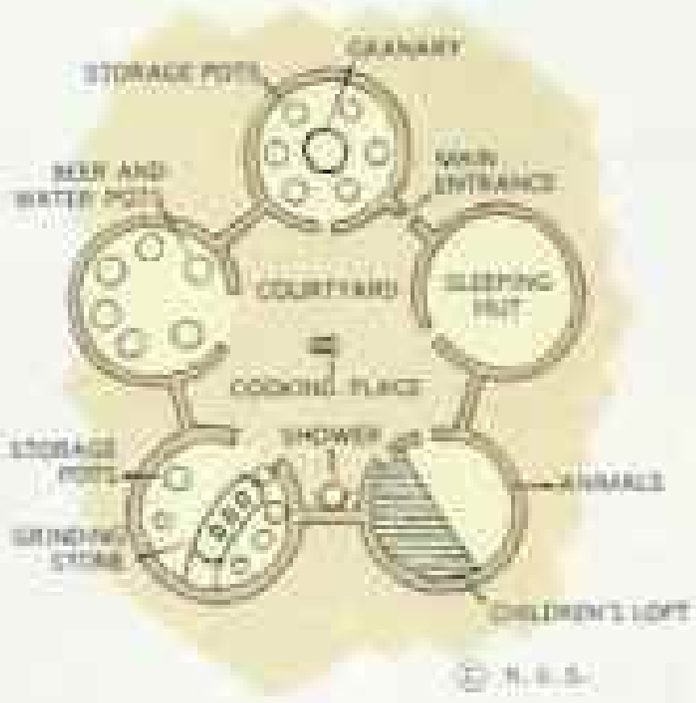
Kosse-Gogo, a woman skilled in these tribal rites, performed the surgical honors. Using a stout thorn, she lifted the skin on Tesse's left shoulder blade. Then, with the front edge of a small knife shaped like a spatula, she firmly made a short incision. Swiftly and deftly she repeated the process in a row of cuts. Blood trickled down (left), but Tesse neither flinched nor showed any emotion.

After a few minutes, the skin artist wiped off the blood, spat on the wounds, and rubbed a little

Tumultuous *sanda* celebration combines harvest feast, sports contest, and dance party in the dusty valley below the turreted huts of Tosara. Whole Nuba villages trek to the chosen site—for some, a walk of three hours. In clearings among the crowd, wrestlers carry the hope and honor of their hamlets into battle. Fans, all holding spears, gather

around their heroes. Women carry calabashes of millet beer on their heads. After the contest the brew flows freely. But it has such a low alcoholic content that, in a two-month stay, the author never saw a drunken tribesman. The Masakin wear any garments they may have to the sanda—strictly as decoration.

KODACHROMES BY HORST LUZ © N.G.S.



In a mud-walled Camelot, castlelike huts conform to centuries-old plans. The five-turret dwelling of the Masakin reserves a separate room for each household activity (right). Husband and wife live with their own families until she first becomes pregnant; then he starts building the complex. Repairs go on regularly on thatch roofs and crumbling walls of dried mud.

Framed by an oval doorway, a woman grinds the day's ration of millet. A tined stick, anchored in the wall, substitutes for a cupboard. Calabashes, clay pots, and a jam tin from the expedition's supplies clutter the flour mill.

sesame oil into them. Tesse rose from her trial, this beauty treatment at an end. More would follow over the years.

The nonchalance of the young lady made the incident all the more incredible. The scene reminded me that we had come to the end of a very long road, a road that had brought us deep into the mystery and immensity of Africa. We were lucky to be here at all, for the Sudanese Government limits access to the Nuba Mountains.

In Khartoum, shaved and well-pressed, we had presented ourselves with some trepidation to a government official.

"We hold it most important, sir," I said, "to make a record of the primitive cultures of the Nuba people before progress further impairs their way of life."

The official knew of our careful preparations for filming the Nuba crafts and ceremonies and for recording their songs, and he must have sensed our zeal and earnestness. He approved the permits that would admit us to the district and allow us to conduct our studies.

South from El Obeid the road lifts gently toward the central highlands of Sudan (maps, page 680). The thin grass bends before the hot wind from the Sahara, and through the sparsely peopled land the rutted track links isolated villages.

Down this little-traveled route, one December day, rolled our small expedition caravan. We had two vehicles: our burly, tough Unimog-S—a converted four-wheel-drive military truck—and a Volkswagen bus, also specially equipped.

Mountain Ridges Mark the Land of the Masakin

Our African journey was mounted under the aegis of the Deutsche Nansen-Gesellschaft, a corporation I had founded. Its name honors the great Norwegian explorer and peacemaker, Fridtjof Nansen. Its mission: to undertake expeditions to little-known areas and make the information collected available to scientists and research institutions.

The Luz family was well represented on our African journey. I was the expedition's leader. My dentist son-in-law, Dr. Waldemar ("Waggel") Herz, came along to make anthropological field studies and to serve as deputy leader and doctor. My oldest son Horst, an architect, was chief photographer. To round out our group we brought agriculturist Rolf Engel and educator Friedrich Rothe.

Along that road aimed at the Equator, blue ridges at last nicked the horizon. The Nuba Mountains! Bouncing through dry wadis, we sped on to Kadugli, where the amiable military chief greeted us in immaculate khaki uniform and jaunty cap.

We explained that we wanted to visit several of the Nuba tribes, but hoped to focus our work on one of the more primitive groups, perhaps the Masakin Qisar.

When the officer understood that we were entirely self-sufficient, with plenty of gasoline, ample food and water, and a stand-by filtration kit, he agreed to give us free rein in our wanderings. He assigned us an interpreter, a bright young policeman who spoke both Arabic and English.

Calling on the various tribes, we found each differed from the others. They lived scattered among the gray and reddish granite of the Nuba Mountains; the Short Masakin in seven villages on the south fringe of the region.

As we skirted a steep knoll one morning and Masakin huts came into view, Horst jumped on the brakes of the Unimog. Shouts came from the bus following close behind us: "Are you crazy? We almost rammed you!"

Horst just stared. I followed his gaze to a graceful young girl standing in the breeze on a rock outcropping. Unencumbered except for bead strings around neck and waist, she was a black nymph on a pedestal.

But she moved. Her torso made writhing, sinuous motions and her arm swept an arc above her head. At the end of a rope she whirled a narrow shingle of wood that produced a soft buzzing sound.

This was the humming whip, a musical toy of the Masakin.

Old *Mek* Gives Orders on Tape

The huts, 200 yards farther on, were those of a village called Tadoro. It was not hard to persuade the boys to stop. We drew up our vehicles where two big acacias cast pools of shade, paid our respects to the chief, and with his ready approval set up our base camp. The entire village turned out to greet us—the chief, his sons, his nephews and nieces, all his numerous relatives. Chief Natu barked an order to bring *marissa*, a beer made from millet, and as the calabash passed around, he bade us welcome.

The crowd responded with nods and smiles when we played a taped message of introduction in one of the Nuba dialects from the *mek*—the chief—of nearby Reikha.

"Strangers have come to us," said the words from the turning spool. "They desire to work near us; not only for themselves, but also to get knowledge that can help us. They are good people. Receive them hospitably, as if they came from your own mother. Help them. So say I, your old mek, to you."

The people at first treated us with reserve; true acceptance came later in our two-month sojourn. They were quite unembarrassed about their own nakedness; their diffidence

Bold frescoes enliven the wall of a hut at Tadoro. A giraffe-necked camel stares skyward beneath a shield, a stylized man, and a crudely drawn child. Painted for pleasure, they have no ritual meaning. A banded walking stick awaits its owner.

Running water in every compound amazed the author. Still wearing her finery, a young Nuba woman takes her daily shower between two turrets of her home (diagram, page 677). A pair of antelope horns cradles the shower's water reservoir—a pot. When the bather reaches up and tilts the vessel, water streams from a hole near the rim.

Home builders value the horns. Formerly, they could obtain them with little trouble by hunting, but now that large game has vanished they must trade for them, or use plain wooden pegs. Decorations on the compound wall and the curving turret sides reveal Islamic influence.

stemmed mostly from puzzlement at *our* manner and appearance.

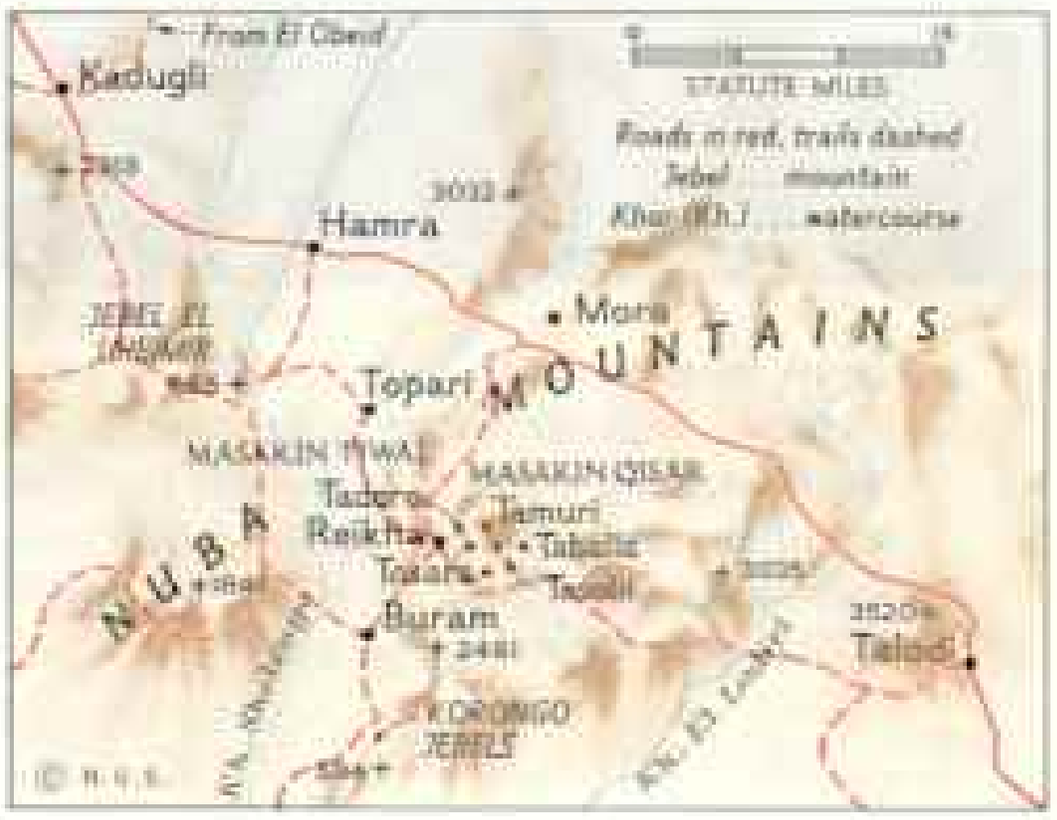
Many of the Masakin had never seen a European. We let them chafe our arms to satisfy themselves that the color would not rub off.

"Think how odd we must look to them," said Horst, "in our shoes, shirts, pants, and absurd pith helmets, and weighted down with cameras, binoculars, and tape recorders."

At Tadoro we had our first close look at the fortresslike Masakin houses. A conical grass roof tops each of five round turret-shaped units (pages 676-7). Sturdily and symmetrically fashioned on stone foundations, the huts are smoothly plastered inside and out with mud. The windowless cylinders huddle close together around a courtyard. Walls close off the spaces between them to form a secure and completely private family enclave. Loosely woven grass and boughs roof the courtyard.

Daylight enters each hut through a small round or oval portal, knee- or waist-high from the ground. The main doorway to the home compound often has the shape of a keyhole, to admit a person bearing a bulky load.

Chief Natu of Tadoro walked with us



Welcoming hills and sheltering valleys, amply supplied with water, gave refuge to the Nuba. In the misty past, the plainsmen took flight from Arab attacks that continued into the 19th century. Now half a million of these people live here, split into fifty groups with varying dialects and customs.

Carefree nursery beneath a giant baobab tree. Older children tend little brothers or sisters. "The youngsters live a happy life," reports the author. "They do not have to learn or obey; they do it voluntarily." At about the age of six, most Nuba offspring go to live with their mother's brother.

through his village, his "son" Aleppo at his side. Actually, Aleppo was Natu's nephew.

"Children usually remain with their fathers and mothers only until they are five to seven years old," the chief explained. Like most of the village leaders, the old man spoke a little Arabic. "Then they are adopted by their mother's brother, and grow up in the uncle's household. Aleppo is my sister's son. This is the tribal rule, which strengthens the bonds between our families."

Natu, as befitted his dignity, wore for the welcoming occasion an Arabic galabia, like a loose nightgown. Aleppo sported a leather belt from which hung a piece of colored cloth —not for cover, but for decoration.

Natu introduced his three wives to us. If a Nuba man can afford more than one wife, he must provide separate quarters for each. He may prepare an extra sleeping place in one of the granary huts, but almost always he must eventually build her a new five-unit house.

"Most Nuba have only one wife. You have to be wealthy, as I am," said Natu complacently, "to keep extra wives. You must have more fields, and more livestock."

Hospitably, Natu showed me his house.

"With me lives the youngest of my wives," he explained. "Her two children, a girl of two and a boy of five, still live with us. Later, they will move to their uncle's house."

The chief's residence followed the pattern of Masakin houses (diagram, page 677). Clockwise from the main entrance, the first hut is the sleeping place of man and wife. The second shelters chickens and goats or pigs, which have their own ground-floor entrance, and accommodates boys or girls in the loft, reached by a separate portal at a higher level.

In the third turret, the wife grinds grain. Here are millstones and a flat stone grinding table—and here also are stored spare grinding stones and grain. Sometimes the husband occupies the fourth hut, sharing it with beer pots, water jars, and calabashes of reserve food. The fifth turret, devoted solely to storage, contains the granary, where the family keeps its harvest of millet and sesame in big jars. A ledge in the granary is reserved for girls, who place their sleeping mats there while they are secluded during their coming of age.

When a girl is released from her seclusion, the foster family puts on a big celebration. Gifts are presented to the girl: beads, ornaments, and live cattle.

Chief's Wife Serves Mush for Lunch

Natu casually led me to the compound's bathroom. To him, it plainly was just another convenience, like doorways or marissa pots. We were soon to observe that every Nuba dwelling has its inside shower.

Running water falls from a clay pot—holding about a gallon—suspended between antelope horns high on one of the courtyard walls. To work the shower, the bather tilts the pot forward in the horn cradle. The water pours out of a hole near the lip (page 678).

One day we watched the chief's youngest wife, Koishe-Tutu, preparing lunch. As she set about cooking the meal, her "dress" was only a bead necklace and a narrow band of beaten bark passing between her legs and fastened to a girdle of beads.

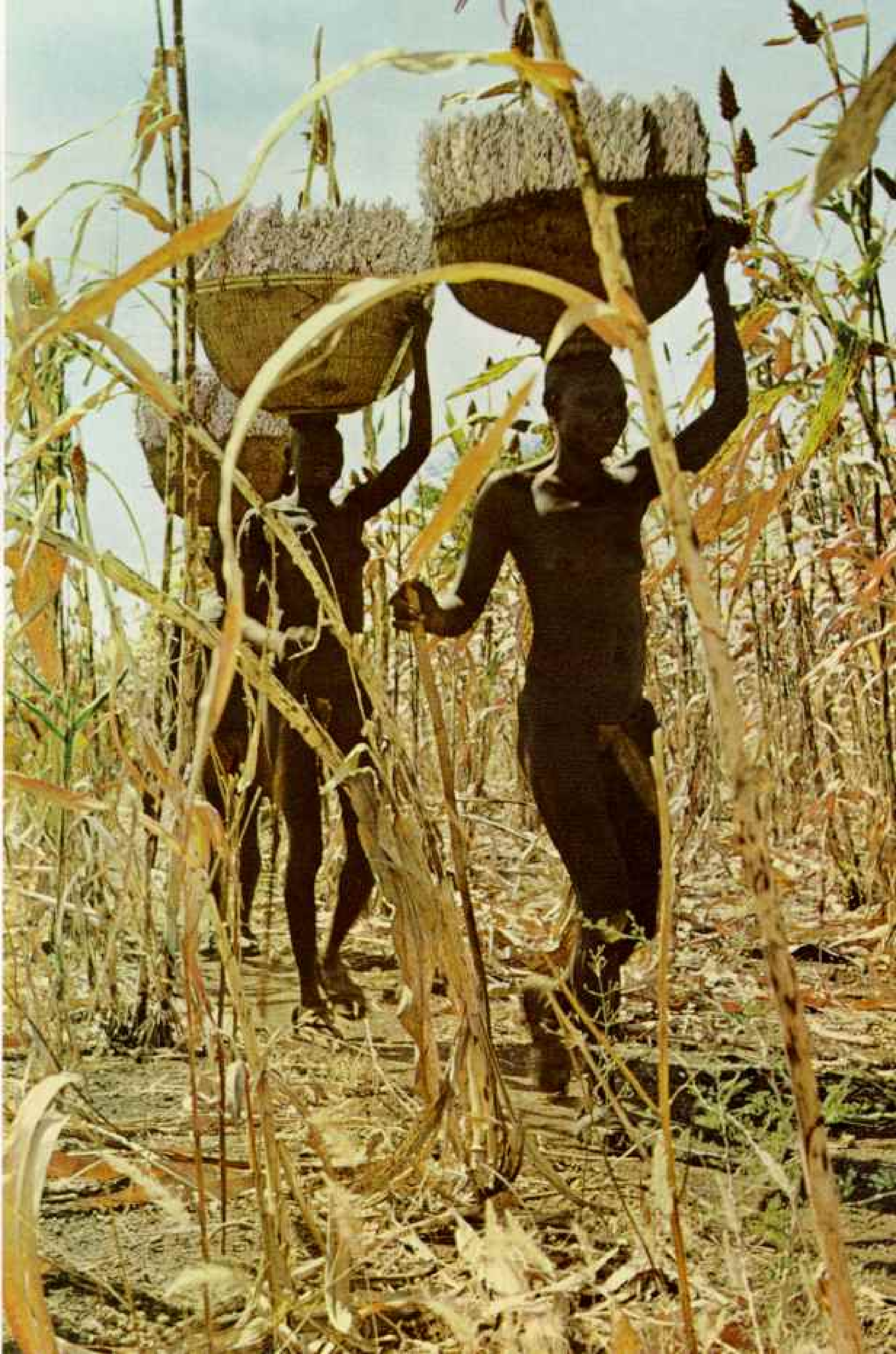
Taking two double handfuls of millet flour, Koishe-Tutu placed them in a pot of boiling water set over the wood fire in the courtyard. The flour cooked into a thick mush.

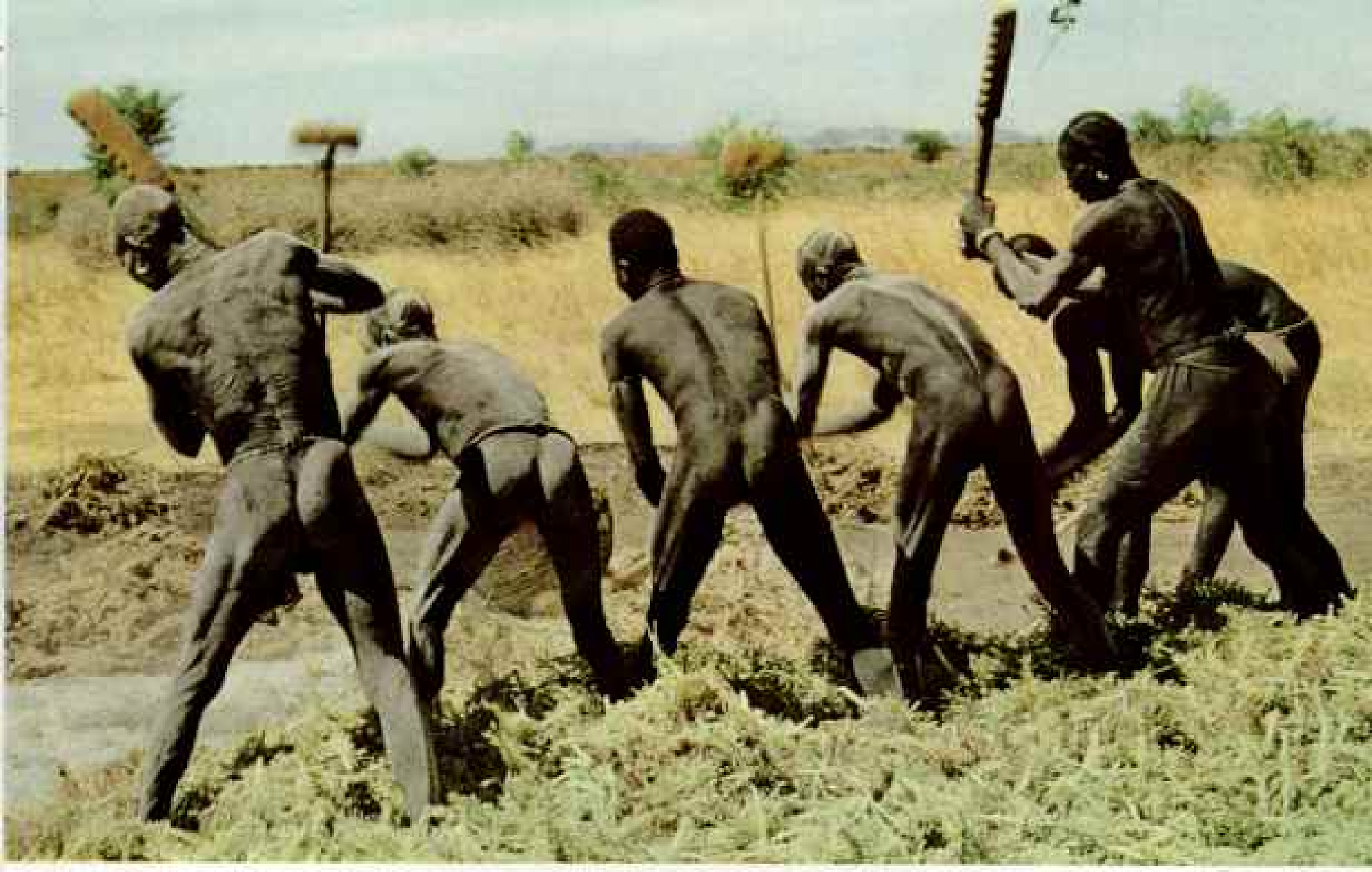
The little boy ate out of his own pot, using a small wooden spoon. Chief Natu was going to be late for lunch, and so Koishe-Tutu rested his dish on pegs high on the wall to await her man's return.

With the mush, which tastes surprisingly

Goddesses in ebony, women carry basketloads of millet weighing as much as 75 pounds. They step through an unharvested field on their way to drying racks two miles distant. The expedition tested the Nuba under the stress of heavy work. Results show that these human work horses endure burdens and heat that would fell a European. Women do most of the carrying while men thresh. From millet, the major crop, the Masakin make porridge and beer.

"Doughnut" of grass (top) cushions the loads; nevertheless, these press so heavily that they deform the skull, leaving a bump under the hole. Nuba women bear such burdens from the time of marriage, perhaps at 15.





Flailing millet with flat clubs, farmers thresh the crop of a neighbor in a community endeavor. The host spends most of his time passing food and beer, his hospitality the only wage he pays. Next day, the men move on to another neighbor's land.

good, Koishe-Tutu served a spicy sauce prepared from sour fruit. To this she added a little *bembe*, a variety of hot pepper. At hand stood a jar of water for the children and calabashes of marissa for the adults.

Soon the Masakin became accustomed to us, and we began making documentary films of their life and culture. We filmed, for instance, the making of a bowl from white clay mixed with cow dung. (The dung is light and tough, and its elasticity makes the bowl break-resistant.) The molding and firing of clay pots, the making of sandals from cowhide, the shaping of a clay flute—there were more subjects than we could cope with.

The people seemed to enjoy getting together with us in the evenings to sing and to hear our songs. We would often play back recordings of these gatherings. At the sound of their own voices, the delighted singers would laugh and tease each other—and we would record this banter and let them hear it, too.

The remarkable integrity and independence of the Nuba stem partly from the remoteness of their homeland, which is off the main trade-and-travel routes. The Nuba Mountains rise from the arid plain between the true desert—the Sahara—and the swampy Sudd region of the upper White Nile (pages 660-61). Here, a few degrees north of the Equator, rain falls between April and October. Heaviest in August, it averages thirty inches a year.

Our visit coincided with the dry season, and temperatures at midday soared above 100° F. At night, we had welcome readings in the 60's, sometimes even lower. March and April bring the most intense heat, as high as 111°. The coolest months are July and August.

Two or three times thermometer readings fell to 48°. We were grateful for our warm sleeping bags, spread out on the roof of our truck and inside the bus.

A Pinch of Snuff, Then off to Work

The Nuba, tough-skinned and acclimated, disregard temperature. It made us shiver to watch them marching to their fields at dawn without a stitch on. Usually they passed close to our vehicles, called out *"Guten Morgen"*—one of the German phrases they had picked up from us—and placed the backs of their thumbs to their noses, signaling their willingness to accept the usual pinch of snuff.

Our native hosts imitated our Swabian dialect quite easily. *"Hock na!"* is the sharply accented south-German slang for "Sit down!" It came as a shock, when we stooped to enter the keyhole entryway of a Nuba hut, to hear the woman of the house exclaim "Hock na!" in greeting as she pushed log seats toward us.

Fire rips through dry fields to clear the way for spring planting. With his ax, a tribesman sets out to cut wood. Arab traders provide the *golaba*'s triangular iron head as well as matches.

Dousing future smokes, a boy irrigates the family tobacco patch. The Nuba smoke pipes—homemade or bought from Arabs. Stone paths hold the soil during heavy rains.

When we left, it was always *"Gute Nacht."*

The Negroid tribes of the Nuba Mountains total perhaps half a million people. Sudanese administrators call them all "Nuba," but by no means are they a uniform group.* Fewer than 1,000 may form a tribal unit, and a ridge of mountains may separate people with languages so different that they cannot converse with each other.

"We came from the plains," a Masakin elder told me. "Six . . . ten generations ago there was much tribal warfare, the Arabs came south, and slave traders from east and west pushed us into the mountains.

"High in the hills we built our round houses like forts. Only in recent years have we once more come to the foothills."

At Tadoro we were close to six other communities of the Short Masakin—Reikha, Tosara, Tamuri, Tosobi, Taballa, and Buram. Each has twenty to fifty houses. The population of these villages, plus the neighboring Tall Masakin, totals about 6,000.

One still night the wailing of women woke us. First it was one voice, then others took up the mournful plaint. The ululating chorus was not unmusical, rising and falling like the moaning of an uneven wind, but there was no mistaking that the sounds were those of unutterable sadness.

In the morning, a small group of young men passed by on the way to dig a grave, and we learned that an old man, the father of one of the secondary chiefs, had died "between one day and the next."

Three deaths occurred in Tadoro while we were there. The others were a boy of 14 and a woman in her middle years. Only the women wailed to lament the souls' passing; the men betrayed no sign of emotion.

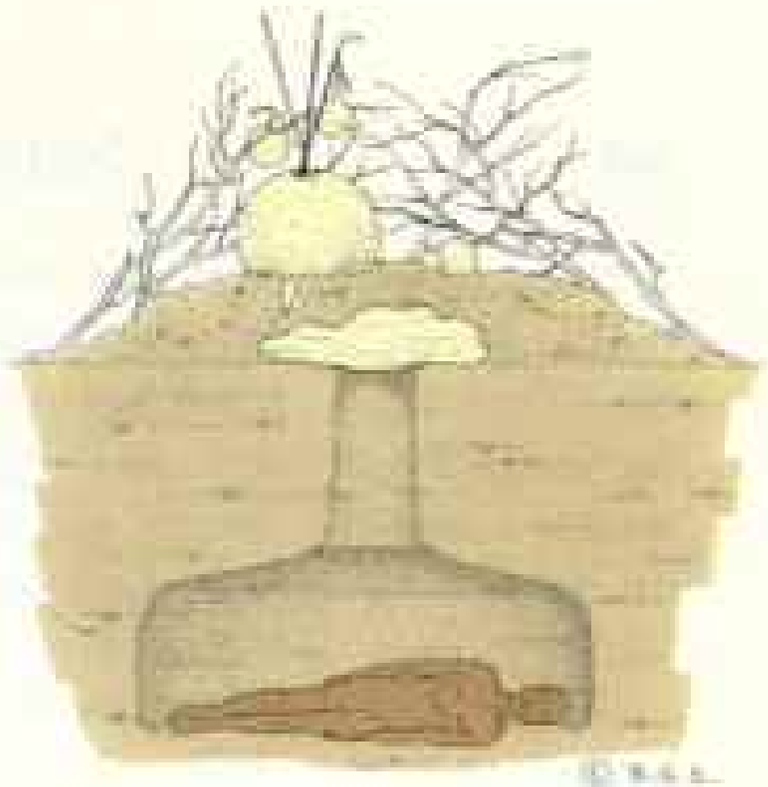
Payment for a Back Cure—One Cow

The Masakins' health seemed good, and some looked to be very old. But vital statistics were hard to come by, for the passing years go unnoticed amid these lonely hills.

Almost every day, we spent several hours disinfecting and bandaging cuts and dispensing pills, powders, and ointments. Our white bandages, glaring against black skin, were often worn as badges of honor. One young man, overjoyed at losing a decayed tooth painlessly—we had injected Novocain—begged Dr. Herz to yank all his teeth on the spot to avert future trouble.

*Other Nuba groups were described in "With the Nuba Hillmen of Kordofan," by Robin Strachan, NATIONAL GEOGRAPHIC, February, 1951.

KODACHROMES © N. G. S.



Nuba way of death. Smearing white ashes on selected cows from a dead man's herd (left), mourners prepare to sacrifice them for his funeral feast. Until recently, this ritual included spear fighting, with the brothers of the dead man starting the battle. Blunted spears 10 feet long smashed into shields of hide as the fighters took aim from 12 yards away. Injuries and deaths forced the Sudanese Government to outlaw this old Nuba custom.

Friends of the deceased dig a jug-shaped grave in the hard red earth, its entrance so narrow the diggers must raise their hands over their heads to enter (below). They lay out the corpse on a north-south axis, facing east (above). Mourners place a flat stone over the entrance, heap dirt above it, and thrust in the dead man's spears. Calabashes of millet and water, set atop the mound, benefit his spirit in afterlife, the Nuba believe. Brush piled on top keeps animals away.

The Nuba have no graveyards; they dig each tomb wherever it suits them—usually where the dirt is easiest to scratch out.

Miracles were expected of us. A fellow who had suffered a bad spinal injury came up to me. "You are a great *kujur* [witch doctor]," he said. "I saw how you ripped off a finger without spilling blood and quickly stuck it on again." He had been taken in by a simple parlor trick I had played.

"Now you've got to cure my hurt back. Our kujurs laid hot irons against my neck, but it did no good. When you fix me, I will bring you a cow in payment."

I told the man that he needed hospital treatment, but gave him a pain-killing pill. Next day he appeared again, a wide grin splitting his face, leading a cow by the tether.

"Keep your cow," I said. "Your pain probably will come back."

It did, but somehow his back slowly improved. And his faith in my "magic" remained unquestioning.

Women Use Gun Oil as a Cosmetic

This admirer was an exception. Among the Nuba we found no formality about reward or even thanks. They did things for each other and for us because the need existed. Service to others is an accepted part of their lives.

This is not to say they rejected our gifts. They were delighted to receive safety pins (worn as ornaments), magnifying glasses (to start fires), spear points, hammers, axes, spades, cowrie shells, beads, and—the most popular item—snuff. The ladies were frantic for our skin lotion. They even prized our gun oil—a drop on the hand was instantly rubbed into hair or skin amid chortles of glee.

During breaks in our evening song sessions, as the beer calabash passed among us, we asked the old chief many questions. What are the Nuba marriage customs and taboos?

"We have certain forbidden marriages," he explained. "We may not marry two sisters, even though we can afford more than one wife. Also, we must marry outside our own clan. If we should disregard these ancient rules, we would not be punished, but the disapproval of our community would be more unpleasant than whipping or fines."

"At what age do your men marry?" Horst asked the chief.

"Aleppo, my foster son, was barely 14 when he wanted to marry Gaga-Gashal, daughter of the chief of Tosara, in another clan. Gaga was only 9 when Aleppo's mother brought gifts to the parents of Gaga to declare Aleppo's suit. The parents, and Gaga herself, were agreeable. Was not Aleppo strong? And had he not shown his mettle as a wrestler?"

"Did those two marry then, at 14 and 9?"

"No, they only became engaged. Aleppo wanted to keep on as a member of the wrestling team, and Gaga had not yet matured.

"Soon Aleppo will be 20," Natu went on. "I have already set aside one head of cattle, three goats, and twelve spears for Aleppo. At a family feast, after the harvest is finished, he will hand over bridal gifts to Gaga's father. The marriage is then concluded.

"But Gaga will continue to live with her foster parents; that is, in the house of the maternal uncle. She will work there by day, and only at night will she stay with Aleppo here in Tadoro."

And when would they have their own home?

"When Gaga gets with child, Aleppo will build a house for his family. And when Gaga moves in with her husband, she will bring with her some baskets of millet, sesame, and beans, and also some cooking utensils, gourds, and pots. But from that time on, he and she will have to take care of themselves."

Curiosity about our family life nagged Natu. One day the chief found me at my typewriter, writing up my journal and taking care of correspondence.

"Are you writing to your wives?" he asked.

"Yes," I replied, not saying that I had only one. The admission would have undermined my prestige.

Mother-to-be Gets Ritual Scars

True love among the Nuba makes strange demands. One day we watched Gaga cut decorative skin patterns on Aleppo's arm. In barely 20 minutes, she made 120 incisions in her fiancé's skin. The procedure seemed to leave both lovers quite unperturbed.

Later we watched Rumbe-Gogo, a popular cosmetic surgeon of Tosara, cut long scars on the abdomen of a pregnant woman. Every

Relentless eye of mother examines her offspring; finding dirt around the eyes, she cleanses them with her tongue. The second wife of a chief, this woman will breast-feed her baby for three or four years. Nuba men may take more than one spouse, but few are rich enough to afford extras. Besides supporting a new wife and her youngsters, a man must build a separate compound of huts for them.

young woman expecting her first child receives these ritual scars, and they follow a pattern of eight to ten pairs of wings, each having three feathers. About 60 incisions must be made, each nearly four inches long. Right and left of the navel, a scorpion pattern also must be applied.

Rumbe-Gogo crouched before her customer, who sat leaning against the wall of one of the huts. For this operation, she cut with a razor-sharp splinter of rock crystal. Because of its natural sharpness, this material is much preferred over steel for making the long abdominal incisions. Slowly, slowly! Rumbe-Gogo could not be hurried, for the gashes had to be precisely parallel.

Skin scarring for a Nuba girl starts when she is seven or eight. By the time she has borne her children, a Nuba woman's body shows few areas free of decoration.

To the Nuba men, however, are reserved the most beautiful patterns, symbolic motifs and animal figures which are incised on their chests and elsewhere. The artist cuts much deeper into the man's skin, producing a design in higher relief.

The Nuba are extremely hard-working, and at no time do they put forth more effort than during the millet harvest. Rolf Engel, who came with us from the Max-Planck-Institut, had been commissioned to report on the food situation. Early and late, Rolf was out in the fields with the laboring tribesmen.

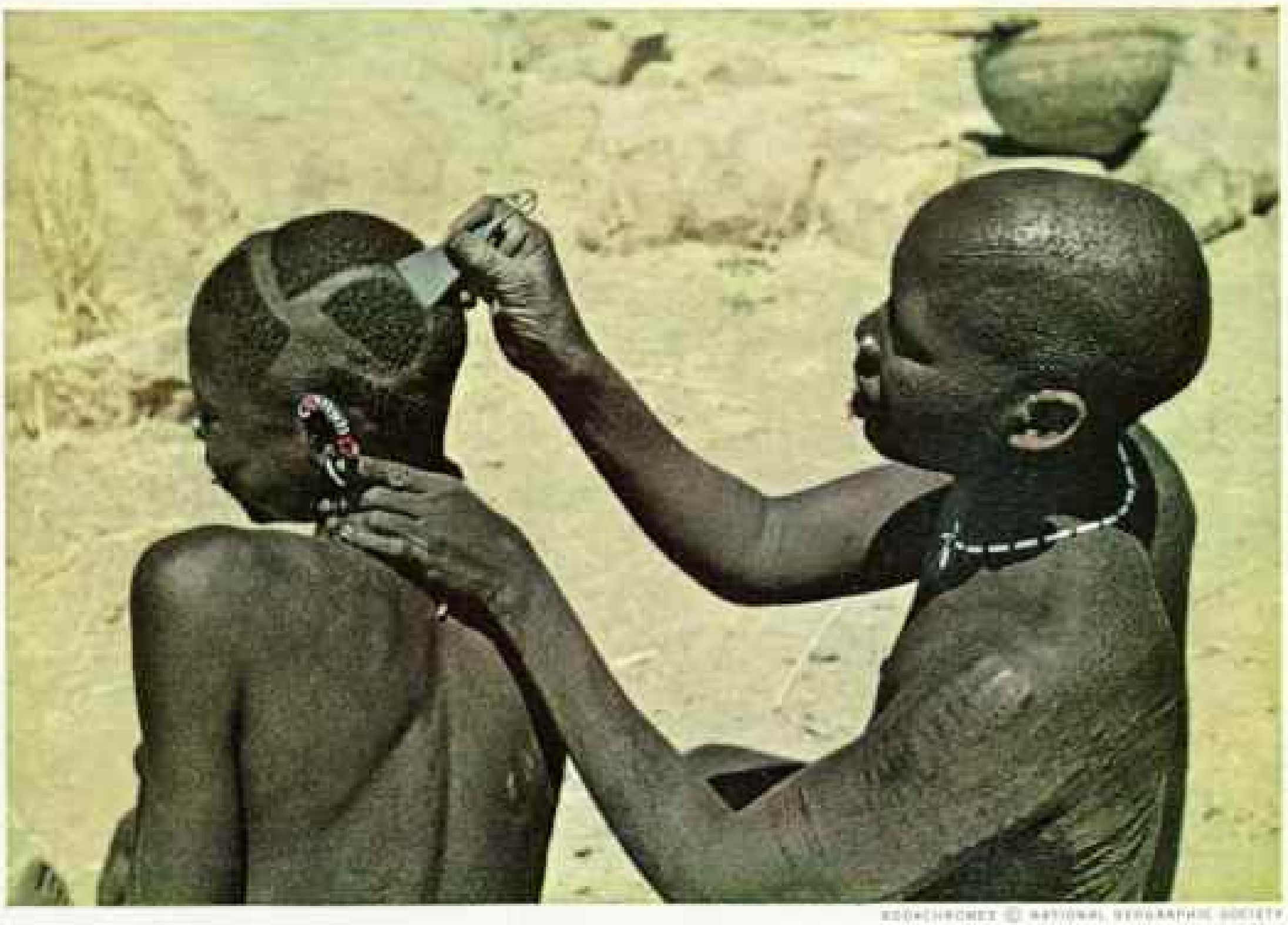
In April the rainy season begins, and by the end of May sowing is completed. The people cut their light millet crop in November, but not until December do they start to bring in the late, or heavy, millet. After the harvest, cattle are driven to the fields and allowed to graze on the stubble.

Hot Work in the Millet Fields

The major millet fields of the Masakin lay in lowlands a long way from the villages. For the natives, it was about a six-mile hike (or hitchhike, if one of our vehicles happened by) to Tadoro's plantations of durra, the variety of millet that provides the staple food. In height and leafage, durra resembles maize.

All day in the hot sun the men would tirelessly wield knives or iron spearheads to cut the bushy grain-bearing ears from the stalks.

Bands and swirls, cut by a sharp blade, pattern the head of a young girl. An older sister (opposite) takes pride in the welts on arms and back (pages 672-3). A wooden plug inserted through a slit in the lip adds a special decoration for the sanda. To keep the hole from closing, she inserts a peanut to wear around the house. A red button dangles from her mouth, another from an ear rimmed with wire; bits of metal adorn her nose.



In the afternoon the women would arrive with large baskets which they packed with durra to a level well above the rims. Heavy, heavy labor it was, carrying on their heads these loads of 75 pounds to the drying racks some two miles away (pages 682-3).

With a Nuba helper, Rolf followed the men and women, measuring their bodily reactions to the extreme stress of arduous work in the blistering heat. Rolf's assistant carried an electronic recording instrument, slung by a leather strap around his neck, like a cigarette girl's tray. Wires from it led to electrodes attached to the earlobes of his sweating subjects; the wires transmitted their pulse rates. Gasping from an afternoon in the fields, Rolf voiced his amazement: "I don't know how they stand it! They are certainly built of steel."

The Nuba harvest is a community project: Neighbors and relatives join in reaping each man's crop, and then move on to another's. During the cutting of the crop, the owner of a particular plot does little work on his own property. He is too busy playing host—serving food, plying the harvesters with marissa, even furnishing musical entertainment. Payment of wages is unknown, but there is a heavy expense—the many baskets of grain consumed in brewing the beer.

In March, chanting teams of men thresh the dried durra, flailing the panicles with their flat clubs (page 684). To clean the grain, the women lift filled calabashes high in the air, and the wind carries off the chaff as they let the contents trickle into baskets.

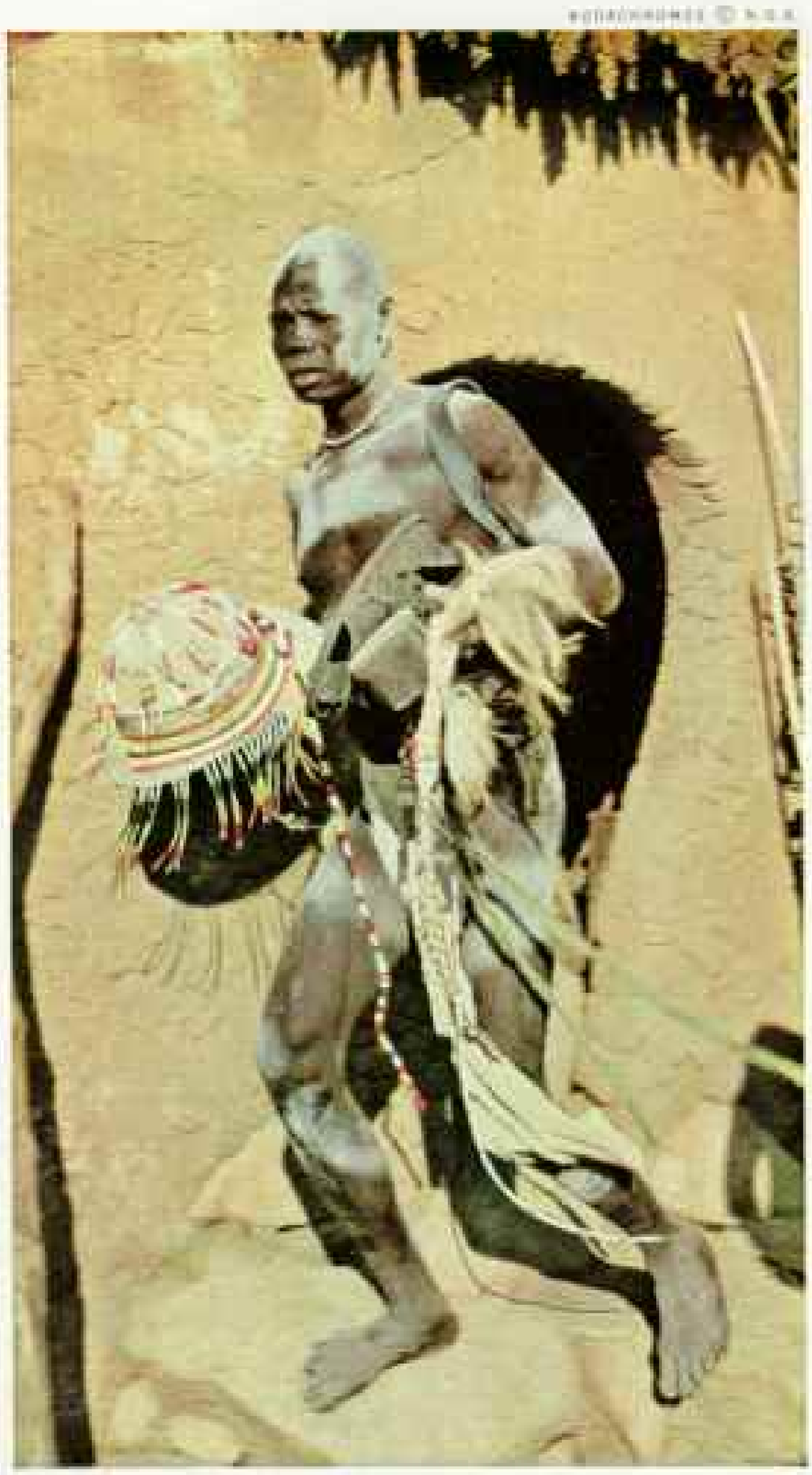
Because grazing is scanty and animals are poor in quality, cattle raising is of secondary importance. Milk, considered palatable only when sour, is mainly reserved for wrestling champions and old men. Sour milk and butter also find use as a skin lotion and adornment for young men and girls during Nuba festivals. Not many, however, are able to afford this luxury.

Villages Take Turns as Festival Hosts

With the harvest came festival time, the days and nights of the *sandas*—wild jamborees of dancing, singing, and wrestling. The barren valleys stirred with life, and between December 15 and January 25 the village chiefs arranged a score of greater and lesser sandas. They were staged in rotation outside the seven Masakin villages.

As messengers ran over the hills to invite the guests, the women busied themselves brewing vast quantities of marissa. This everyday beverage in the land of the Nuba has much less potency than German beer, and this undoubtedly explains why I never saw an intoxicated tribesman.

None of us will soon forget the sanda at Tosara. We joined the exodus that started

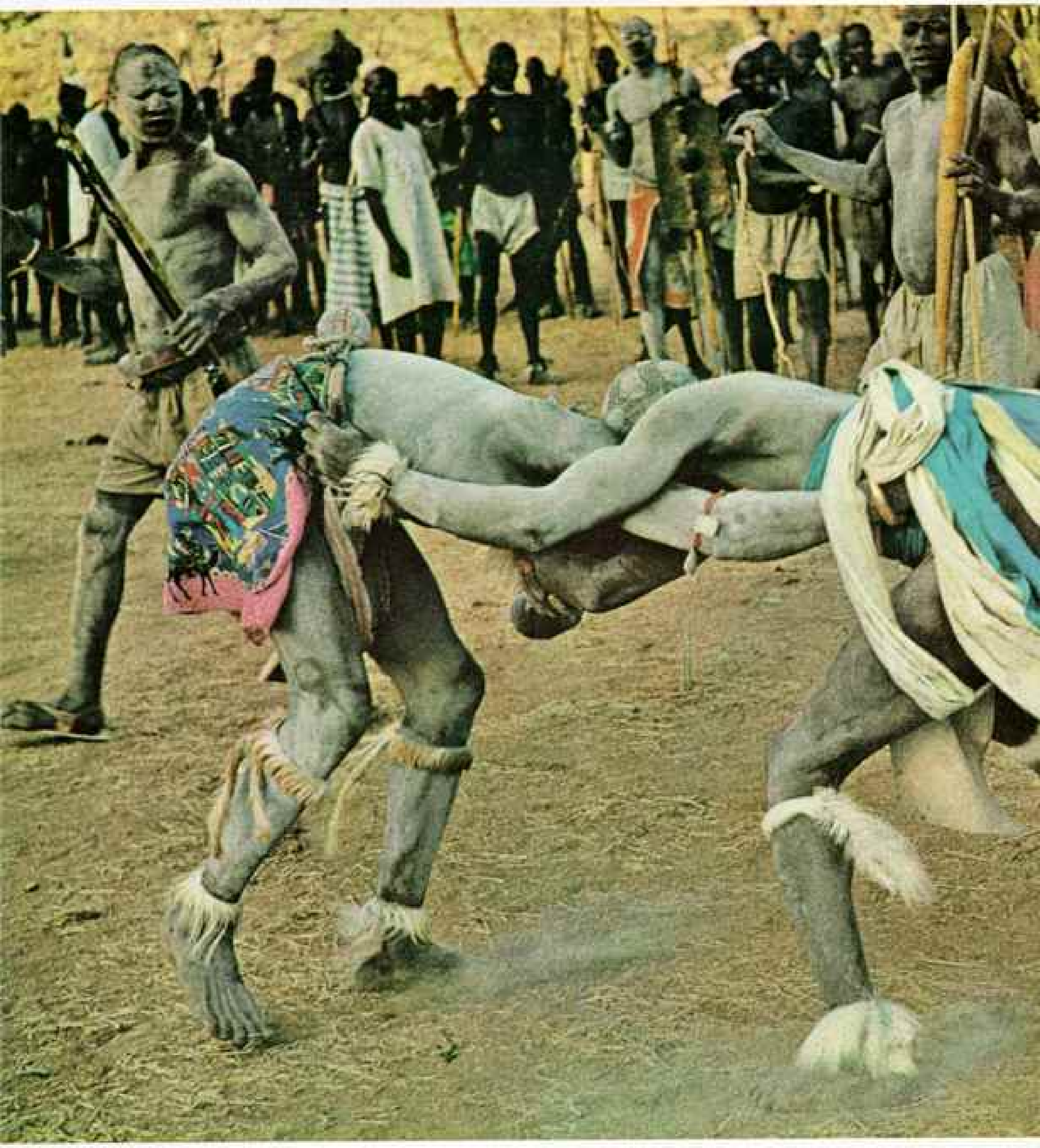


Friends robe a proud champion; bright strips of cloth circle the wrestler's torso, goatskin decorates ankles and knees. His shaved head precludes hair grips; ashes reduce slipperiness and, fighters believe, give extra strength. All year the village champion does no work, but trains for the sanda. He eats a special diet of millet mush, sesame, sour milk, and honey. An assistant (left) brings the crowning touch—a fringed pith helmet.

from Tadoro early in the afternoon. For us it was a walk of only three miles, but for marchers from other valleys the trek took two or three hours.

People moved in small or large groups, sometimes even singly. The men carried banners, spears, shields, clubs, and boughs. Ribbons and strips of skin, animal tails, and rattles bedecked them. Those who owned such things also wore bits of colored cloth, handkerchiefs, hats, and sandals. Most wore no clothing at all, only their ornaments.

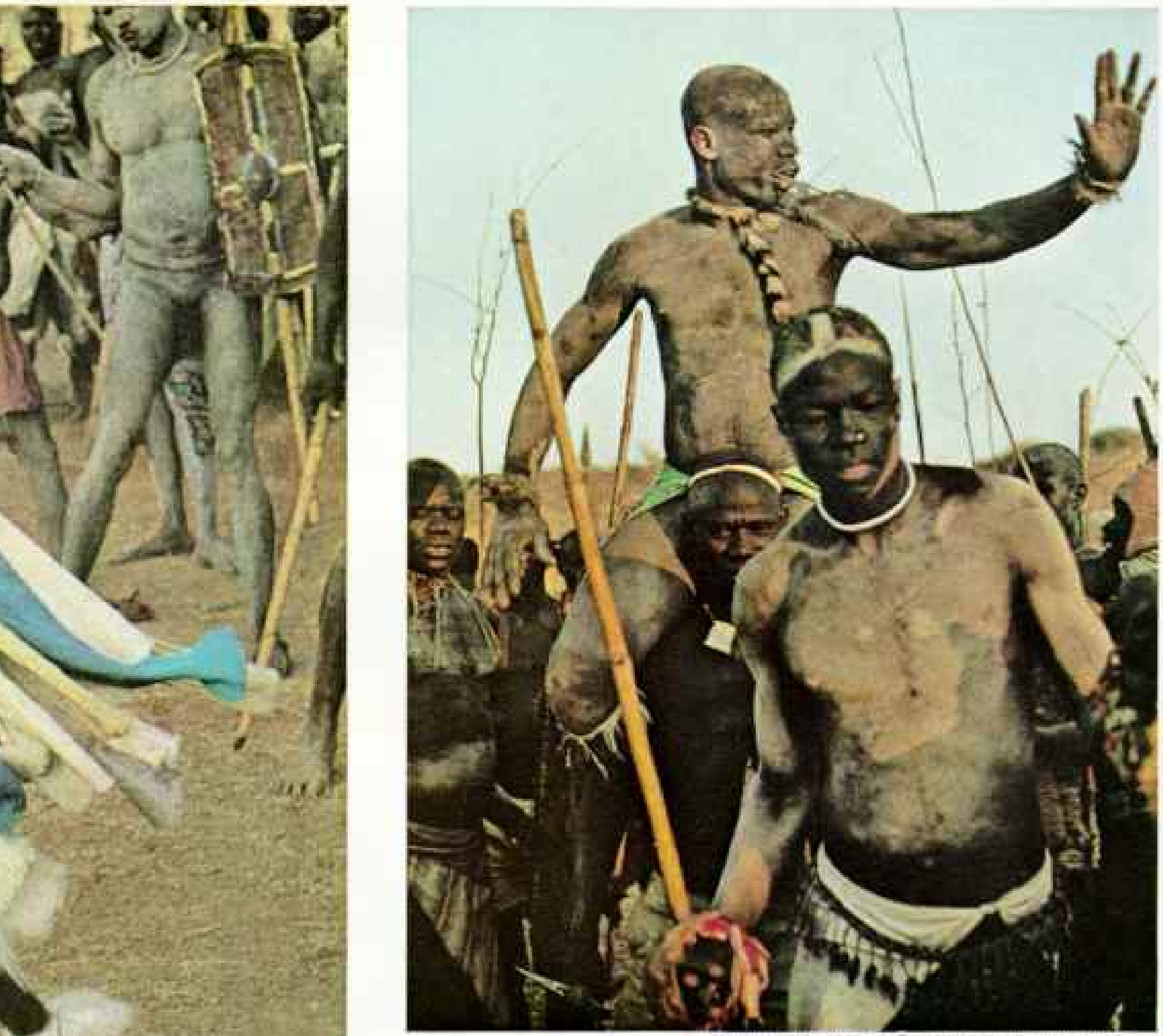
Before leaving home, dancers and wrestlers had whitened themselves with ashes. The ghostly powdering helps the fighters get a grip on each other and, Nuba wrestlers believe, increases their strength (pages 696-7). Former champions and current favorites wore lavish costumes fashioned of skins and long strips of cloth (preceding pages).



From braided round leather belts, black cows' tails dangled down behind. Some fighters hung calabashes from the small of their backs; as long as these survived unbroken, they would prove that their wearers had not been thrown.

Some of the girls and women carried carved canes to be waved and whirled with the rhythm of the dance. On this festive day, the Nuba women's lip plugs of wood, stone, or ivory had to be the longest they owned. I saw many that protruded more than an inch from the lower lip (page 691).

What a fantastic sight, when we reached Tosara, to see the multitude that had come together in the dusty valley for this great sanda! While the last stragglers were still arriving, the teeming mass of dusky bodies already was falling back here and there to form the open circles of the fighting rings (pages 674-5).



Grunting and grasping, two wrestlers strive to make each other fall. They began the bout by hissing and flicking out their tongues. The first to touch ground with any part of the body except the feet loses. Warden at left carries a swatter to keep back the crowd.

Like a football hero, the victor, adorned with a wildcat tail, rides in triumph (above), while villagers dance in his honor.

Ghostly glee club garners strength to ward off evil spirits by bathing in ashes before singing at a sanda. Leaning over a tublike hole, members wallow in the whitening, while friends pour on more from calabashes. The Nuba believe that magic branches also give protection.

Greased with butter and sesame oil, the bodies of the girls and women glistened in the afternoon light.

Each village had sent a dozen wrestlers, led by its champion. The sequence of matches and the pairings seemed to proceed without prearrangement.

Crowds gathered at the rallying banners carried by their favorites. When spectators pressed too close to their barrel-chested heroes, wardens drove them back by beating the ground at their feet with long-handled leather paddles, like oversize fly swatters.

Wrestlers Fight With Dancelike Motions

A wrestler dances into the ring, looks challengingly around, assumes a fighting stance, elbows on his knees—and waits. Whoever accepts the summons enters the ring.

In Nuba wrestling, the first to touch ground with hip or head, arm, knee, or shoulder—any part of the body other than the feet—loses.

Now the two men take measure of each other, crouching, wary, flexing bulging biceps. To overawe the opponent, they whirl with springy steps, shake arms and shoulders, limber up, and ripple their muscles.

One wrestler darts forward, taps his head, feints probingly, backs away, flicks his tongue in and out, advances again. The easy, graceful movements resemble a dance.

The adversary springs forward, reaches down, tries to seize his opponent's legs (pages 694-5). The two grapple, arms coiled around each other. One lifts his opponent and attempts to throw him to the ground, but the other, catlike, lands on his feet.

It is only a momentary reprieve. A quick fake, a rush, another clinch, another lift—and this time the victim is slammed on his buttocks to the ground. Next match.

When daylight faded into dusk, a blast on a six-foot horn signaled the end of the wrestling. The instrument is fashioned partly from a kudu horn, but most of its length is modeled from beeswax. The festivities continued, awaiting the rising of the moon to light the homeward way. Meanwhile, the marissa calabashes passed back and forth.

Now it was time to dance. Boys and girls, lavishly adorned though naked, took up their positions. Drumbeats and strummed guitars—the native five-stringed *benembenes*—sent movement into the youngsters' bodies; feet stamped the ground, arms lifted, bodies quivered to the rhythm of the dance. The sons and daughters of the Nuba felt their hearts echo the music's beat. We saw Tesse, her recently-scarred shoulder almost healed, jouncing and gyrating with youthful joy.

At last, with the rising moon, one by one the drums fell mute. Then, like the blinking beacons of giant fireflies, the beams of flashlights swept the darkness. Every tenth man's hand, it seemed, held a long silver-colored torch. The Arab traders had found a best seller!

Quietly and without hurry, village groups gathered together, then began the march home through the night. Silent columns wound away through the bush, through valleys and over hills, back to their villages and hill-shadowed huts.

Tears and Honking Horns Say Farewell

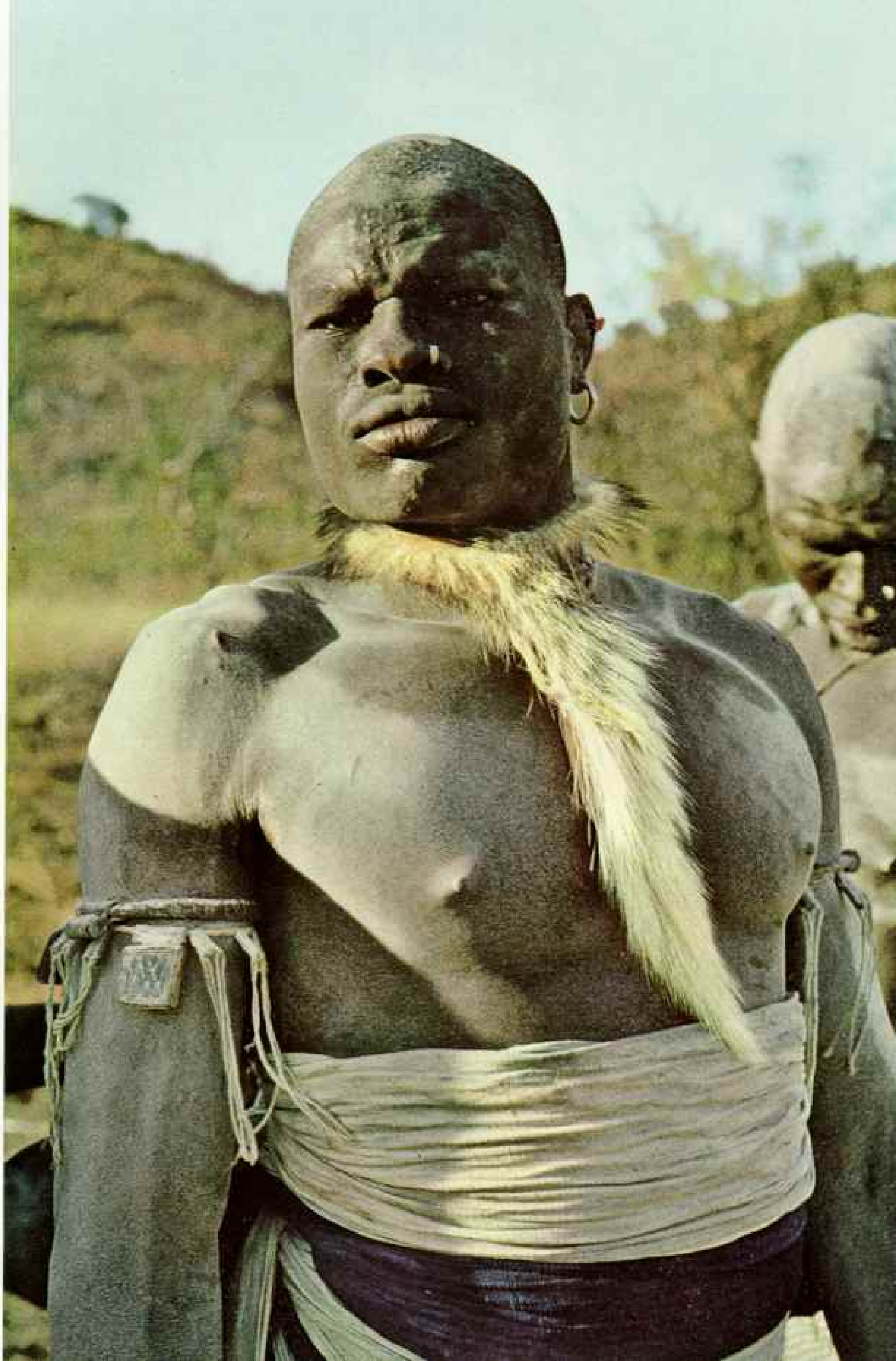
By early February we had finished our work. Looking back, we could take pride in what had been done.

We had made 15 films, the original prints to be held by the Institute for Scientific Films at Göttingen. This institute furnishes documentaries to researchers throughout the world.

We had taken some 500 color photographs and as many black and whites, and had made 80 tape recordings of Nuba songs and speech. Anthropological measurements were taken from more than 200 people by Waggel and Horst, including five photographs of each one's physique. These records were to be turned over to the Anthropological Institute of Tübingen University for study. We also had detailed drawings of buildings and samples of implements and weapons. Rolf Engel would report on agriculture to the Max-Planck-Institut, and Friedrich Rothe would submit a study of Nuba education to Tübingen University.

On the day of our departure, Natu presented to me his handsomest spear. More than 200 people saw us off, Gaga-Gashal with tears in her eyes, Koishe-Tutu waving a new scarf we had given her. Horns bleating, our vehicles rolled out into the plain. THE END

Muscles like iron, his leather arm amulet worn as insurance against disaster, a champion wrestler exudes confidence. In his world, a man's strength and agility count for much, and at festivals he earns the plaudits of his peers. But modern civilization—a force beyond his comprehension—threatens his primitive way of life.



Preserving the Treasures of Olduvai Gorge

By MELVIN M. PAYNE, Sc.D.
Executive Vice President and Secretary
National Geographic Society

Illustrations by National Geographic photographer JOSEPH J. SCHERSCHEL

ON A WARM MORNING not long ago, nineteen elders of the Masai tribe gathered under a shady umbrella tree on the rim of a gorge in East Africa. They had assembled at the request of the great anthropologist Dr. Louis S. B. Leakey, who sought the help of these spirited and primitive people in saving one of man's priceless heritages—Olduvai Gorge.

Fossils of early man are rarer than the most precious stones. Yet Olduvai has yielded remains —some only small fragments—of 18 prehistoric individuals, 13 of them in the seven years since the National Geographic Society assumed major sponsorship of Dr. and Mrs. Leakey's work (map, page 706, and diagram, page 707).

Those momentous discoveries have thrown a brilliant light upon man's origins. Beginning with the finding in 1959 of *Zinjanthropus*, a new member of the group of near-men called australopithecines, they have included an entirely new species, which Dr. Leakey has named *Homo habilis*, nearly two million years old and believed to be earth's first tool-maker.*

This incredibly rich lode has been ascribed to what Louis lightly calls "Leakey's luck." But it is far more. It stems from the Leakeys' persistence and competence applied to an anthropological site without peer.

Masai Cattle Threaten Relics

Now that site faced an unusual danger. What the sands of forgotten deserts, clays of vanished lakes, and wind-blown ashes of volcanic eruptions had preserved for so long, the hoofs of Masai cattle could destroy in seconds. Such a disaster had already occurred. Three years ago a herd spilled down a fossil-rich slope, seeking water. In its wake a hominid skull around one million years old was found crushed.

Greatly disturbed, Louis called a *baraza*, or meeting, with the Masai elders and offered to build two cattle-watering dams in the gorge—provided the herds were kept away from the fossil beds. The elders agreed, and with National Geographic Society aid the dams were built (page 704). But recently Dr. Leakey had been shocked to find that the Masai young men were taking down his thornbush fences and again driving their cattle through the restricted area—so many bulls tramping through anthropology's most delicate china shop. Grim-faced, he had called

KODACHROME (OPPOSITE) BY MELVILLE BELL GROSVENOR, EKTACHROME BY JOSEPH J. SCHERSCHEL © N.G.S.

Racing toward a rendezvous with the past, a Land-Rover whirls the dust of Olduvai Gorge in Tanzania, where Dr. Louis S. B. Leakey (opposite) probes one of earth's richest hoards of fossils. He holds the broken molar of a dinotherium, an extinct tusked mammal; his hat cradles a tooth of an extinct elephant. Discoveries by the famed anthropologist and his wife Mary have cast revealing light on man's beginnings and drawn thousands of visitors to the remote gorge.

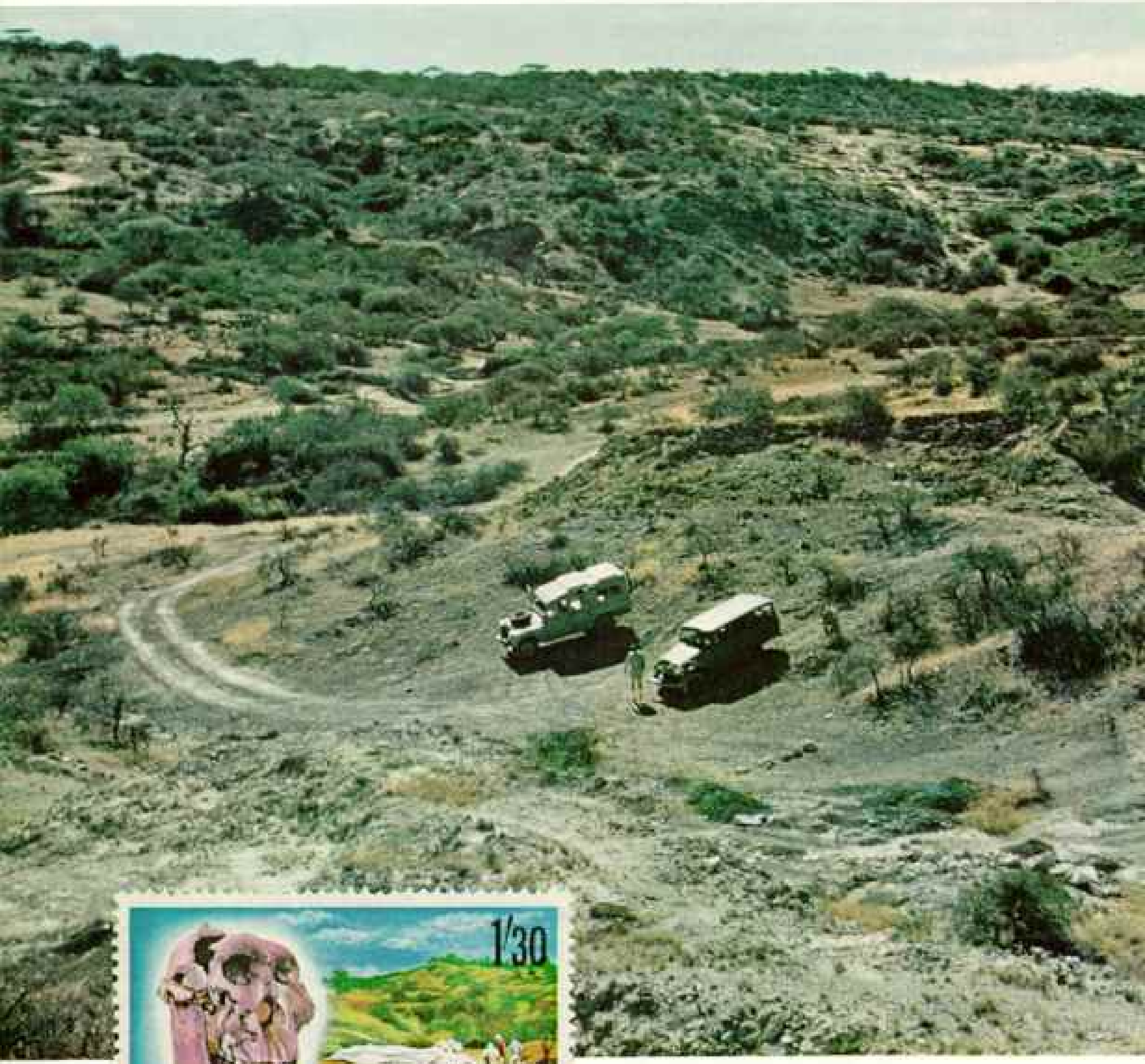
*Mary and Louis Leakey's discoveries in East Africa have been reported extensively in NATIONAL GEOGRAPHIC—"Finding the World's Earliest Man," September, 1960; "Exploring 1,750,000 Years Into Man's Past," October, 1961; and "Adventures in the Search for Man," January, 1963. See also "The Leakeys of Africa: Family in Search of Prehistoric Man," by Melvin M. Payne, February, 1965.

Swahili and English on a sign posted at the visitors' center tell of the Society's role at Olduvai. Mrs. Melvin M. Payne, the author's wife, compares the languages.

this second meeting of the Masai elders.

Solemn as lions, they wrapped their cloaks about them and took their places on log stools, bearing in dignity and silence the awareness of their responsibility (page 705). Dr. Leakey spoke first, in tumbling phrases of Swahili, translated into Masai by an elder who repeated his every gesture.

Louis reminded the Masai of the good relations that had long existed between them and the Leakeys, but explained that if they did not keep their promise, he would have to destroy the dams. If the Masai kept their agreement, however, he would build a third



Silent stage in an ages-old drama, sliced hillside exposes the shore of a vanished lake where *Zinjanthropus*, one of a group of near-men called australopithecines, lived 1,750,000 years ago. Guide stands

dam, and drinking troughs for the cattle.

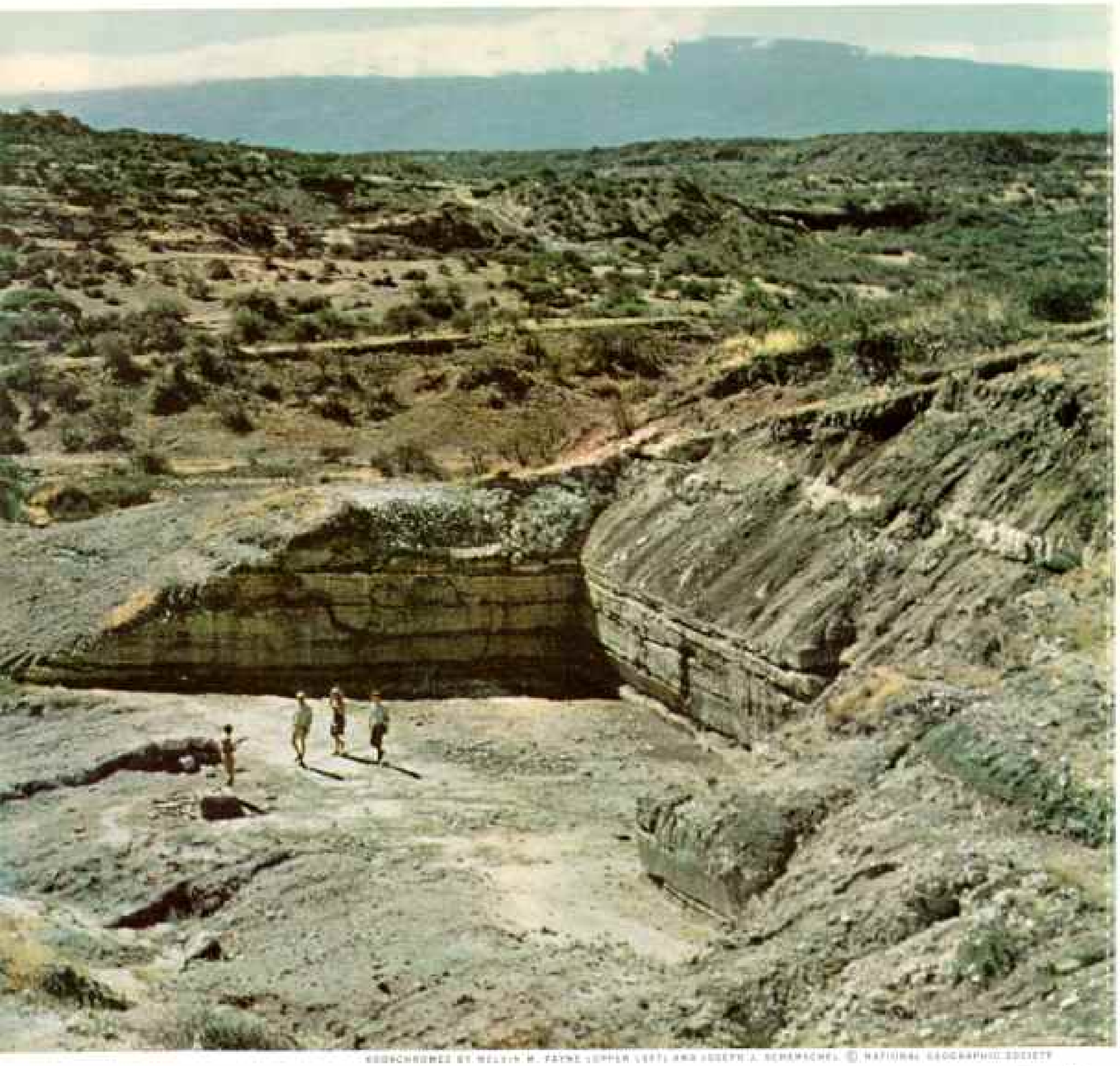
After a moment of silence the spokesman for the elders rose. He leaned on his staff and used a fly switch made of a wildebeest tail to emphasize his gestures. This place, he said, was rightfully the home of both the Masai and the Leakeys. He expressed gratitude for the help that the Leakeys have always given —medicine, emergency ambulance service to distant clinics, and friendship. The elders promised that if the young men offended again they would be "beaten with sticks."

At last report the precious gorge seemed once more safe from Masai cattle. Meanwhile the Tanzanian Government is cooperating with the Leakeys to make Olduvai a rewarding mecca for increasing numbers of visitors.

Having first been to Olduvai when this was one of the loneliest spots on earth, I was surprised, on a recent visit, to see rooster tails of dust ahead of us as we neared the camp.

"The day's first visitors coming down from Ngorongoro," Louis said. "More and more people on their way to Serengeti National Park decide to stop off at Olduvai. You must take a look at our guestbook."

Approaching the small hut where visitors are greeted by uniformed English-speaking



KODACHROMES BY MELVIN M. PAYNE (UPPER LEFT) AND JOSEPH J. SCHERSCHEL, © NATIONAL GEOGRAPHIC SOCIETY

near a concrete block at the spot where Mary Leakey discovered the Zinj skull in 1959. The 1965 Tanzanian stamp (left), based on a NATIONAL GEOGRAPHIC photograph, honors Olduvai's first famous find.

TEAR OUT THE ATTACHED PAGE, your passport for an unforgettable television journey to the dawn of man.

Now: Safari With the Leakeys of Africa to Man's Beginnings

KODACHROMES BY HELEN AND FRANK SCHREIDER © N.G.S.

Churning a gritty wake, a Land-Rover hustles across the Serengeti Plain near the tree-studded rim of Olduvai Gorge. Volcanic-debris and wind-blown dust cloak the Naibor Soit hills.

Smile outshines the finery of a Masai girl. Her people live chiefly on the blood and milk of cattle they herd near the gorge.

KODACHROMES BY ROBERT F. SISSON (YELLOW AND GREEN) AND JOSEPH J. SCHERSCHEL, © N.G.S.

Taught by his parents, as were his two brothers, Richard Leakey deftly frees a fossil animal bone with a dental pick.

Craning necks, giraffes inspect visitors in Masai Amboseli Game Reserve on the road to Olduvai.

YOUR ROAD, a parched thread of dust on a vast East African plain, lies westward—and backward into time to the infancy of mankind. With your guide, the noted Dr. Louis S. B. Leakey, you descend into the clinging heat of Olduvai Gorge, a remote canyon carved by erosion after cataclysms had sundered the ancient earth. You watch epoch-making discoveries as *Zinjanthropus* and *Homo habilis* are freed from their ages-old prison of rock. Wildlife teems around you.

"Dr. Leakey and the Dawn of Man" opens the National Geographic Society's 1966-67 season of special television documentaries on Saturday, November 5. Again, Encyclopaedia Britannica, Inc., and Aetna Life and Casualty Insurance Companies are sponsoring the hour-long color programs, produced in association with David L. Wolper and televised by the Columbia Broadcasting System (listings overleaf).

In the years that Louis and Mary Leakey have worked at Olduvai, their discoveries have added new chapters to the story of early man. Since 1960, when the Society assumed major sponsorship of their work, remains of 13 ancient hominids have been found in the gorge. Now you and your family can join the Leakeys and stand at their elbows, while scientific history is made.

Crisis arose at the gorge when cattle, driven by Masai tribesmen, crushed a million-year-old hominid skull. To restrict wandering animals, Dr. Leakey fenced off areas and built two watering dams (above). But young warriors—often distinguished by dung-and-mud headdress (below)—ignored the restrictions. Calling the Masai elders together (right), Dr. Leakey asks their cooperation; otherwise he may have to destroy the dams. Tribal leaders, who value Leakey's long friendship, agreed to curb the herders.

WATCH "DR. LEAKEY AND THE DAWN OF MAN"
ON MOST OF THESE CBS TELEVISION STATIONS

(A few stations may schedule the program at a later date. Check your newspaper for day and time.)

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SEE IT ON TV, SAT., NOV. 5

Dr. Leakey and the Dawn of Man

guides, I recalled my first trip to the gorge from Nairobi, Kenya—327 miles in a pounding Land-Rover via Arusha, Tanzania. Today the road is much improved, especially the final stretch west across the Great Rift Valley to Ngorongoro Crater and down its flank to the Serengeti and Olduvai (map, page 708). Comfortable lodges provide convenient way stops, although there are no restaurants or overnight facilities at Olduvai itself.

Hyenas Satisfied With Only One Shoe

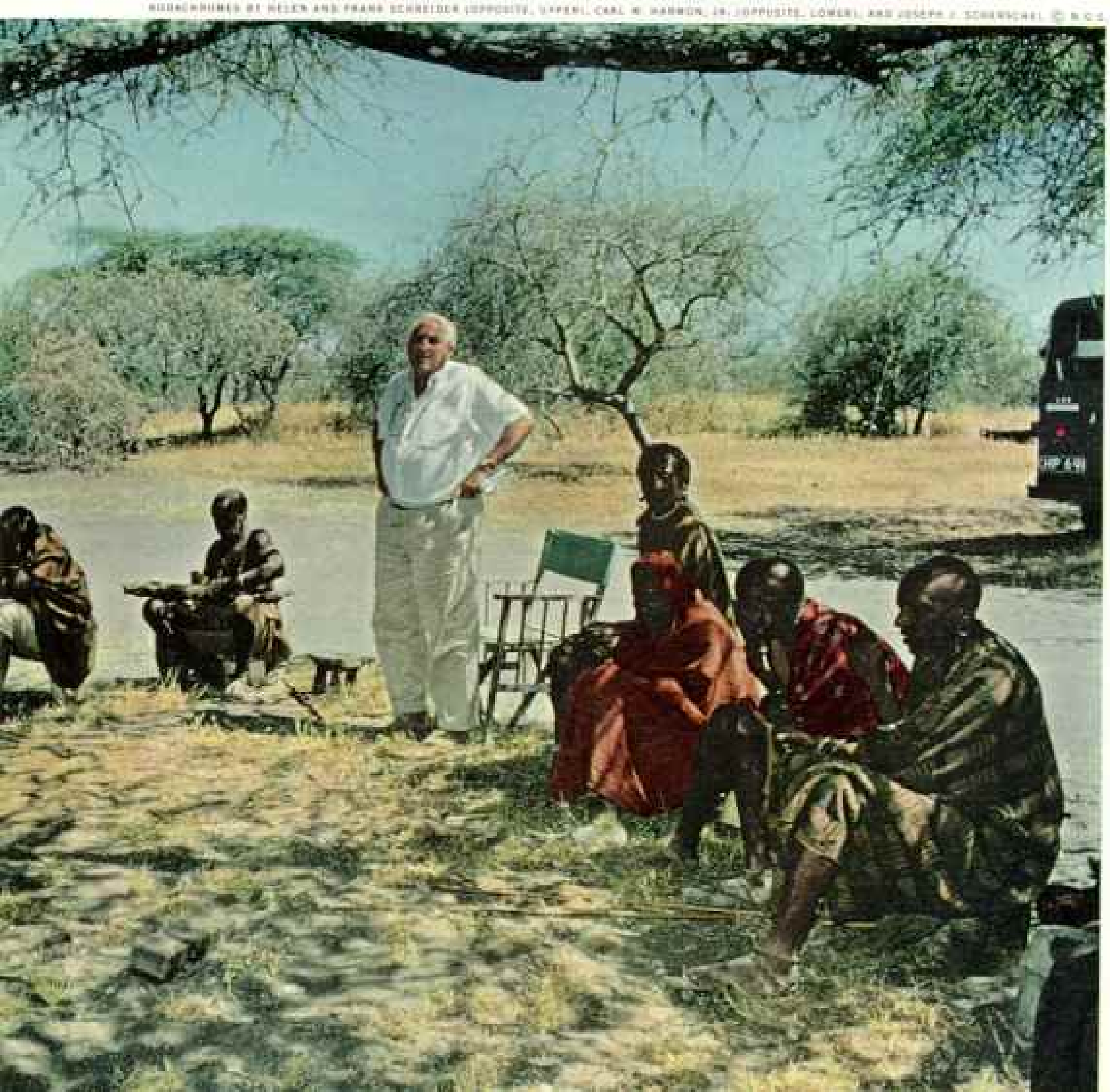
Nevertheless, the guestbook was a cross section of the world. New York and New Zealand marched down the pages next to Nigeria and the Netherlands. The scripts of citizens from more than forty countries on five continents totaled 1,244 visitors in 1964, and nearly three times that number in 1965.

"Visitors are now coming in ever greater numbers," Louis said. "As many as 6,000 will find their way here in 1966. Thirty-five years ago it took six of us seven hard days to get here, and we spent three months with lions, giraffes, rhinos, and an occasional Masai for company. Even the hyenas are becoming more conscious of civilization; last night they ate only one of my shoes, the left."

Another new facility, an airy thatched shed, or banda, where visitors may enjoy a picnic lunch, stands at the cliffside. Its walls are decorated with large color photographs that recapture highlights of the Leakeys' finds.

"I would like someday to put a small museum here," Louis said as we drove down into the simmering heat of the gorge. "Meanwhile we have built shelters over our more interesting sites."

We followed the northern edge of the side gorge and then turned sharply downward again. I soon spied one of the new shelters, a small thatched hut, perched on the side of the brown hill. I remembered the site—named "BK"—as little more than a ledge where one



had to scramble for a foothold. A couple with their two young boys, visitors from Nairobi, were making their way down the path as we pulled in. Louis greeted them cordially.

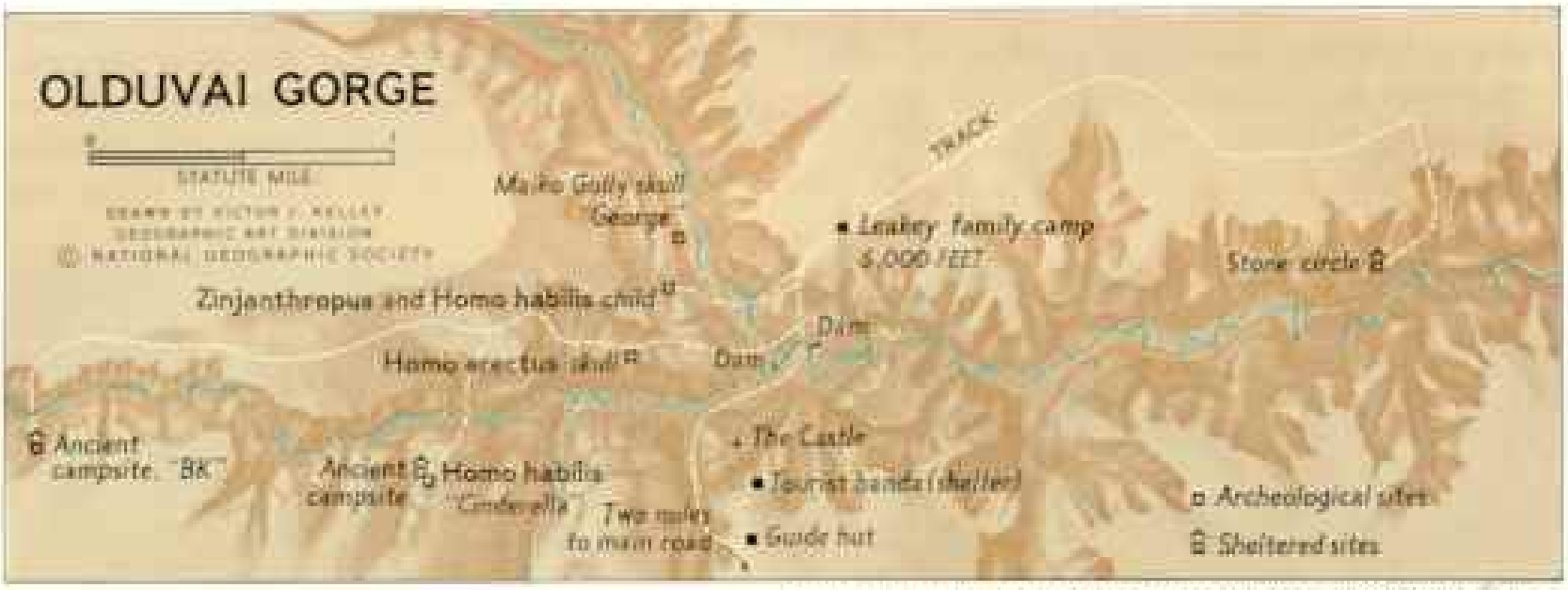
"I suppose you're wondering how we know where to look for things," he said, smiling at the boys. That was exactly what they had been wondering—as do most visitors.

"We examine the surface of the ground very closely. As wind and water wear away the face of the cliff, they expose bit by bit what lies hidden there. We can tell from these surface remains whether or not a site is promising. It helps, of course, if you know what you are looking at.

"A Masai herdsman used to come through here," Louis added. "He would watch us dig and then mutter disgustedly, 'Nothing but old bones you can't even eat!' "

Under the thatched roof is preserved a campsite used by a hunter more than 500,000 years ago. His stone tools lie exactly as he left them, mixed with the bones of extinct animals—bones he had split to extract the marrow. One moment of one day in that long-vanished life, out of that unremembered time, still survives at Olduvai (pages 708-9).

At another sheltered site, in the gorge's lowest level, we stopped at a mysterious circle of stones, some piled on others, laid out by an unknown being almost 2,000,000 years ago. The circle, possibly the base of a windbreak



EXPLANATIONS BY ROBERT M. CAMPBELL, ARMAND DERIA PRODUCTIONS © N.G.S.

Olduvai's stony hope chest yields clues that are helping scientists piece together the story of earliest man. Diagram (opposite) places the Leakeys' principal discoveries in the gorge's geological time scale—nearly two million years of deposits laid down by the ebb and flow of ancient lakes, birth and death of deserts, and debris of volcanic eruptions. Map (above) shows actual locations of the finds in the Y-shaped gorge.

Three types of early hominids, perhaps more, inhabited the changing landscape. *Homo habilis*, short, slender, and small-brained, probably made the tools found at the oldest level, Bed I, and upward into Bed II. His contemporary at Olduvai, *Zinjanthropus*, had a heavy skull housing a tiny brain and immense teeth suggesting a vegetarian diet. Skull and teeth found in Maiko Gully, around the one-million-year-old level, may be ancestral to *Homo erectus*, discovered 15 feet below Bed III and similar to types of primitive men found in Java and China. Dr. Leakey believes that *Homo habilis* seems to be heading toward modern man, while *Zinjanthropus* and *Homo erectus* mark dead-end branches in evolution's tangled growth.

Stones speak to Mary Leakey in the new National Geographic Society-sponsored laboratory in Nairobi, Kenya. These rocks, shaped nearly 2,000,000 years ago, give evidence of the first known tool-making.

Major finds by the Leakeys in
OLDUVAI GORGE

Each fossil superimposed on
present-day human skeleton

PAINTING BY MAC SEIDLER
CROSS-SECTION DATA BY DR. RICHARD L. HAY
COMPILED BY JEAN B. MCCONVILLE

HOMO ERECTUS

HOMO HABILIS WOMAN
"CINDERELLA"

ZINJANTHROPUS

MAIKO GULLY
"GEORGE"

BED IV

BED III

500,000
YEARS AGO

BED II

1,000,000
YEARS AGO

BED I

1,800,000 YEARS AGO

HOMO
HABILIS
CHILD

HOMO HABILIS WOMAN

STONE CIRCLE MAY BE REMNANT OF ANCIENT SHELTER

Where man the hunter roamed in bygone ages, governments now protect East Africa's incomparable animal life in national parks and vast game reserves (above). A traveler encountering a bull elephant near Kilimanjaro (below) may imagine the dangers faced by prehistoric man. Under a shelter at Olduvai Gorge, one can see stone weapons still lying by the bones of an extinct elephant. Anthony D. Marshall, a National Geographic Society Life Member from New York City, and his wife Thelma bear Kasuli, an Olduvai guide, explain that the site remains just as the Leakeys excavated it. Bones cracked for their marrow give mute evidence of the difficulty of life when man was young.

KODACHROMES BY JOSEPH J. SCHERSCHEL, © N.G.S.

of branches, may represent one of man's first attempts to build a shelter.

As we climbed back up the slope, a roaring jet airliner high above announced its mastery over time and space—herald of a changing world making itself felt even at Olduvai.

Olduvai Holds a Century of Work

Soon we too were airborne, on our way by light plane to the new laboratory facilities at the Centre for Prehistory and Palaeontology in Nairobi. Rising from the bumpy private airstrip, we looked down on the gorge.

"There are 150 miles of exposed surfaces in those canyon walls," Louis said. "We have managed, after 30 years of periodic work and seven years of intensive work, to cover about ten miles of them. There is at least another 100 years' labor here, and probably 200. Who can guess what Olduvai will be like then?"

Millions of Americans will soon become better acquainted with the gorge and with the Leakeys through a National Geographic Society program on nationwide television.

Every new discovery means months, perhaps years, of careful analysis. This task was keeping Mary Leakey at the Centre, working hard on a description of the stone-tool industries at Olduvai. She is contributing two volumes to a planned series that will cover every aspect of the treasures of the gorge.

To aid in this work, your Society provided funds for the new laboratory (page 706). Labeled boxes of stone tools line the walls. After painstaking study, Mary has reported her conviction that *Homo habilis* was the maker of the earliest tools found in the gorge—the oldest known tool-maker on earth.

Examining these tools, I thought again of Olduvai, that quiet place where the song of the barbet echoes from ancient canyon walls. Standing there, the traveler is stunned by the possibility that this is where the story of mankind began.

THE END

Marvels of a Coral Realm

Article and photographs by
WALTER A. STARCK II, Ph.D.

OFF THE SHORE of southern Florida I dive to a world of fantastic richness and variety, a world unbelievable until you see it—the world of a coral reef.

As I hover above the sandy plain of the reef's outer edge, I see a fish that walks on its fins and attracts prey with a lure dangling from its overhanging nose.

Nearby, pencil-slim garden eels curl upward from their burrows, creating a cluster of question marks.

Like goats grazing on stony pastures, indigo parrotfish, with teeth fused into birdlike beaks, scrape away the small plants that cover the rocks.

If I imagine myself scaled down to the size of a small fish or a shrimp, monsters confront me at every turn. Nature's rule of eat and be eaten prevails here.

Still, harmony exists, and some examples of piggyback living are miracles of cooperative existence. Within the shelter of the six-inch spines of a sea urchin lurk elegant high-hats, or jackknife-fish, formally clad in black-and-white stripes, with dorsal fins like tall sails. At dusk, a tiny transparent fish emerges from one end of its sluglike host, a sea cucumber, to seek its supper.

After dark, a spiny lobster stalks across the scene, moving like an ungainly wind-up toy. With greedy tentacles, the myriad coral polyps blossom forth to rake minute sea life into their gaping mouths.

Diving here, one quickly senses the rhythms of the water world. Waving bottom grasses time the slow beat of the sea. Gliding sharks, sinuous moray eels, and stately groupers pick up the andante. Darting squid and smaller fishes add their glittering staccato.

This is the world that holds me in thrall, for I am a marine biologist. As a research associate of the University of Miami's Institute of Marine Science, I head a

Ghostly arms of elkhorn coral reach for the author as he kicks through shallow, sun-glazed waters of a reef. Stinging coral, nemesis of divers, sprouts beneath the elkhorn. Dr. Starck, of the University of Miami's Institute of Marine Science, reports on 10 years of exploring an underwater realm of bizarre shapes and vivid colors. The National Science Foundation and the National Geographic Society now support his work.

program investigating the coral-reef fishes.

Coral reefs—among the oldest and richest animal communities on this planet—have been the subject of surprisingly little scientific investigation. What species live on a reef? *How* do they live? What are the relationships among the many sizes, forms, colors, and ways of life of reef inhabitants?

Diving by night as well as by day, we have sought to answer such questions in studies supported by both the National Geographic Society and the National Science Foundation.

In another project of the Institute of Marine Science, Dr. Gilbert L. Voss and Dr. Frederick M. Bayer have been studying the ecology of coral reef populations in Florida waters. Supported by the Society since 1960, their researches center on shallow reefs of Margot Fish Shoal, about 24 miles south of Miami. (So much work has been done under the Society's auspices here that institute faculty and students now call it the "Geographic Reef.")

Skiff Makes a Journey to Another World

Our own study, for the most part, has focused on Alligator Reef—a mile-long pile of submerged coral at the edge of the indigo Gulf Stream, almost four miles off the Florida Keys (diagram and maps, pages 714-15).

From the beginning we knew that in the sea, as in space, ordinary terrestrial hardware will not work. Thus we became involved in a secondary research effort, developing apparatus we required: photographic equipment, underwater lights, collecting devices, sound and optical equipment, underwater transportation, and submarine firearms.

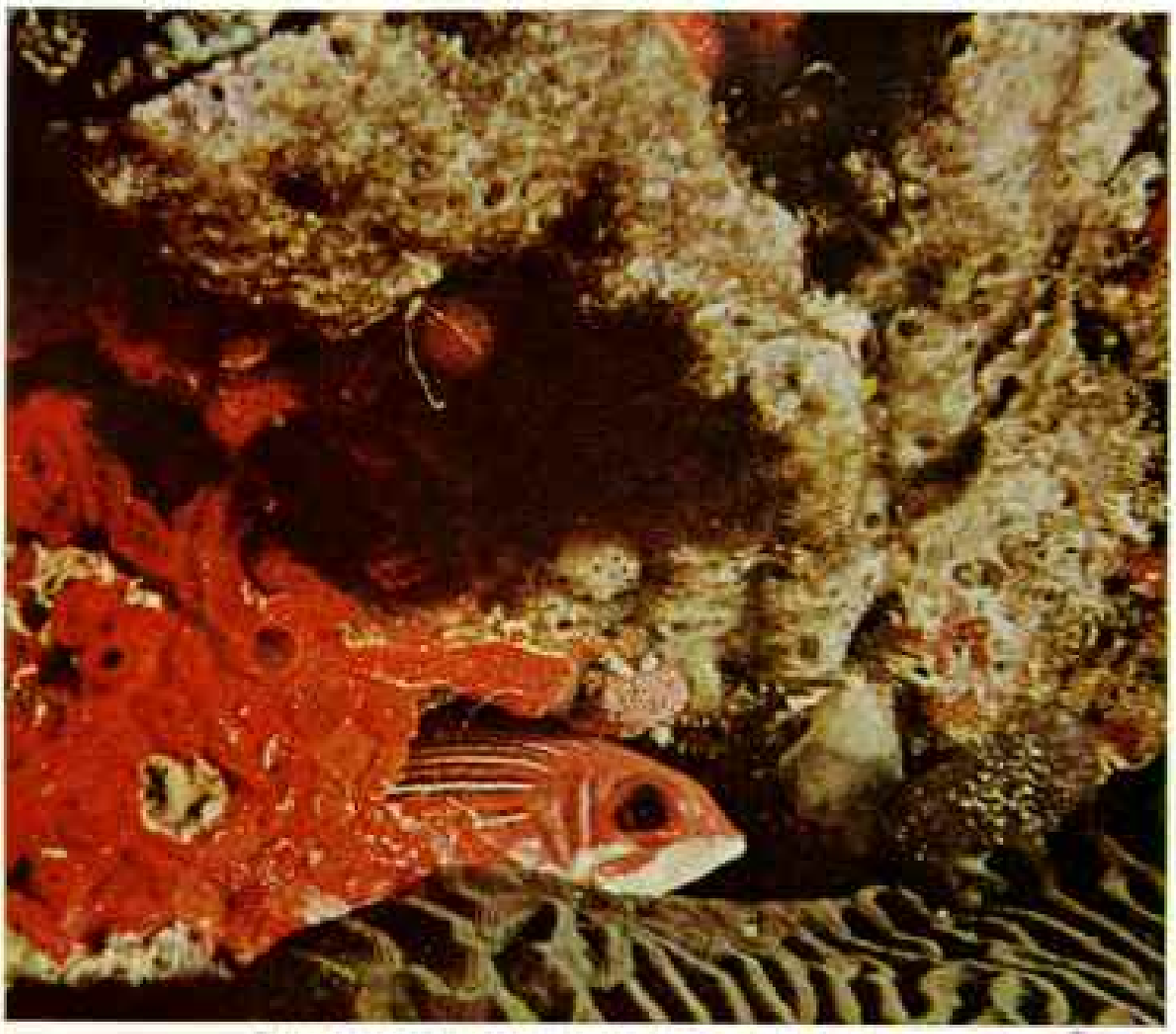
When we leave our boat slip on Lower Matecumbe Key in our 23-foot outboard skiff and steer for the reefs, we literally head for another world. Two miles offshore, the dark lagoon bottom, shadowed by turtle grass, abruptly gives way to the white scoured sand of the back reef—the landward side of the coral formation. Our speeding boat seems suddenly to take wing through oily-smooth water of unflawed aquamarine, and the green band of the keys falls rapidly astern.

Pirate-fighting Ship Left Its Bones Here

Gamboling porpoises, nose to tail, flee before us. On the ocean floor, weed patches and scattered shells appear. The water shoals to the pale green of six feet or less, and we sweep across the living corals and graceful sea fans of Alligator Reef.

The reef takes its name from the schooner *Alligator*, a naval vessel that had been successful in fighting pirates in the area, but sank here in 1822 after striking the reef. Occasionally we have dug into the sand and uncovered cannon balls, parts of gun carriages, bronze spikes, and pottery from *Alligator* and other victims of the reef. At several places, piles of ballast stones from *Alligator* and from 18th-century Spanish ships form artificial havens for marine life.

The racing shadow of our boat and the whir and wash of our propeller send droves of multihued fishes streaking for the depths,



First life portrait: Previously known to scientists only from dead specimens, a rare deepwater squirrelfish, *Holocentrus bullisi* (left), matches crimson brilliance with a sponge that roofs its home—a cranny in brain coral. In the blue gloom of the deep reef, the five-inch fish normally appears drab, but here glows in the white light of the author's flash.

Among fish at Alligator Reef, Dr. Starck found 19 new species and 60 others hitherto unknown in North American waters.

Gilded pin on sea-fan lace, the arrow crab (life-size) usually hides its beauty in a rock-hole den.

PHOTOGRAPHS BY WALTER A. STARCK II (ABOVE) AND ROBERT E. SCHROEDER © N. G. S.

EXPLANATION (RIGHT) AND SUBMERGENCE BY WALTER A. STAPIN | © N.G.S.

Lower Matecumbe Key

Upper Matecumbe Ke

Overseas Highway U.S.1

Straits of Florida

Alligator Reef Light

Lagoon

25 feet

Patch reefs

Grass flats

10-20 feet

Alligator Reef

Deep reef 60-100 feet

5-10 feet

Sandy shallows of back reef

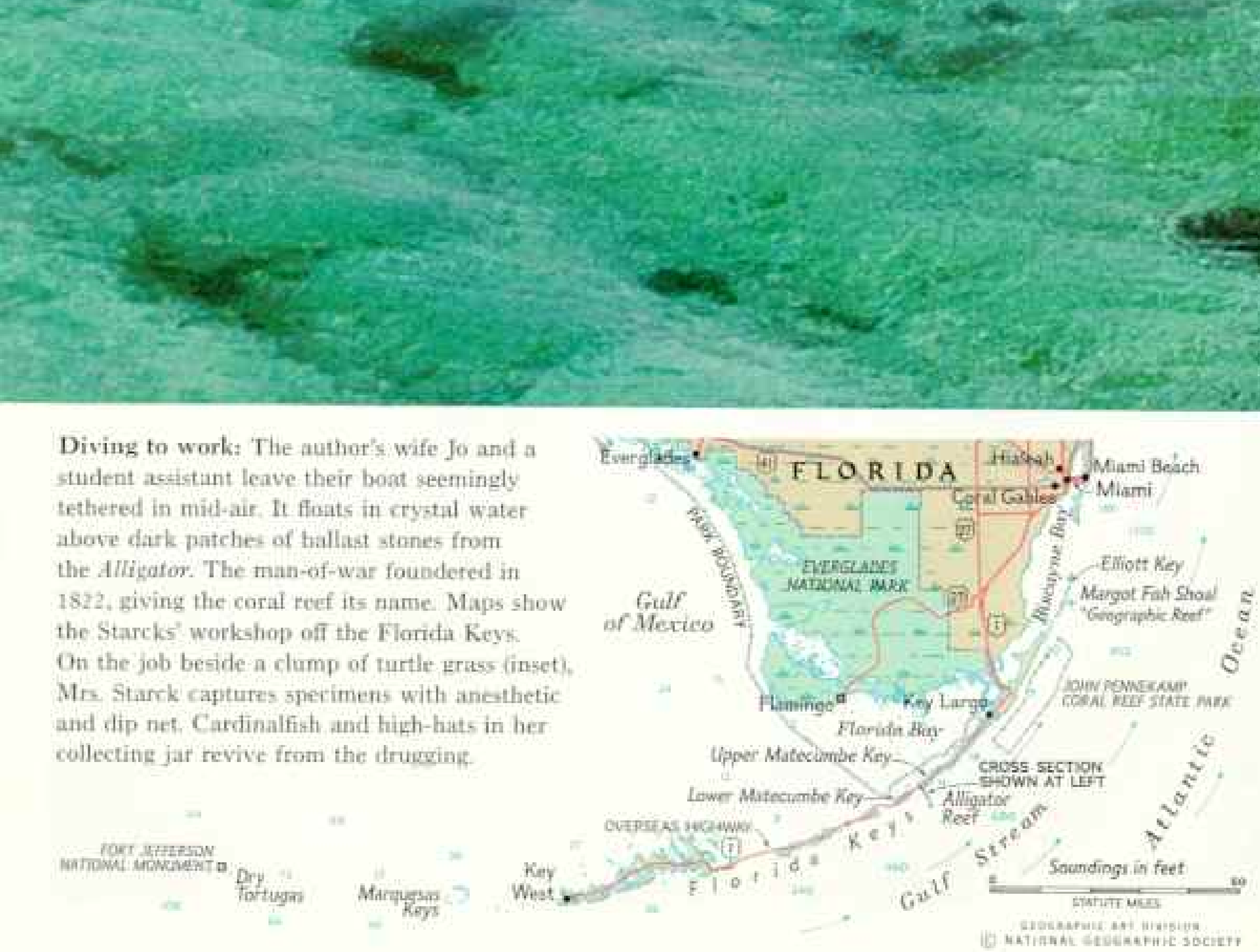
Grass, soft corals, and sargassum weed

NORTH

Upper Matecumbe Key to Alligator Reef 7,000 yards

DRAWN BY JOHN W. LOTHERS
GEOGRAPHIC ART DIVISION
NATIONAL GEOGRAPHIC SOCIETY

Diving to work: The author's wife Jo and a student assistant leave their boat seemingly tethered in mid-air. It floats in crystal water above dark patches of ballast stones from the *Alligator*. The man-of-war foundered in 1822, giving the coral reef its name. Maps show the Starcks' workshop off the Florida Keys. On the job beside a clump of turtle grass (inset), Mrs. Starck captures specimens with anesthetic and dip net. Cardinalfish and high-hats in her collecting jar revive from the drugging.



where the pellucid water shades swiftly to turquoise and cobalt blue. Sixty feet down, we glimpse the dark edge of the deep reef, washed by the Gulf Stream.

Back to the reef top we swing.

"Drop the anchor," I call out to Jo, my wife.

Donning masks, swim fins, and air tanks, we jump overboard—and join the inmates of a vast and crowded aquarium.

Blonde Acquires a Quarter-ton Admirer

Until one day on the coral reefs, I did not know that blondes attracted turtles. Then a friend and I had to drive off a big one that persisted in approaching too close to my wife.

Equipped with swim fins and Aqua-Lungs, we had been collecting angelfish in 95 feet of indigo water. Jo and I were helping graduate student Henry A. Feddern with a research project, I with a small spear, Jo—hair streaming behind her—with a collecting bag.

A whopping big loggerhead—he must have weighed 500 pounds—materialized out of the dim depths and hovered just above my wife. He looked down at her, Henry and I looked up at him, and Jo kept looking for angelfish swimming along the ocean floor.

Loggerheads usually are not aggressive, but their powerful jaws have a tremendous potential to hurt. They can crush a thick conch shell with one bite. And we had heard of a fisherman in the area who had been crippled by a loggerhead that bit his knee.

We had the safety catches set on our anti-shark guns, or "bangsticks." These weapons fire .357 magnum revolver cartridges when thrust against an intruder. Henry and I moved toward the turtle, wielding our guns as spears. The big beast paddled calmly away.

But hardly had Henry and I turned our backs when the loggerhead swam again directly above Jo, five or six feet over her head.

"Jo! Turtle!" I shouted through my mask (the garbled gurgle of speech *can* be heard some little distance underwater), and we both tapped our air tanks with our bangsticks to attract Jo's attention. She paid no heed to us, obviously still unaware of the turtle.

Henry and I moved in, shoved hard with our guns—still on safety catch—against the

Backing into its garage, a pearlfish parks inside a sea cucumber. After a night of foraging, the transparent eight-inch-long *Carapus bermudensis* finds safety in the partially hollow body. The cucumber, actually an animal, ignores the squatter. But when molested, some holothurians eject a sticky threadlike substance to entangle attackers.

stubborn creature, and pushed him away, this time for good. By the time Jo unlimbered her camera, her admirer had vanished.

The great turtles normally are solitary creatures, but we frequently encounter thousands of individuals of other species swimming together within a few yards of us at Alligator Reef. Masses of grunts and snappers, like living walls, lie almost motionless as they wait for dusk, when they disperse to feed.

Fishes Teem in Jewel-like Clusters

The shallow reef crest and seaward deep reef, in particular, support a fantastically abundant fauna (painting, pages 721-3). Often more than a hundred species of fishes may be in our immediate vicinity, their multitudes suggesting clusters of bright jewels. Forests of fanlike and treelike gorgonians—horny corals—sway endlessly with the waves.

Thousands of lesser creatures hide, forage, creep, wriggle, or rest. There are brittle starfishes, fire sponges, tiny crabs, longhorn shells, red-and-white-striped barbershop shrimp—the profusion of life staggers the mind.*

As the result of our studies at Alligator Reef, more species of marine fishes are now known from that area than from any other one location in the New World. Here, we have recorded 517 species.

Of these, 390 belong to the coral-reef community. Others include groupers and snappers from surrounding waters, and dolphins, tunas, marlins, and sailfish from the open sea.

Sixty of our collected species had never before been taken in North American waters, and 19 of them were new to science—so new that they still lacked common or scientific names. They include several small sea basses, gobies, and burrowing eels.

Among other finds was a striking coal-black shrimp with a white pinstripe. This creature uses tiny claws to cling to the spines of sea urchins. Its blackness, blending perfectly with that of its host, hides it from hungry

(Continued on page 724)

*For other articles on Florida reef life, see "Florida's Coral City Beneath the Sea," by Jerry Greenberg, and "Key Largo Coral Reef: America's First Undersea Park," by Charles M. Brookfield, both in the January, 1962, issue of NATIONAL GEOGRAPHIC.

DETACHROME (ABOVE) BY ROBERT F. SCHROEDER; KODACHROME BY WALTER A. STARCK © N.G.S.

Spooky trio of purplemouth moray eels haunts coral-encrusted ballast stones of a Spanish vessel wrecked by a 1733 hurricane. The dangerous three-foot-long predators may attack divers who come too close to their lairs. Powerful jaws and needle-sharp teeth can inflict severe wounds.

Handy hideout for many of the coral reef's creatures, a tube sponge harbors a brittle starfish. Spiny arms of the ophiuroid, pictured life-size, break easily but grow back again.

WITH A ROBE FOR EACH OCCASION, *a blue surgeonfish drifts in from the ocean as a transparent larva. When it reaches its permanent home on the reef,* Acanthurus coeruleus *dons cloth of gold overnight. Later, juvenile yellow darkens to the royal blue of adulthood. The fish, shown life-size at the two younger stages, may grow to a foot in length. It takes its name from scalpel-like spines at the base of the tail.*

Color rules the reef

TEEMING TENEMENT, *the coral reef houses residents as brilliant as they are numerous. Foot-long green parrotfish, a male, nibbles algae with beaklike mouth; the female of* Sparisoma viride *wears black, white, and red. Fooled by her different garb, marine biologists once thought the lady a separate species. Silvery hitchhiker, a remora with a spiny suction disk atop its head, clings to her.*

In a Fisheye-lens view, Jo Starck releases rotenone amid graceful sea fans. The paralyzing poison, harmless to divers, helps her take specimens of Alligator Reef's 390 fish species.

Turn the foldout for a look at the coral-reef community from ocean slope to shore-side shallows.

1 Yellow jack
2 Smooth trunkfish
3 Neon goby cleaning trunkfish
4 Bluestriped grunt
5 Bluehead wrasse, adult male
6 Rock beauty
7 Squirrelfish
8 Brittle starfish
9 Scrawled filefish

10 Jellyfish
11 Queen angelfish
12 Elkhorn coral
13 Jewelfish
14 Red sponge
15 Blue angelfish
16 Stinging coral
17 Blue chromis
18 Tube sponge

19 Bull shark
20 Bar jack
21 Butter hamlet
22 Staghorn coral
23 Black angelfish, juvenile
24 Coral polyps (life-size)
25 Zooxanthellae (enlarged 1,100 times)
26 Rainbow parrotfish
27 Detail of parrotfish mouth

28 French angelfish
29 Porkfish
30 Sea fan
31 Bluehead wrasse, adult female and juvenile
32 Gray triggerfish
33 Sea urchin partly eaten by triggerfish
34 Striped parrotfish
35 Lettuce coral
36 Cardinalfish

37 Blue surgeonfish
38 Spadefish
39 Foureye butterflyfish
40 Common butterflyfish
41 Banded butterflyfish
42 Sergeant major
43 Blue surgeonfish, juvenile
44 Starfish
45 Spotted scorpionfish
46 Barracuda
47 Sargassum weed
48 Black angelfish
49 Gorgonian
50 Turtle grass (female flower enlarged 1.5 times)
51 Yellowhead jawfish
52 Banded coral shrimp
53 Crowns of feather-duster worm

Lisa Bjurwald

enemies. Still another shrimp, hitherto unknown and colored tan, white, and blue, lives among the tentacles of anemones.

The flamboyant hues common to many reef fishes have three purposes: to confuse other animals, to provide concealment, or to advertise the wearer's presence.

Schooling fishes with contrasting horizontal stripes—the ever-present grunts, for example—make a most effective use of confusion as a defense tactic. When a predator spies a milling school, with its shifting maze of lines, he finds it difficult to single out an individual for a long enough time to capture him. And if the predator dives into the school without selecting one member of it in advance, the fish have a better chance to escape by darting in different directions.

To circumvent this defense, large jacks first flash into the schools of grunts and scatter them so they can be chased individually.

Many of the most beautiful reef fishes, such as angelfish, queen triggerfish, and spotfin hogfish, bear markings in hues that range the spectrum. Their colors, in some cases, make them difficult to detect against the variegated background of the reef, and their markings break up their outline, size, and shape.

"Neon" Signs Say, "At Your Service"

Among the smaller fishes there are clever advertisers, like the showy neon gobies with their electric-blue stripes. To larger fish troubled by parasitic copepods and other sea lice, the gobies' bright markings say, "At your service." In payment for relieving the bigger fish, the gobies get free meals.

The importance of our individual findings lies in the picture they give of the coral reef community as a whole—one of nature's most colorful and intriguing creations.

Early in my work on the Florida reefs, I developed a sharp curiosity about what goes on under the sea at night. We knew vaguely that certain fishes that huddle among the coral heads in daytime wander far afield at night to forage. But there had been little direct nocturnal observation. Several years ago we began a program of night diving to learn more of this aspect of coral reef ecology.* The results proved so important that we now make it a standard technique.

One of our recent dives blended many of the happenings that make night-diving

KODACHROME BY WALTER A. STARCK II © N.G.S.

experiences so unforgettable. Jo and I, with graduate students Alan Emery and Richard Chesher, had guided our boat to the chosen reef. Five miles away the red light pulsed on the microwave tower on Upper Matecumbe Key. Overhead, the stars of the tropic night spread their silver spangles across the Gulf Stream skies. Before me, the glowing face of the echo sounder read 150 feet. We lay just to seaward of the outer edge of the deep reef.

Soon we were encumbered with wet suits, inflatable life vests, Aqua-Lungs, and weight belts. We carried cameras, bangsticks, nets

*These fascinating adventures are described in "Photographing the Night Creatures of Alligator Reef," by Robert E. Schroeder, with illustrations by Dr. Starck, NATIONAL GEOGRAPHIC, January, 1964.

EXTACHROME (ABOVE) BY ROBERT E. SCHROEDER; KODACHROME BY WALTER A. STARCK JR. © N.G.S.

Like exploding fireworks, hungry coral polyps (above) spread their tentacles by night to snare plankton. Using limestone gleaned from the water, the tiny animals, here about twice life-size, build rock-hard skeletons. Rapidly multiplying colonies often create huge calcareous domes. Rayed skeletal pattern (right) gives the star coral its name.

In a cross section of living coral (left), polyps with folded tentacles glitter at top like gold filigree. Greenish tinge, just below, results from a band of algae which lives under the polyps. Sponges and other organisms have bored holes into the fused skeletons.

and spears for collecting, and signal flares for use if we should stray from the boat. All of us wore plastic football helmets surmounted with sealed-beam lights.

At the stern, I adjusted my mask and turned on my headlight. I dropped into the dark sea; Jo, Rick, and Al splashed in after me.

We went down the white anchor line, hand over hand, pausing occasionally to relieve the pressure on our ears. At 100 feet the darkness beneath us opened up as our headlight beams reached the pale ocean floor.

We landed on a plain of sand and coral rubble strewn with large sponges. Directly ahead, a sand perch nestled against a fragment of dead coral. The fish's familiar daytime stripes were now obscured by a camouflage pattern of irregular pale and dark blotches, a transformation not previously known in this fish.

Carpeting the entire bottom, a vast colony of brittle starfish waved feathery arms as they fished for food. I touched one gently, knowing its limbs break off easily but soon grow out again, and the writhing arms quickly pulled back into the sand.

A tug on my arm drew me away, and Jo

EXTACHAUNE (RIGHT) AND KODACHROME BY WALTER A. STARCK © N.G.S.

Proud aristocrat: The queen angelfish earns its title with graceful form, stately movement, and rich coloring. Even as a juvenile (left), the angelfish cloaks itself in hues befitting a princess. Vertical bars mask eyes and break up the youngster's outline, confusing predators.

Holacanthus ciliaris uses brushlike teeth to graze on plants and invertebrates. Dagger-sharp cheek barbs can cut foes and the hands that remove the beauty from a fishhook. Juvenile and adult here appear life-size; full-grown queens may reach 18 inches.

pointed out a finger-size soapfish sidling along the bottom. Days before, Jo had been stung badly by a fire sponge while collecting a soapfish. This time she used a hand net.

Kicking our flippers, we edged along the bottom. Rick pointed at a pencil-size stick with a knob in the middle that came tottering into sight. Multiple feet protruded from the knob. Here was a Texas longhorn shell, joint property of a hermit crab and a colony of bryozoans, the latter a group-living animal that secreted the peculiar longhorn shell the hermit crab had adopted for a home.

We stopped, and silvery clouds of reef herring swirled about us. Some, mesmerized by the lights, fell to the bottom, where brittle starfish wrapped snaky arms around them. Bar jacks—seagoing jackals—darted through the fringe of darkness and preyed upon stragglers.

A few feet away, a swimming crab held a struggling herring cigarette-fashion in its pincers and devoured it tailfirst. Several more tiny silvery forms met their fate entangled in Jo's hair, their bodies to be exhumed later by comb.

Thirteen minutes had passed—by our schedule, time to return to the surface. We headed upward, feeling the familiar yet always uneasy sensation of swimming in the open ocean at night, with no reference point to assure us we were really moving. We found the anchor line and followed it up. After hauling anchor, we steered for the lights of home on the horizon.

Relatives of Jellyfishes Build Stony Reefs

To understand reef life one must know how the reef proliferates. Coral, the backbone of a reef community, looks dead, but is actually a living animal. Its stony skeleton is like the shells of snails, or our own bones (preceding pages).

Animals that manufacture the coral rocks are related to the watery jellyfishes and the flowerlike sea anemones, familiar seashore inhabitants even in cooler climates. All belong to the large and ancient line of animals called cnidarians.

Corals live in almost all the oceans, but they form reefs only in tropical seas. And they cannot build their reefs if the water temperature falls below 68° F. for an extended time.

Swarms of one-celled plants, the microscopic algae living within the corals' tissues, are the all-important catalysts in this miraculous architecture. The algae, known as zooxanthellae, may or may not provide some nutriment to the polyps but, more important, they do help them build solid coral rock. Exactly how they accomplish this remains a mystery.

Most of the food the coral polyps need is strained by their

Standing on its head, a trumpetfish imitates a swaying branch of soft coral. Two-foot-long *Aulostomus maculatus* lives most of its life in topsy-turvy posture, pouncing down on passing crabs, worms, or smaller fishes.

tentacles from the clouds of plankton that currents wash across the reef. The plankton animals get their energy from the sun through microscopic plants.*

As the corals build, the destructive forces of nature relentlessly tear down the edifice. Myriad boring organisms penetrate the dead stony heart of the coral. Thus weakened, the structure eventually crumbles. Meanwhile, new coral cities grow on the seaward fringe and face of the reef, and on the eroded skeletons of their ancestors.

Rotted remnants of the reef soon would be washed away, except that sponges, seaweeds, stony algae, and a host of other masons cement the fragments together. The result is porous limestone, honeycombed with tunnels, caves, and grottoes large and small. The rock abounds with little nooks and crannies, and big potholes filled with sand. Here, the reef's residents set up housekeeping.

The tiniest crack or crevice is a room in the reef's apartment house—saucy jewelfish here, a spiny lobster there, a colony of heart-shaped sea urchins in the sand of a pothole.

In many areas the bottom is densely

*See in the GEOGRAPHIC: "How the Sun Gives Life to the Sea," by Paul A. Zahl, February, 1961, and "Strange Babies of the Sea," by Hilary B. Moore, July, 1952.

Pancake-flat with peacock spots, the eyed flounder blends with a sandy bottom. Sometimes *Bothus ocellatus* buries itself in bottom debris until only its knoblike eyes peer out. The species grows five inches long.

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Prairie dog of the coral reef, a yellowhead jawfish digs its burrow. Colonies of the three-inch fish sink individual shafts a foot deep into sandy bottoms and flit inside, tail-first, when danger threatens. If another member of the community comes snooping, *Opisthognathus aurifrons* darts out threateningly. The small fish often tussle over possession of pebbles they gather to line the walls of their tunnels.

overgrown with the plantlike purple, yellow, and tan fronds of horny corals gently waving in the swell. These gorgonians, though cousins of the true corals, never build reefs.

The reef is occupied to capacity. Such close crowding perhaps was the pressure that produced among reef animals the many intimate associations that we observe today.

Black Poison Makes Milky Cloud

To collect specimens, we often use rotenone. This chemical, harmless to humans in the amounts we use, paralyzes the respiratory systems of the fishes.

To run a "poison station," we take down plastic bottles filled with an emulsion of rotenone. We squeeze the fluid into the water so that it drifts over the chosen area.

In the bottle the liquid looks like oily black coffee, but when squirted into the sea water it forms a milky white cloud that is easy to follow (foldout, pages 719-20).

So we swim around, puffing rotenone clouds over the big coral heads, under the ledges, into the caves, everywhere that fish may hide. Within two or three minutes affected fishes can be caught easily with a hand net.

Even though the grunts and snappers normally feed at night, they often offer us stiff competition as collectors of the smaller fishes we have stunned or killed.

During one collecting foray, I watched a small spotted soapfish emerge groggily from a crevice in the rocky bottom. A gray snapper from a nearby school came to investigate. As the snapper approached the spotted tidbit, a dark stripe appeared on each side of the aggressor's face. When only inches separated the two fish, the stripe became almost black, merging with the dark pupil of the eye. My own observation suggests that fishes gauge the intent of a predator by the look in its eye, and the snapper masks its lethal purpose by shadowing the eye to obscure it.

Suddenly the attacker shot forward with a flash of white teeth and grabbed its smaller prey. Almost as abruptly the snapper stopped, vehemently spat out the soapfish, and swam rapidly back to its school, working its jaws and shaking its head. The snapper had discovered the toxic properties of the soapfish's copious coating of slime, one of the many strange defense mechanisms of reef fishes.

Shortly after the snapper developed a distaste for soapfish, another of its school swam toward us to investigate a grunt that had been stunned by rotenone. A four-foot barracuda saw its chance; a blurred flash of gray met the snapper. As a cloud of scales descended upon Jo, we both watched the barracuda move slowly away with its still-struggling prey. The razor-studded jaws worked several times—we could actually hear the crunch of bones—and the snapper was gone.

Although the lightning-fast barracuda can be dangerous, we have not found it to be so, and we see 15 or 20 every day we dive at Alligator Reef. Man's greater size tends to restrain the aggressiveness of these predators.

Back Reef Harbors Hidden Creatures

In contrast to the teeming reeftop, the mile-wide back reef area seems a virtual desert under the shallow sea.

At first glance the sand seems almost devoid of life, but as in many land deserts, this is an illusion. Ghostly mojarras, miniature silvery fish, move swiftly across the sea floor.

When rotenone takes effect, the apparently sterile sand yields a crop of stunned shrimps, crabs, flounders, stargazers, lizardfishes, cusk eels, dragonets, gobies, and strange eels with pencil-point noses.

Many sand animals of the back reef emerge only at night; the visible population swells dramatically. Thousands of the brown heart-shaped urchins called sea biscuits dig themselves out of the sand. Delicate, translucent sea anemones burst into flower from their parchment-walled burrows.

Grunts, foraging here a mile or more from their daytime homes, demonstrate an interesting aspect of reef ecology: Many fishes and other animals that crowd the main reeftop by day migrate at night to relatively distant feeding grounds. These creatures therefore do not deplete the food supplies of the reef proper.

To cover large areas of the back reef at night, we use a small submarine towed by our skiff. The fiber-glass submersible is a torpedo-like, open-cockpit, two-man vehicle.

A "windshield" partly protects the crew from the sea wash. Control fins allow maneuvering up and down and sideways. Though the sub has its own electric motor, we prefer to tow it, unpowered, with our boat.

Riding silently 100 feet behind and 20 feet below the mother ship, the sub is especially useful for mapping the dark-period ranges of the reef's nocturnal feeders. Our sudden appearance catches the sand creatures unaware, and our bright lights transfix them.

From our open sub we can reach out and pick up objects in passing. We can even hop out, if an especially tempting subject appears.

Ray Delivers a Mighty Jolt

Once Al Emery and I spotted an uncommon ray resting on the sand. I blinked the sub's lights, and Jo, at the helm of the tow boat, saw the green glow below her vanish and reappear. She threw the engine out of gear. I swam out of the sub and it coasted away from me into the darkness. Then I speared the ray for later study.

As the sub glided away, Al left the rear cockpit and anchored our vehicle. He swam back to my light with a burlap bag. I passed the impaled ray to Al, and he shoved it into the sack. As he did so, his arm jerked spasmodically—shocked by 30 to 40 volts! We had collected an electric ray.

Bursts of bubbles—a nervous underwater chuckle—streamed from Al's Aqua-Lung as we continued our night's hunt.

In many places patch reefs loom above the grass that carpets much of the lagoon floor. Such a reef may consist of an isolated coral head weighing as much as several tons, or mound upon mound of coral, towering almost to the surface. Usually, barren sand encircles the patch reef. Grass eaters, afraid to venture far from its protection, overgraze the immediate area, creating a characteristic ring.

On large patch reefs we can swim between walls of coral and in places even go inside the

Scattering like locusts, dwarf herring flee a flippered invader. Once after Mrs. Starck encountered a school like this one, she had to comb out wiggling slivers of silver entangled in her hair. Favorite morsels of larger fishes, plankton-eating herring such as *Jenkinsia lamprotaenia* provide a vital link in the sea's food chain. EXTACHROME © N.G.S.

reef itself. Coral caverns display modernistic murals that Neptune has painted with blotches and dabs of color. Red, blue, green, brown, black, and white sponges, bryozoans, foraminiferans, and other animals form living frescoes on the chamber walls.

Larger fishes often occupy the coral caverns and ledges of the patch reefs. They normally retreat beyond reach or flee to open water when approached too closely. One large jewfish, however, did not back off.

Slowly, deliberately, I came within six, then three feet of the 200-pound fish, raising my camera. The huge, still head filled the viewfinder as I prepared to trip the shutter.

Uncomfortable thoughts flashed through my mind: The whole sea turtle I once found in the stomach of another jewfish; the Navy diver, who was engulfed head and shoulders by a jewfish he had tried to spear; my father, who was knocked unconscious by a startled jewfish that blindly rammed his diving helmet. How would this one react to the camera flash, now only 18 inches away?

The flashbulb exploded with light.

The big fish did not stir, except for the measured pulse of its breathing. Carefully I replaced the bulb and fired again. Only when I backed away after several exposures did the jewfish come to life. In a flurry of disturbed sediment it vanished around the side of the reef.

"Snow" Falls on a Sea Urchin

Because of their shallow, protected, and isolated location and self-contained character, patch reefs afford ideal environments for biological study.

In one experiment at Margot Fish Shoal, Dr. Voss and Dr. Bayer built an artificial patch reef of coral boulders brought from dry land and studied the rate of its colonization by fishes and invertebrates. Even after many months, only a small number of plants and invertebrates had established themselves.

One day a summer assistant, Sam Stout,

On midday promenade, reef residents meet under a coral ledge. By night these pinstriped Spanish grunts, yellow French grunts, vertically barred porkfish, and gray snappers will hunt alone—combing the back reef for crabs, shrimp, and smaller fishes. Spanish grunts also relish the reef's long-spined sea urchins, whose pigment stains their jawbones purple.

PAINTING BY WALTER A. STARCK © N.G.S.

reported excitedly to Bayer: "There's a sea urchin down there that has a snowstorm that won't go away!"

With Stout, Bayer went down to investigate. Near a big coral head Sam pointed to a huge black sea urchin—*Diadema antillarum*—bristling with needle-sharp spines six inches long. Sure enough, above it swirled what appeared to be a snowstorm of brightly sparkling silvery motes. As Bayer swam closer, the "snowflakes" retreated among the spines, and Bayer could see that they were small animals with gleaming eyes.

After vain attempts with a nylon dip net, they finally captured a few in a large glass jar. Back in the boat, Bayer was astonished to find that the sparkling, elusive little eyes belonged to a tiny shrimplike crustacean, and not to baby fish as he had suspected.

Under laboratory examination, they turned out to be mysids, sometimes called opossum shrimp because they brood their eggs in special pouches beneath their bodies. These little crustaceans, hovering above a spiny sea urchin, show how a relatively defenseless animal may use the shelter of another's weapons.

At Alligator Reef we, too, have studied artificial patch reefs, but they are quite different from the one built by Voss and Bayer. Ours—at least eight of them not far from Alligator Reef Light—tell somber tales of maritime disaster. They are piles of ballast stones from the wrecks of old sailing ships.

Eels Lurk Amid Ballast Stones

The holes between the rounded stones are more uniform than the assorted crevices of a natural patch reef, and thus the fauna is different, too. Some animals find abundant cover; others find little or none. For example, we have seen more purplemouth moray eels on the wrecks than anywhere else—often two or more peering from a single hole (page 717).

Certain groupers also frequent the wrecks. One large Spanish ship, sunk by a hurricane in 1733, is home to a pair of tame 20-pound black groupers. A Miami graduate student began feeding them one summer while studying cleaner shrimp on the site. One day he neglected to feed the groupers. After following

Feather-duster tentacles of a tube worm, spiraling an inch above living coral, strain food from the water. If disturbed, the worm folds its crenelated umbrellas (shown twice life-size) and zips them into a tube in the coral, where it lives.

Spotted mantle of a flamingo tongue cloaks its shell as the inch-long marine snail grazes on polyps of soft coral. When endangered, the little creature draws the soft mantle inside.

Frothy blue gills frill a nudibranch, or "naked gill," climbing a flame-hued sponge 50 feet down. This sea slug appears life-size.

him about impatiently for a while, one of them seized his hand, cutting it in several places. Thereafter, when we dived on that wreck, we kept our hands out of reach or bribed the demanding groupers with food.

Of all coral habitats, the most fascinating to us is the deep reef. Here, 60 to 100 feet down, at the edge of a sandy plain, lies a quiet, shadowless blue world of 15-foot sea whips ending in springy coils, vase sponges big as barrels, and numerous species of corals. Many common corals and plants take on delicate new forms in this serene, dim kingdom, and much of the life is peculiar to deeper water.

Large fish, sharks included, frequent the deep reef, where they have ample maneuvering room, both as hunters and as hunted.

We have not yet suffered attack from sharks, and the odds say that we are not likely to. The threat is always present, however, for the decision lies with the sharks. And collecting fish sometimes attracts them.

Only a short distance from the deep reef, we have seen hammerheads measuring more than 20 feet, even though these powerful fish do not normally average more than 12 feet.

As we were ascending the anchor line after one rotenone collection on the deep reef, I saw several fish we had missed. I signaled Jo to go on up. On the way down I glanced back and saw Jo continuing her ascent.

I netted the fish and headed up again. Above, I could see the outline of our skiff; beside it, curiously, my wife appeared to be sitting in the water. When I broke surface, I saw her clinging to the rail, her legs in the boat, unable to pull herself aboard. The short metal stern-light staff was bent double.

"What's the trouble? How did you bend the light?" I asked, helping Jo into the boat.

"Shark . . . circled me . . . ladder gone . . . tried to climb aboard. . . ." Her voice trailed off; she was still winded.

When she had recovered, Jo told me that just after I had turned back, a 12-foot hammerhead began to circle her. She continued her ascent. Unlike most sharks, which circle curiously once or twice and leave, this one showed too much interest. Jo watched as the large eye on one end of the hammer came

closer with each circuit. Would this shark decide to attack?

She reached the skiff and found that just then—of all times—the boarding ladder was gone! It had worked loose from the tossing boat—the only time this had ever happened.

Guessing—and hoping—that the shark had been drawn to her by the fish in her net, Jo threw the catch into the boat. She then grabbed the rail and the light to haul herself in. The staff folded and dropped her back in the water. The shark circled closer. Feeling her dangling legs vulnerable, she threw them over the gunwale. Weighted by the heavy air tank on her back, she could not pull herself entirely clear of the water.

At that moment I appeared, and the hammerhead swam away.

Deadly Anemone Shelters Shrimp

Among the many fascinating aspects of reef life, I think, are the close relationships among different animals. Washtub-shaped loggerhead sponges, for example, are busy tenements for 16,000 or more small shrimp, as one patient biologist found by actual count. A small black cardinalfish lives inside the broadlipped conch's shell—with the living conch. Certain fishes and shrimps feed on parasites of larger fish that submit docilely to their attentions.*

I discovered one cleaner shrimp, astonishingly enough, to be a member of a four-party relationship. It lives in the shelter of a sea anemone's stinging tentacles. The shrimp, *Periclimenes pedersoni*, attracts fish toward the anemone with its long waving antennae, then darts out of hiding to feed on the visitors' parasitic crustaceans and worms. We had known this three-way relationship, but the fourth party did not reveal itself until I interfered by touching one anemone.

My curiosity was rewarded. A husky little snapping shrimp emerged from beneath the anemone and thumped my finger with its outsize snapping claw. By living within the shelter of the sea anemone's tentacles, the

*See "Finned Doctors of the Deep," by Douglas Faulkner, NATIONAL GEOGRAPHIC, December, 1965.

Cluster of matches with a fiery sting, a sea anemone gives protection to a jewel-like cleaner shrimp, here twice life-size. When parasite-ridden fish station themselves nearby, delicate *Periclimenes yucatanicus* ventures from its home to pick its customers clean with tiny claws. Anemones flourish among their relatives, the corals.

snapping shrimp also enjoys its protection.

Human interference led us to unexpected results in another experiment. To find out more about the movements of certain night feeders, we altered their color by shooting fluorescent green, blue, or red granules into their scales with an air gun. We marked yellow-striped grunts in one area, hoping to find them later at their nocturnal feeding sites.

But fishy greed foiled our experiment. Predators promptly spotted the marked fish. After seeing one grunt gobbled up almost as soon as we let it go, I ran a test to learn if this was an isolated incident. It wasn't.

Marked Grunts Find No Refuge

While tagging a group of grunts, I glimpsed a large school of snappers beneath the boat. Slipping into the water, I had Jo throw in a marked fish. It headed downward, green fluorescent patch glowing brightly. Several snappers rose to meet it. Panicking, it began to flee, but before it reached bottom a puff of scales signaled its demise.

"Throw in another," I called, and watched a similar result.

I personally escorted the next marked fish to the bottom. As soon as I moved away, the snappers closed in. The tagged fish darted into a rocky hole. But I was not alone in observing this: A small grouper, a rock-dweller, also had an eye on the grunt and pursued it. Sediment billowed out from the hole, and the grouper emerged with the grunt's tail protruding from its mouth.

After 10 years of study we have gained a far better understanding of the fascinating world of the coral reef. In addition to the 390 fishes we have catalogued as members of the reef community, we have discovered many shrimps, crabs, starfishes, soft corals, marine worms, and other creatures to be added to the known fauna of the Florida reefs.

We have compiled data on feeding, growth, movements, nocturnal behavior, early life history, and other aspects of the lives of reef inhabitants. We have established differences in the composition of the fauna in the various zones. For example, we have found a greater percentage of herbivorous species on patch reefs than on the main reef.

Still, there is much to be learned. Each time I swim along the outer deep edge of a reef, 150 to 200 feet down, I see below me unfamiliar fishes and strange life of other forms. To be able to dive to the deepest reaches of the reef, down to 600 feet or more, would be to explore a scarcely known realm.

What creatures live there? What happens to plants and corals with increasing depth? How deep do they go, and how are the fishes that feed on them affected? These and a thousand more questions remain to be answered.

At our doorstep lie whole realms unseen by man, their inhabitants undreamed of. The frontier has not vanished.

Neither love nor conversation draws bluestriped grunts into this mouth-to-mouth confrontation. They battle over territorial rights, biologists believe; no one knows how *Haemulon sciurus* determines the victor in such kissing contests. The fish grows a foot long.

KODACHROME BY HOWARD HASKIN © N.G.S.

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COVER: Queen angelfish reigns from a coral throne, a reef in the Florida Keys (pages 726-7).

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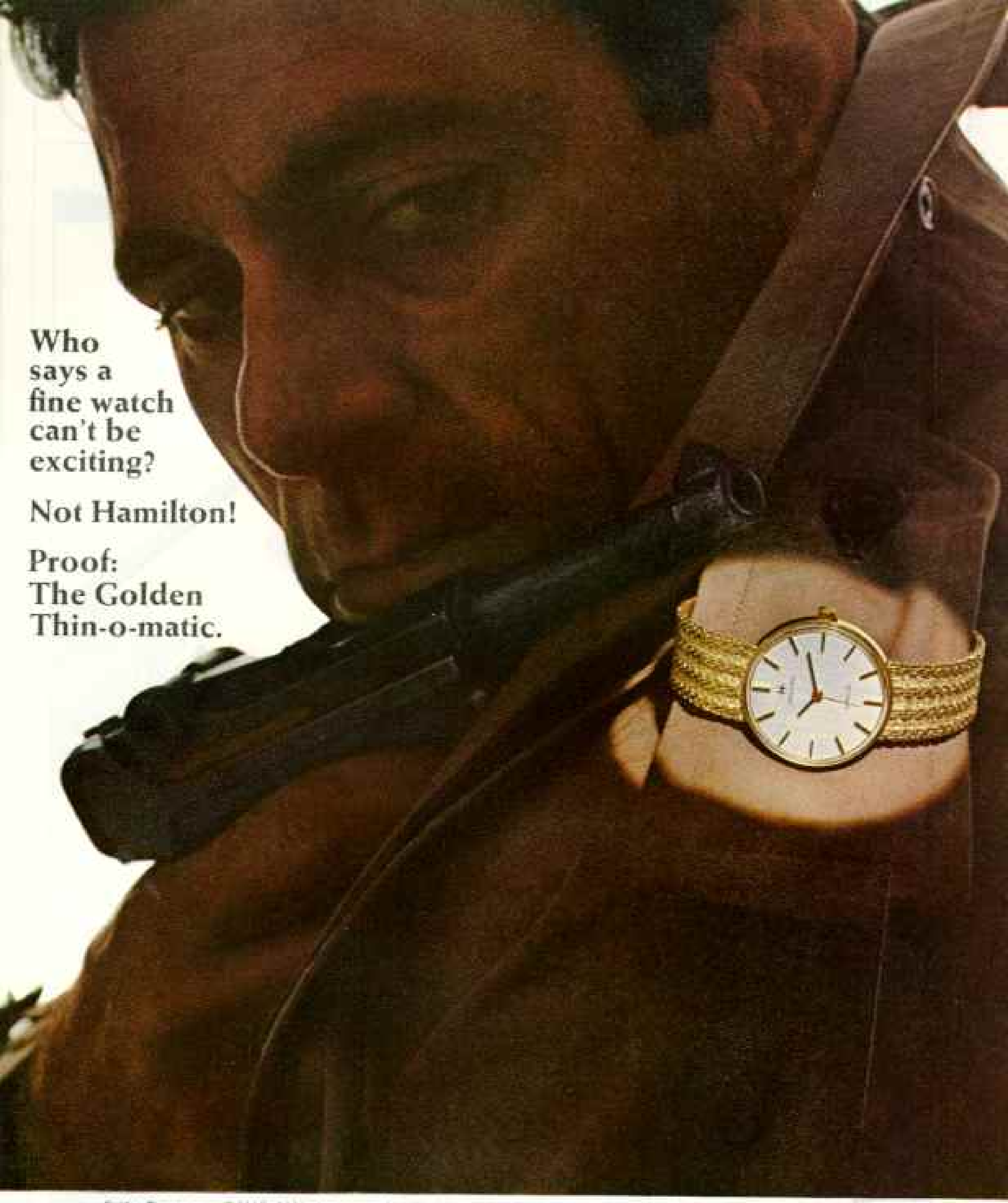

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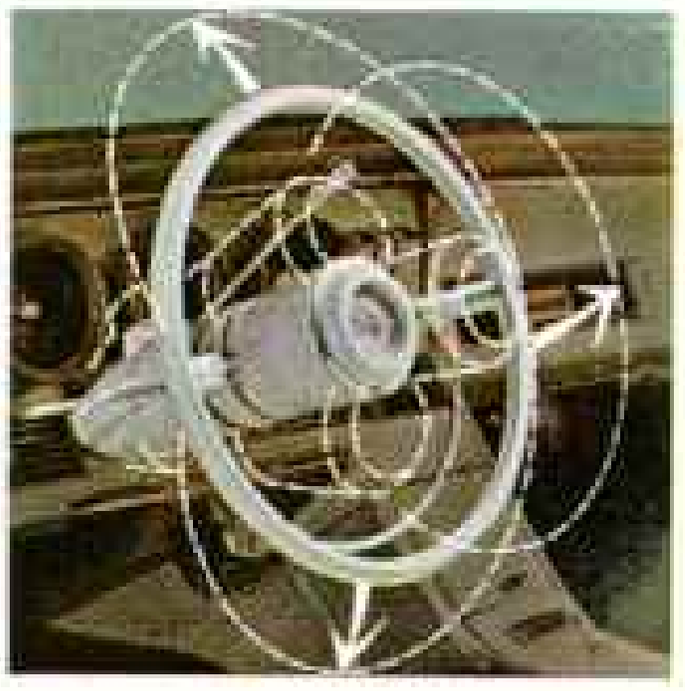

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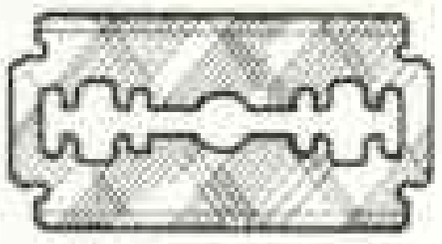

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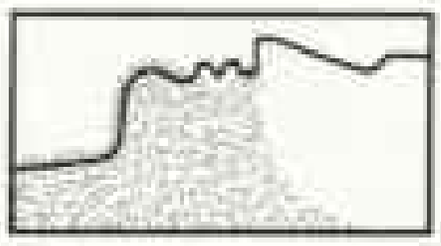

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It's a unique car that offers elegance you want at a price most new-car buyers desire.

dual master cylinder brake system with warning light, energy-absorbing instrument panel with smooth contoured knobs and levers, four-way hazard warning flasher.

The inventory of things to add is more impressive than ever before. Like the new 8-track stereo tape system, complete with a free 80-minute tape. Like the Comfortilt steering wheel. Comfortron automatic heating and cooling; set it once and stay that temperature all year long. Not to mention Turbo-Jet V8 power you can add.

There are four 1967 Caprices: sedan, coupe, two wagons. They're all salon-styled and Chevrolet-priced. And they're at your Chevrolet dealer's now.

CHEVROLET

Everything new that could happen . . . *happened!*

THE GRAND CHEVROLET '67 CAPRICE

Leo Darga was cut out to work with wood.

Today he fashions tomorrow's cars.

The hands that hold the chisel are the hands that help shape the car. And exceptional hands they are. For they belong to Leo Darga, for 35 years with General Motors, and now a skilled wood craftsman and designer at the Fisher Body Central Engineering Plant in Warren, Michigan.

Leo is *really* a chip off the old block, as his father was a woodworker for GM for some 30 years. In fact, as a young boy Leo became interested in working with wood by watching his father carve out his own pipes with knife and chisel. It naturally followed that young Darga showed an amazing aptitude and skill for wood shaping in manual training all through school.

Today, with all of his experience Leo concentrates on the fine work—minute detailing of the dips, bend and flairs on the exteriors and inte riors of Fisher Bodies in the initia stage of their development.

It's great to have the skill and artis try of men like Leo Darga working o the General Motors team.

General Motors is people making better things for you.

GM

This is a bribe

Tear out this page and slip it into her copy of Vogue, Ladies' Home Journal, Harper's Bazaar or McCall's.

You're probably wondering how this page got into your magazine. Just think of it as a hint, a request or a bribe from the man who put it here.

If you give him the REMINGTON® 500 Selektronic shaver, you could be in for a pleasant surprise.

First, there's the matter of his face. The REMINGTON 500 does things for it. It's a new shaving invention. With a dial. It shaves so close, he needs a dial to protect him. A dial to adjust to his particular face and beard.

It has a huge shaving surface. So he won't waste a lot of your time shaving.

There's a man-size sideburn trimmer.

And it's cord/cordless. Which just means that it works anywhere anytime.

Give him the REMINGTON 500. It could come back pearls.

Or a diamond.

TEAR HERE

REMINGTON 500 Selektronic Shaver!

QANTAS TO ROME?

Face it, pussycat, Rome is for roaming. And Qantas is to get you with it. Qantas, the Australian airline. The one that swings around the world. The one with service that's nothing less than purrfect. Play it cool. See that fountain of information, your travel agent. Or Qantas, Austraiia's round-the-world airline.

The Rocket Action Cars are out front again!

Enjoy fine-car quality and luxury without paying the fine-car premium.

Oldsmobile Ninety-Eight for 1967.

Be good to yourself. Move up to Ninety-Eight this year and discover how easy it is to enjoy the prerogatives of fine-car ownership! Interiors as original as a private art collection. A ride that's singularly silent—end product of an expansive 126-inch wheelbase and a cushiony four-coil-spring suspension. The quiet cadence of a 365-hp Super Rocket V-8. Embellishments that cater to your every whim: Turbo Hydra-Matic, power steering and power brakes with finned front drums are all standard. And as for all-new styling, what else can we say: You're at the top; enjoy the view!

Oldsmobile thinks of your safety, too, with the GM-developed energy-absorbing steering column that can compress on severe impact up to 8½ inches; with four-way hazard warning flasher; safeside rear-view mirror; dual master cylinder brake system, plus many other safety features—all standard for '67.

Engineered for excitement . . . Toronado-style!

'67 OLDSMOBILE

GM

A great new camera takes the guesswork out of fine photography

New Honeywell Pentax Spotmatic camera measures light precisely for perfectly exposed pictures.

The magnificent new Honeywell Pentax Spotmatic is simplicity itself to operate, yet it will never fail to delight you with what it (and you) can do. Because it has a wealth of professional know-how *built in*, the Spotmatic lets you step up to the world of fine photography without forcing you to acquire and master a roomful of equipment.

The secret is a remarkable through-the-lens exposure metering system that is both automatic and uncannily precise. It assures you that you will never again lose a once-in-a-lifetime picture because of poor exposure. It gives you absolute control over the most difficult lighting situations. And it saves you time and film because you can forget about those extra shots "just to make sure." With the superb new Spotmatic camera, you *are* sure.

Here's how it works. The Spotmatic's metering system reads the light coming through the taking aperture of the lens—*the same light the film sees.* Its highly sensitive cadmium sulfide sensors can't be fooled by light that does not reach the film. An ordinary exposure meter *will* read such extraneous light, and the result will be an approximate—and often disappointing—exposure. Expert photographers know how to compensate for difficult situations, but now, the amazing Spotmatic does the work for you, giving you professional quality exposures time after time.

Fast, foolproof operation. You simply set the Spotmatic for the film you're using (color slide, color print, or black and white) and choose a shutter speed—1/125 or 1/250 for most average pictures. Then, you compose, focus, and flip the meter switch "on." Turning the diaphragm ring will center an easy-to-see needle in the eye-level viewfinder window. When it's centered, you shoot—confident that you've made a perfectly exposed picture. It's that easy! And, you've composed, focused, adjusted lens opening and shot *without removing the Spotmatic from your eye.*

Lightweight, compact, and magnificently built to deliver a lifetime of pleasure, the Spotmatic sells for just $289.50 with the 50mm f/1.4 lens; $249.50 with a 55mm f/1.8 lens. See it soon at your Honeywell Pentax Dealer's, or mail the coupon for free literature. Other Pentax models from $149.50.

Honeywell takes the guesswork out of fine photography.

Honeywell Photographic 9-17
Mail Station 209, Denver, Colorado 80217
Please send literature on the new Spotmatic to:

Name_____

Address_____

City_____ State_____ Zip____

Honeywell
PHOTOGRAPHIC

Come live the Continental life.

The Continental life may include riding lessons for your daughter. Certainly it includes the luxury motorcar driven by the kind of person whose discernment matches his means.

Lincoln Continental is designed for today's uncluttered taste. It offers, as standard equipment, every luxury you might expect: power steering, power brakes, power windows, power seat, Select-Shift Turbo-Drive automatic transmission, to name a few. And to tailor your Continental to your own individual taste, you may choose from a wide offering of luxury options, including a new power seat with adjustable headrest and reclining feature, an automatic temperature control system, a four-speaker Stereo-Sonic Tape System.

Shouldn't you be living the Continental life?

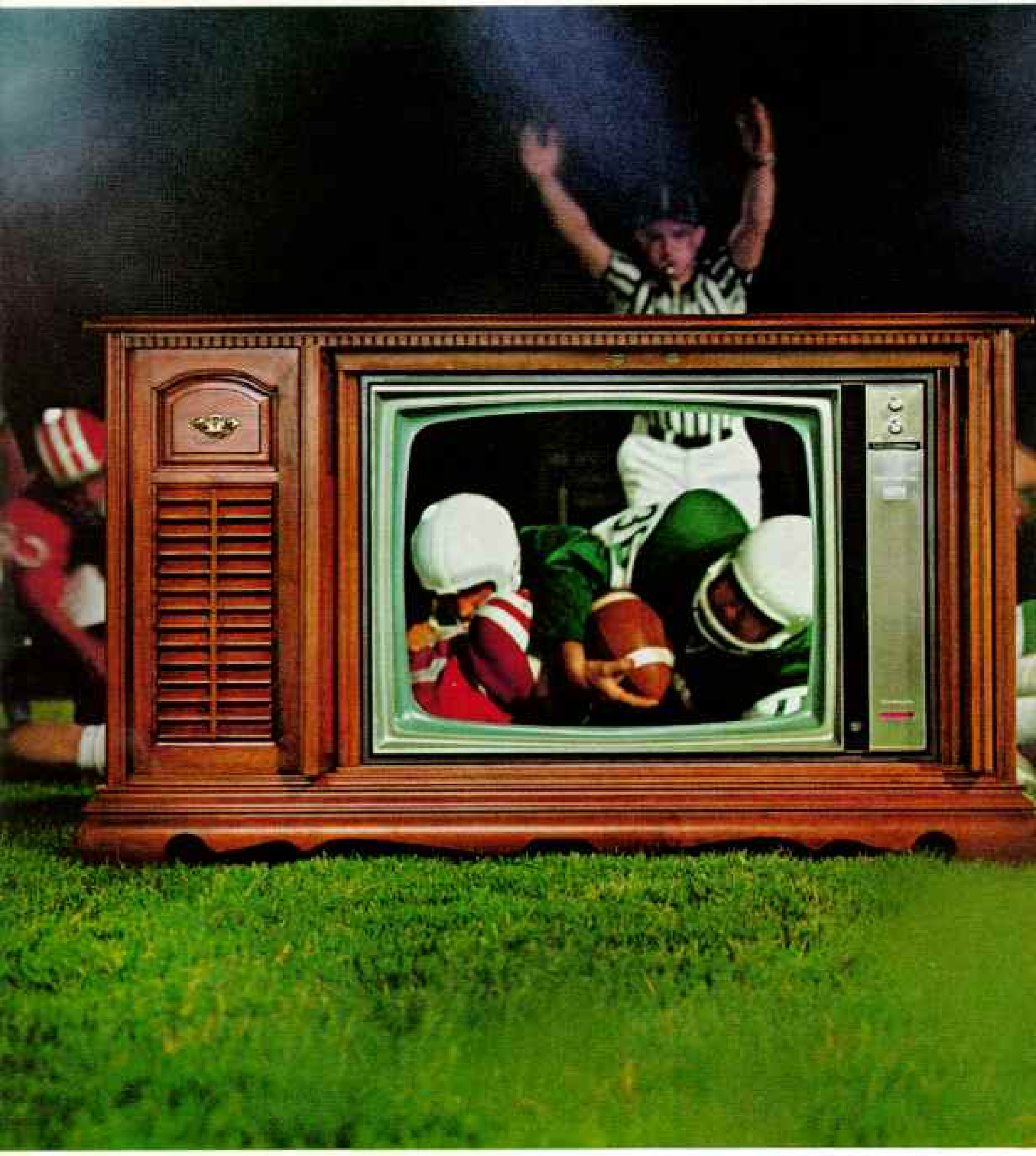
LINCOLN *Continental*

AMERICA'S MOST DISTINGUISHED MOTORCAR

Ford LINCOLN-MERCURY DIVISION

Shown above, the 1967 Lincoln Continental sedan in Arctic White, with optional vinyl roof in Light Ivy Gold. Also available, the Continental coupé, America's only four-door convertible, and the executive limousine, the ultimate luxury motorcar.

RCA Victor–for color so real



Now with Automatic Color Controls

New RCA Victor Mark I Color TV for 1967 is almost as simple to tune as a push-button radio. Just turn it on—and electronic controls take over immediately. RCA Victor Automatic Frequency Control tunes precisely and locks the signal in place—*automatically*. And RCA Victor Automatic Chroma Control keeps the color level constant even when you change from channel to channel—*automatically*. All you have to do is adjust the color tint...

you'll think you are there!

Shop early for wider selection. All models may not be available at every dealer. Shown above, The Lexington.

sit back . . . and enjoy yourself. What else? A new remote control for all VHF and UHF channels (an RCA Victor exclusive!) And an ultra-reliable solid integrated circuit in the sound system. It's one more reason why RCA Victor is the most dependable Color TV you can buy. Sound good? It looks even better. See for yourself at your nearby RCA Victor Dealer's soon—it's the most colorful place in town. RCA Victor—the Color TV pioneer.

RCA

The Most Trusted Name in Electronics

Powered to tune in the world and FM, too . . . Zenith's famous 9-band Trans-Oceanic radio

Powered to tune in the world—the Zenith Trans-Oceanic® portable is the world's finest all-transistor radio. Super-sensitive reception for AM, international shortwave and amateur broadcasts, ship-to-shore and ship-to-ship, marine and FAA weather services. And glorious FM too! The Zenith Trans-Oceanic Royal 3000-1—now at your Zenith dealer's.

ZENITH®

The quality goes in before the name goes on

Specifications subject to change without notice.

Good pictures in the palm of your hand!

(As discovered by over 2,000,000 travelers)

Handy OLYMPUS PENS have won favor with over two million globe-trotters. It figures. They're half the weight and size of old fashioned cameras. And they shoot twice the number of photos or slides on the same roll of standard 35mm film! You're always ready for that once-in-a-lifetime picture when you tote a Pen in pocket or purse. A wide range of models to choose from!

PEN-F, world's only single-frame Single Lens Reflex, with bayonet-mount interchangeable lenses. Speeds 1 sec. to 1/500. Automatic diaphragm with depth-of-field preview button. Focuses thru the lens to 11". With f2.8 lens, under $120, plus case. With f1.8, under $140. Coupled meter, tele, wide angle and zoom lenses and full range of accessories.

World's Only Single-Frame Single Lens Reflex

OLYMPUS PEN-F

SCOPUS, INC. P.O. Box 1075, Woodside, N.Y. 11377
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OLYMPUS CORPORATION OF AMERICA
In Canada: W. Carson & Co., Ltd., Ontario

Now. Buick improves on the ultimate.

Electra 225 Limited: a car even more luxurious than the Buick Electra 225. Which means it's more luxurious than virtually anything. Its interiors are softer, more supple, more comfortable. (And more sophisticated: Electra 225 Limited interiors come in black or champagne, vinyl or cloth and vinyl.) So if you think you already own all the automotive luxury there is to own, you have something new to think about. Electra 225 Limited. At your Quality Buick dealer's now. As the name implies, there may not be enough to satisfy demand. When better automobiles are built, Buick will build them. This is further evidence.

GM



Dozens of companies would like to write your business insurance . . . but do they



provide all the services you get from Ætna Life & Casualty . . . the P.S.–Personal Service



that's helping us grow so much faster than the rest of the insurance industry?

There are two reasons for Ætna's phenomenal growth in the highly competitive field of business insurance.

First is the *quality of service* businesses in every field get through Ætna agents and brokers everywhere. Second is the *eagerness with which this service is provided.* We take these things *personally.*

Ætna's combination of *specialized insurance knowledge* and *detailed attention to individual needs* will give your company better protection, better value . . . and better satisfaction.

You'll like our P.S.—*Personal Service.* It covers service from Ætna's underwriting experts, full-time loss control engineers, and our own salaried claim representatives working from branch offices in all major cities . . . plus the help of thousands of highly-skilled independent agents and brokers throughout the country.

Isn't this the kind of service you *deserve* from your insurance company? More and more businessmen think so. Why not join them?

Don't miss our National Geographic Special: "Dr. Leakey and the Dawn of Man" on CBS-TV, Saturday evening, November 5th.

Ætna
LIFE & CASUALTY

VIRGINIA packs more into your Winter Vacation

Pack Your Skis and Skates! Man-made snow and ice create superb winter sports, mid-December to mid-March. Ride up the latest ski lifts, then fly down miles of trails and slopes. Skiing awaits you at The Homestead, Hot Springs; Ski-Bryce, at Bayse; Shawnee-Land Ski Area, near Winchester, and Skyline Ski Area, near the town of Washington. Cut a figure on spacious outdoor rinks at The Homestead, at Natural Bridge and other places.

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WRITE FOR FREE 100-PAGE PICTURE GUIDE, "Carry Me Back To Old Virginia," plus illustrated highway map. Learn about places to stay, things to do, on your autumn holiday in Virginia.

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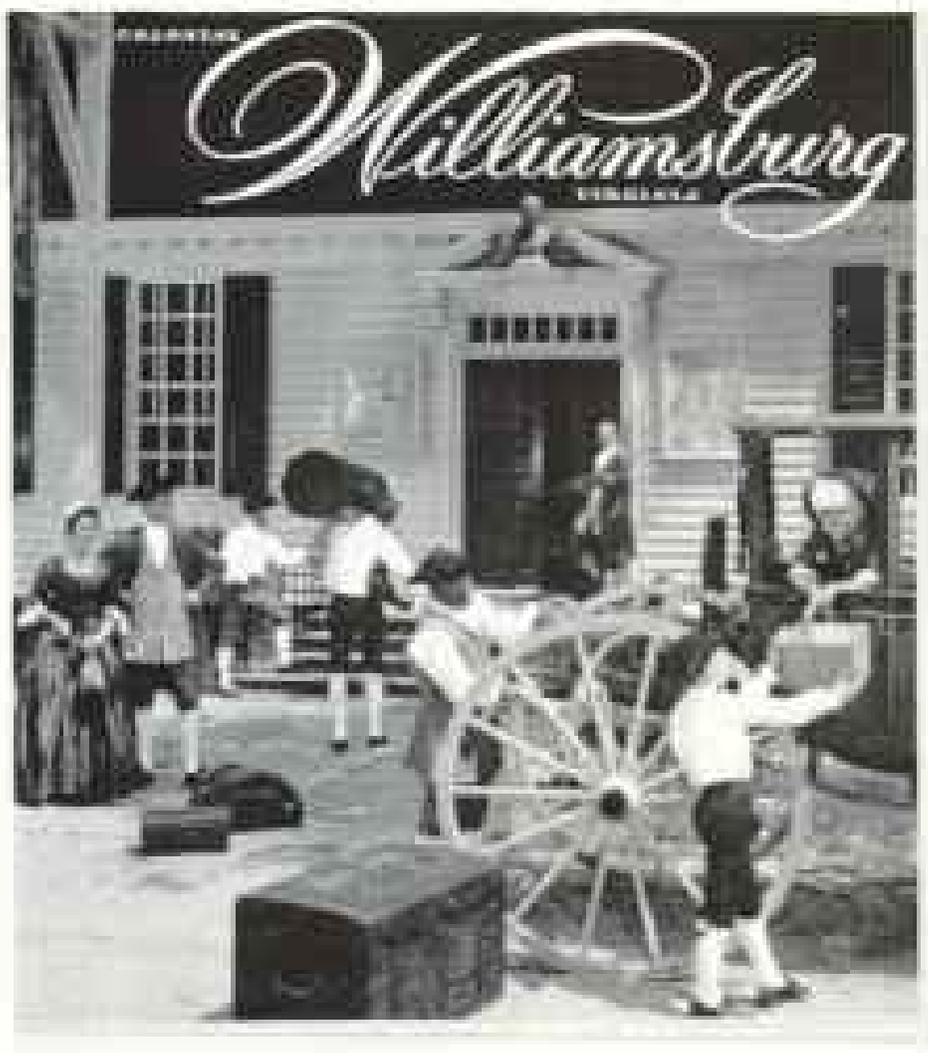
Give the gift that transcends the commonplace—membership in the National Geographic Society. Use order form on the third page of this magazine.



Write for this beautifully illustrated color folder filled with scenes of Virginia's 18th century capital.

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Please send me your *free* color folder.

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We'll fly you to 70 countries all for the price of Montreal.

St. Helen's Island site of Expo 67.

Here's your chance to see the world for one low air fare. Next April 28th, 70 countries begin a 6-month residency in Montreal. At Expo 67, largest world exhibition ever. Air Canada will take you there. To see the Russian ballet. To sample the exotic dishes of the South Seas. To explore the silent world under a polar ice cap. Or to listen to the African drums.

Next year is also Canada's 100th Birthday of Confederation. Something exciting will be happening in every province. And lucky you can take it all in without paying a penny extra for stopovers, just by flying Air Canada all the way.

Bring the whole family. Air Canada's money-saving Family Fare Plan is good every day.

See your travel agent or call Air Canada. Ask about our Expo Tour #IT-MGT-2: 3 days and 2 nights in Montreal for only $28.00 per adult, double occupancy, meals extra; plus air fare.

Visiting 70 countries may never be this reasonable again.

AIR CANADA

Offices: Boston, Buffalo, Cleveland, Chicago, Detroit/Windsor, Los Angeles, Miami/Miami Beach, New York, Philadelphia, San Francisco, Seattle/Tacoma, Tampa/St. Petersburg and Washington.

It's coming-the greatest world exhibition ever. Expo 67 opens next year in Montreal, Canada.

You've never seen anything like Expo 67 before. Nobody has. Because there has never been a world exhibition as big, or as imaginative, before.
Expo 67 is what happens when more than 70 countries get together to show you the exciting, fascinating world you live in. Right now, they are creating a fantastic city on islands in the St. Lawrence River, at Montreal. You'll find the whole world there.

A world of exploration and discovery, of science and the arts. A world of fun, that you'd only get on a world tour, any other year.
Every nation will present its achievements, music, songs and dances. A great World Festival will bring the great names in entertainment, from La Scala of Milan to Barnum & Bailey.
Expo 67 is a once-in-a-lifetime opportunity for the whole family. Start planning your visit NOW.

EXPO 67 IS EASY TO GET TO — Montreal has expressway links with major highways from New York, New England and the west.

ACCOMMODATIONS. See your travel agent, or write or phone the official Expo 67 accommodation bureau: LOGEXPO, Expo 67, Cité du Havre, Montreal, Canada.
Phone (514) 397-8817.

YOUR PASSPORT TO EXPO 67 will admit you to ALL 115 National, Theme, Provincial and Private pavilions, is good for unlimited rides on the Expo Express, and lets you see much of the entertainment at no extra charge. (U.S. residents do not need an official U.S. passport to enter Canada.)

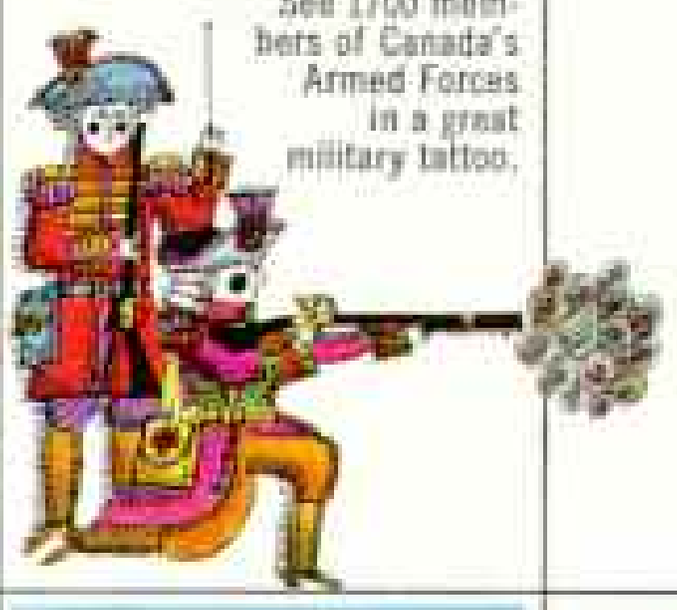
SAVE BY BUYING NOW. At the reduced advance price, a Daily Passport costs $1.90, a Weekly Passport (7 consecutive days) $7.00 (U.S. funds). Children 2-12 on April 28, 1967, half price. On sale at banks, travel agents, airline offices, department stores, American Express offices, or wherever you see the official Expo 67 sign. Or order by mail from Expo 67, Box 1967, Church Street Station, New York, N.Y. 10045.

BONUS BOOKS, TOO — offering you big discounts on food and entertainment. Be sure to ask about them.

See the life of your time - and have the time of your life.

"Man the Explorer" shows man's voyage of discovery in every dimension.

The U.S. Pavilion presents "Creative America", and its achievements in the arts and technology.



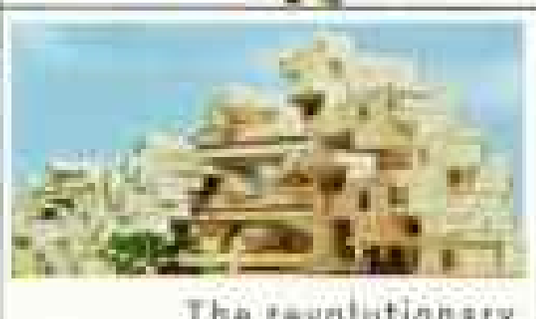
See 1700 members of Canada's Armed Forces in a great military tattoo.

A world of fascinating experiences awaits you in the impressive USSR Pavilion.

Enjoy Thailand's exquisite ballet, the music of Japan, Mexican mariachis, gaucho songs from Argentina, plus the world's most famous opera, ballet, drama.

Centennial of Canadian Confederation

See the thrill-a-minute display of the Gendarmerie Française, rodeo, helicopter acrobatics, human cannonballs, the World Horse Spectacular.



The revolutionary Habitat — 158 separate houses piled 12 stories high — is an intriguing answer to city congestion.

The 11½-acre Canada Pavilion presents a revolving theatre, children's centre, art, sculpture, gymnasts, glee clubs. Great buffalo steaks in the restaurants!

expo67
MONTREAL CANADA
THE UNIVERSAL AND INTERNATIONAL EXHIBITION OF 1967, Montreal, (Canada), APRIL 28-OCTOBER 27, 1967

For 1967... Surprisingly New! Superbly Cadillac!

Who else but Cadillac could introduce a personal car as fabulous as the Eldorado —and at the same time offer you eleven more of the newest and most exciting luxury cars ever created! There are dramatic new advancements throughout, including a new padded instrument panel . . . a more responsive Cadillac engine . . . improved variable ratio power steering . . . and a new General Motors-developed energy absorbing steering column. The remarkably new Eldorado provides the spirit and action of a performance car with the comfort and elegance of a luxury car. It is the first car in the world to combine front wheel drive, variable ratio power steering and automatic level control for a totally new driving experience. These are but a few of the many achievements that make the 1967 Cadillacs incomparable in comfort, unmatched in performance and unexcelled in safety and convenience. See and drive the 1967 Cadillacs soon.

GM

Cadillac Motor Car Division

And introducing ELDORADO *World's Finest Personal Car.*

Feel like a healthy animal

Charge up, sleek down with Special K

Loaded with sheer animal spirits! Is that you? Or have you been skimping on breakfast? If so, get with Kellogg's Special K Breakfast. Unloaded in calories—a scant 240. But loaded with good nutrition.
Crisp, light Special K's loaded with protein. Loaded with vitamins. Loaded with vitality. Feel like a healthy animal.
Charge up, sleek down with Kellogg's Special K.

Kellogg's SPECIAL K

FAMOUS SPECIAL K BREAKFAST

4 ounces orange or tomato juice—or half a medium grapefruit
1⅛ cups (1 ounce) Special K with 1 teaspoon sugar and 4 ounces skim milk
Black coffee or tea
Only 240 calories

POLAROID®

Show-off.

This is the finest automatic camera Polaroid has ever produced.

It's a terrible show-off.

Worse yet, it will turn you into one.

Like all Polaroid Color Pack Cameras, it will deliver a color print in 60 seconds. A pretty flashy act in itself.

But this model has a few other tricks up its sleeve. (It's all done with a sensitive electric eye and a remarkable transistorized shutter.)

For instance. Load the camera with black and white film. Turn off all the lights, except perhaps a candle or night-light near the subject. *Without flash*, it will give you a perfect time exposure. Automatically. (Great for portraits of dinner guests, sleeping kids, pretty girls by the fire.)

This one's pretty impressive too. Load with color film, add the flash and start shooting. The electric eye will read the light of the flash and set the exposure. Automatically. You never have to worry about special distance settings.

What else? It produces beautiful close-ups with the close-up and portrait attachments. It has a triplet lens, a superimposed-image, coupled rangefinder, 2 exposure ranges for color, 2 for black and white. It's light. Compact. Fast-loading.

But don't say we didn't warn you. Once it's in the house, you're going to be unbearable.

This professional camera has some amateur features.

Like price. And automation.

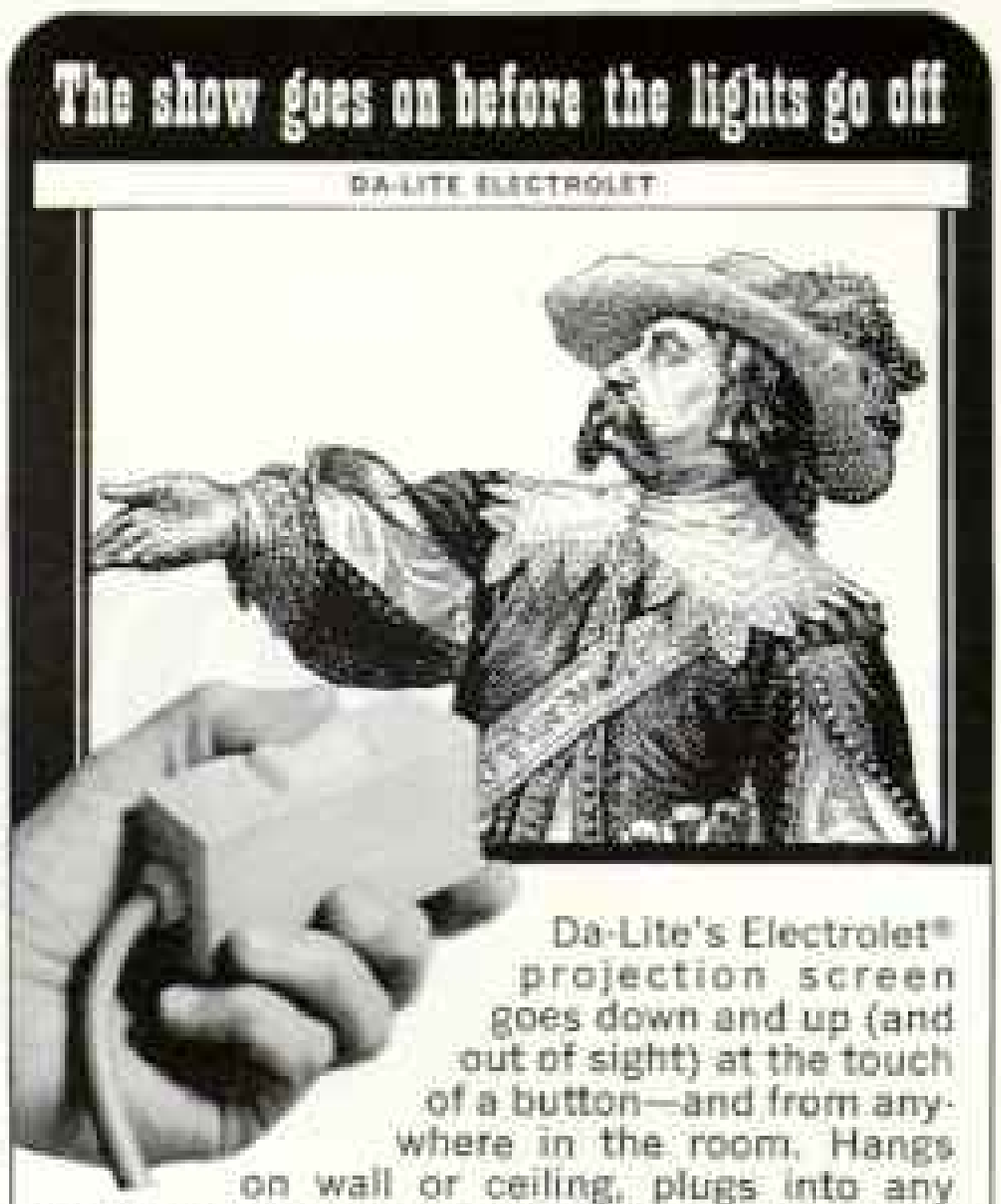
"The Lens Alone is Worth the Price"

It looks and performs like the luxury, professional camera it is. But you don't have to be a 'pro' to own it. Or use it. The fast, sharp Hexanon f1.8 lens is cross-coupled to a super sensitive CdS electric eye. They work together to give you perfect pictures, automatically, under most any lighting conditions. The bright range/viewfinder window shows you exactly what the camera sees. No more, no less. You say, "*smile*", and Konica Auto-S2 does everything else. Under $110 *(plus case)* and as any pro will tell you, "*the lens alone is worth the price*". See your dealer or write for free brochure: Konica Camera Corporation, P.O. Box 1070, Woodside, N. Y. 11377. A BERSEY PHOTO COMPANY

Konica Auto-S2

The show goes on before the lights go off

DA-LITE ELECTROLET



Da-Lite's Electrolet® projection screen goes down and up (and out of sight) at the touch of a button—and from anywhere in the room. Hangs on wall or ceiling, plugs into any outlet, cost only $54.95 (50" x 50" model). 60" and 70" sizes, too. See the big show at your dealer. Write Dept. N. for color brochure.

DA-LITE

Da-Lite Screen Co., Inc., Warsaw, Indiana

CORPUS CHRISTI—America's most beautiful city. Swim, surf, fish on Padre Island National Seashore. Old Mexico 3 hours away. Economical prices the year-round.

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Dealers Wanted

20 X 50

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Tremendous power brings objects 20 times closer . . . 3 times the power of ordinary binoculars. Achromatic. Wide 30 mm (2" across) front lens assures greater illumination, sharper & brighter images. 17 oz. 7" high. Coated lens! Streamlined, new, lightest frames make these binoculars **easy to hold and focus.**

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If not satisfied return for refund! Made in Japan. Sturdy, plush lined case & straps included. Add $1.25 postage, handling. C.O.D.'s require $2 deposit. ORDER TODAY.

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Display Sales Room Open 9:00-4:30 Monday thru Friday

"Don't worry, Grandma. Shots don't hurt—much."

Maybe you've always thought that immunization injections are only for youngsters.

Nowadays, though, doctors recommend that many adults get shots for protection against influenza. If it strikes an older person—especially one who has a chronic condition such as heart trouble—it can be doubly serious.

Women expecting babies, and anyone over 45 if especially susceptible to respiratory infection, should also ask their physicians about the advisability of vaccination—preferably well in advance of winter—to insure maximum protection against this infection.

An ever-increasing number of vaccines is making life safer for all of us, and Parke-Davis has been producing vaccines for your protection longer than any other company in the United States.

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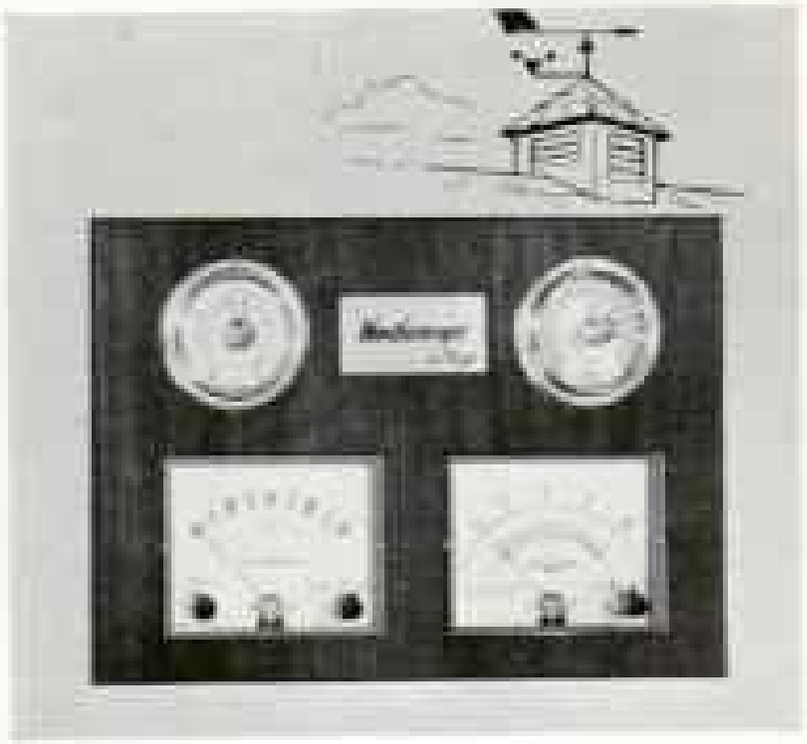
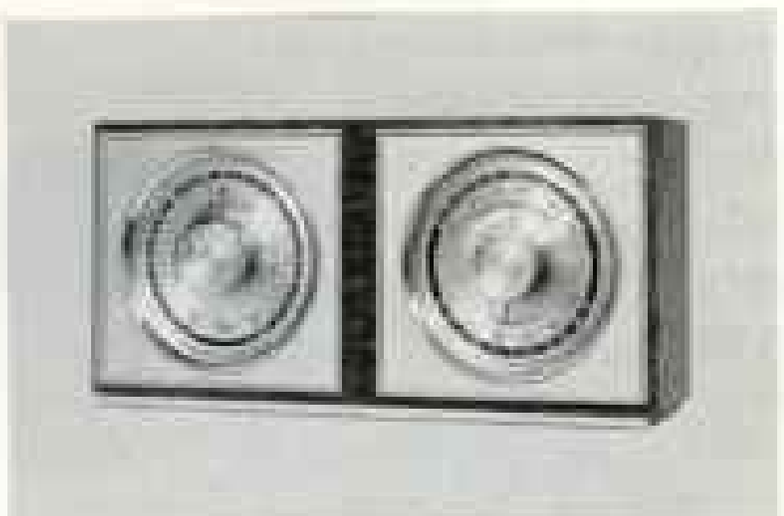
BETTER MEDICINES FOR A BETTER WORLD

1866 1966 100 ANNIVERSARY

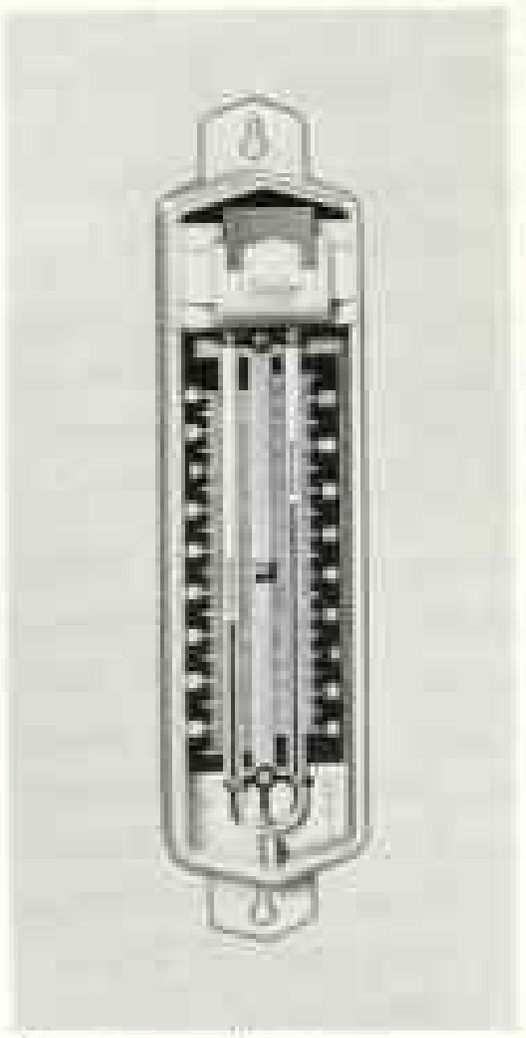
Taylor Gifts



WEATHERSCOPE panel tells the complete weather story including wind direction and speed, barometric pressure as well as maximum-minimum outdoor temperatures. 17" x 12" panel in a choice of woods. #**3108, $249.50.**



Aquila Combination Desk barometer adds distinction to any den or office. Barometer, temperature and humidity dials are recessed in gold lacquered panels in solid mahogany or cherry with fruitwood finish case. 11" x 5". #**6501, $27.50.**



Maximum-Minimum Thermometer tells present temperature as well as highest and lowest points reached between settings. Gray Tenite case, 10½" long. #**5458, $12.95.**

get results

Taylor Instrument Companies
Consumer Products Division, Asheville, N. C.

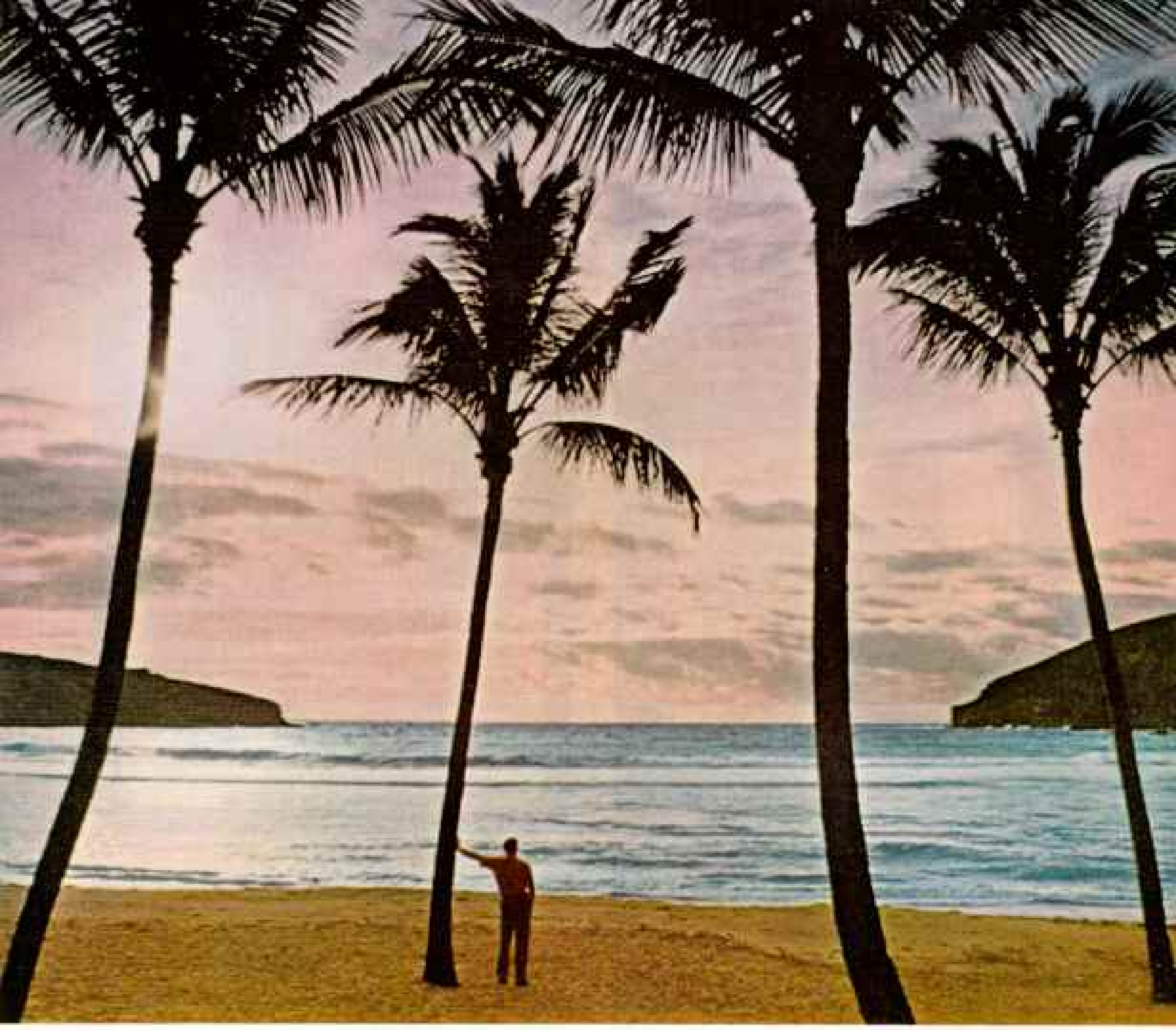
discover real travel adventure

Want to visit exciting new places? Or maybe you'd prefer sunbathing in Florida or relaxing beside some inviting stream? Perhaps you know a road somewhere you'd like to follow to the end. It's all the same with an Airstream Land Yacht . . . good beds, bathroom, hot and cold water, refrigeration, heat and light independent of outside sources wherever you go—for a night, a week, or a month. Airstream Land Yachting means real travel independence—no time-tables, tickets, packing. You just tow your Airstream lightly behind your car and follow your travel whims wherever they urge you to go. Yes, it's the exciting, better way to travel anywhere in the world. For extra fun join a Wally Byam Caravan.

write for free new color catalog—Thrilling as a world cruise

AIRSTREAM TRAVEL TRAILERS

AIRSTREAM INC. 10 CHURCH ST., JACKSON CENTER, OHIO • 12804 E. FIRESTONE, SANTA FE SPRINGS 10, CALIFORNIA



Until today, the closest Ken Fisher had been to Hawaii was a flowered sport shirt.

Now look at him.

A lot has happened the past few hours.

First he boarded a United Air Lines jet. (And charged it with his United Personal Travel Credit Card.)

Then he settled back and watched a movie. (Color and wide screen.)

Then he ate the best meal he'd ever had aloft. (A sizzling sirloin with all the trimmings.)

Then he listened to some stereo . . . and suddenly he saw Diamond Head slide beneath him and presto! He was in Honolulu, inhaling the soft air and pinching himself to make sure it was real.

Now Ken is discovering one of the most beautiful sights in the world: Hanauma Bay on the isle of Oahu.

He's discovering a bit of America he'd always dreamed about.

And United flies to more of it, more often, with more jets, than any other airline.

"Let's see, did I pack that sport shirt?"

fly the friendly skies of United.

Send now for your Hawaii Kit.

It features a new 128-page guide book (a $1.95 value) plus your vacation folder and travel schedules.

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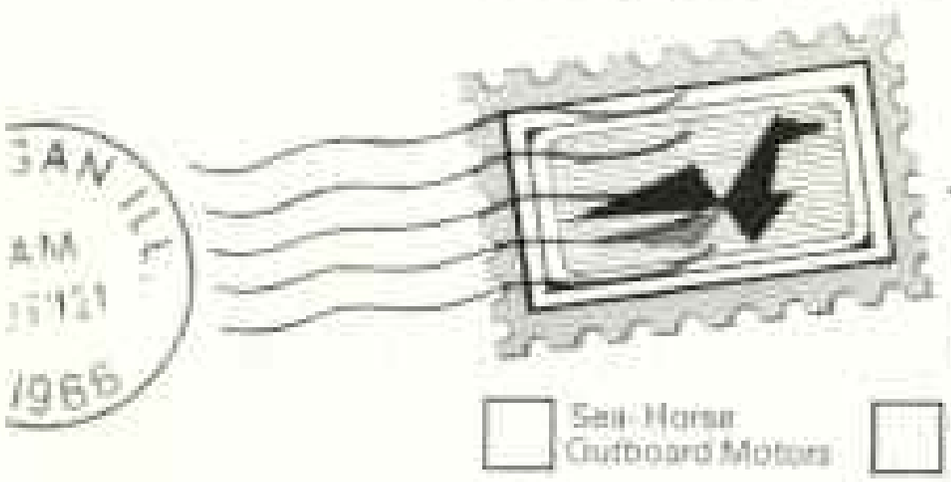

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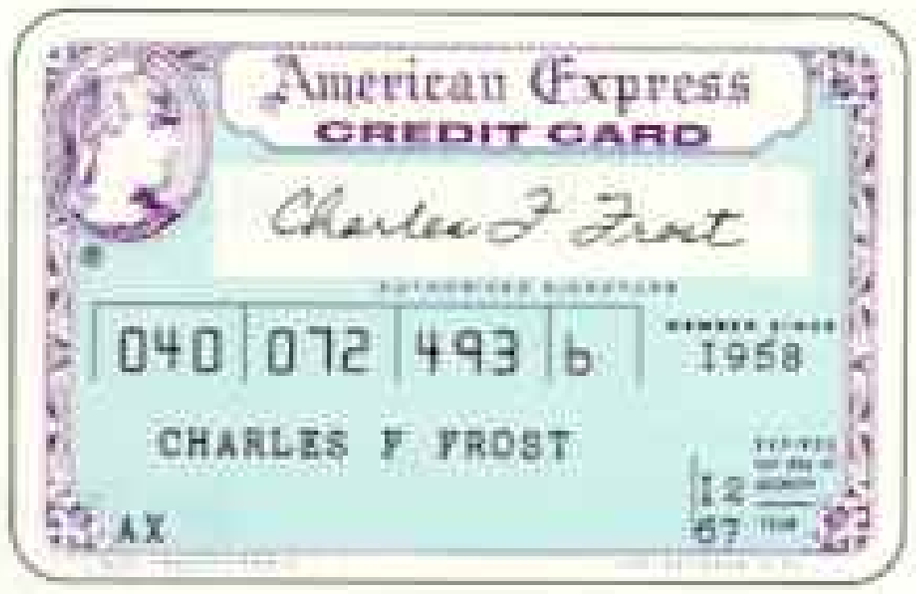

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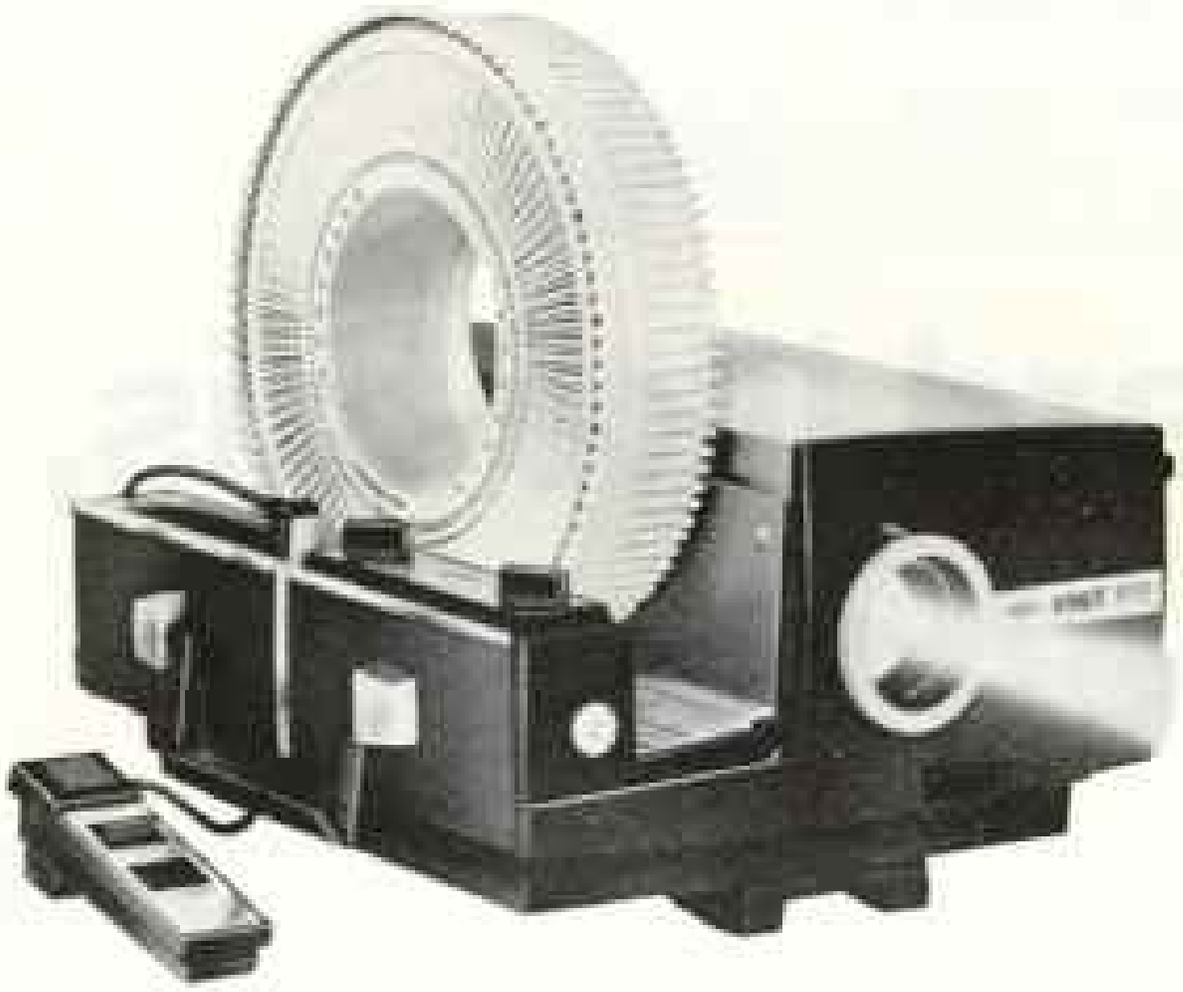

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