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The Bahamas, Isles of the Blue-green Sea

Once the Lair of Pirates and Smugglers, These Subtropical Islands Shelter Yachtsmen, Sun-seekers, and Burgeoning New Industry

BY CARLETON MITCHELL

Illustrations by National Geographic Photographer B. Anthony Stewart

"NATURE made the Bahamas for pirates," said Charlie Turtle, squinting out at brilliant early-spring sunshine.

Below us, in the landlocked hurricane hole of Stocking Island in the Exuma Cays, *Fini-terre* swung to her anchor in water so clear she seemed to be set in glass. Beyond, we could see sails as white triangles against a sky incredibly blue. Charlie, a lifelong Bahamian, pointed to the narrow inlet.

"Look at this one harbor. You can enter it from either end, depending on wind. Inside there are channels between coral heads and sand shoals. By the time a man-o'-war had felt her way through, the pirate would be sailing out the other end. And there are dozens of similar places in the Exumas—and the rest of the Bahamas."

First Governor Expelled Pirates

I remembered reading that in 1696 a Mr. Randolph had written King Charles II that the Bahamas were one of the "chief places where Pyrates Resort & are Harboured," and humbly proposed "that his Majesty be pleased to send a first Rate frigate under the Command of a sober person" to deal with them.

When Woodes Rogers, the first Royal Governor, arrived in 1718, he did just that, and later he adopted as the motto of the Colony *Expulsis Piratis Restituta Commercium*—"Pirates Expelled, Commerce Restored."

"It's impossible to understand the Bahamas

except in relation to the sea," said Charlie. "We rely on the sea for everything. Through the centuries it has given us our food and our wealth. Our products and our people move by boat. This is one of the last places in the world where a large part of the population still depends on sail and the wind.

"In few places can you get away from the sight and sound of the sea. And, of course, the sea provides our greatest natural beauty."

Building Boom Under Way

We were sitting on the veranda of a new clubhouse, part of the postwar construction boom that is rapidly transforming this old British Crown Colony. Across the blue-and-green water rose the houses of George Town, on Great Exuma, one of the "Out Islands." The Bahamian applies this term to all islands except New Providence, site of Nassau and therefore center of his world.

The Out Island Regatta was in progress, and the harbor was crowded with boats of all types and sizes, lending emphasis to the truth of my friend's words.

The Bahamas are a huge and sprawling collection of outcroppings from the sea, nearly 3,000 if you include the smaller isolated rocks (map, page 152). From the time of the first settlement the sea has been the only highway. Columbus found dugout canoes that were capable of voyaging between islands. Fish has always been the main staple of diet.



*A Study in Color: the Bahamas;
Greens and Blues Scallop the Sea*

Three thousand islands, cays, and rocks composing the Bahamas dot an ocean area nearly as large as Great Britain, the Colony's mother country. Fringed with coral, the islands are the eroded summits of a sea-rooted mountain range. The Atlantic (right)



All Kodachromes by National Geographic Photographer H. Arthur Stewart © N.G.P.

drowns the range's valleys, creating sounds and channels. High plateaus, just failing to breach the surface, form the famed Bahama Banks (horizon at left). Here the white sails of the Out Island Regatta (page 154) speckle the passage between Stocking

Island (foreground) and Great Exuma Island. Dark-blue patches indicate channels. Large vessel at left is H.M.S. *Vidal*, which charts Bahamian waters; the last previous survey of the islands was finished more than half a century ago.

Consequently, the Bahamas have produced a sturdy race of seafarers.

That afternoon I had visual proof, as native skippers jockeyed their boats to the starting line for a race. Here were no sleek, fragile yachts but solid working vessels, taking a few days off from fishing and sponging or carrying produce. These same sloops link the scattered islands, beating "up east" or scudding "down west," sheltering during gales behind tiny cays, carrying on their decks enormous cargoes and entire families (page 167).

Work-boat Regatta Settles Arguments

The regatta was the idea of J. Linton Rigg, an American yachtsman who fell in love with George Town while cruising the Bahamas and built his home there. Once settled, he became interested in helping the natives. Rub two pieces of wood together and you produce a fire; do the same with two boats and you start a race (pages 148 and 154).

Listening to the arguments, Rigg conceived that a spring regatta for work boats would not only prove which skipper was champion but provide an incentive to build and maintain better vessels. Also, it would bring color and gaiety into the simple lives of the Out Islanders.

From the first event in 1954 the regatta has been a great success. A carnival atmosphere prevails. Big-eyed children wander under gay bunting, and many see their first movies on the village common at night. Through the assistance of interested yachtsmen, there is free food and music for dancing.

His Excellency the Governor of the Bahamas inspects a Royal Navy honor guard and later presents prizes. Navy ships deck themselves in flags by day and lights by night.

The Out Island Regatta is similar to no other sailing event in the world. Decorum does not exist; it is somewhat like transporting the Milwaukee Braves' bleachers to a tennis match at Wimbledon. When the boats anchor on the starting line, shouts, challenges, and insults fill the air. The crowd along the waterfront joins in.

The starting cannon can hardly be heard in the bedlam. Immediately crews heave in their anchors, hoisting sail while trying to push near-by vessels back with their feet. Once away, there is only one racing rule: if two boats are in danger of collision, both must come about. As Bahamians are individualists, sometimes each skipper waits too long for his rival to make the first move, and splinters fly. Then lanterns burn far into the night as repairs are made.

During the regatta, my wife Zib and I lived aboard *Finisterre*, as we had in many other climes and places. Only 38 feet 7 inches overall and drawing a scant 4 feet, she is able to lie snug in the byways as well as to cross the oceans. In the fullest sense she is a home afloat. We enjoyed the luxury of shower baths and ice cubes from a mechanical refrigerator; we lolled under a gay awning that was a memento of the previous summer's Mediterranean cruise, and had our meals on a table in the cockpit (opposite).

Food to Be Had for the Diving

We dived over the side whenever we pleased, and when fresh food got low I donned swim-fins and mask to bring back grouper and spiny lobster (page 191). Visitors from other yachts stopped by, and one moonlight night we listened on the hi-fi system to Heifetz playing Bach concertos; while astern a sand beach glowed as bright as a silver bar.

For our cruise back to Nassau we were joined by friends, including Robert H. Symonette, who represents the Exuma group in the House of Assembly, one of the oldest legislative bodies in the Western Hemisphere (page 162). Together with Bermuda and Barbados, the Bahamas form the "three B's" of the British Commonwealth, retaining their original constitutions and virtually complete management of their own affairs.

For our start we were blessed with perfect weather and a moderate easterly breeze. The Bahamas lie partly in the Temperate Zone, partly in the Tropic. Somehow they seem

The Author's Home Afloat, *Finisterre* Rides Anchor in an Island Cove

Finisterre, a 38-foot yawl built at Saybrook, Connecticut, has won more trophies in ocean racing than any other boat. Carleton Mitchell and his wife lived aboard while attending the Out Island Regatta. Here, with friends, they push off for lunch on deck. Evidence of the Bahamas building boom, a new clubhouse (right) marks Stocking Island.

Sparkling blue-green water and white sail provide the background. Meat and salad come chilled from the yawl's refrigerator. The writer and his wife (left) entertain Robert H. Symonette and Helen Zieeler.



to partake of the advantages rather than the disadvantages of each: temperatures are never extreme, either way; fruits and vegetables common to both may be grown.

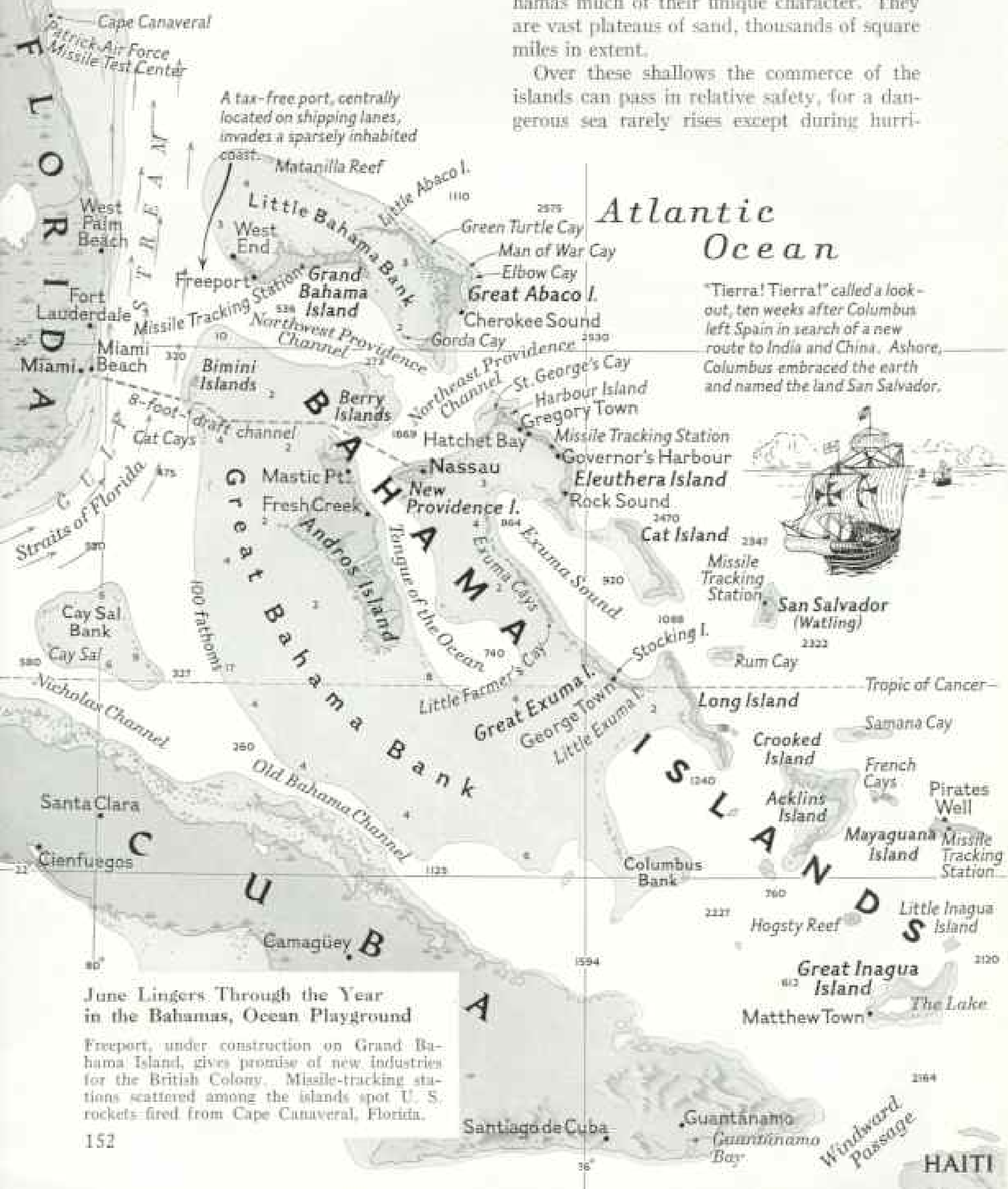
The trade wind sweeping unchecked from the coast of Africa usually provides a steady breeze, so uniformly from the east that Bahamian sailors say they are going "up" when voyaging east, and "down" when returning; to them, anything else is an "out-wind." Setting reaching sails, *Finisterre* bowled out of

the harbor to parallel the line of islands stretching away to the northwest.

To understand the Bahamas, it is necessary to know something of the surrounding sea itself. Many of the islands are visible peaks of mountains rising almost vertically for thousands of feet from the ocean floor. Yet while most of the islands are surrounded by deep water, others are hummocks of only a few feet, rising above the Banks.

To me, it is the Banks which give the Bahamas much of their unique character. They are vast plateaus of sand, thousands of square miles in extent.

Over these shallows the commerce of the islands can pass in relative safety, for a dangerous sea rarely rises except during hurri-



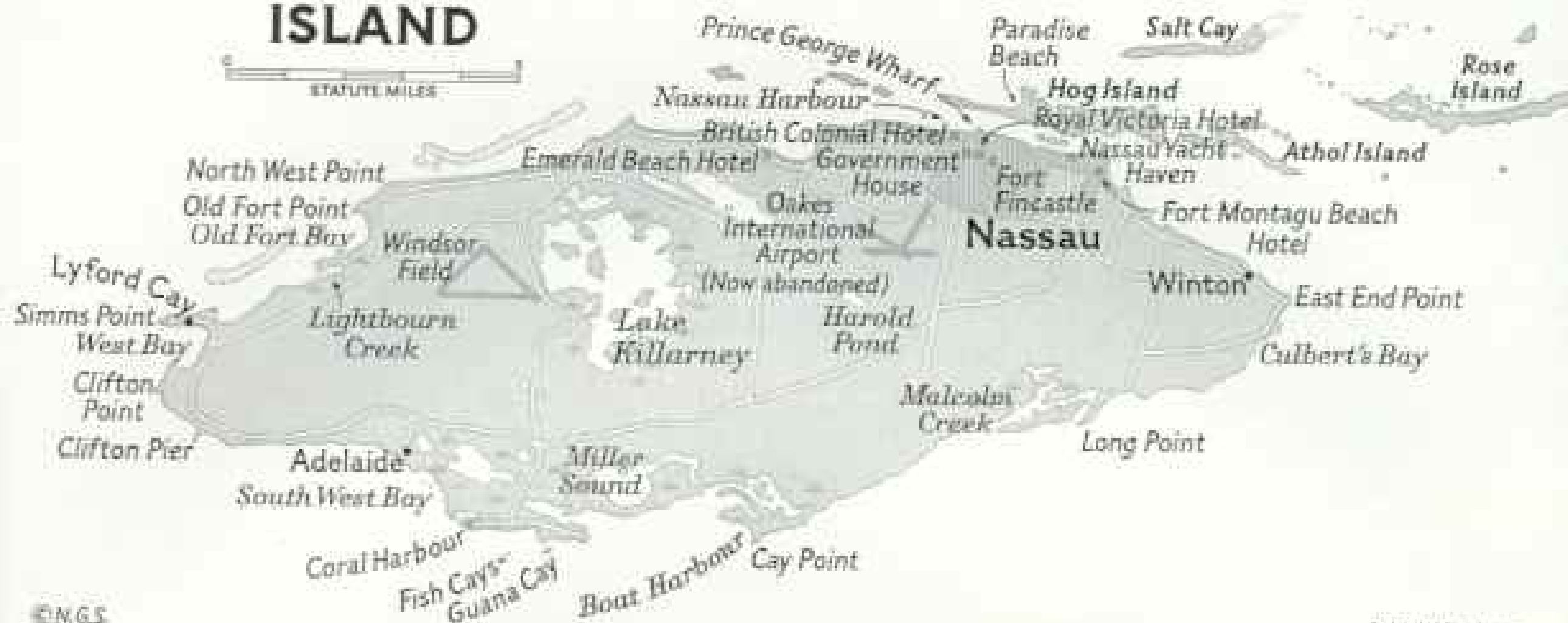
Atlantic Ocean

"Tierra! Tierra!" called a lookout, ten weeks after Columbus left Spain in search of a new route to India and China. Ashore, Columbus embraced the earth and named the land San Salvador.



June Lingers Through the Year in the Bahamas, Ocean Playground
 Freeport, under construction on Grand Bahama Island, gives promise of new industries for the British Colony. Missile-tracking stations scattered among the islands spot U. S. rockets fired from Cape Canaveral, Florida.

NEW PROVIDENCE ISLAND



John W. Lochers

canes. A boat can anchor almost anywhere and take food from the bottom. The conch, a king-sized shellfish, is found there in such quantities that native-born Bahamians are sometimes called "conchs."

But equally important and almost as unusual is Bahamian water itself. It is virtually colorless. Imagine the clearest swimming pool you ever saw, or the most limpid mountain stream, and you have some idea of the sea that washes the Banks and deep passages. It is ocean water at its purest.

There are no rivers in the Bahamas to carry silt, and very little topsoil for the rain to wash away. The islands are formed principally of aeolian limestone and the beaches of ground-up shells. Since there is nothing to be carried in suspension, the water remains clear. Particles churned up by bad weather soon settle.

Having no color of its own, the water takes its hue from the depth and character of the bottom. Consequently the range of blues and

greens is infinite and incredible; in the Bahamas the term "seascape" has validity. No dappled countryside could be more varied or more lovely.

As *Finisterre* sailed through one of the cuts that lead from the deep water of Exuma Sound to the shoal water of the Banks, we had a practical demonstration of Bahamian pilotage. It is based on watching the color of the water ahead to know what is coming. Native skippers use this method, as charts have little value. Channels shift after every storm.

Water's Color Warns of Danger

Bobby Symonette stood on the bow. Under us the deep blue of the ocean abyss rapidly changed to the paler blues of soundings. Looking over the side, we could actually see the bottom rise.

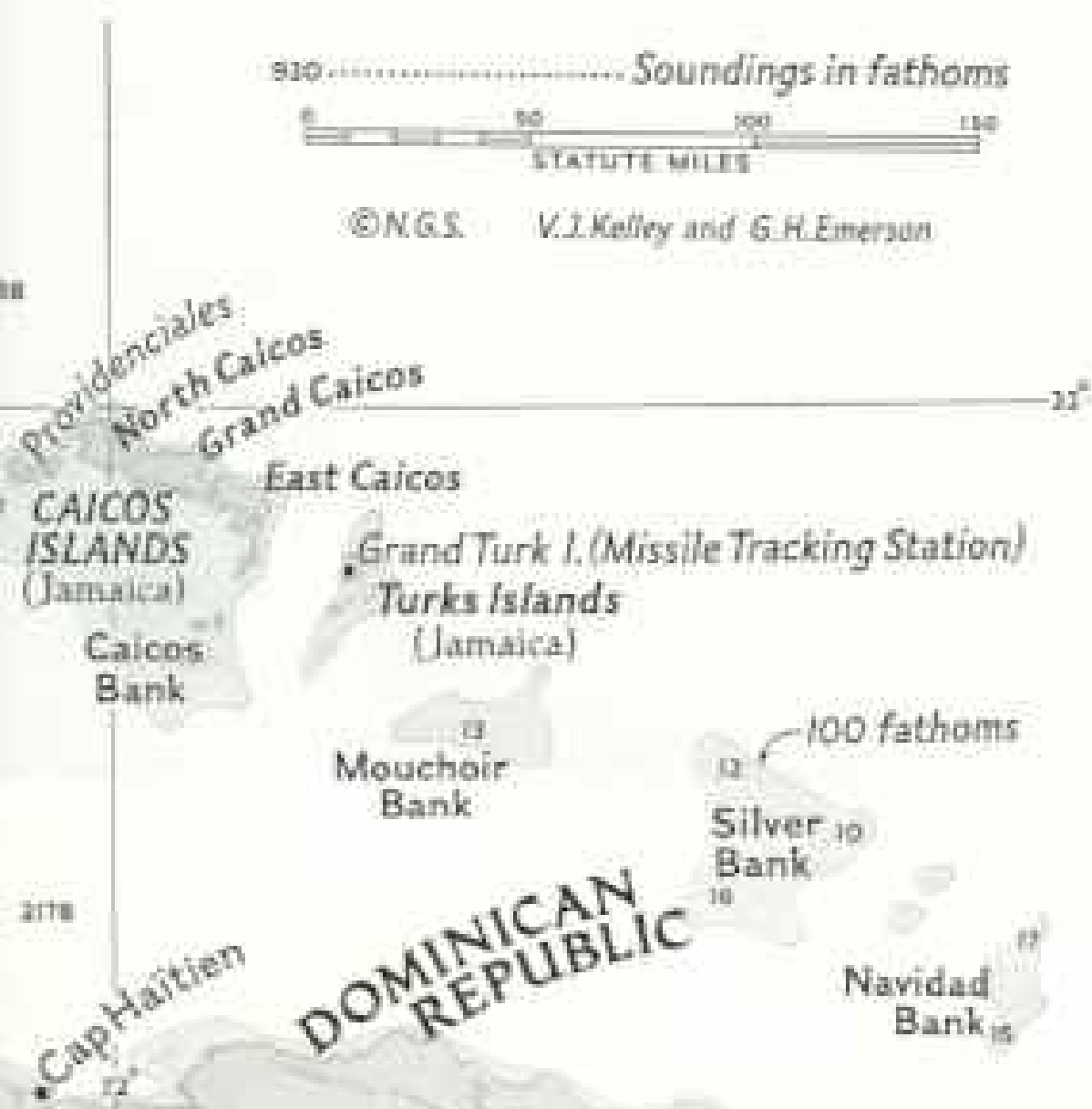
"Starboard!" called Bobby. "A little to starboard!"

As a discolored patch came abeam, I could tell from its purple-brown shade, touched with the yellow highlights of sea fans, that we had avoided a head of living coral, capable of tearing out a vessel's bottom.

"Steady."

Before us stretched a lane of blue, as clearly defined as an automobile driveway. Along the edges of the channel the water was perceptibly paler, indicating it was less deep. Dark-green areas to either side marked patches of sea grass. In other places it was nearly crystal white, showing where shoals of sand almost reached the surface. Sometimes the water is so clear it is impossible to tell from a distance where dry beach begins.

Many consider the Exuma Cays the loveliest
(Continued on page 150)





**Working Sloops on a Holiday
Race Under Leaden Skies**

Bahamians consider Nassau on New Providence Island the center of their world; everything beyond they call the Out Islands. To escape isolation, Out Islanders build and sail the sturdy cargo boats that link the



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archipelago. Last year 60 working boats gathered for the three-day Out Island Regatta off Great Exuma Island. They raced under one simple rule: don't collide. These sloops appear in tandem as they run

downwind. Large crews serve as ballast on decks usually loaded with produce (page 167). The boat in foreground uses a dinghy sail as a spinnaker; its jib-headed mainsail curves loose footed.





Police Patrol the Governor's Home with Palace-guard Dignity

White columns and broad galleries preserve the mood of Nassau's past. Half a century ago the city wore a look of "old-world leisure" and "regal tropic charm," according to Canadian poet Bliss Carman. In "White Nassau," a poem contained in his *Ballads and Lyrics* (Dodd, Mead), he wrote:

The trade winds fan her forehead; in
everlasting June
She reigns from deep verandas above
her blue lagoon.

* * * * *
Unmodern, undistracted, by grassy ramp
and fort
In decency and order she holds her
modest court

Honor Guard Stands Inspection

Bewigged Sir Guy Henderson, Chief Justice of the Bahamas, checks policemen on the opening day of the Supreme Court. The constables serve as the Colony's only armed force; they double as the fire brigade.

Aiguillette and mace distinguish the drum major of the Police Force Band, Constable L. K. Brathwaite. St. Edward's crown and the Royal Cypher on the helmet compose the official badge of the Police Department.





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A Human Tide Washes Bay Street, Nassau's Main Thoroughfare

Property values here rank among the world's highest. Smart shops display goods from London, Paris, and New York beside Bahamas-made accessories (page 181). A crowd gathers to greet a new governor. The British Colonial Hotel towers on the horizon.

of the Bahamas. The word "cay" (pronounced "key") derives from the Spanish *cayo*, meaning small island. Like a string of pearls lying on blue velvet, the Exumas extend for more than 100 miles. Gleaming deserted beaches and snug anchorages appear behind headlands.

The chain is uninhabited except for the homes of a few winter visitors and widely scattered native settlements. On most of them life remains simple, unchanged from colonial days.

Ashore at Little Farmer's Cay we found ourselves virtually in another century. A tremendous pile of conch shells rimmed the beach. Behind, small houses straggled up the hillside, without pattern. There were no streets, no electric wires, no faucets gushing running water.

School Lets Out for *Finisterre*

Never have I met friendlier or more cheerful people. When *Finisterre* appeared in the tiny harbor, usually used only by local sloops, classes had been dismissed for the occasion. We were engulfed by shy, curious children, and taken over by the village schoolmaster.

"You'd have to work hard to starve here," commented Bobby Symonette, as we walked through the settlement to the combination church and school.

Palms heavy with coconuts waved overhead. Around us were trees bearing various fruits: oranges, genips, sapodillas, tamarinds, limes, papayas, bananas, sea grapes, sugar apples, plantains, mastic berries, mangoes, and avocado pears. Chickens and goats foraged beneath them. In sprawling gardens grew thyme, peppers, tomatoes, and corn. Fish, scored and salted, hung on lines to cure in the sun.

"All a man needs besides what he can reach out and pick or take from the sea," said Bobby, "are a few matches, some cooking fat, rice, tea, and sugar. He can cut his fuel with a cutlass. His children don't need warm clothes. This is the life people dream about when they have trouble keeping up the installments on the Cadillac!"

During the afternoon the sky clouded over, our fine east wind diminished and swung "out," and all signs indicated a norther. These interruptions of the trade winds are the final flick of the tail of blizzards which may originate as far away as the icy Bering Strait. After sweeping over the continental

United States, they cross the Gulf Stream to dissipate in the Tropics.

By morning it was blowing hard. On the Banks the sea was steep and confused, and the going was wet as *Finisterre* drove through at high speed.

Standing on the bow, watching ahead for the silhouette of Nassau, I reflected that it was 25 years since I had first looked for the tall spire of the water tower above Fort Fincastle. On that cruise I had gotten sand in my shoes. Natives say that means you must come back, and return I did through the years—until now I am called "at least half Bahamian."

Now, with the sun turning the bow wave into cascading diamonds, the proud arch of the sails overhead, and the exhilaration that comes from driving a boat in shoal water, I would have traded places with no man.

As New Providence lifted, I was again amazed by the transformation that had taken place during the short span I had known Nassau. On my first visit it had been a sleepy colonial town. Carriages and occasional automobiles meandered along Bay Street. Tall schooners from Abaco and Spanish Wells anchored off the market while their crews sold fish directly from the midship wells. There were few dwellings beyond the boundaries of the town.*

Nassau a Year-round Resort

Now I could see houses from water's edge to hill crest, even at the eastern extremity of the island. Nassau is no longer a town; it is a city. One-way streets are crowded with automobiles, and carriages remain only to accommodate the nostalgic tourist. Apartments and hotels have multiplied. Smart shops display the cream of the world's merchandise. Property values have soared, along with the population. Far from being crowded only during the winter season, Nassau now thrives all year (opposite).

Most of this growth has taken place since the beginning of World War II. Many Englishmen moved their families here, away from the danger of air raids, and later joined them. In Nassau were sunshine, a profusion of food and consumer goods, attractive homesites, and cheerful servants.

After the war, winter vacations for Americans and Canadians became more popular than ever. New, fast planes cut the flying

* See "Bahama Holiday," by Frederick Simpich, NATIONAL GEOGRAPHIC MAGAZINE, February, 1936.



**Nassau Began as a Pirate Town;
Its Site Proved a Treasure**

Early in the 18th century the buccaneer Henry Jennings and his followers discovered in this spot "a retreat and general recepticle" for their business of plunder. The harbor, convenient to ship lanes, pro-



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vided good shelter for their fleet. The island proved well watered and fruitful. Its natural advantages still intact, Nassau today replaces pirate shanties with fine homes and hotels. Harborside Bay Street, a show-

case of the world's finery, angles toward Prince George Wharf. Shirley (left) and Dowdeswell are the other two wide streets. Hog Island (right) offers Atlantic bathing on a beach called Paradise (page 179).



time between New York and Nassau to about four hours. Soon jets will halve even this "commuting" time.

But the most important reason for Nassau's growth is the system of taxation. Costs of government have always been paid almost wholly out of customs duties. In contrast with England, here there is no tax on incomes or unimproved property, and only nominal levies on improved. The inheritance tax is negligible.

People and wealth flowed in, and Nassau changed. Yet the underlying charm remained, and much of the old was untouched by the new.

"Nassau is something like an elderly lady trying very hard to be respectable, but with a closet full of skeletons," a Bahamian friend once told me. "In the past our periods of prosperity came first from piracy, then stripping and selling the cargoes of wrecked ships, then blockade-running during your Civil War, then bootlegging."

Nassau was named in 1695 in honor of England's King William III, who had been Prince of Orange-Nassau. From the begin-

ning its magnificent harbor attracted ships—and pirates. By 1730 it and the few other settlements in the Bahamas had been attacked and reduced no fewer than 30 times.

At last, in 1718, the Crown sent a detachment of soldiers under the stout sea captain Woodes Rogers. With him he brought a royal promise: pardon to the pirates who repented, death to those who did not. Several hundred surrendered, and a few were hanged later by Rogers.

Headquarters for Blockade-runners

That night, having dinner on the terrace of the Royal Victoria Hotel, my wife and I reminisced about other phases of Bahamas history. The hotel had been completed at the beginning of the Civil War, in time to be the focal point of Nassau's golden age.

"It must have been like *Gone With the Wind*," I remarked. "Each evening everyone of importance connected with blockade-running collected here—diplomats, steamer captains, Confederate agents, shippers, British naval officers, newspaper correspondents, and cotton



Bahamas House of Assembly Debates by Night in Evening Attire

Dating from 1729, the Bahamian Constitution provides a form of government similar to that in the North American Colonies before the Revolution. Executive power lies in a Governor appointed by the Crown. He is advised by a Crown-nominated Executive Council of nine members. The House of Assembly, an elected body of 29, represents the islanders; no taxes may be imposed without its consent, but its acts may be vetoed by the Governor.

Here the House sits beneath a portrait of Queen Victoria. Speaker Asa Pritchard (in chair at left) confers with the Honorable R. T. Symonette, Leader for the Government in the House of Assembly. Mace on the Speaker's desk is thought to have been used in South Carolina before the Revolution and taken to Nassau by Loyalists.

New Governor, Sir Oswald Raynor Arthur (right), hears the Provost Marshal read his commission of appointment before a gathering of Bahamian leaders.

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Sailboats Unload Fruits in Nassau; Grower-Vendors Eat and Sleep on Deck



buyers. And, of course, the Rhett Butlers and the dashing officers in gray.

"England desperately needed cotton. Her mills were closing for lack of raw material. The Confederate States equally needed the munitions, machines, and goods they could get in exchange for cotton."

I also remembered vivid yarns of sailing craft and steamers running the Union Navy blockade. It was dangerous but fabulously rewarding work. One ship earned £7,000 from taking cargo in, and £50 a bale on 500-odd bales of cotton coming back. The *Banshee*, built for the trade by a Liverpool firm, was one of the early steel steamships to cross the Atlantic. For the eight voyages she completed before capture, her shareholders were repaid 700 percent profit.

Money, earned at great peril, was squandered freely. Men tossed \$20 gold pieces to watch native urchins scramble. "Shaping my course for hell or cotton" was the motto of the captains. Either might be waiting under the guns of Fort Sumter.

Nassau underwent transformation. Old shops expanded, and new ones were built. Bay Street was widened. Large houses replaced the humble dwellings of colonial days. Everyone had a share in the prosperity.

When the South collapsed, Nassau went to sleep for half a century, not to awaken until Prohibition and its outlaw companions, rum-running and bootlegging, came to the United States. Then once again fast, dark vessels, this time bearing valuable liquid contraband, slipped out of the harbor.

Nassau Has Its Own Calypso

Looking out over softly lighted gardens, it took little imagination to recapture the past, but Zib and I were brought back to the present by insistent and compelling rhythms. Blind Blake and his fellow musicians had begun playing on a corner of the terrace.

The "goombay calypso" of Nassau combines the storytelling chants of Trinidad, the drums of Haiti, and the percussion effects of Cuba (page 195). It is a recent contribution to West Indian folk music. On my earliest visits troubadours sang of local themes, with little emphasis on beat. But during the 1930's a Nassau businessman named Charles Loft-house wrote "Goombay Drum."

It had an insidious rhythm which soon found expression among musicians "over the hill," the purely African section of Nassau.

Haitians trading in small sloops and schooners from Port au Prince undoubtedly contributed, as did occasional Cuban musicians. Now goombay has swept far beyond the boundaries of the Colony as a popular music fad in England and the United States.

Everywhere in Nassau the past and present blend gracefully. Quiet avenues run back from the harbor, tree shaded and accented by the glowing colors of hibiscus and poinciana. A soft pink wash covers the stone of many houses. Behind shuttered windows and jalousied verandas is maintained a gracious way of life. Many of the newer homes on the eastern and western beaches overlook the sea and its never-ending pageant.

Speech Abounds in Graphic Phrases

Along the waterfront sailing vessels moor to discharge their cargo; this is one of the last wind-driven commercial fleets. The produce the fleet brings from the Out Islands is sold in a market that has changed little in decades. Women sit behind piles of fruit and vegetables, ready to gossip or bargain. Small boys and dogs wander underfoot.

Sometimes it is hard to understand the rapid flow of conversation. Pronunciation is strange, and phrases must be virtually translated. A sailor may call "tie me loose, boss," when he wants to be cast off. Inquiring about a boat, you will be told "she ain't fetched yet," if she hasn't arrived. The other side of the market is the "next side." The "bar is raging" when heavy seas break across the harbor entrance.

A superstitious person will say "don't put mouth on it," asking that something not be mentioned for fear of bringing bad luck, and might add "shut mouth catch no fly"—keep quiet and keep out of trouble. The wind "falls down" when it slackens, dawn is the "day come clean," and a boat sailing fast is "bruising God's water."

Always to me, as to a native sailor, Nassau is the center of the Bahamian world. Yet as Nassau has a character of its own, so does each of the Out Islands; and in 1957 I decided to see as many as possible.

To have visited them by boat, as I had done in the past, would have taken weeks. But now Bahamas Airways serves the important settlements on regular flights, bringing the most remote within easy reach of the capital. More than any other factor, air transport is swiftly altering the character of the group.



Crew and Live Cargo Crowd a Sloop at Nassau Market

Men and sheep compete for space on the deck of this Out Island vessel. Meals are cooked in the open firebox beneath the boom, and crews often nap amid stems of bananas. Bahamians for generations have hauled produce to market in this manner.

A vendor dozes between sales. His baskets hold lemons, cucumbers, and sapodillas (right), a tropical fruit. Tin cups measure pigeon peas, a staple in the Bahamas (page 177).



All Kodachromes for
National Geographic Productions
by Anthony Stewart © N.G.S.

On impulse, after studying the schedules, I chose Great Inagua as a first stop. Boarding a de Havilland Heron at Oakes Field, I found as my across-the-aisle neighbor A. Wentworth Erickson, Jr., a pioneer in the development of an Out Island.*

"Bill" Erickson is the senior member of a Boston family that came to the Bahamas in 1934 looking for a promising investment. On Great Inagua they found the crumbling stone walls of century-old pans where salt had been produced from sea water by solar evaporation.

Once it had been a flourishing industry. Fishing and coasting schooners from the Maritime Provinces of Canada came each year for salt to cure the haddock and cod caught on the Grand Banks. Matthew Town prospered. Carriages rolled along shaded streets between imposing stone houses, and in the late afternoon the men played polo. But when the Ericksons arrived, they found a ghost town, walls falling down, trees growing through rootless walls and windows.

Bill and his brothers went to work. It was pioneering in the true sense. Almost every-

thing had to be imported. Little could be grown in the sparse soil under the burning sun, for Inagua is hotter and has less rain than the rest of the Bahamas. This is ideal for salt, but hard on other crops.

"First we had to rebuild old pans," said Bill. "This meant bringing in modern equipment. Then we had to train men to use the machines, and build stores and a hospital to care for the workmen. Now we do everything, from supplying the town with electricity to making ice."

Half a Million Tons of Salt a Year

The Erickson company employs 250 men and includes a fleet of 11 ships. The newest, a 5,500-ton vessel especially designed to transport salt, is being completed in Japan.

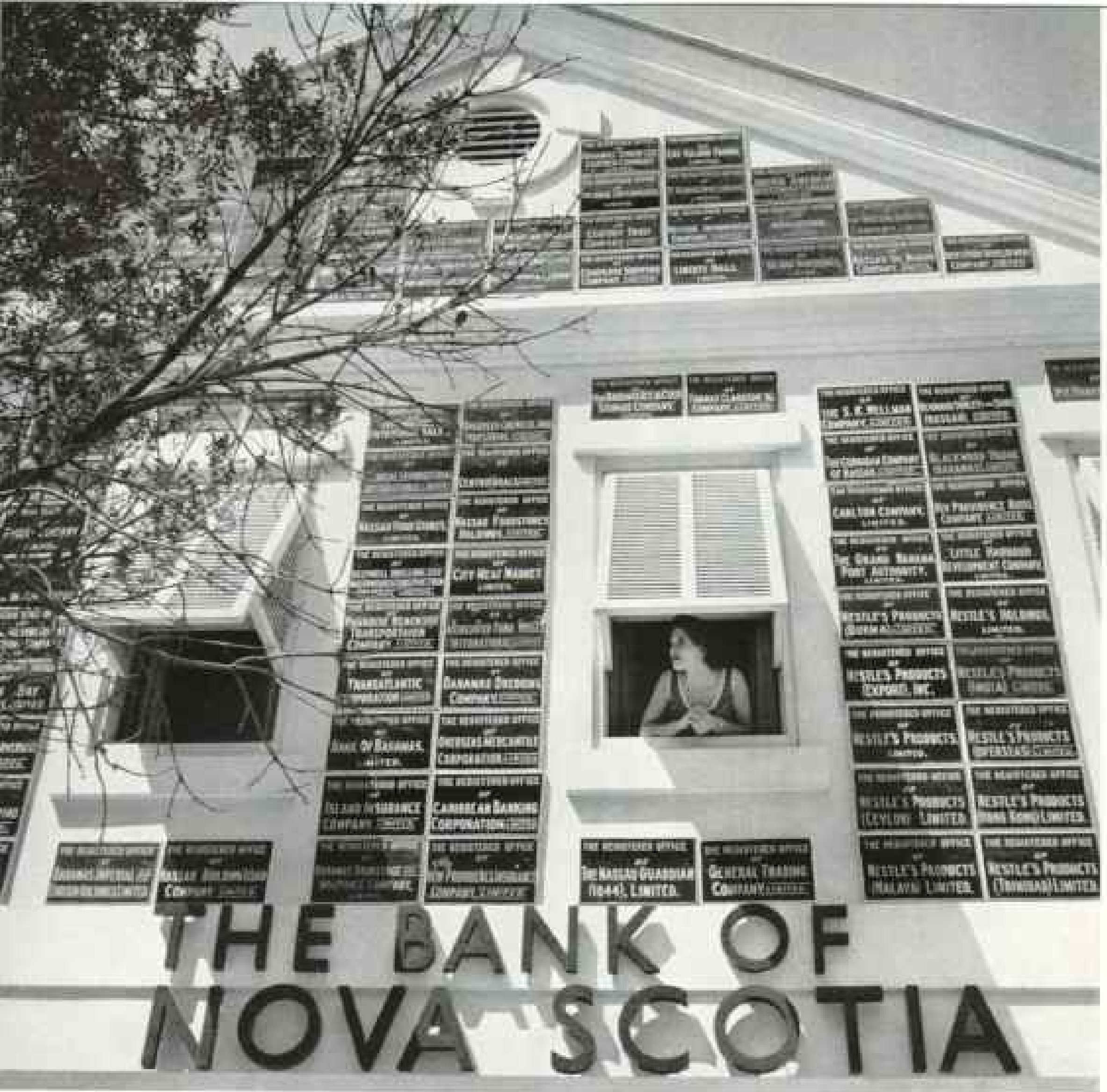
"When we arrived, the islanders were hand-raking about 500 tons of salt a year," Bill told me. "Our present annual production is more than 250,000 tons, and we are work-

* See "Carib Cruises the West Indies," by Carleton Mitchell, NATIONAL GEOGRAPHIC MAGAZINE, January, 1948.

Government Buildings Cluster About a Statue of Queen Victoria

Colonial Secretary and staff occupy offices at left; the House of Assembly meets in the structure at right. Columns frame the entrance to Post Office and Legislative Council.





Office Signs Proclaim Nassau a Headquarters City

Freedom from income and corporation taxes attracts many business firms from abroad. These plaques cover the front of a lawyer's second-floor office.

ing toward a projected maximum of half a million. Our sea salt averages 99.4 to 99.6 percent pure, against an average for mined salt of 97 to 98.5 percent. Most of it is used in commercial chemicals."

Seen from the air, the salt pans form a striking tapestry of color and design. Stone dikes bound the evaporating areas into lakes of geometric pattern. Some are laid out in neat rectangles, others are triangles, while some look like the inventions of a cubist painter (page 182).

The water within varies in color with each stage of evaporation. When water is pumped from the ocean to the brine lake where preliminary evaporation takes place, it is jade green. In successive steps it turns light brownish red, then takes on purple tints.

At intervals along the dikes huge, glittering piles of salt, whiter than any snow, are reflected in the colored water. And sometimes, if a visitor is lucky, flamingos may be stalking in the pans or flying above, looking like pink javelins tipped with black.

As we jeeped into Matthew Town, Inagua's port and chief settlement, I was struck by the changes that had taken place since I had first called here in 1946. A ship swung in the roadstead, awaiting cargo. There was a general air of prosperity, showing how the initiative of one small group can alter the destiny of an entire community.

While we lunched in a quiet, cool room that somehow managed to convey the impression of Massachusetts transported to the Tropics, I remembered that Inagua had truly become



**Straw Flowers Burst into Bloom
on Hats Made in the Islands**

The manufacture of straw products is a cottage industry in the Bahamas. Islanders strip palmetto and coconut palm fronds from trees and plait them into strips. Sewn together into sheets, the material is sold in Nassau, where hats, purses, and baskets are made.

Vendors sew on straw, shell, and cloth decorations in this open-air market on Rawson Square.

Burlesquing the "sack silhouette,"

170 Vivien Fairbairn wears a palmetto bag.







home to the Erickson clan and had witnessed one of the most remarkable homecomings of World War II.

After long duty in the Pacific, Lt. Josiah M. Erickson, U.S.N.R., was ordered to return his LSM to the eastern United States for decommissioning. But with special permission, Lt. Erickson stopped off in Matthew Town harbor on the way and virtually poked the LSM's bow into his bedroom window. It was the homecoming a naval officer might dream of in his loneliest moments, and the whole crew shared in the family celebration.

On our flight back to Nassau I had visual proof that, despite modern aids, navigation of

the Bahamas is still dangerous. Strong, unpredictable currents sweep across countless coral formations. Each year there are disasters: Now, under us, a large German freighter lay helpless on a reef near Pirates Well, Mayaguana Island. The pilot told me she had been on her way to load sugar in Cuba. While a salvage tug worked at her bows, a fleet of small native craft clustered near by, waiting to pick up the pieces if the salvage operation failed.

As I looked down, I was also reminded that, despite airplanes whizzing through the sky to link distant settlements, in between lie isolated bits of land as lonely and desolate as



Youngsters Play Walk-the-plank in the Pool at Coral Harbour

Created out of marshland on New Providence Island, this new 3,000-acre resort operates as a club. In and out of doors, the clubhouse (left) keeps several areas for dining. Two wings offer luxurious suites for guests. Docks and mooring wall accommodate a fleet of pleasure craft in a harbor dug out of the coral limestone. Similarly, a big harbor is being dredged at Freeport on Grand Bahama (below).

commodate the largest merchant ships afloat.

As I stood on man-made hills looking down on a man-made harbor, I was deafened by the roar of diesel engines and pneumatic drills eating through rock (page 196). The stark arms of cranes, draglines, and structural steel made patterns against the sky. I was reminded of the wartime transformation of entire islands. But Freeport is the project of private enterprise, not of an aroused nation.

In 1955 the Bahamas House of Assembly passed an act permitting purchase of 50,000 acres of crown land on Grand Bahama, and granted certain unique privileges.

New Port to Be Duty-free

"Our agreement is to develop an industrial and commercial community served by suitable harbor facilities," I was told by Wallace Groves, the man who conceived and is promoting Freeport.

"Under the act, for 30 years from 1955 businesses establishing here will pay no taxes on income, capital gains, real estate, or personal property. For 99 years there will be no customs duties. We control our own immigration, and can bring in skilled labor from any part of the world. It is our hope to establish here not only an industrial complex but a permanent community with schools, hospitals, recreational facilities, and all amenities."

In Nassau I later heard the rumor that if all progresses well, inside of 10 years this state within a state might employ 60,000 workers. With their families, this would surpass the total of 85,000 inhabitants achieved by the rest of the Colony in 300 years.

First to commence business operations in Freeport was Daniel K. Ludwig, of New York, head of several United States shipping firms, including National Bulk Carriers, Inc. His shipping empire rivals those of the famous Greek magnates, Stavros Spyros Niarchos and Aristotle Socrates Onassis. Mr. Ludwig is building the harbor in return for the right to construct a shipyard where even supertankers may be built or repaired.

before the coming of Columbus. Under us passed cays showing no sign of ever having known the tread of man. On others the rubble heaps of dead houses and indistinct outlines of stone fences around overgrown fields showed where nature had triumphed. Undoubtedly there are cays in the group which are not visited once in a decade. Robinson Crusoe could still happen here.

Inagua is not the only island remote from Nassau where industrial development is taking place. Across the archipelago, on sparsely inhabited Grand Bahama Island, men and machines are changing geography. Here they are creating Freeport, designed eventually to ac-



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Swimmer Wrestles a Loggerhead; Its Jaws Could Crush an Arm

This 300-pounder lives in a crawl at New Hope Lodge near Hope Town, Great Abaco Island. Frank Kenyon avoids the jaws by holding the turtle's shell. Its flesh is not highly esteemed.

Hawksbill turtles wear living jewels on their backs. Shells go into cuff links, earrings, and necklaces. Reginald Johnson displays these specimens in his Nassau shop. One reveals its straw stuffing.

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"Remember that on a world chart Grand Bahama is centrally located in relation to shipping lanes," Mr. Groves pointed out. "We are just off the Gulf Stream, the highway between North and South America, and the way to the Panama Canal; and we're directly on the Northwest Providence Channel, a main route to Europe. By steamer we are only a day from ports in Florida; by air, an hour or so. This is equally important to the factories and assembly plants we hope will develop at Freeport."

I felt slightly dazed as I drove the 20 miles back to West End, a small Out Island settlement drowsing under palms. Anchored sloops swung off the beach. Children splashed in the shallows. Smoke climbed lazily from cooking pots behind the houses. Here was a feeling only of the past.

Tuna Fishermen Train Like Athletes

Later the same afternoon I was to see another of the contrasts that exist in this scattered archipelago. Looking down from my plane, I watched Bimini come into sight ahead. It had been my first island landfall, on Christmas Eve, 1932, and each view of it since has brought back something of my original excitement.

Bimini is truly an isle of the sea. The Gulf Stream flows past in front, and the Great Bahama Bank stretches away behind. One teems with giant pelagic fish, the other with small and colorful reef fish. Bimini spans the line of reefs and rocky cays that divides ocean abyss from shoal water. Tides swirl in and out of the cuts, flowing on and off the Bank. Here is a perfect feeding ground for marine life. And Bimini exists by and for fishing (page 202).

As our plane dropped out of the sky, we could see the dark-blue water off the island patterned by the wakes of sport-fishing boats. The Tuna Tournament of the Bimini Big Game Fishing Club was under way, timed to coincide with the annual northward migration of the huge fish.

Bimini-style fishing is to ordinary angling as stalking elephants is to hunting rabbits. Special tackle, techniques, and even boats have been developed to make easier the landing of fighting fish weighing hundreds of pounds. I have heard stories of anglers training for weeks, only to be carried from the boat after struggling with a monster for hours. There is sometimes doubt as to who is playing whom!

But in the Bahamas even sport fishing has a serious aspect. Behind the docks are the trim buildings of the Lerner Marine Laboratory of the American Museum of Natural History.* Fish brought in as trophies are not only dissected for study but used to feed specimens kept in a large aquarium in the harbor. The laboratory was established by Michael Lerner of New York, one of the first sportsmen to become interested in big-game fishing and one of the earliest winter residents of Bimini.

Among other projects, the laboratory is undertaking extensive research on cancer.

"All types of tumors that afflict humans are found in fish, and for the same causes," explained Dr. Ross F. Nigrelli, a visiting pathologist from the New York Aquarium, "so it is our hope that an inhibiting chemical may also come from the sea, as antibiotics have come from organisms of the soil (page 203).

"At present we are working with a fluid generated by the Cuvierian organs—glandular tubules—of the sea cucumber, *Actinopyga agassizi*. The secretion is called holothurin, and it is a powerful poison. For centuries Pacific islanders have used it to kill fish. We have injected it into malignant tumors that normally would kill mice in 12 days, and the mice live indefinitely. The spread of the growth is arrested.

"Our problem is learning the chemistry of holothurin, so that it can be purified and modified to make it less poisonous but intensify the anticancer properties."

Around us were dozens of rectangular glass tanks. In them tiny, brilliantly colored fish swam among branches of coral or drifted over the shells of living conchs. Bright-red starfish slowly moved across white sand.

An Ideal Site for Research

"Bimini is the perfect place for marine biochemical research," said Dr. Nigrelli. "We have an unlimited source of specimens. Metabolic processes are exaggerated by the high temperature of the water; so tumors are more frequent and grow larger and in a greater variety of organisms."

Bimini has changed greatly since I first sailed in on the venerable ketch *Temptress*, in the '30's. Then there were few houses. The only activity took place at sundown, when a procession of powerful motorboats would

* See "Man-of-War Fleet Attacks Bimini," by Paul A. Zahl, NATIONAL GEOGRAPHIC MAGAZINE, February, 1952.





Picture Window in Nassau Captures a Vista of the Sea

The Honorable Godfrey Higgs (seated) and his wife (standing) entertain on the veranda of their home on eastern New Providence Island. Nassau Harbour reflects the blue of the heavens.

A yachting poodle (opposite, lower) is rowed ashore to stretch his sea legs. Mistress and dog came from France. She was a spectator at the Out Island Regatta.

A Bahamian Feast Is Spread on the Author's Patio

Anzlo Strachan, butler at Mr. Mitchell's Nassau house, serves green-turtle pie (right), pigeon peas and rice (in bowl), and baked plantain (in basket).

"The Bahamas' native cuisine is excellent," says the author.



roar out across the Gulf Stream to Florida, for the island was a rum-running center during Prohibition. Now the fishing docks are nearly as crowded as those of Miami Beach, 55 miles to the westward.

But somehow the narrow streets running the length of the settlement retain an Out Island charm. Palms arch overhead and cast a pattern of filtered sunshine across gossipers lounging against beached dinghies. Bimini is a curious combination of American energy and Bahamian languor.

Only a few miles away is an island with the same general physical characteristics and equal fame as a fishing center, yet with a completely different character. North Cat Cay is a world-famous symbol of gracious living. Originally it was planned as a winter estate by Louis R. Wasey, a New York advertising executive. Later he formed a club and allowed friends to build their own homes.

Cat Cay has been groomed through the years to a state approaching perfection. Pink-and-white cottages are framed by vistas of palms, or look down across a beach of dazzling white sand to the dark-blue Gulf Stream. A golf course occupies the center of the island. In season, guests dress formally for dinner in the Manor House, an 18th-century English country house transported to the edge of the Tropics. There are tennis courts, a swimming pool, and a skeet range. Cat Cay, first of the private island luxury resorts, possesses a charm of its own.

Strange Formations Mark Sea Bottom

Twenty-three miles to the west of New Providence, beyond a fantastic submarine chasm called Tongue of the Ocean, lies Andros. On my first visit it was known as the Mysterious Island. There were vague rumors of tribes of primitive people, living in hidden interior villages, who still hunted with bows and arrows. Colonies of flamingos nested behind almost impenetrable barriers of eroded limestone, tangled mangrove, and marl swamps.* As late as 1926 the *Bahamas Handbook* noted: "It is to be hoped that the mystery of the interior of this land will someday be unfathomed by means of aviation."

Andros is a big island, more than 100 miles long and 40 miles wide, comparable to Puerto Rico. Wide cuts known as bights slice across, dividing it into three parts. Each bight in turn subdivides into smaller tidal streams, until from the air the land looks like a pattern of

lace. Here is the only place in the Bahamas where fresh water meets the sea.

Among other strange formations are "ocean holes," where perfectly round tunnels through rock bottom link the sea and subterranean springs (page 200). Swimming over one is a weird sensation; looking down through my face mask, I had exactly the feeling I have known on land when peering over the edge of a precipice. Through water almost as clear as the air above, I could see fish in swarming clouds, gradually receding into the shadowy depths. I felt dizzy and suddenly insecure, as though I might go tumbling down into a bottomless pit. Taking in a mouthful of water under my mask, I found it almost fresh.

Largest Island the Most Primitive

At Fresh Creek the Swedish industrialist Axel Wenner-Gren has built a modern resort, the Lighthouse Club. Despite this oasis of luxury, Andros remains the most primitive of the Bahama group. Only a few scattered settlements rim the coast to the east. The entire west coast and interior are uninhabited; modern exploration, as the *Bahamas Handbook* hoped, has disproved the existence of any mysterious Stone Age tribes.

Elgin Forsythe, for 25 years as commissioner almost the only representative of government on Andros, told me the folk legend of the Chick Charneys, birdlike creatures with large red-rimmed eyes which build nests by pulling together the tops of three pine trees.

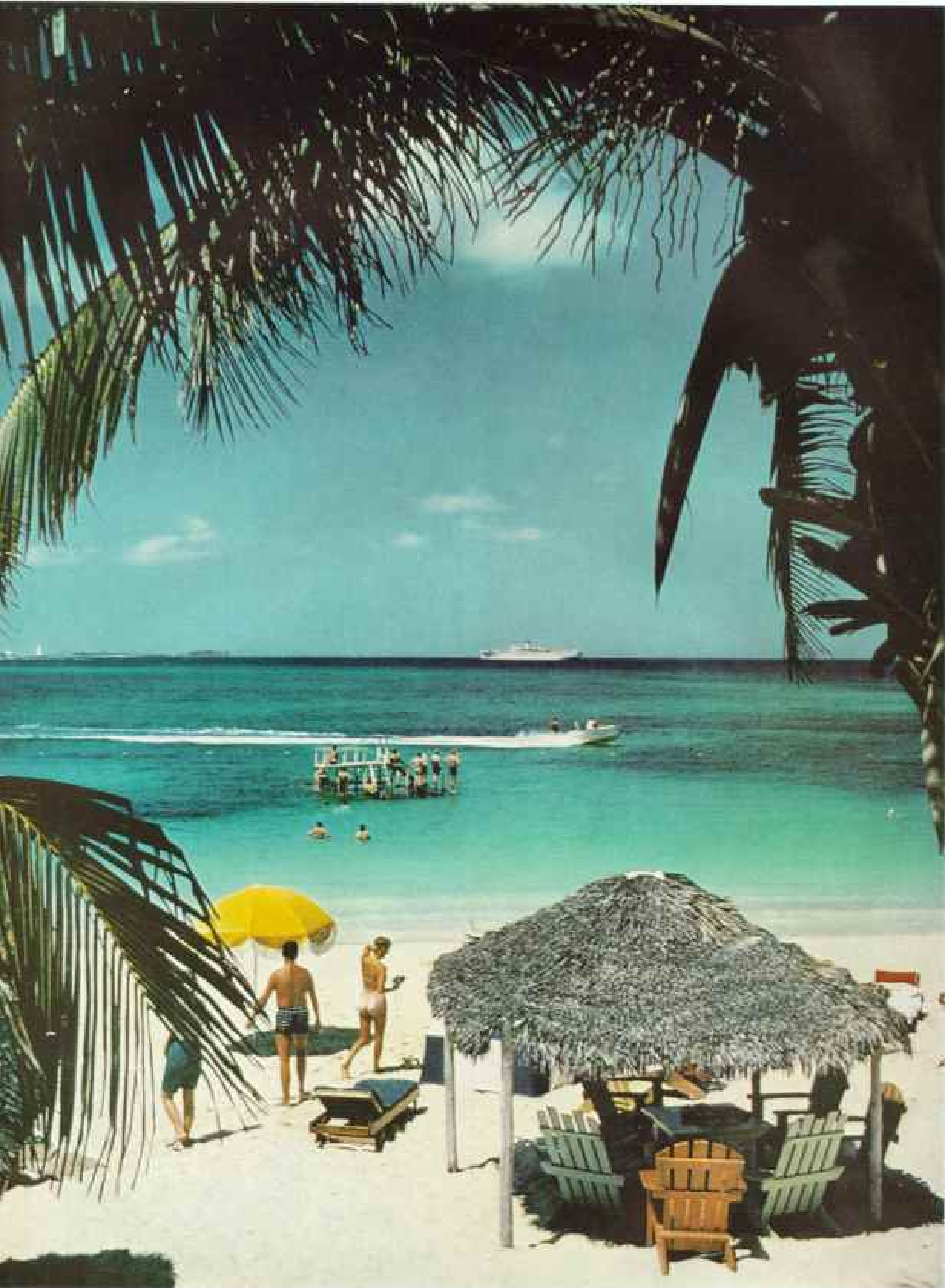
These spirits of the forest are usually gentle, never harming the people who believe in them. But if their nests are willfully disturbed, they become hostile. Natives believe if they put a curse on a man he can never recover.

"Neville Chamberlain, afterwards Prime Minister of England, managed a sisal plantation near Mastic Point when he was young," Mr. Forsythe said. "One day when he was directing the clearing of a field, the native workmen refused to cut down a cluster of trees that had a peculiar structure of sticks and rubble at the top.

"Chamberlain asked the trouble, and was told it was a Chick Charney nest. 'Nonsense!' he replied, and seizing an ax, cut down the trees himself. The Chick Charney cursed a wicked curse, and the natives fled. To this

(Continued on page 187)

*See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Ballerinas in Pink," by Carleton Mitchell, October, 1957; and "Flamingos' Last Stand on Andros Island," by Paul A. Zahl, May, 1951.



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Paradise Beach Drapes a Scarf of White Sand About a Turquoise Sea

Tradition says that in these waters the pirate Blackbeard played devil and gave his sailors a taste of Hades by setting fire to brimstone and forcing them to inhale the fumes. Now passengers from the distant cruise ship sample the "paradise" on Hog Island.



Surrey with a fringe on top carries a sightseer through Nassau at a horse's pace.



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Milk fresh from a coconut quenches the thirst of a guest at the Emerald Beach Hotel near Nassau.





Bay Street Strollers Inspect Nassau Wares at the Straw Market

During World War II, when the Duke of Windsor was Governor of the Bahamas, his American-born Duchess imported handcraft teachers for the native women. The outcome: higher-quality straw products of an intricate design (page 170).

Pink hands and gold bells adorn the hat of a spectator at the Out Island Regatta.







Farmlike Salt Pans on Great Inagua Build a Glittering White Mountain

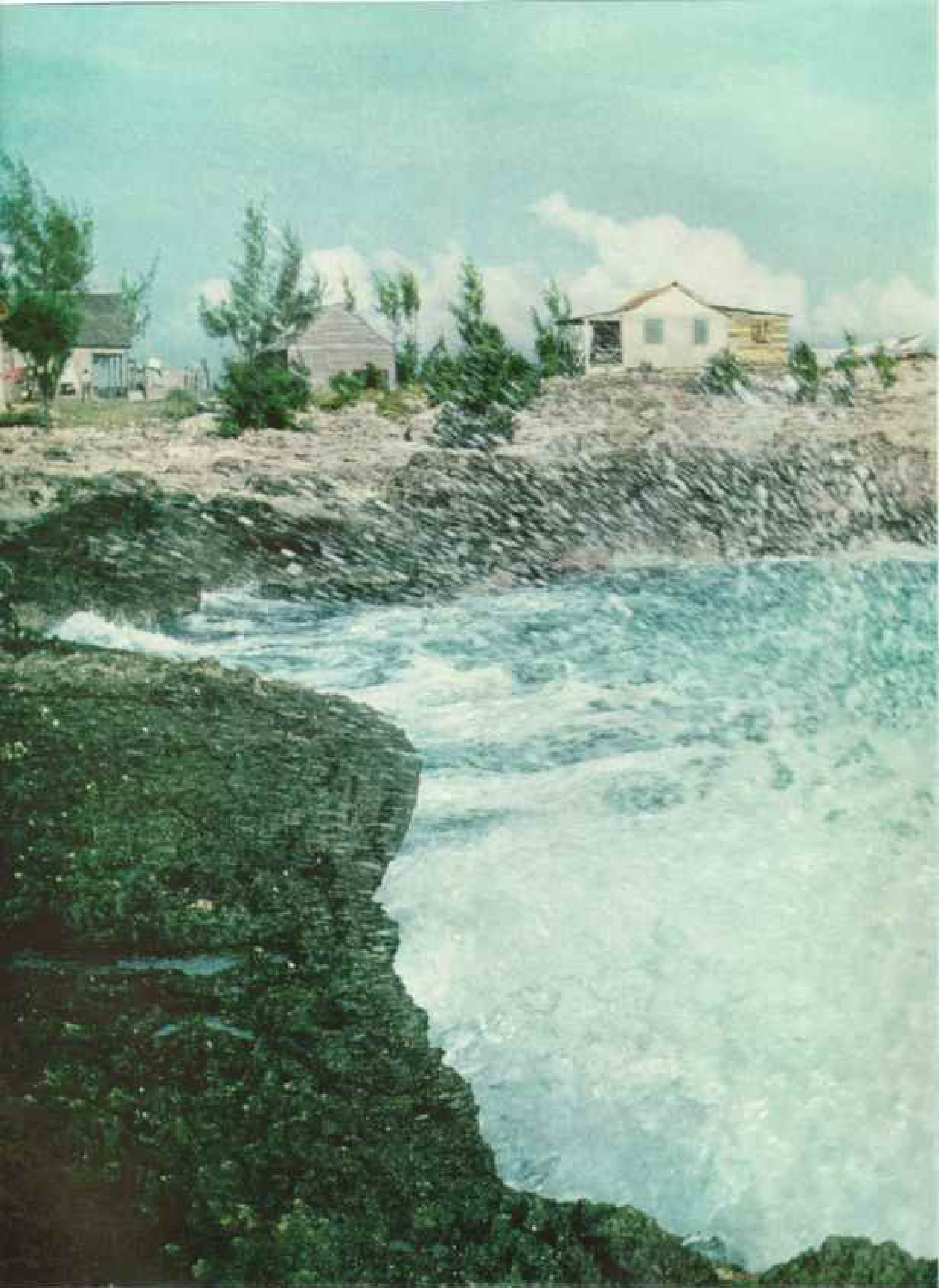
On this southernmost of the Bahamas the sun shines virtually the year round. Using its evaporative power, Inaguans began producing salt from sea water in the late 1700's. They struck a bonanza during the Civil War, when the Confederacy paid six gold dollars a bushel. Hard times followed. Three Erickson brothers of an American family set out to revitalize the industry in the 1930's. This air view shows the result.

Primary evaporation takes place in the reservoir at upper left, into which pumps pour 30,000 gallons of sea water a minute. Canals and stone walls hem the 30-acre pans. Darker lavender water indicates pans nearing harvest. Plots drained and white are ready. Salt is transported to the curing pile by truck.

Worker will wash hands and feet upon leaving the pan because the brine solution is so strong it tends to dehydrate the skin.

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Eleuthera Rock Shatters the Sea;
Island Homes Keep Lonely Vigil

In the mid-1600's a small band of Puritan "Adventurers" landed here and formed a representative government. They named the island Eleuthera, after the Greek word *eleutheros*, meaning free. Later, when the



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colony needed help, Puritan churches in New England sent money. The Adventurers repaid the gift with 10 tons of brazilletto wood, directing that proceeds from the sale be given to Harvard College. This

settlement at Governor's Harbour stands on a rock nearly surrounded by water. A causeway links it to the body of the island. Shaped like a shield, Eleuthera serves as a breakwater against Atlantic surges.



© National Geographic Society

Storm blackens the sky even as the sun spotlights a beach party on Andros Island. A calypso drummer beats rhythms beneath a sea grape tree. Prevailing winds have bent the tree trunk. In some woods, stems of trees distorted into knee-shaped crooks are eagerly sought by shipbuilders (lower).

Plank sheathing hides natural knees used in the framing of a boat on Great Abaco Island. The author examines a crook of madeira, or mahogany. Pickled in sea brine, the wood is nearly impervious to rot. Most Abaco people descend from Loyalists who left the Colonies at the time of the American Revolution.

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day they believe that history might have been different except for that Chick Charney nest. People of Andros will tell you that the Chamberlain plantation failed and Chamberlain failed in his meeting with Hitler at Munich because of the spell cast."

On one visit I met an old native, so old he looked like a modern Methuselah. There was no way of knowing his exact age. Few records were kept in the last century. However, on Andros the great hurricane of 1866 is remembered by anyone who lived through it. The old man was once asked by a judge in court if he remembered the hurricane of '66. He nodded.

"Remember the cholera epidemic of 1851?" continued the judge.

"Yes, suh!" answered the patriarch.

"How old were you then?"

The old man scratched his head and replied: "Pretty near as old as I is now, I reckon, boss!"

Andros sailors are among the best of the Bahamas. Before a mysterious blight swept through the Caribbean and Gulf of Mexico sponging grounds in 1939, "the Mud" to the west was one of the great sponge-producing areas of the world. Sloop-rigged smacks less than 40 feet overall but carrying crews of 12 or 14 men, plus dinghies and all supplies, lived on the sponge banks for weeks at a time.

On Sundays, if the sea was smooth, several boats would tie together in a raft and the men would spend the day singing hymns and visiting. Virtually overnight the sponges died by the uncounted million, and are just now coming back in commercial quantities (page 194).

Subtropical Isle Boasts Greek Name

Vaulting over New Providence to the east, we found the island of Eleuthera curving like a bow into the Atlantic, forming the outer bastion of that immense plateau, the Great Bahama Bank.

Eleuthera was the first of the Bahamas to be settled by Europeans. In 1647 William Sayle, a former Governor of Bermuda, who had already visited the archipelago and even named New Providence Island, formed a "Company of Adventurers for the plantation of the Islands of Eleutheria." The name was taken from the Greek *eleutheros*, meaning free, for the new colonists were seeking a place to carry on the "independent way of worship" of their Puritan friends in New England.

The first Adventurers offered to admit to

the company persons qualified by "godliness, justice and sobriety," who could also contribute £100. Each Adventurer was to have at first 300 acres of land, and later an additional 2,000, as well as a share in the proceeds of "all wraks, mines of gold, silver, copper, brass, or lead, ambergreise, salt and all rich woods."

Curiously, when the Adventurers came, the islands were depopulated. Not one of the gentle Lucayan Indians who had greeted Columbus on San Salvador in 1492 had survived the man hunts of later Spaniards. By 1503 most of the original inhabitants of Hispaniola had perished in the mines, or had been wantonly slain; so the Spanish sent ships to the north. Systematically the Indians on each island were rounded up and carried away until, within eight years, the Bahamas were depopulated, and presumably remained thus for more than a century.

New England Puritans Sent Help

From the first, the Adventurers had a difficult time. Their ship was wrecked and they were forced to live in caves. Puritan friends in New England sent a gift of £800 and a shipload of provisions from Boston. In order to "avoid the foul sin of ingratitude," the Adventurers sent in return 10 tons of brazilletto wood, valuable for making dye.

They specified that the proceeds of the sale, which came to about £124, be given Harvard "as a stock for your colledge's use." In appreciation, on December 15, 1956, Harvard University "Friends of Eleuthera" presented a plaque to the Colony to commemorate three centuries of friendship.

Eleuthera has the least primitive feel of any Out Island. Dunmore Town, on Harbour Island, a detached community to the north, is in a sense a smaller Nassau, perhaps the Nassau of 25 years ago. Many homes overlook a magnificent beach of pink sand, whose color comes from bits of shell ground by the surge of the sea across outer reefs (page 188).

Farther south, on Eleuthera itself, there are resort communities at Governor's Harbour and Rock Sound (page 184). At the latter a golf course has recently been completed, with putting greens thrusting out over the ocean.

Once the main occupation was growing pineapples, introduced by German refugees from the Palatinate about 1720. I was told by an elderly man that his grandfather recalled that the first "pines" shipped to England had been

Crushed Shells Tint Harbour Island's Sands Pale Pink

One and a half square miles in area, Harbour Island ranks second only to Nassau as a resort for Bahamians. Here, on Pink Sands Beach, sunbathers' awnings lend off Atlantic breezes.

Bougainvillea and *hibiscus* (opposite, below) frame a street in Dunmore Town, Harbour Island's only settlement.

Islanders in dinghies commute daily to Eleuthera for work in coconut groves and vegetable gardens.

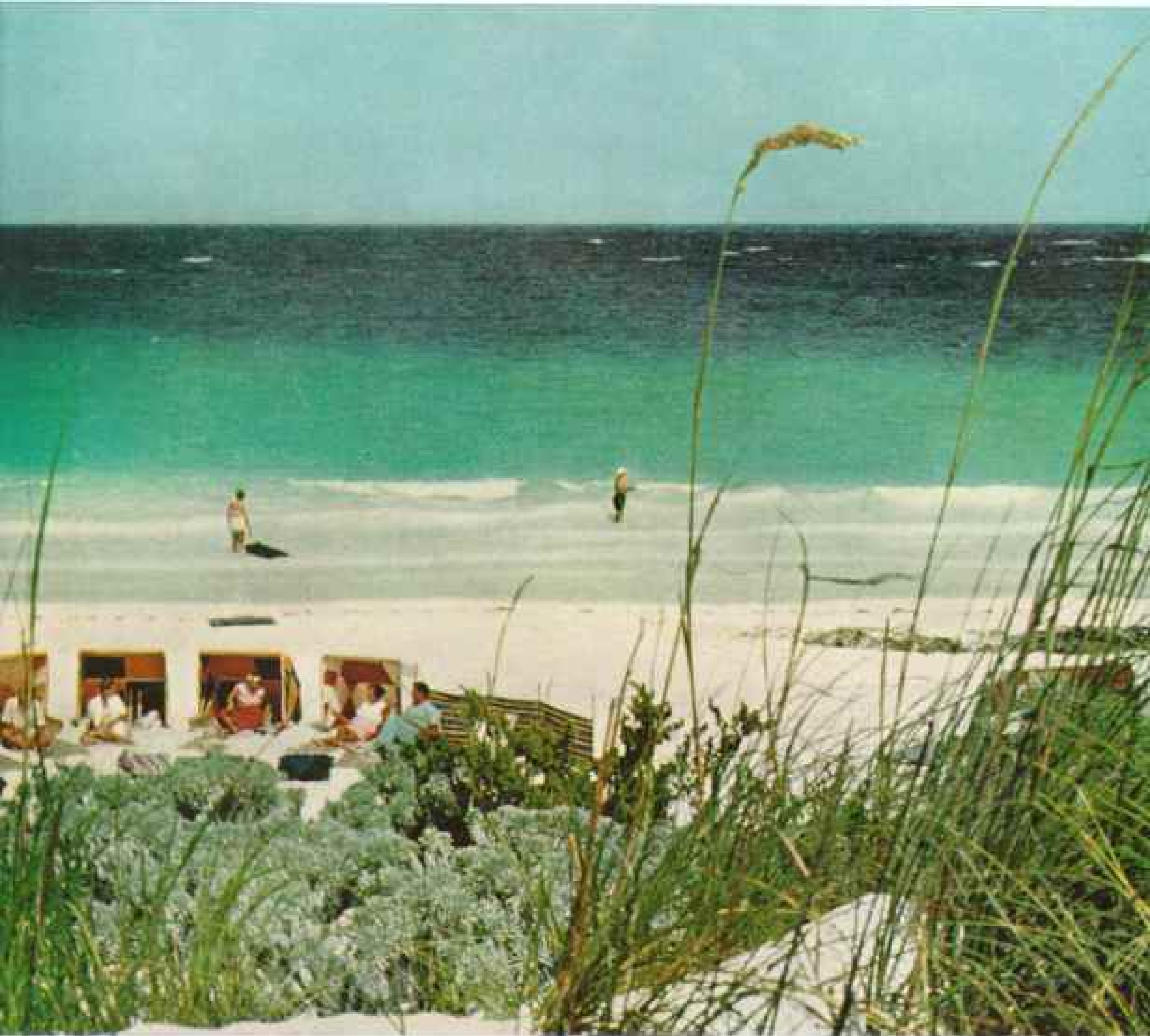
Fisherman Weaves a Palm-rib Trap

Completed, the trap will resemble a basket. Weighted with stone and dropped to the sea bottom, it will catch grouper and snapper.

Simple frame houses compose Gregory Town, an Eleuthera community.

All illustrations by
National Geographic Photographer
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uprooted and carried aboard sailing vessels as complete plants, carefully tended during the long voyage, so that London gourmets could pick the fruit in their dining rooms. When Hawaii transformed the growing of pineapples into a streamlined industry, the island could no longer compete.

Eleuthera produces much of the food consumed in Nassau, and some of its output is exported to Canada. Hatchet Bay Plantation claims to be one of the largest combined poultry and dairy operations in the world. Visiting it, I found myself surrounded by a feathered population of between 90,000 and 100,000 chickens. As many as 30,000 eggs have been collected in a day, while 6,500 to 7,000 broilers are processed weekly. During the same period dairies ship nearly 3,500 gallons of milk.

Beef Cattle Suited to the Climate

Near by, William Wood Prince, formerly president of the Chicago stockyards, is experimenting with beef cattle. Black Angus is being crossed with Charolais, a French breed, to produce animals which become marketable at an early age and are suited to the climate. At present 450 sleek animals graze the fields of Three Bays Farms. It is the first attempt to produce Bahamas beef for local use.

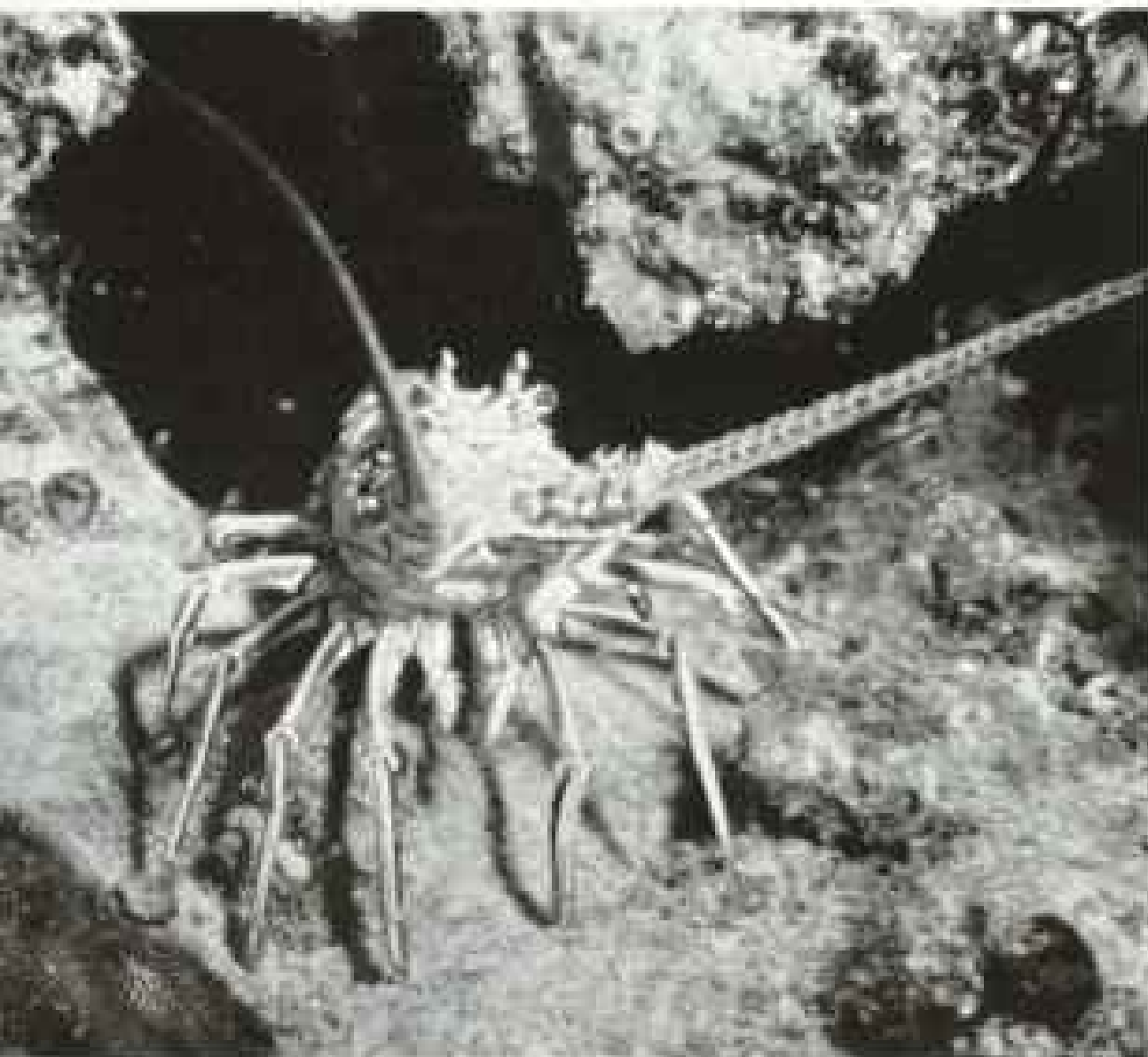
Driving along the road which runs almost the entire length of Eleuthera, I thought of the historic reason for the barren appearance of most Bahamian islands, so puzzling to tourists, who usually arrive expecting rich tropical vegetation.

At the time of the earliest voyagers the islands were lush. Flights of birds to darken the sun had plumed out of towering forests, and flowers bloomed in shaded glades. The native Lucayans lived a carefree, simple existence, not changing the primeval character of the land. The Spaniards, driven by a mad lust for gold, passed on swiftly, leaving the archipelago depopulated. For another century it was to lie fallow, until the Eleutherian Adventurers arrived. Despite the failure of the enterprise as planned, many of the original band remained, as evidenced by family surnames surviving throughout the Colony today: Bethell, Knowles, Low, Newbold, Pinder, Sands, Sawyer.

These settlers, and a few who followed, tilled the land, but their efforts did not extend far. According to the census of 1731 there were only 1,378 inhabitants in the entire Bahamas group, and more than 1,000 of these were concentrated on New Providence.

Until the latter part of the 18th century the Out Islands remained as Columbus had found them. Furniture surviving from the early colonial period contains a kind of native mahogany in widths approaching three feet, showing that huge trees still existed at that time.

The real alteration took place as a direct result of the American War of Independence. Loyalists, those remaining faithful to the Crown, left the United States with their possessions, including slaves, and the British Government undertook to resettle them in the islands.



Goggled Diver Bags a Spiny Lobster

Provisions ran low as *Fruitsterre* lay off Great Exuma (background). The author went to market in his swimsuit. Dropping off the deck, he searched the crystal waters through his goggles. Twenty feet down, in a clump of rock, he spotted a lobster and captured it with his spear gun. The gun stock, seen in his hand, uses rubber bands to propel the spear.

The spiny lobster hides amid coral. By flexing its powerful tail, the animal speeds backward to escape enemies. Two antennae warn of approaching danger. This crustacean lacks the big claws of the Maine lobster.



A great number came to the Bahamas. Forests were stripped away so that fields might be planted. Sea-island cotton was the principal crop. Within a few years a system of plantations modeled on the Southern States covered most of the eastern islands.

They prospered while the virgin topsoil lasted, but destructive methods of clearing and tillage gradually lowered production. And on August 1, 1834, slavery was abolished throughout the British Empire. Overnight the plantations were economically doomed. Fields and homes were abandoned as freed slaves moved to small settlements.

Again many islands were depopulated, or the few inhabitants concentrated in one section. But the damage had been done. There was nothing left to hold the soil, which had never been deep. Burned over in clearing and exhausted by cotton, it was blown by the wind and washed by hurricane seas. Enough remained in potholes to keep the islands from being wholly barren. Most are covered by a low second growth. Gradually soil has reaccumulated, but there are few places where the underlying limestone formation is not evident.

Loyalists arriving from America made their greatest impact on Abaco, the most northerly group of the Bahamas.

"You are seeing New York's true 'four hundred,'" my old skipper, Si Strong of *Temptress*, told me on my first cruise as we anchored among a fleet of fishing schooners from Cherokee Sound. Around us blue-eyed, blond men, untanned even after a lifetime of exposure to

Divers Find a Civil War Cannon Moldering in 25 Feet of Water

Before dawn on August 23, 1862, the Union's *Adirondack*, a screw-steam sloop on her maiden cruise, ran aground on a reef near Man of War Cay.

Bahamian wreckers swarmed out to rescue the crew and claim salvage rights. But *Adirondack's* Capt. Guert Gansevoort determined to save his ship. To lighten her, he jettisoned his heaviest guns and off-loaded coal and stores. Eventually he bought a wrecker's schooner to help him get off the reef, but it was too late; *Adirondack* had broken her back.

Gansevoort stayed aboard the dying ship for four days. Finally he spiked and threw overboard other guns to keep them out of the hands of *Florida*, a Confederate raider, and abandoned ship.

The captain was court-martialed but acquitted of negligence. His navigator admitted a miscalculation.

Wearing Aqua-Lungs, National Geographic writer Louis Marden and friends explored *Adirondack's* grave. They saw guns and wrought-iron boiler plates.

Louis Marden, National Geographic Staff







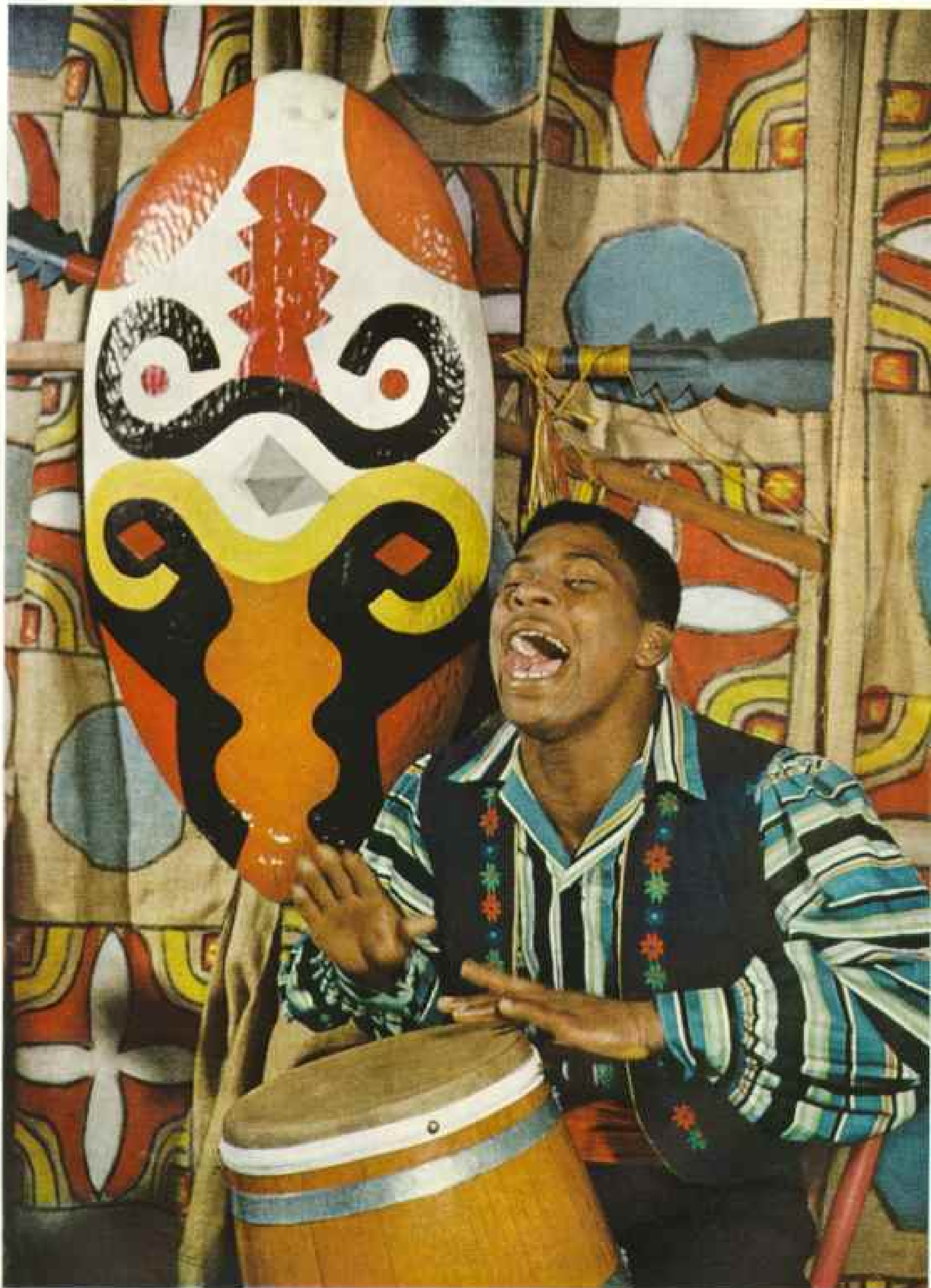
Boatmen hook sponges off Andros Island. Glass-bottomed bucket and a window in the boat's hull aid in spotting. Sponges in these beds are planted,

Spongers trim the harvest for shipment. In 1939 a mysterious disease killed millions of Andros sponges. They have since multiplied, permitting limited fishing,



Jungle Beat Transports a Goombay Drummer to Ecstasy

Native music of the Bahamas, called goombay, achieves a rhythm and style of its own by merging folk songs, like Trinidad's calypso, with percussion effects known to Haiti and Cuba. Berkeley (Peanuts) Taylor pounds a drum in the Junkanoo, a Nassau night club.





Dredges Scoop Out a Harbor for the Largest Ships Afloat: the Grand Bahama Freeport Project

Here on an island 80 miles from Florida, American capital is creating a deepwater channel, a land-locked harbor and turning basin, and numerous berths as a tax- and duty-free facility for world commerce. Shipyards and dry docks will be added. Other industries are planned for some 50,000 acres of land near by (page 175).

This air view shows a dredge at work in the channel (right). Pipe linking it to the shore carries silt to man-made hills.

Floating crane (above) moves a toothed cutting head designed to shear through rock. The tool is one of the largest of its kind.

Bahama Development Board

the sun, showed unmistakably their unblemished Anglo-Saxon heritage.

"Most of the Abaco settlers came from New York City, under the sponsorship of Sir Guy Carleton, commander of British forces in America. They were the aristocrats, the established conservatives who remained loyal to the Crown. They brought along their way of life and their point of view, as well as resistance to change. Abaco remains in the past."

Twenty-five years later, walking down the waterfront street of Man of War Cay, I remembered his words. Boatmaker William Albury and his helpers were building a large motor sailer on the beach, using the tools and methods of an earlier century. There were no elaborate slipways, no power tools (page 186).

Through the clear water off a dock I could see knees of madeira, or mahogany, cut from



trees having the desired shape so that there had to be no steam bending or sawing. Since the curve of the grain is natural, it makes much stronger framing for a boat.

While I watched, Mr. Albury used a length of string to mark a straight line along a large balk of rough-hewn timber. After him came a carpenter armed only with an ordinary small hand hatchet. Chips flew. In amazement I sighted along the line and found the tough wood as level and smooth as it might have been after coming from a planing machine. Later the workman produced paper-thin shavings with a heavy adz, the basic tool of the colonial shipwright.

"How did you learn that trick?" I inquired. He grinned. "From grandfather. An' he learned from his'n. 'Bout a hundred years ago, I guess."

After the abolition of slavery and the failure of the plantations, most of the Loyalists who had settled on Out Islands moved to Nassau or away from the Bahamas. But many of those who had come to Abaco and near-by Spanish Wells on St. George's Cay remained.

Until recent years their descendants lived in isolation, intermarried, and became increasingly proud and sensitive. They were truly men of the sea. They supplied Nassau with fish, and built magnificent schooners and





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San Salvador's Cross Marks Columbus's First Landing in the New World

The explorer believed the 15-mile-long island was a part of the fabled Indies. Stepping ashore somewhere near this spot, he was welcomed by a people thereafter called Indians.

Faces of the islands: an old man of the sea, a woman of the soil—Eleuthera.

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smaller vessels, lovely little ships with flaring bows and sweeping sheer lines.

Now the tide of change has reached even Abaco. The tall rigs have disappeared from the fishing schooners, to be replaced by diesel engines. Homes of winter residents dot several of the cays, and at Man of War has gathered a colony of American yachtsmen.

The casual visitor may find modern accommodations at Green Turtle Cay and Hope Town on Elbow Cay. Near the latter settlement is New Hope Lodge, a group of cottages rambling through trees but overlooking the water. During the summer months it becomes a children's camp, the first in the Bahamas, with an "underwater classroom" where boys and girls are introduced to the Aqua-Lung and taught to be at home in and under the water.

Divers Find Spanish Silver Ingot

Abaco vies with the Exumas as the favorite cruising ground of visiting yachtsmen. It might well have been the same for buccaneers. Only a few years ago Spanish treasure was found near Gorda Cay. A bar of almost pure silver weighing 72 pounds was brought up from shallow water over a reef by Howard Lightbourn and Roscoe Thompson of Nassau.

An expert on ancient coins and treasure decided from marks stamped into the ingot that it was cast in South America, probably at Santa Fé de Bogotá (now Bogotá, Colombia) in 1652. Near by were coins of Spanish origin, but it is believed the bulk of the treasure slipped into deeper water beyond the reef.

"The bar was found a long way off the route of any Spanish fleet," reported Andrew J. S. McNickle, an English numismatic expert who made the identification.

"The ship carrying it could have been driven from her course by a storm, or possibly the ingot had become part of the booty of a pirate vessel."

Mr. McNickle estimated its present value at \$20,000, but also attempted to evaluate its purchasing power three centuries ago. "In 1652...it would have paid for about 250 arquebuses, the best infantry weapons ashore or afloat. It would have paid the salary of...a pilot for one year eight months, and a ship's surgeon and a gunner each for no less than five years. At the time it was cast, the bar represented the accumulated life wages of two workmen in the Americas..."

Untold treasure must still lie hidden in the sand of lonely cays, or be strewn, coral-

encrusted, among the waving sea fans of countless reefs. But few discoveries of recent years rival that of Capt. William Phips, who in 1687 located the wreck of a galleon lost among the reefs east of Turks Island.

The approximate position was known, but after days of search the project seemed hopeless. The quest was being abandoned and the small boats were returning to the mother ship for the last time when an officer happened to look over the side. Through the crystalline water he saw a sea feather of unusual beauty. Thinking it might cheer his despondent captain, he sent down a diver. Within seconds the man came up gasping.

"Guns!" he cried. "The feather grows from among great guns!"

Thus does chance play a part in man's destiny. From the treasure ship the divers recovered pieces of eight, plate, jewels, silver bullion, and ingots of silver and gold. They were overgrown by coral, but still little damaged. The silver alone weighed 65,466 pounds troy. The fortune of Phips was made. He went on from the poverty he had always known to knighthood and the governorship of Massachusetts.

San Salvador, Isle of Discovery

As I have written, to me the Bahamas are isles of the sea. And while I hope I have made clear that each island has its own particular charm and character, I must admit that because I am a sailor San Salvador is to me the most romantic.

Each time I approach it, I visualize the drama of the first landfall. For 33 days three little ships, the *Niña*, the *Pinta*, and the *Santa Maria*, had scudded across an uncharted ocean. The men aboard had become terrified; their leader claimed the world was round and they would eventually reach the Indies.

They were also frightened by the wind, almost undeviatingly from the easterly quadrant, so that it would be virtually impossible to sail home.

On the 10th of October near mutiny had forced Columbus to promise he would turn back if land was not sighted within three days. So he drove relentlessly ahead on the night of the 11th, through a rising wind. There had been signs indicating they were nearing shore, and it would have been better seamanship to have hove to until dawn.

An hour before moonrise Columbus thought he saw a light which "was like a little wax



Toylake Fishing Boat Bobs in a Mysterious Ocean Hole That Plunges to Depths Unknown;
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Water from Subterranean Tunnels Circulates Through This Pit in the Reef of Andros



Ralph L. Boston

Whale Shark, World's Largest Fish, Rides a Hoist off Bimini

The 29-ton shark was hooked off Bimini's harbor, where it had frightened inexperienced fishermen. Actually this species is mild mannered and harmless to man.

Scientist Probes a Tumor on the Back of a Snapper

Working with the knowledge that fish suffer malignancies akin to those in man, the Lerner Marine Laboratory studies sea life in a cancer-research project on Bimini Islands (page 175).

Dr. Ross F. Nigrelli here begins the dissection of a fish.



candle rising and falling." It must have been an hallucination, but it increased to an almost unbearable degree the tension aboard the fleet. The ships roared on through the night, bow waves gleaming ghostly white against the dark water, masts tracing a pattern across the sky as the vessels rolled in the long swells.

Then, suddenly, at two o'clock in the morning, Rodrigo de Triana, lookout on *Pinta's* forecastle, saw something like a white sand cliff and a dark smudge of land.

"*Tierra! tierra!*" he shouted, and Columbus had come "to a small island of the Lucayos called in the Indian tongue Guanahani."

Years of research have left little doubt Guanahani is the island now called San Salvador. After daylight the fleet sailed around the southern end to find shelter in the lee, and somewhere along the shore dropped anchor. Columbus was rowed to the beach in the armed ship's boat displaying the royal standard, while the other captains in their boats flew the other banners of the expedition.

"All having rendered thanks to Our Lord kneeling on the ground, embracing it with tears of joy for the immeasurable mercy of having reached it, the Admiral arose and gave this island the name San Salvador," wrote the missionary and historian Las Casas.

Always I picture it as one of the most dramatic spectacles in the history of mankind, and certainly among the most far reaching in its effects. Thus again the operation of chance: had light wind prevented the approach to land, the expedition might have turned back; had the ships been too far to the north or to the south, they might have

ripped their bottoms out on hidden reefs.

San Salvador is one of the few islands riding out in the open Atlantic that would be visible in darkness for some distance. Because it was a small island, the ships were not likely to be trapped on a lee shore as they lay hove to awaiting dawn.

There are three monuments on the island commemorating the first landing of Columbus (page 198). There is also a modern 400,000-candle-power light casting its beam 19 miles over the waters where Columbus thought he saw "the little wax candle."

"Columbus Been Here!"

Scholars have never been able to agree on the exact spot where Columbus "first set foot in the New World." One of the monuments overlooks a tangle of reefs on the windward side, which no sane seaman of any age would have attempted to cross; the other two are a few miles apart on the leeward beach, and probably come closer to being accurate.

My favorite memento of the visit of Columbus was offered me several years ago on a cruise to Eleuthera. We had dropped anchor in Rock Sound and were sitting in the cockpit. A man sculled out in a dinghy.

"Evening, boss," he said.

"Evening," I replied.

"Want to buy a turtle, boss?" he asked, lifting a small hawksbill.

"No, thanks," I answered.

"But dis a special turtle, boss," he insisted, holding it closer. "Look y'ere: see, it got 'C.B.H.' cut in de shell. Dat mean 'Columbus Been Here!' He must have cut it hisself!"



Marsh Dwellers of Southern Iraq

Primitive Ma'dan, Building Cathedral-like Houses of Reeds, Share a Watery Domain with Buffaloes and Wild Boars

BY WILFRED THESIGER

With Color Photographs by Gavin Maxwell

ARABS say the Garden of Eden stood at the present site of Al Qurna, a small town at the confluence of the Tigris and Euphrates Rivers. Tourists who come there from near-by Basra are shown a thorn tree, surrounded by a palisade, which they are told is the tree of knowledge of good and evil.

Recently the old tree fell down, but the townsmen, reluctant to lose such a profitable attraction, have planted another.

No Eden Now; More Water Than Land

All around Al Qurna lies a strange region few visitors ever penetrate—the marshes of southern Iraq, into which the Tigris and Euphrates overflow during spring floods (page 224). Anyone who has flown from Europe to the Persian Gulf, to India, or to the Far East has passed over this widespread marshland (map, page 211).

Just before the plane gets to Basra, passengers see below them a vast patchwork of reed beds, lagoons, and waterways. They can pick out small villages, and, if the plane is low enough, they may see water buffaloes and canoes. It all looks grim and desolate from the air, and that is about as close as most foreigners have been to it.

The main road from Basra to Baghdad runs northward through Al Qurna, up the west bank of the Tigris, along a narrow strip of dry land. The marshes stretch away on either side of the road—a waste of mud, water, and monotonous vegetation. Few people looking at it would think it a tempting or rewarding country. In winter it is cold and often damp; in summer it is terribly hot and sticky and there are clouds of mosquitoes, midges, and other insects. Yet people live here, following a way of life that I, dwelling among them,

found full of fascination and even charm. The houses the marsh people build of reeds are marvels of ingenuity and beauty.

During the winter the marshes are alive with wild fowl—a wonderland of birds. I have seen ducks flying onto rice fields at sunset in numbers which reminded me of swarms of locusts. I have watched, spell-bound, while seemingly endless skeins of geese passed overhead and the cold air rang with their calling. There are many sorts of birds—herons, coots, cormorants, pelicans, ibises, avocets, flamingos, eagles, ospreys, and falcons.

Sometimes you see a family of otters playing in a lagoon, and there are wild boars, among the largest in the world. I have counted 30 or 40 boars feeding in the open outside a reed bed. Truculent and immensely powerful, they are the marshman's bitter enemy. They destroy his crops and all too often attack and sometimes kill him while he is cutting reeds.

Spring Brings Color to Marshes

There is a tranquil beauty in the marshes, especially in springtime, when the shallow water is white with flowering ranunculuses or ablaze with vivid yellow or snow-white nymphoides. Then the marshlands look like a green meadow carpeted with daisies and buttercups (page 232).

There are also the deeper lagoons where crystal-clear water, with long weeds trailing gracefully, is blue under a blue sky, and floating islands—tangled jungles of giant reeds, sedges, and brambles—drift languidly.

And there are narrow, tortuous waterways, shut in by almost impenetrable reed beds 20 feet and more in height, where the tasseled reedtops form an ever-changing pattern against the sky as you glide along in your canoe.

Arab Marshman Scans the Iraq Horizon from a Reed Doorway

The Ma'dan, a marsh-dwelling people of southern Iraq, inhabit the vast swamps surrounding the lower Tigris and Euphrates Rivers. Feared and shunned by neighboring villagers, the marshmen roam a watery province once the refuge of rebellious slaves. Their blood includes strains of Arabian, Sumerian, Babylonian, and Persian. This Ma'di serves in the bodyguard of a landed sheik. He stands in the entrance of a *mudhif*, or guesthouse.





Marshmen Raise a Prefabricated House; Even the Scaffold Is Made of Reeds

Migratory Ma'dan take their collapsible homes with them wherever they go. These Suaid tribesmen erect a hut in summer quarters near the Iranian border. Lacking wood, they turn for building material to the giant reed *Phragmites communis*, which grows 20 feet high in the marshes. Workers here use ropes to pull together bundles of stalks set in the ground. Man on the tripod joins the tip ends with reed twine, forming arches. Split-reed mats complete walls and roof.

The marsh is a place of many moods and colors, sometimes bright and sparkling, sometimes dark and somber. You can get lashing rain or tearing gales or a damp heat that wraps itself round you like a wet towel.

But to me the real fascination of this land is the marshmen and their way of life. I have been with them now, on and off, for the past seven years. They were not easy to get to know. They are primitive and suspicious and have a bad name among the surrounding tribes. Bedouin Arabs despise them for their dubious lineage and willingly impute to them every sort of perfidy and wickedness.

Townsmen, traveling up and down the rivers, fear the marshmen, shun them, and readily believe all they hear against them. Among the British, too, their reputation is bad. This feeling is a legacy from World War I, when, from the shelter of their marshes, they murdered and looted both sides indiscriminately as opportunity offered.

Few People Know the Ma'dan

During the years of British administration in Iraq, the political officers were too busy with more important problems to concern themselves very much with the marshmen, or Ma'dan. Since then few people have had the time or inclination to travel among them. To know them properly, you must stay with them in their villages and live as they do for long periods of time. No one had done this before I went there.

In a small canoe paddled by a mainland Arab, I went into the marshes without kit or provisions to live with the Ma'dan, entirely dependent upon them for food, shelter, and transport. We paddled for two hours along narrow, twisting corridors among the reeds, passing occasional canoes piled high with cut reeds and poled by men or boys, often naked, who eyed us curiously.

At last we got to a village, a strange-looking place in the middle of a shallow lagoon sur-



rounded by reed beds. There were a couple of hundred houses, each on its own little artificial island: many buffaloes, some standing outside the houses and others submerged to their noses in the water; and an endless coming and going of marshmen in their canoes.

We headed for the nearest house. An elderly man, dressed in a long cotton shirt with a thin, curved dagger at his waist and a black-and-white checked cloth thrown over his head, hailed us and bade us welcome. It is this easy, informal hospitality that is so pleasant among tribal Arabs. You turn up



Walter Dillinger

at the house of someone you have never seen before, and he makes you welcome and gives you of the best he has, because you are a guest.

We pushed our way past some buffaloes and entered. Our host threw down a piece of carpet for us to sit on and busied himself brewing us some tea; and I mean "brewing," for he boiled it more than half an hour. The house was about 24 feet long, divided in two by a platform built from bundles of thick reeds on which were piled some tattered quilts, cushions, and pieces of clothing.

At the far end of the house were two women,

unveiled—no marshwoman wears a veil—three naked children, two buffalo calves, a dog, a cat, and some chickens. There were some cooking pots, grindstones, a large mortar and pestle, an earthenware pitcher, a sack of rice, and nothing else except a bundle of fishing spears, paddles, and punting poles.

We drank tea, black and sweet, out of small glasses, and then my Arab canoeman got up to go. Saying that he had work to do at home, he declined my host's pressing invitation to stay for a meal, stepped into his canoe, and was gone.

The food, when it came, was a large bowl of rice with sour milk poured over it, the marshmen's staple diet. Sometimes they eat fish or wild fowl, and often a coarse unleavened bread instead of rice (page 222).

We ate with our fingers, which is the custom among tribal Arabs—my host, his two sons, who had just got back from cutting reeds, and myself. The women and children finished what was left.

I spent the night with them, wrapped in one of their quilts. Luckily fleas don't worry me, but they kept me awake at first by weight

of numbers. After breakfast—three glasses of tea and a piece of bread—my hosts took me on and delivered me at the next village, where I started all over again, a stranger in a very strange land.

Naturally the people were suspicious of me and wondered what on earth I was up to. Most of the Europeans they had seen had come out from Basra to shoot on the edge of the marshes and had gone back in the evening to their own homes or to a sheik's guesthouse on the mainland. They could not understand why I should forsake the comfort of the towns



to live with them in the poverty of their villages, unless for some ulterior motive.

I had hoped at first to persuade some of them to travel with me around the marshes. They refused. Men from each village took me as far as the next and left me there. However, they got used to me in time. They found that I not only did them no harm but actually some good.

I shot the wild boar that plagued them. I doctored their sick. Slowly we became friends. Now I can count on as many paddlers as I need to take me where I wish to go and to



Watery Wastelands of Southern Iraq Serve as Home to the Rugged Ma'dan

Few peoples' lives match those of the marshmen for bitter hardship and privation. Ma'dan families earn a precarious existence from their vast refuge of endless reed beds, mud flats, and waterways at the head of the Persian Gulf. Draining of the marshes, an idea being considered by the Iraqi Government, would change a way of life that has endured for centuries.

Reed Spires and Vaulted Door Lend Cathedral Grandeur to a Mudhif

Guesthalls invariably have an odd number of arches, custom dictating the figure for each tribe. This elaborate structure with its latticed facade and tapered buttresses stands in the marsh country of the lower Euphrates River (map, above). The hall's large proportions and decorative design bespeak a well-to-do owner.



remain with me as long as I require them.

They are a genial, happy people, welcoming and friendly once they have accepted you.

English people often call the marshmen "Marsh Arabs," but I do not like the name; I am convinced that most of them are not pure Arabs but belong to earlier stock. Among the Ma'dan there is probably Sumerian, Babylonian, and Persian blood.

The Ma'dan are buffalo-owning marsh dwellers. In the same tribe, or even in the same family, living on the edge of the marshes, one man may call himself a fellah, or cultivator of the soil, another Ma'di, or marshman. The difference is not one of race but of habitat, and to some extent of occupation.

Ma'dan and fellahs both keep buffaloes, grow rice, move about in canoes, and spear fish. Among the Ma'dan the emphasis is on buffaloes. These animals are the most important things in their lives, as vital to them

as camels are to people of the desert; among the fellahs it is cultivation of the soil that matters most.

It is interesting, and I think significant, that while a Bedouin would always boast that he was a Bedouin and many Arabs proudly claim Bedouin origin, the word Ma'di outside the marshes is synonymous with "yokel." Even the marshmen boast of being Ma'dan only when they claim for themselves the technical skill proper to a marshman. I have frequently heard a Ma'di say to another marshman who was being clumsy with his canoe: "Are you a Ma'di or an Arab?"

Most of the villages are semiaquatic, but sometimes the houses are clustered together on small islands, many of them the sites of ancient villages and towns.*

* See "Ancient Mesopotamia: A Light That Did Not Fail," by E. A. Speiser, *NATIONAL GEOGRAPHIC MAGAZINE*, January, 1931.

The marshmen think there is buried treasure on most of these islands. Occasionally they unearth small statues or pots filled with ancient coins. I was given a small piece of lead sheeting that bore writing since identified as Phoenician.

All the marsh people believe in a mysterious island called *Hufaidh*, which they say is guarded by spirits who have the power to make it invisible or to cause anyone to go mad who visits it. On this island are reputed to be buried treasures, palm groves, and gardens filled with pomegranate and other fruit trees.

Flood Waters Invade Houses

In most villages the houses are built on stacks of rushes packed behind a low reed fence to form a sodden platform. This platform constantly subsides, and its level is continually being raised with new layers of rushes. During floods the water sometimes rises inside a house, and its inmates have to squat on the raised reed platform built in the middle of each house to divide the family quarters from the men's side, where guests are entertained.

Among the Ma'dan there is, however, little

Marshmen Waterproof Sturdy Canoes with Pitch from a Boiling Vat

Fishermen strain to haul their net aboard a *balam*, or heavy double-ended boat. These men are Bahbara, a net-fishing people. Marshmen fish with spears (page 239).

Wittred Threlter



if any attempt to keep the women apart from the visitors. The family side of the house is used for cooking, and for this reason visitors are invited to sit at the other end. Anyone can enter from either end and sit and talk with the women, if he wishes.

The more permanent houses are built of overlapping split-reed mats laid over five or even more parallel ribs made from bundles of reeds. Each rib is constructed by setting two long, tightly bound bundles of reeds into the ground opposite each other, the width of the house apart and inclined outward. The tops of the bundles are then pulled inward and spliced one into the other to form a horseshoe arch (page 208).

Guesthouses Always Face Mecca

Transverse bundles of reeds, some six inches in diameter, are fastened close together along the length of these ribs, and the mats are then sewed onto this framework, with sufficient overlay to ensure a treble or quadruple thickness of matting. Four thick but tapering pillars of reeds support the two end walls, which consist of alternating matting and trelliswork.

In warm weather the house ends are left open, but in cold, wet, or windy weather they are closed with mats. From this simple type of house have evolved the spacious barrel-vaulted *mudhifs*, or guesthouses, that are such a conspicuous feature of larger villages around the marshes, especially on the lower Euphrates (pages 210 and 219).

All *mudhifs* and houses are built with an odd number of arches, either 5, 7, 9, 11, 13, and occasionally 15 or more. The number of arches in a *mudhif* is fixed for each tribe and family. Its entrance always faces Mecca.

Buildings Made Entirely of Reeds

A typical *mudhif*, in which I have often stayed, consists of 11 arches and is 60 feet long, 20 feet wide, and 18 feet high, but the longest *mudhif* I have seen consisted of 21 arches and was 120 feet long. The rib of each arch is nine feet in circumference at the bottom, tapers to about two and a half feet at the top, and is made from a great number of thin reeds carefully bound together.

The inside of the *mudhif* conveys the impression of great space, so that one has the curious feeling of being inside a cathedral, an effect enhanced by the ribbed vaulting and the trellis-covered windows (page 206).

This impression is not altogether lost outside the building, where the heavy tapering columns supporting the façade break the skyline at the arched roof. These beautiful reed buildings have never ceased to amaze me.

Canoes are indispensable to the Ma'dan. Without them the marshmen would be immobile, unable in many cases to move from one end of a village to the other and quite unable to gather reeds as fodder for their buffaloes or to spear fish. They call their craft by the general term *mashuf*. There is a silver model of a canoe from Ur in the Iraq Museum, Baghdad, which closely resembles a present-day *mashuf*.

These boats are built of planks meeting flush at the seams, flat-bottomed, and coated outside with bitumen. The top half of the ribs is planked on the inside; the outer planking is carried forward and upward to form a long, thin, tapering stem, which parts the reeds as the canoe is forced through the marshes. There is a thwart about a third of the way forward, and a strengthening beam across the boat two-thirds of the way forward. Passengers always sit on the bottom of the craft, never on the thwart (page 218).

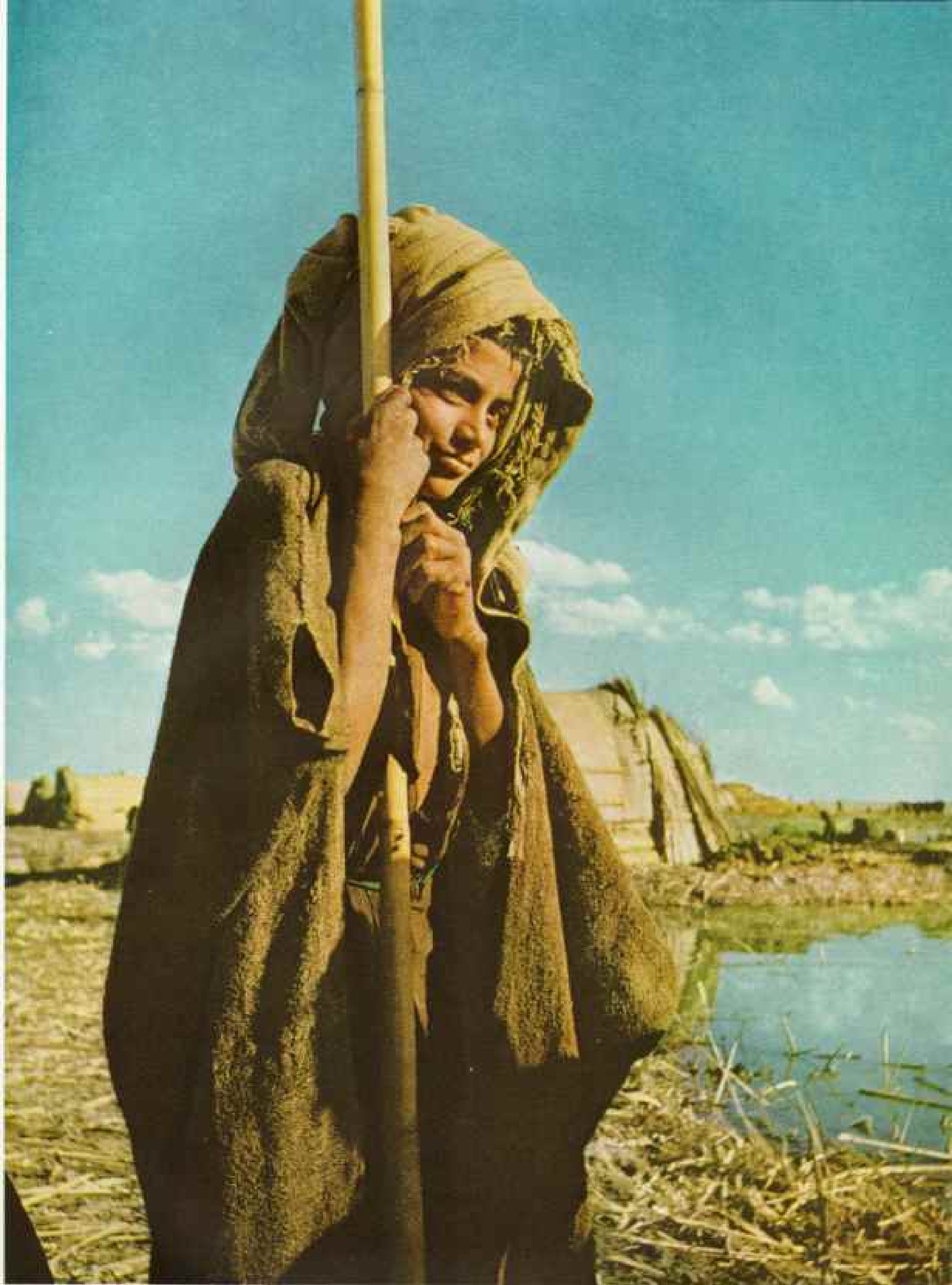
Canoemen Cover Great Distances

Taradas, which were once the war canoes of the marshes and are still used by the sheiks because of their speed and comfort, are as long as 36 feet, but only about 3½ feet across at their greatest beam. They will carry 12 people. Unlike the ordinary *mashuf*, the *taradas* have floor boards, and the inside planking is decorated with rows of iron studs two inches across (page 229).

In general the marshmen favor a broad, roomy canoe that can carry a large load of reeds. A *tarada* or a large *mashuf* usually has a crew of five, two in the bow and three in the stern, who pole or paddle in unison, first on one side and then on the other. The Ma'dan pole their canoes whenever possible, since they then travel more quickly and with less effort. They cover 50 or 60 miles in a day with ease.

Although these canoes have little freeboard, the Ma'dan move about in them freely, often jumping from them into deep water and scrambling back without swamping them. They learn to handle a canoe almost before they can walk. They are, however, afraid of venturing out upon open water in bad weather.

(Continued on page 223)



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Buffalo Herdboy, a Seminomad, Keeps Watch in the Marshes

Most Ma'dan families live in permanent settlements, growing crops and tending their water buffaloes. A few tribes like the Suidi own herds numbering hundreds of animals. This boy's family migrates once or twice a year in search of grazing lands.



Sunset Bathes Canoe-borne Hunters
Stalking a Giant Marsh Boar

Wild boars of Iraq, among the world's largest, terrorize unarmed marshmen and ravage crops. These Faraijahat tribesmen pole their craft across mirror-



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flat water toward the beast's lair, a hidden platform of reeds near open water. Wary of the boar's savage charge, hunters try to maneuver their quarry into

the water, there to be speared or shot. Two riflemen cover the boar's line of retreat. Boss-headed nails decorate the canoe's hull.



Man on Shore Tows a Canoe Upstream

Waterways threading southern Iraq's 6,000 square miles of marshland provide the Ma'dan's only link with the world. Merchant boats use the network to reach customers within the marshes. Villagers paddle out on infrequent trips to near-by towns.

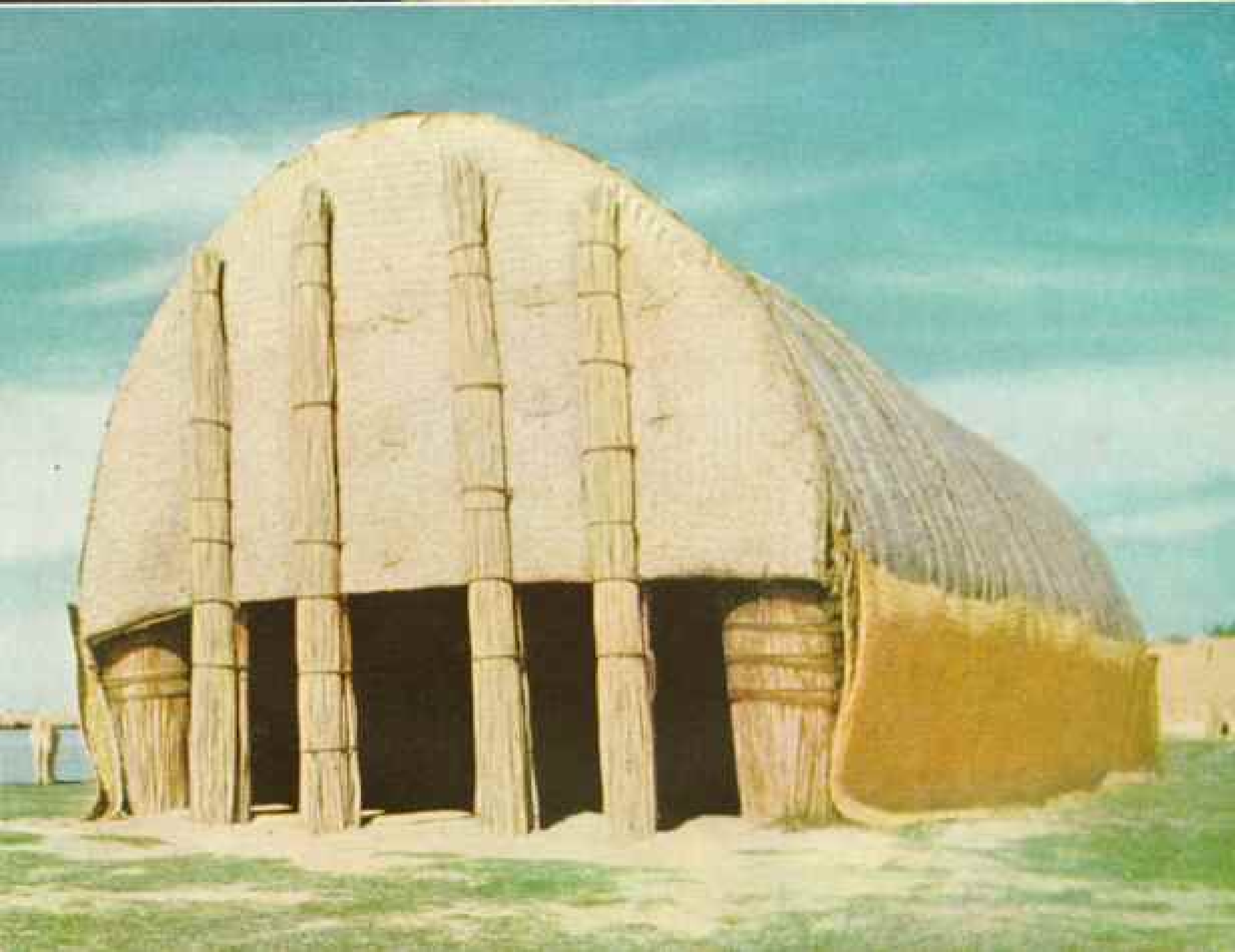
Man, rather than beast, pulls this *mashuf*, or canoe, against the current.

House of Reeds Suggests a Blimp Hangar

Ma'dan architecture, a miracle of lashed and interwoven reeds, traces its origin back some 6,000 years to the original inhabitants of the Tigris-Euphrates region.

This riverside mudhif owes its design to the simple marsh hut, a rude structure of lesser size. The finished building, a three-week project for a team of men, always faces Mecca.









Sailors Pull a Balam by a Line to the Mast

Deep-draft trading vessels, unable to reach the inner marshes except in times of flood, unload grain and cloth at mainland villages. They carry out split-reed mats, the marshmen's main cash product. Families on shore are rice cultivators.

Ma'di Smoker Puffs a Hubble-bubble

Children often begin smoking between the ages of seven and nine. This man has an improvised water pipe whose wooden chamber and coconut-shell bowl came from the mainland. Only the reed stem is a product of the marshes.

Sahaeans, members of a religious sect neither Moslem nor Christian, are distinguished from the Ma'dan by their long patriarchal beards. Rites that demand running water cause Sahaeans to shun marshes and live on riverbanks. Expert boatbuilders, they supply and repair most of the marshmen's canoes.





Once I was crossing a sheet of unprotected water about eight miles across. It was a calm, still morning when we started, but when we were halfway across we heard the wind. Had there not been a large sailing boat near by to take us aboard, we should certainly have drowned, for the water here was six to eight feet deep. Many marshmen are drowned in these sudden storms.

Nomads and Herds Move in Summer

Some marshmen are seminomads. They spend the winter in the marshes grazing large herds of buffaloes on ground exposed by the receding water. They build themselves large temporary villages, the houses clustered close together, each house with a long annex at the entrance in which the animals shelter at night.

In the summer the nomads move outside the marshes and graze their buffaloes along the riverbanks to the north. A nomad family may own 60 or more buffaloes; a few families own as many as 200.

The majority of the Ma'dan are, however, settled in villages (page 228). Some cultivate rice, others spear fish, and yet others earn a living making reed mats and selling them to merchants, who come into the marshes to collect them.

Unlike the nomads, villagers own few buffaloes. A man with a dozen would be reckoned well off, and most of them own only five or six. The buffaloes provide milk, cream, butter, and, in some villages, cheese. The dung is used for fuel. A buffalo is never slaughtered for food unless it is already sick and its owner is afraid it will die.

Buffaloes Signal Day's Beginning

Some of the Ma'dan own a few small cows. Nearly every house is guarded by a watchdog, which is usually large and savage. There are a few cats in the villages, and some chickens.

The buffaloes spend the night outside the houses, and at dawn they drop into the water with resounding splashes and swim off to their grazing grounds. Then the village comes to life. After a hurried breakfast everyone, man, woman, and child, gets into a canoe and heads off into the reeds.

Some go to collect dried reeds for fuel or

for matmaking, others to spear fish with long five-pronged spears like giant toasting forks. The tribesmen never net fish; this is done only by a low-caste people known as Barbara (page 213).

Most of the villagers go to areas in the marshes where fresh, green shoots grow in recently burned reed beds. They fill their canoes with these shoots, which serve as fodder for the buffaloes at night. A great part of their lives is spent in collecting this fodder. It is hard work, especially in the terrible sticky heat of summer, but almost worse in winter, wading about waist deep in the icy water. Yet around the reed beds there is always merriment and laughter, with voices lifted in song.

In the evenings, as the sun goes down, often blood red through the distant smoke of burning reeds, the buffaloes drift back from their grazing grounds. They scramble ponderously onto the platforms in front of the houses, water dripping from their flanks. Everyone is busy, carrying armloads of young reeds to scatter in front of the slowly ruminating buffaloes, lighting smoke fires to keep the mosquitoes off them during the night, or milking the buffalo cows into wooden pails.

Frogs Provide Background Music

It is very peaceful. The dusk deepens, and firelight flickering through the doorways is reflected redly in the still, dark water; ducks fly over high and fast, heading for their feeding grounds near by. A boy sings, his voice clear and sweet, as he paddles back toward the village. The endless chorus of the frogs grows with the passing minutes into a vibrant background of sound.

Later, when it is dark, the villagers come paddling over in their canoes and crowd into the house where I am staying. They sit drinking tea and chatting, making room for each newcomer as he arrives. I have usually spent a busy day treating their ailments and hope that now I shall be able to rest. But often news of my presence has been carried to neighboring villages. A canoe arrives outside the house and another sick person is helped into the room.

The Ma'dan suffer much from sickness as

Doughy Fingers Fashion Wheat Cakes for an Oven Made of Clay

Fish from the marshes and milk from buffaloes give the Ma'dan a wholesome diet. Unleavened bread and rice complete the list of staples. This girl kneads dough on reed trays for baking in the urn-shaped oven. Westerners find the bread coarse and pungent.



Flood on the Tigris Turns the Marshmen's Home into a Vast and Desolate Sea.



Wilfred Thayer

Like Castaways on a Desert Island, a Marooned Family Keeps Watch Behind Dikes

a result of the conditions under which they live. The Iraqi Government maintains hospitals in Basra, 'Amara, An Nasiriya, and other large towns, and dispensaries in the smaller towns near the marshes, but it is often difficult for a marshman to spare the time from tending his buffaloes or his rice to go to one of these places for treatment. Most of them have had little contact with the world outside the marshes and prefer, when they fall sick, to remain in their villages and to hope for the best.

I always carried with me a well-stocked medicine chest. Although I have no medical training, I have acquired, during 25 years of wandering in remote places, some practical knowledge of medicine and first aid. Living among the marshmen, I have sometimes been able to help them, but all too often I have been defeated by my ignorance.

Bilharziasis and dysentery are the main scourges of the marshes. Bilharziasis, caused by parasitic worms invading the blood stream,

is endemic in the area, and nearly everyone suffers from it. Dysentery is rife in both amoebic and bacillary forms.

The water around the houses is always contaminated, and this is equally the case when the Ma'dan are crowded together on an island. When fetching water, the women seldom wade out more than a few feet to fill their pots. Living among the Ma'dan, I could take no precautions, but luckily I escaped infection.

Mosquitoes, but Little Malaria

There are many other diseases from which they suffer, but there is surprisingly little malaria, despite the clouds of mosquitoes. The mosquitoes prevalent here are fortunately poor carriers of disease.

Often someone has been brought in to me who has been badly wounded by a wild boar on which he had stumbled while gathering reeds. Some fail to survive the terrible injuries inflicted by the razor-sharp tusks.

(Continued on page 235)

Buffalo Herdboys, Homeward Bound, Straddle Amphibious Mounts

Wilfred Thesiger





All illustrations by Garin Maxwell. © National Geographic Society

Water Buffalo's Fearsome Horns Serve as Handlebars for a Friend

Buffaloes, the marshman's most precious possession, dominate his economy. Only dire need can persuade him to part with his animals, the source of food, fuel, and leather. This boy and his companions live in the permanent marshes.

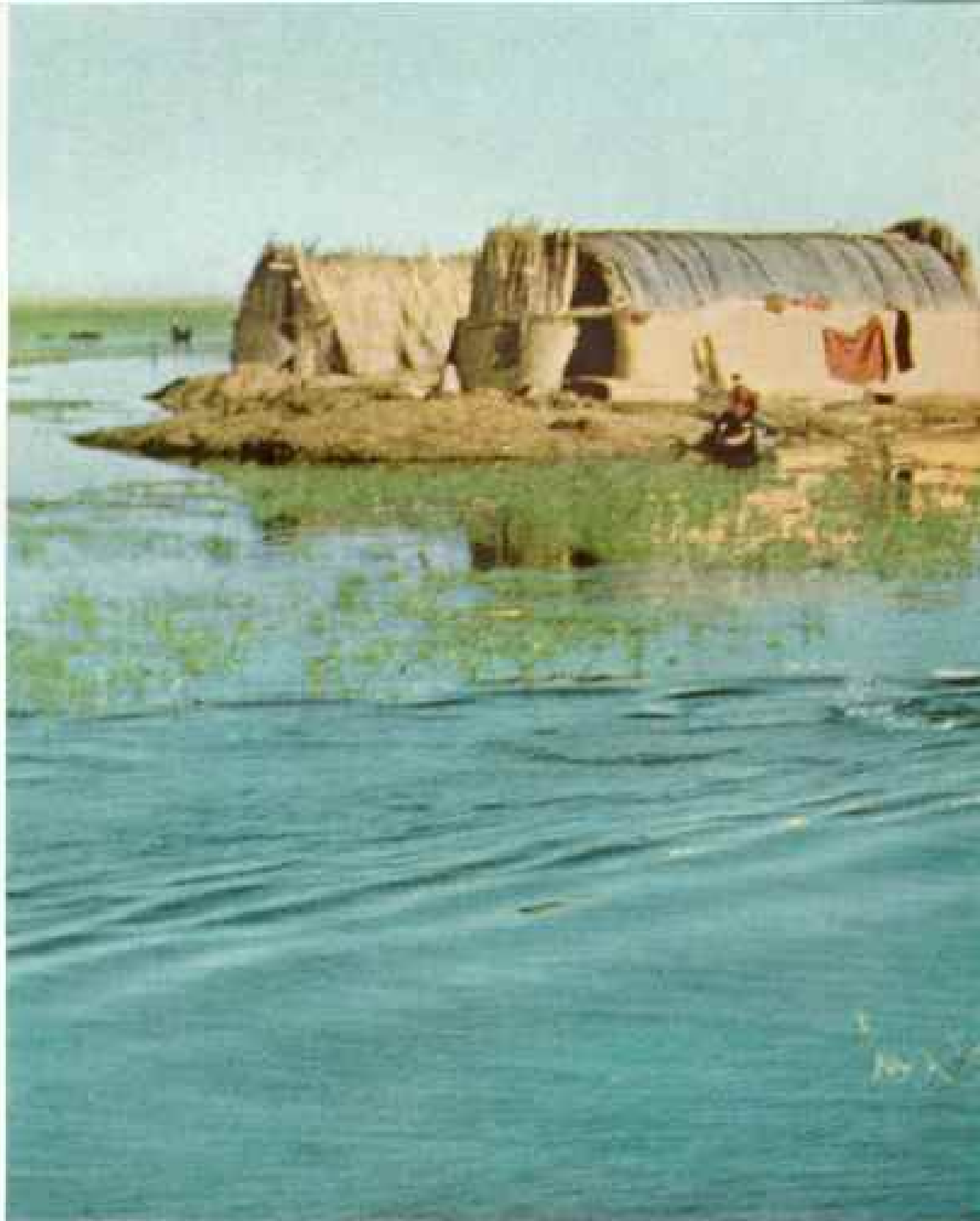
Villagers Paddle down Main Street

Few natural islands dot the inner marshes. Families construct homes on platforms of reeds, tamping down successive layers for a foundation. For security against theft, they often build houses in groups.

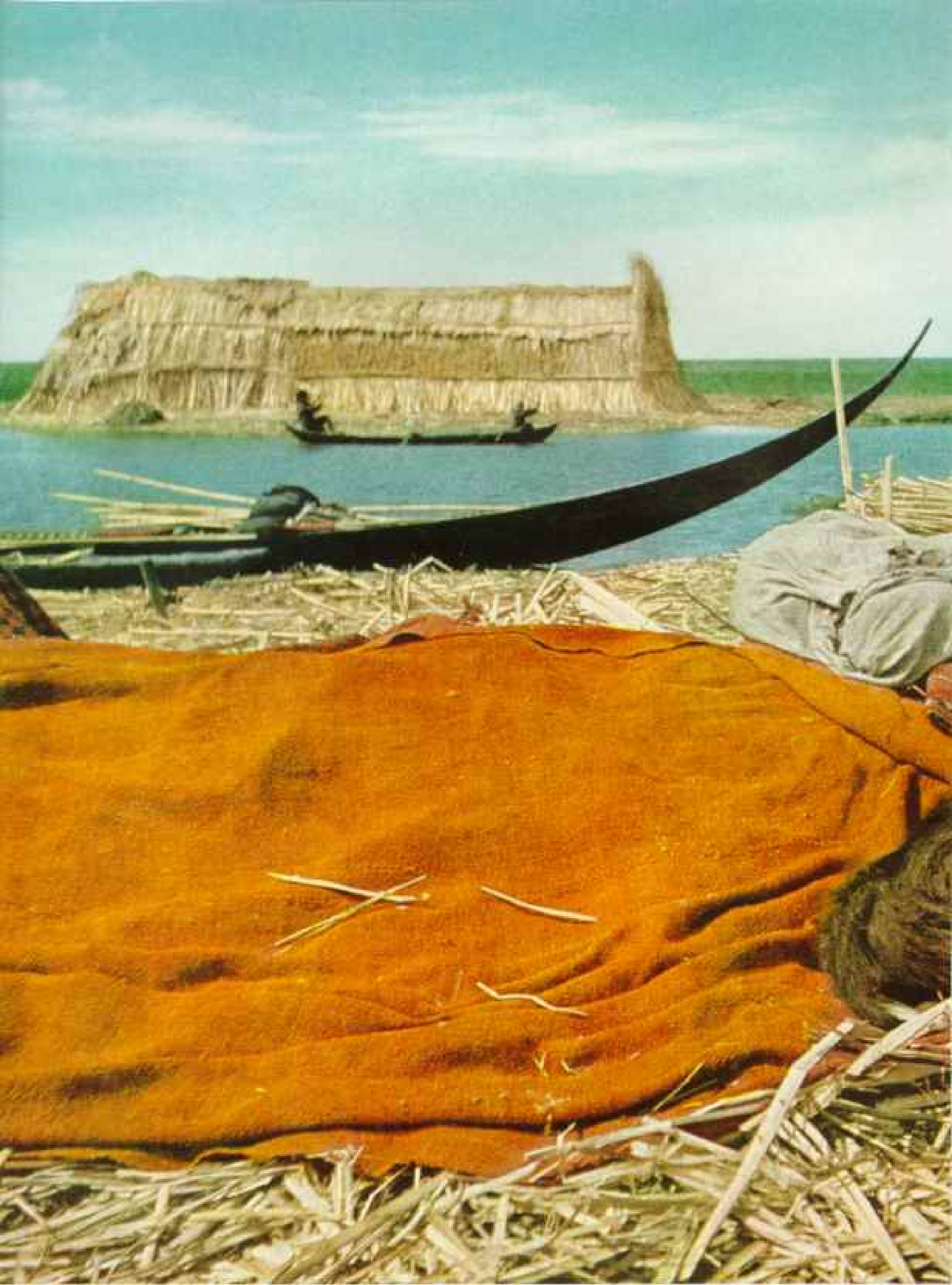
Every family owns at least one canoe. Without it, a marshman could scarcely move from one house to another.

Networks of rice fields (opposite, lower) ring the inner marshes, hampering access by boat. The author's crew here hauls the heavily loaded canoe across a dike. Marshmen call the 36-foot-long craft a *farada*, or war canoe. High, curved bowsprit pushes aside obstructing reeds.

Migratory buffalo herders build more primitive huts than settled folk. This seminomad carries his entire reed house in one boatload.







Too Young to Follow the Herd, a Buffalo Calf Dozes
Amid the Furnishings of a Ma'dan Home



© National Geographic Society

Few possessions complicate life for the marshman. Tools may include fishing spear, reed-cutting knife, and grindstone. Most textiles come from the outside; the figured rug was woven by a neighboring tribe. This boy, whose chores include cutting reeds and tending livestock, mounts guard over his family's newest acquisition. A tarada lies beached near by. Buffalo dung for fuel dries on the house wall.



Back Yard Serves as a Family Wharf

Few people are as dependent on boats as the marshmen. Children, reared in a world completely isolated by water, learn to paddle a canoe almost before they can walk. Adults often cover 50 or 60 miles in a day. This man and his children stand on a platform used by buffaloes at night.

Boatmen Glide Through a Sea of Buttercups

Spring in the marshes lasts only a month. Water flowers bloom overnight, painting coves and channels with sudden color. These men push through a floating meadow of white water buttercups (*Ranunculus aquatilis*).





Ma'dan women disdain the veil, a Moslem custom based on tradition rather than religion. Wives go unveiled, even in the presence of strangers and on visits to mainland towns, where custom is more rigid. They are rarely secluded.

Marsh women served until recently as compensation for lives taken in feuds. The tribe of a slain man often demanded women from the clan of the murderer.

Mother and son belong to the Farajahat tribe.





© National Geographic Society

Gay headdresses brighten the costumes of these eastern tribesmen, who favor livelier colors than their neighbors to the west. The boys relax on a garish rug, a modern product of mainland bazaars. Arabs call the cross-wrapped headcloth a kaffiyeh.

Precious wood supports a water tank, the customary Ma'dan drinking urn; its contents cool by evaporation. Marshmen, lacking sticks and lumber, adapt the giant reed to many of the functions of wood. These boys wear Western-style jackets.

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All marshmen enjoy singing and dancing. Frequently in the evening, after we have dined, someone starts to sing. A boy is sent off round the village to collect drums and tambourines. As these are warmed up at the fire to tighten the skins, and then tried out to test their tone, more men and boys come crowding into an already overcrowded room. No one minds if the floor has sunk and half of them are sitting in water.

News of Dance Spreads Quickly

Soon the whole village knows that there is going to be a dance at this house. More men and boys arrive. The house is surrounded by empty canoes, and latecomers, who cannot squeeze in, sit outside in their *mashufs*.

Most of the marshmen join in the singing. They keep time to the music by beating the ground with the heel of one foot and clicking their two index fingers together, which makes a surprisingly loud noise.

There are usually two or three people

pounding drums, while several others are beating a rhythmic jingle on tambourines. The drums are made of clay, shaped like vases, about 18 inches long and 8 inches across at the wider ends, and covered with skin. They are played by tapping on them with the fingers.

Boys are encouraged to get up and dance, either singly or two or three together, in the small space left in the center of the room. Their dancing varies a certain amount, since each boy develops his own distinctive style, but the broad pattern is uniform.

Most of the young men and boys, some of them quite small children, can dance, and the most virile of the lads is usually the most skillful. They enjoy dancing as they enjoy singing, but they would bitterly resent being called dancers, since this word is usually applied only to professional dancing boys.

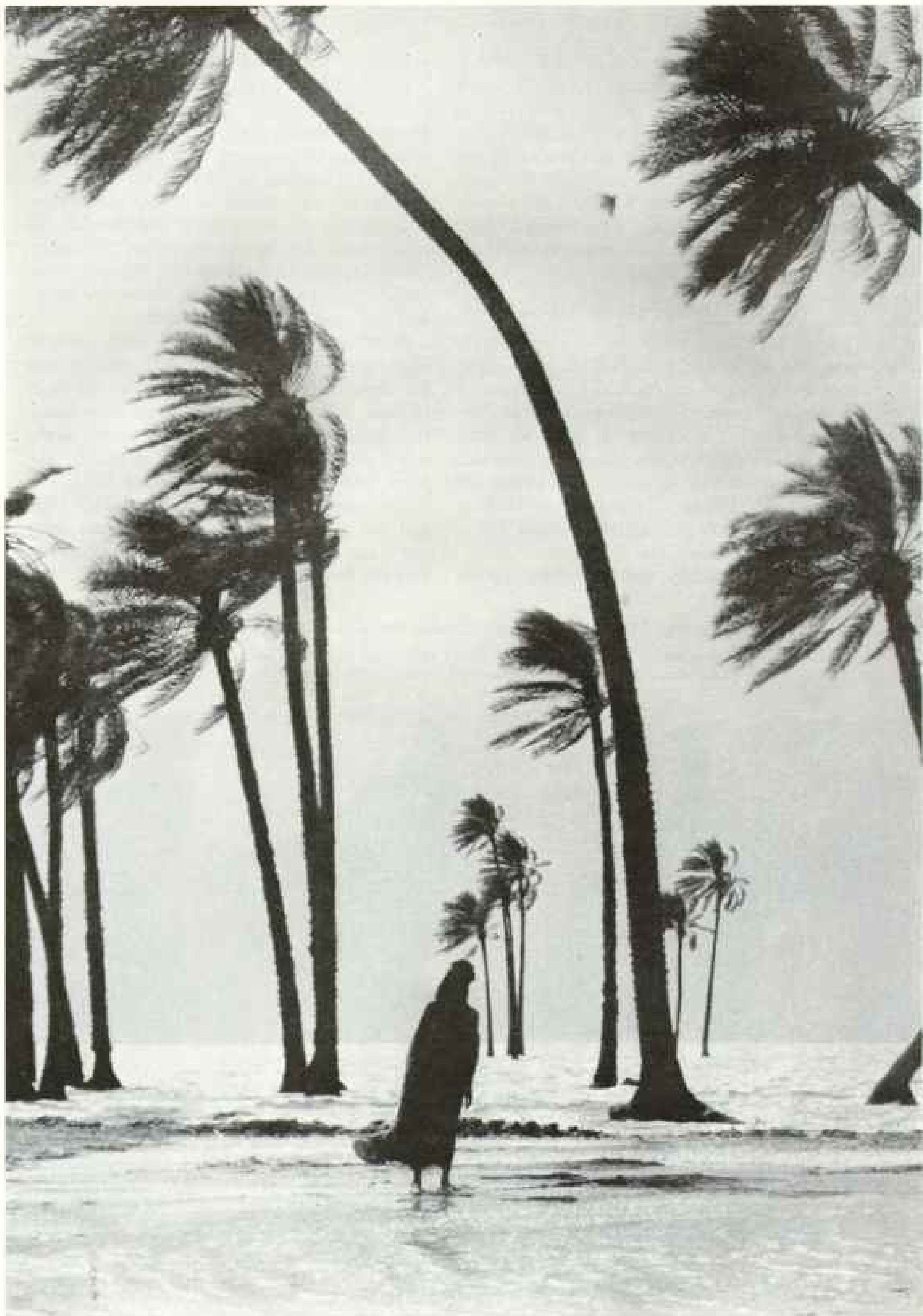
The dances performed by the village boys and the professional dancing boys are very much the same, but the villagers do it for fun and the dancing boys for pay.

Snarling Marsh Dogs Fight Under the Eyes of Anxious Backers

Sport-loving Ma'dan find time for an occasional hunt or a dogfight. Villagers, valuing the animals as watchdogs, stop the fight before either contestant gains a crippling advantage.

Wilfred Thesiger







Wilfred Thesiger

Flood Waters, Relentlessly Driven by the Wind, Turn Desert into Lake

Cargo Handler Guards a Stack of Reed Mats Stored for Export

Families sell the matting to itinerant merchants. The man holds five-pronged fishing spears.

Most of the professional entertainers live in villages and towns outside the marshes. They travel about the country to perform at important weddings and other festivities. When dancing, they use castanets, which the villagers do not.

New songs are frequently composed and sung by the Ma'dan. A song that was wildly popular a couple of months ago, sung by everybody at marriage festivals or as they paddled their canoes, cut reeds, or sat in their houses in the evening, will go out of fashion and be replaced by another.

A marriage among the marsh people is always the occasion for great festivity. If the bride belongs to another village, friends of the bridegroom set out in the morning in their canoes to fetch her. The bridegroom himself never accompanies them but remains behind in his house.

The greater part of the day is spent at the bride's village in feasting and dancing. Toward evening everyone collects at the bride's house, where they dance the *hausu*, or war dance. A man sings a couple of lines, which the others repeat in chorus as they stamp in a circle, brandishing weapons and firing rifles.

Three Buffaloes for a Bride

The young woman is then placed in a canoe with the carpets, cushions, quilts, chests, and a few provisions that her father has presented to her as her dowry.

For his bride a man normally pays her father the equivalent of three buffaloes. The father spends as much or as little as he likes of this money on furnishings for his daughter to take with her to her new home. An important man might easily give his daughter clothes and household goods in excess of the value he had received as the bride's price.

The bride is accompanied to her new village not only by the party that has come to fetch her but also by friends from her own village. They stop in every village through which they pass to dance the *hausu*. The rejoicing reaches its climax as they approach the bridegroom's home.

On one occasion I attended the wedding of an orphaned boy called Dakhil. He had disposed of almost everything he possessed



in order to pay the bride price, for he was passionately in love with the girl and determined to marry her. He did not even own a house of his own. He erected a small red mosquito net at the end of a cousin's house as his bridal chamber. Earlier Dakhil had spent the day lengthening the house with two more arches.

Since he belonged to a different tribe from that of the rest of the village, it seemed likely that his marriage would be a small affair. He was, however, an old friend of mine. He had for a while been one of my canoe boys. I therefore turned up at his marriage with a party. We fired off a considerable number of rifle shots while we fetched the bride. This



Wilfred Thesiger

firing attracted marshmen from several surrounding villages, and the marriage became, for Dakhil's village at any rate, the event of the year.

In the evening the house was packed to suffocation, and many people had to sit outside in their canoes; inside, the singing and dancing were continuous. At midnight I left, thinking that Dakhil would be glad if the party broke up.

When I saw the bridegroom in the morning, he was a bedraggled sight. His headrope was missing and his new shirt was sadly torn.

Dakhil's friends, who had remained behind in the house, laughingly maintained that his bride had thrown him out of the house into

the water, a charge he indignantly denied. He never did explain his disarray.

In the seven years, off and on, that I have lived among the marsh people, they have given me the freedom of the marshes and of their homes. Naturally they were suspicious at first, but even in those early days they were never inhospitable, never made me feel unwelcome when I entered a house.

There are few corners of the marshland where I have not been and few villages in which I have not lived. I was alone among the people, except for brief periods when occasional Englishmen traveled with me, but I was never lonely. In the marshes I found friendship and peace.

Arizona's Window on Wildlife

Near Tucson's Desert Museum a Small Water Hole Lures Wild Animals
Within 10 Feet of Human Watchers and Their Cameras

BY LEWIS WAYNE WALKER

With Photographs by the Author

FROM inside the blind our eyes, alert for the slightest movement, scan the desert night. We peer across a tiny pool toward the gaunt, eerie silhouettes of saguaro cactus limned against the Arizona sky. All is quiet.

Suddenly there is a crunch of footsteps on the coarse sand. Someone sucks in his breath as a family of deer appears—buck, doe, and thin-legged fawn. My finger creeps slowly toward the firing mechanism.

Cautiously the deer pick their way toward the water hole. They approach to within 20 feet of us . . . 15 . . . 10! I can almost touch them as they bend to drink. Sighting carefully, I press the button.

The night erupts in a brilliant flash of light as four cameras register simultaneously. The deer blink and bolt into the darkness. Inside we silently ready our cameras for the next close-up.

This exciting nocturnal hunt is a common event at the Wildlife Blind of Tucson's Arizona-Sonora Desert Museum. For during the dry months—April, May, June, and October, November, and part of December—thirsty denizens of Tucson Mountain Park's 30,000-acre sanctuary converge on the water hole by hundreds. There, just 15 miles west of the city, visitors to the blind can see and photograph wild animals at incredibly close range.

Leaking Pipe First Lured Wildlife

Dedicated to exhibiting the colorful flora and fauna of the great Sonoran Desert—a region so arid that many people believe it virtually devoid of life—the museum has built a reputation for originality in wildlife display.

Its star attraction, the popular Wildlife Blind, was conceived only four years ago, when museum officials discovered a multitude of tracks around a leaking water pipe near an old corral.

The imprints had been left by an amazing variety of wild animals. Dry-season evaporation of natural seeps, their normal source of

water, was driving them to slake their thirst at the pipe.

We of the museum staff immediately envisioned the limitless possibilities for nature education if we could influence the animals' comings and goings. So we added 40 feet of pipe to the leaking joint. This carried the water to a small pool under the arm of a grotesque saguaro.

The pool lay at the bottom of a shallow, boulder-strewn ravine, where flash floods had lodged masses of uprooted brush. Some of the brush piles were large enough to conceal an observer, and from these vantage points we tested our idea.

Desert Animals Fail to Smell Water

The first fruits of our observation were frustration and amazement. Much has been said and written about the alleged ability of animals to smell water, and numerous pawed spots in dry stream beds are cited as proof. But when the museum extended the pipeline by a mere 40 feet from the accustomed drinking spot, the desert creatures were completely baffled.

We watched incredulously as whole herds passed within 15 feet of the new water hole without detecting it. Going to the old site, they would stand bewildered, tongues hanging out. When this pattern repeated itself for three days, we began to fear that the animals' lack of wit would doom the project at the outset. But, happily, one deer finally blundered upon the pool and led the others to it.

Our discovery that the deer would drink almost within reach of their most feared enemy, man, gave rise to the idea of the Wildlife Blind. Simple in design, it rests on a firm cement foundation and contains four windows for cameras (page 246). Carpet covers the floor and walls to ensure quiet.

The exterior often resembles an electrical engineer's fantasy. Flashbulb reflectors cover every square foot, and wires crisscross in crazy cobwebs connecting them to switches inside the blind.



Mule Deer, Alert for Danger, Pay a Cautious Call at the Water Hole

To simplify the problems of focus, we restricted the water hole itself to a diameter of some three feet. The faint rays of a 15-watt spotlight illuminate the water. This light enables observers to see even on the darkest nights, and, by glaring in the eyes of approaching animals, it prevents their discerning any movement in the blind's dark interior.

At first some of us thought that the spotlight would frighten away the shy creatures we were trying to attract. But within a few days the animals accepted it as a normal

part of the desert environment. Now, when bulbs burn out, we find that the unaccustomed darkness unnerves them.

Light Bulb Traps Toad's Dinner

The light has also become the ally of a seven-inch Colorado River toad that took up residence near the pond a year ago. Each evening, soon after dusk, he scrambles out of a rock pile and flops into the water. After half an hour's soak he finds a comfortable perch below the spotlight. As night falls, moths and bugs hurl themselves at the light, hit the reflector, and drop to the ground, where the shrewd toad languidly gobbles them.

Occasionally he forsakes his post and returns to the water—despite the fact that deer, peccaries, or other animals may be drinking. During his bumpy progress toward the pool, the hoofed creatures watch him with curiosity. But the moment he splashes into the water their bravado vanishes in abrupt terror.

For when the toad sits half submerged, with head and bulbous eyes protruding, he is monarch of the water hole (page 245). Deer, cowed by that baleful glare, crowd the farthest edge. Even the short-tempered, ferocious peccaries, or javelinas—native wild pigs of the border States—never attempt to use their tusks on this amphibian.

Deer vs. Snake

Observation from the blind has definitely laid to rest the widely held belief that deer kill rattlesnakes on sight. About a year ago Museum Director William H. Woodin set up an experiment to test this belief. Milking

A lean doe minces toward the pool, where the author's wife sits motionless. Weeks of safe drinking have lessened the creature's fear of humans.



a diamondback to deplete its venom supply, he tied a thread noose to its first rattle and tethered it at the water hole edge. Then we settled down to see what would happen.

The first doe appeared shortly after sunset. With dainty steps she advanced to within three feet of the water before the rattler buzzed a warning. The deer swung her ears forward and sniffed within a foot of the tethered snake. When the reptile's head raised to a striking position, she backed up only slightly. Not only did she show no hostility toward the snake, but remarkably little fear.

In the course of the night more than a score of thirsty deer ventured within striking distance of the rattler. It actually buried its fangs harmlessly in two of them; but after a moment of fright, they returned to the water without a trace of antagonism.

Four similar experiments, spaced quarterly over a calendar year, have since confirmed our initial findings. Not even a buck in rutting season or a doe with fawn ever threatened the lethal reptiles (page 247).

Peccaries Rule the Desert

Months of observation have taught us the chain of command among the different species of visiting animals, and even within the same species. As demonstrated by the one-sided truce between the deer and rattlesnakes, neither size nor brawn is the deciding factor. In fact the peccaries, whose razor tusks and sharp hoofs make them masters of desert wild-life, rarely exceed 55 pounds (page 248).

When peccaries approach the water hole, deer disappear with nervous haste. This often happens many minutes before the pigs actually arrive. When they come in large herds, the peccaries crash through the brush with brazen assurance; one can hear them a hundred yards away. But smaller bands usually slip noiselessly up to the water hole; frequently they stand quietly in the shadows, reconnoitering before coming in to drink.

Newborn young, usually tiny reddish-colored twins, visit the water hole walking under the bellies of their belligerent mothers. Strangely, the babies boss their elders, and even battle-scarred old boars accede to their whims. Once at the pool, the youngsters crowd toward the edge. If an adult pig fails to give ground, they squeal in shrill rage and sink their tiny milk teeth into his ankle. Meanwhile the mother backs her infants with gnashing tusks and unfriendly grunts.



Hooded skunk uses his formidable weapon to intimidate fellow predators. Should they approach while he drinks, he raises his plumed tail and holds it vertically above the back; other animals step aside in respect for his chemical armament (page 247). Several species of skunk visit the water hole.

Black-tailed jack rabbit seldom calls at the pond; he regards water as a luxury, not a necessity; moisture from succulent plants quenches his thirst. The slightest disturbance flushes this lanky sprinter.

Marcia H. Frost (Dallas)





Sparrow Hawk Feeds on a Mouse in a Cactus Crown

The Arizona desert plays host to a large and varied bird population. Some are permanent residents; others are transients that spend only the winter months or merely pass through in spring and fall. Year-round dwellers must endure scorching summer heat with little or no water.

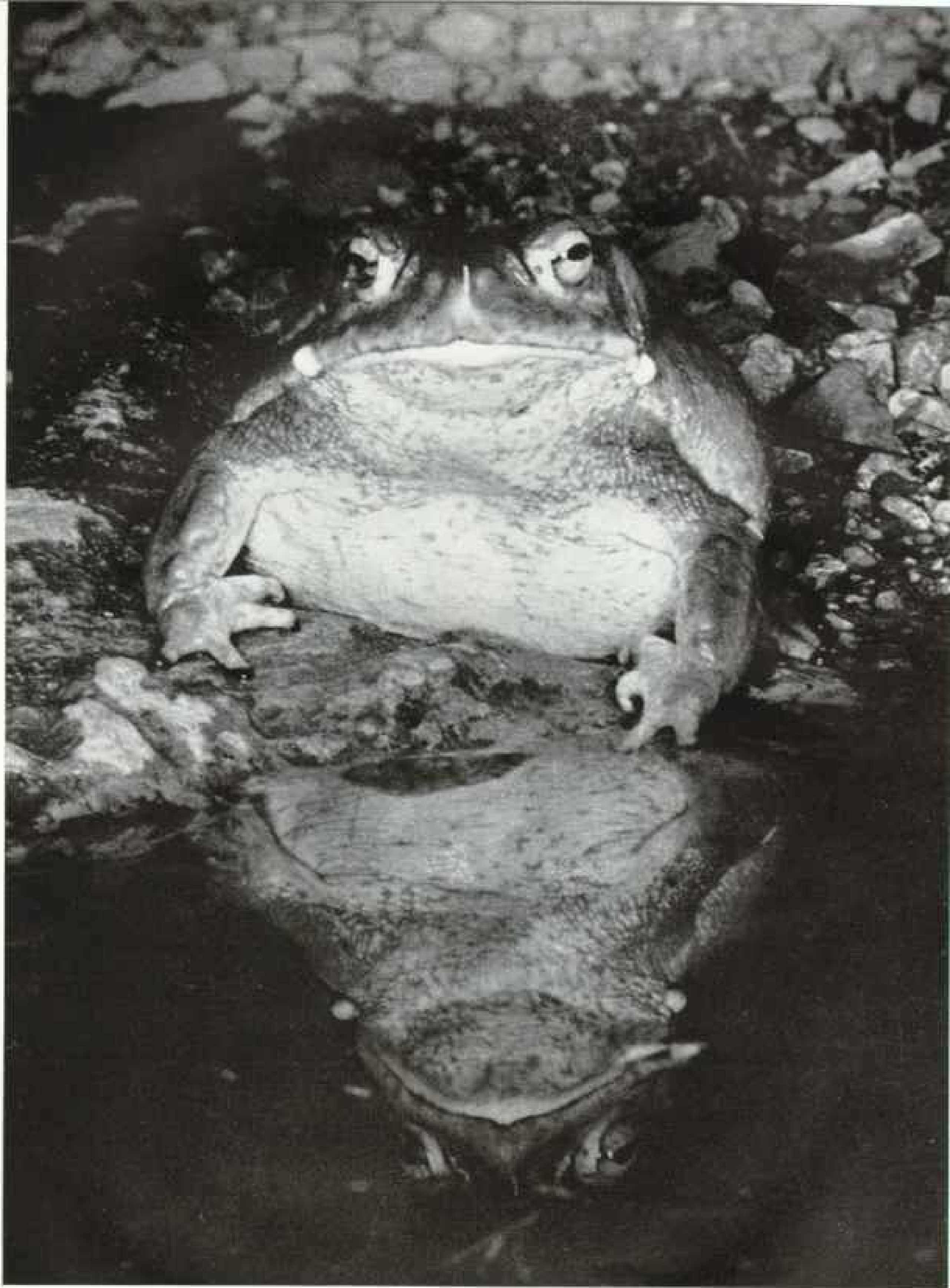
Sparrow hawks, most common of the desert falcons, nest in holes drilled by woodpeckers in cactus trunks. These handsome, robin-sized birds of prey have pointed wings and reddish tails.

Wood Rat Finds Her Baby Abducted from the Nest

The wood rat's gentle disposition and cleanly habits set it apart from the house rat. About a foot long, including the six-inch tail, the buff-colored creature is also known as trade rat. It often carries objects in the mouth and swaps them for more tempting items encountered in its travels.

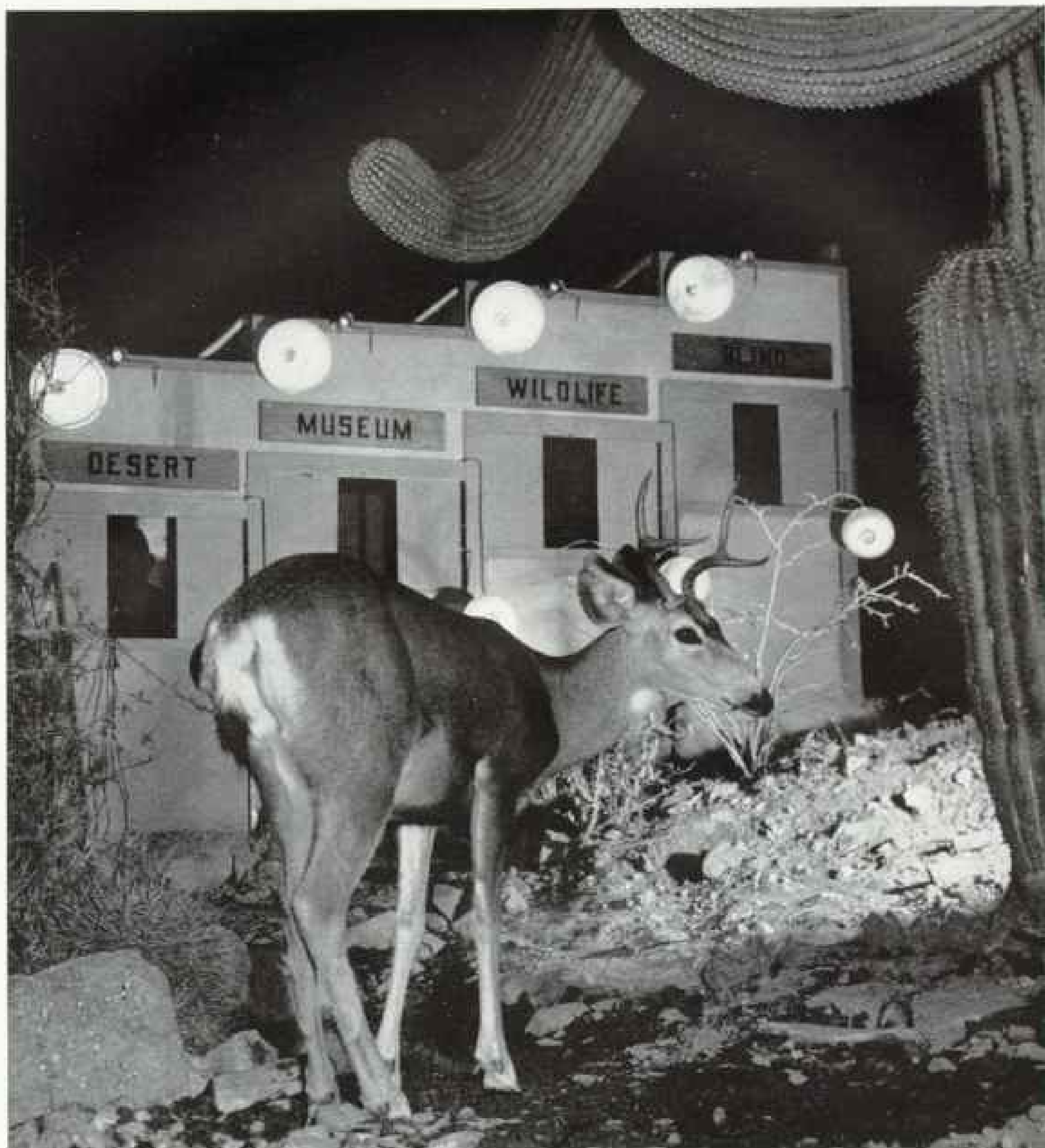
The wood rat builds moundlike nests of dried cactus joints and chewed prickly-pear pads. To entice this mother within camera range, the photographer removed the baby from the nest. The parent quickly seized her offspring and hustled it back into the mound.





Mr. Toad, Boss of the Water Hole, Glowers at Intruders

This giant Colorado River toad sleeps by day in a rock pile near by. Nights he spends at the pond, gorging on insects attracted by the poolside spotlight and occasionally soaking in the cool water (page 242). Other animals give the popeyed trencherman a wide berth. A moment after this picture was made, he plopped in and threw a miniature tidal wave against the shore. 245



Thirsty Buck Blinks in Surprise as Flashbulbs Light Up the Desert

Animals usually bolt when the flash shatters the blackness, but they return within minutes. Four cameramen can work simultaneously behind the windows. A new blind equipped with electronic flash has recently been installed in the rock-strewn gully. Drooping arms of a saguaro cactus 30 feet high and more than 150 years old frame the pool.

The Tucson Mountain preserve affords complete protection for everything that lives there. As a result, bobcats, foxes, and other predators are allowed to hunt unmolested. Among other benefits, this serves to maintain nature's delicate balance and prevents squirrels and other small rodents from increasing to plague proportions.

Our water hole, however, failed to attract the meat eaters. The moisture content of their raw-meat diet enables them to go without water for months at a time. Therefore a visit to the blind was a risky luxury rather than a dire necessity.

We eventually evolved a method of luring them within photographic range by wedging

a container of frozen horse meat into a cement hole just outside the blind. As the thawing process doles out the food, skunks, foxes, bobcats, and badgers close in. Price of the meal: one portrait.

Among the predators the skunks hold a supremacy of sorts. While they possess a formidable weapon, they seem to realize that it is exhaustible and should be used only in emergency. When other animals approach, a skunk will raise his plumed tail and hold it vertically above the back (page 245).

As a rule this pose discourages undue familiarity. Sometimes, however, a peccary or a deer will disregard the warning. Then the skunk bows his body sideways and literally aims with both barrels; at the same time he taps his front feet in a rapid dance and makes short forward charges.

But if all this fails to daunt an approaching animal, the skunk—at least the ones I have observed—holds his fire and philosophically disappears into the darkness, to return when the water hole has been vacated.*

Battle of Skunks

One memorable night in late June those of us at the blind played grudging hosts to a brace of these four-legged fumigators. Because of the heat, we had left the door ajar. Shortly after dark two hostile skunks met at the meat dispenser and took up battle stations.

Standing side by side but facing in opposite directions, they leaned against each other and went into a tight pinwheel circle. Whenever one relaxed pressure, even for a fraction of a second, the other bit him savagely. Their squeals drowned out the noise of approaching peccaries. But when the skunks finally did see the pigs, they broke for the

darkest spot in sight—the open door of our blind!

Four of us sat in petrified horror as the skunks brushed by our legs to resume their battle at the far end of the shelter. We remained rigid, realizing that any movement might cause the enraged skunks to open fire.

Minutes ticked by with agonizing slowness; vaguely I wondered if I would have to bury my clothes after a barrage. But salvation came suddenly when one skunk, apparently convinced the fight was lost, scampered through the open door with the other in close pursuit. Four loud sighs of relief caused the

*See "Skunks Want Peace—or Else!" by Melvin R. Ellis, NATIONAL GEOGRAPHIC MAGAZINE, August, 1955.

Deer do not always kill rattlers on sight, experiments at the museum showed. Scientists milked the poison from reptiles and tethered them at the water hole with threads tied to the base of the rattles. Deer made no attempt to trample the snakes (page 243). This doe ignores the wriggling diamond-back as she drinks her fill.

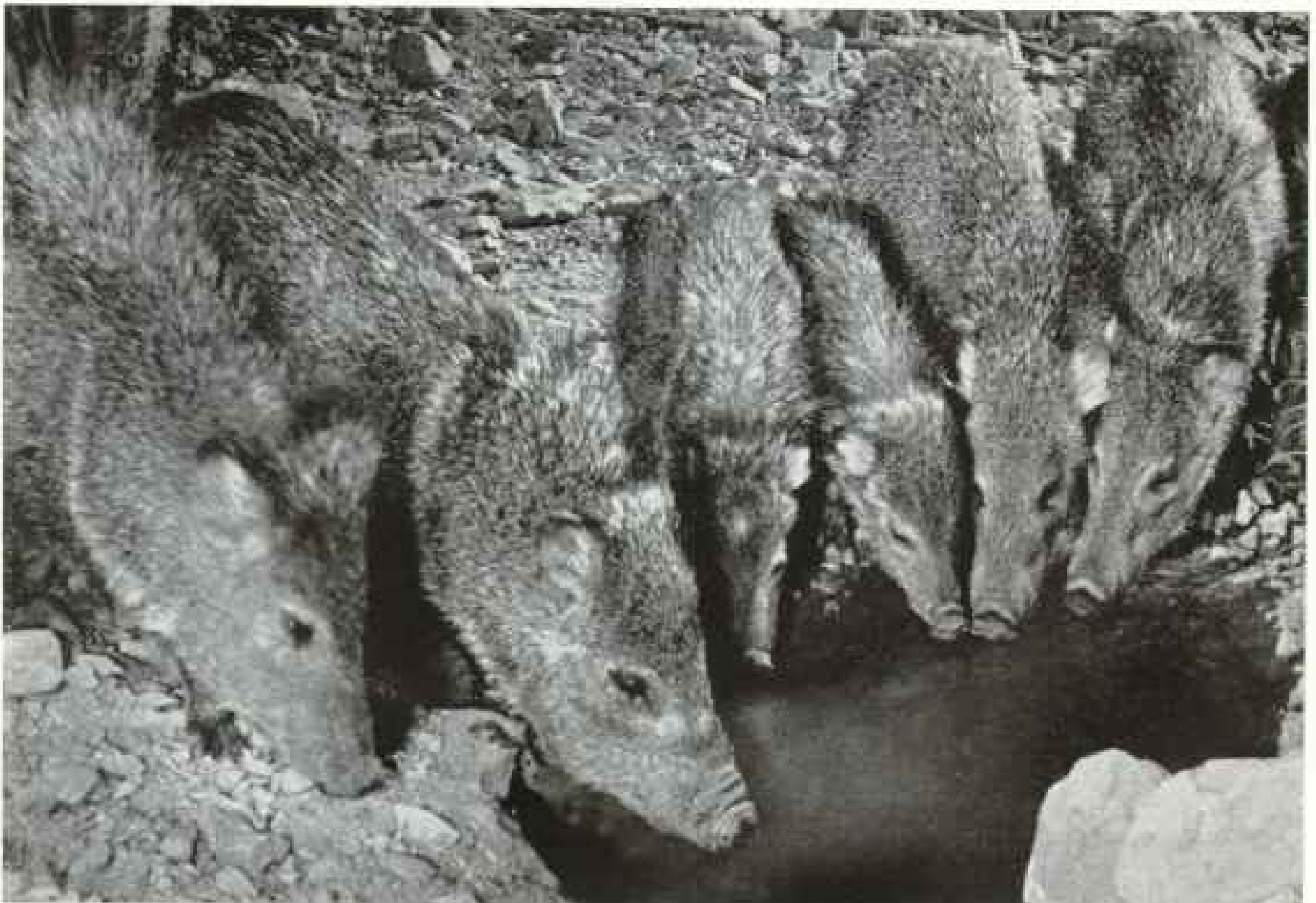




Desert gray fox, furtive as a thief on the run, scans every tree, bush, and rock on the approach to the water hole. The sly, graceful creature ventures abroad mostly at night. If drinking deer try to chase him away, he eludes their hoots with tantalizing ease.

Peccaries, also called javelinas, travel in bands of 4 to 50. These wild pigs instill fear in all other desert animals, even bluffing skunks into reluctant retreat. Razor tusks and hoofs can inflict deep wounds. The creatures eat anything from cactus fruit to snakes.

Marvin E. Frost (Illus.)



peccaries at the water hole to raise their heads.

A typical night's viewing commences at sunset. Quail, thrashers, wrens, and doves flit among the bushes, trying to steal a last drink. Rabbits and ground squirrels dart out for a hasty sip and then disappear for the night.

Crunching gravel signals the approach of the larger animals. Strangely, buck fever seems more prevalent behind a camera than behind a gun, and most first-nighters remain rigid until fatigue brings relaxation. I've often had to whisper an unheeded "Now! Now!" as a visitor froze with his finger on the flash-firing button.

After the first sound of a displaced pebble, we hear other animals moving in through the darkness. Eventually one more venturesome than the rest peers through the foliage. Our first view of the animal—a deer—is the light-colored hair of its legs as it advances silently into the circle of light. We freeze into motionless attention; whole minutes pass without a muscle twitching, either in subject or in photographers.

Finally the deer decides there is no danger. Either carefully or carelessly—depending upon the individual—it moves to the water hole and starts to drink noisily.

Doe Shoulders Own Fawn Aside

At the deer's first sip we set the camera shutters so that they will remain open until and during flash exposure. The slurp of the water also seems to reassure other hidden creatures; animals now approach from all directions. Family groups are generally amicable, but courtesy is conspicuously absent. For example, if there is room for only one more drinker, a thirsty doe will shoulder her own fawn aside.

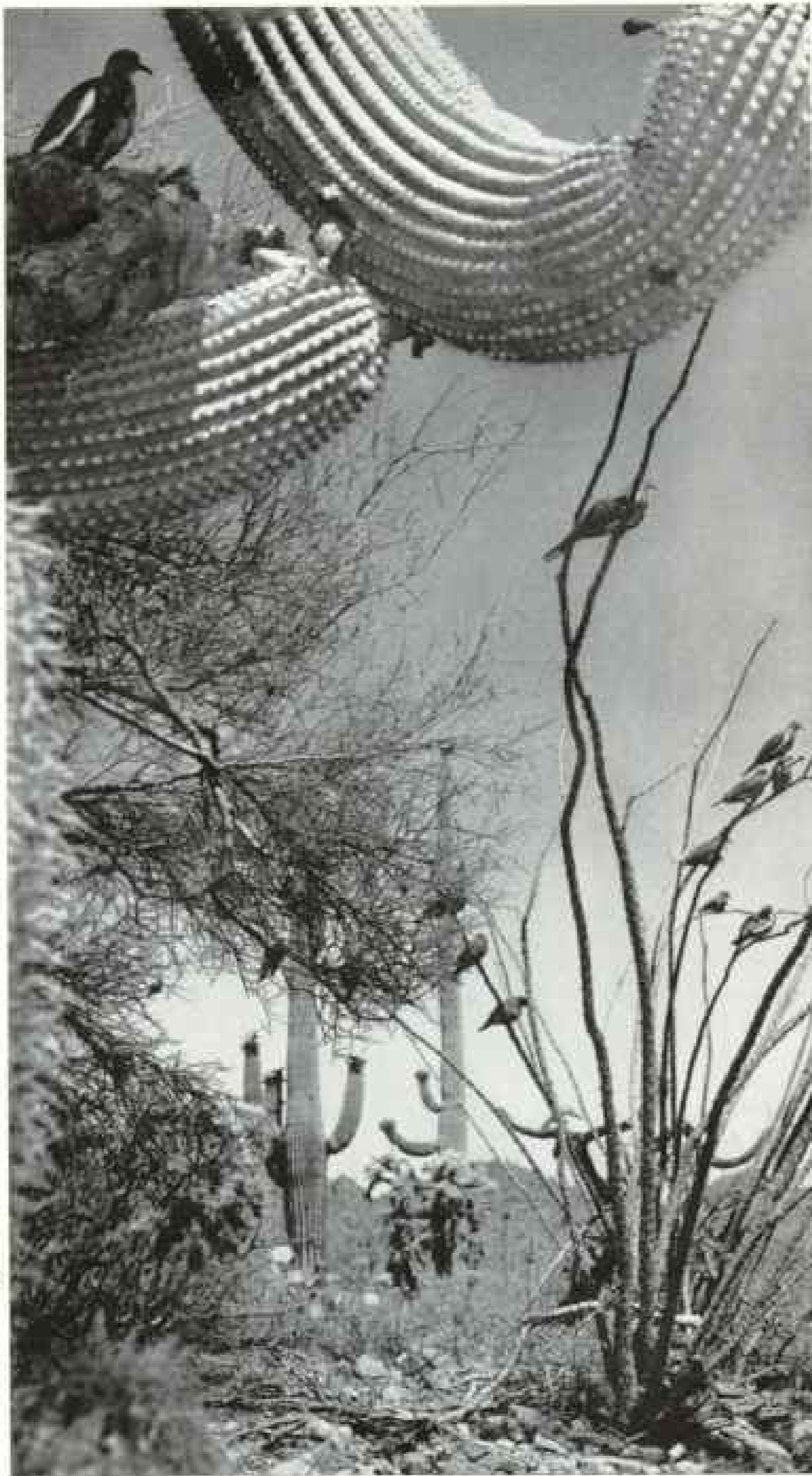
Battles are frequent. While full-grown deer always defeat fawns or yearlings, the buck that picks a fight with a doe is foredoomed. Through some instinctive politeness, the bucks never use their antlers in these mixed fights. Slashing front hoofs are the only weapons, and the doe always prevails.

As more and more animals appear, those of us inside the blind become



Scared Cottontail Casts a Quivering Image

Favored prey of horned owls and other flesh eaters, cottontail rabbits visit the water hole only at dusk or dawn, when predators usually sleep. This desert dweller is almost identical to its eastern and northern cousins.



White-winged Doves Await Their Turn at the Pond

Gathering for a last sip before nightfall, the birds perch on ocotillo (right), saguaro, and the limbs of a palo verde, the State tree of Arizona.

tense with expectancy. My neighbor, nervously fingering his camera, keeps whispering: "Not yet. Not yet. More are coming." Finally someone presses the button and the flash of four bulbs creates a light as bright as that of the desert sun.

Almost anything can happen in the next fraction of a second. On one unforgettable evening a terrified deer cleared the pool in a single bound; only the sturdy frame of the window kept him from following his head and joining the startled photographers.

After still another flash, we heard the sound of breaking brush from a near-by jojoba bush. We found a fawn suspended in the branches; even though all four feet were clear of the ground, they continued to churn in a running motion.

The scare is always short lived, however, and the animals return within a few minutes.

Actually this fright reaction is caused by the click of shutters closing—which sounds almost like a breaking twig—and not by the noiseless flash of bulbs. We have found that the click alone will invariably cause the deer to bolt, while they often stand their ground when only the bulbs are fired.

There is no logical pattern to this sensitivity to noise. If the animals hear human voices during their approach, they will stampede madly. But once they start to drink, they will often continue while people converse loudly only 10 feet away.

As the night wears on, the pattern recurs over and over, until every photographer is satisfied. Then we pack up our cameras and head back to-

ward the lights of Tucson that glow distantly on the horizon.

But with us we take a sense of wonder. For the Wildlife Blind has worked its special magic on us, transforming hunters into photographers and laymen into naturalists.

Huntington Library, California Treasure House

A Railroad Magnate's Priceless Gift to Posterity Includes Rarities
Ranging from Cactus Plants to Medieval Manuscripts

BY DAVID S. BOYER

National Geographic Magazine Staff

With Photographs by the Author

THE ELEVATOR stopped at the sub-basement, and we walked out.

"This," said Robert O. Schad, as he opened the bank-vault doors of solid steel, "is the safest place in the West."

Military men and residents of Alcatraz Island might choose to debate the point. But Mr. Schad is Curator of Rare Books for the Henry E. Huntington Library and Art Gallery in San Marino, California. He made his claim with a librarian's care.

"Here we are protected by 30 tons of four-inch armor plate recessed in a casing of reinforced concrete nine feet thick," he continued. "Even if a Hiroshima-type atomic bomb hit near by, the contents of this vault probably would survive."

I examined the 12-by-23-foot inner vault, empty except for a small pile of boxes on a lonely tier of shelves.

"A microfilm of our most valued possession, our card catalogue," Mr. Schad explained. "It took four decades to compile it from our 1,200,000 books and manuscripts."

Sanctuary for "Pinkie" and "Blue Boy"

"In case of war, what else would you store down here?" I asked.

"No doubt the Gutenberg Bible would come down; Mr. Huntington paid \$50,000 for the two volumes. And certainly the even more expensive copy of 'Venus and Adonis' by Shakespeare. 'Pinkie' and 'The Blue Boy' would both come here, of course."

I was glad that these two charming portraits of 18th-century English children would be so well protected. I had spent weeks here photographing the paintings, rare books, and magnificent gardens that railroad magnate Henry E. Huntington bequeathed to California. Time and again I had returned to those two paintings. In the early mornings, when Huntington's marble home, now the art gallery, was empty and still, "Pinkie" and "The Blue Boy" were good company.

I could even sympathize with the little old

lady from the East who not long ago crossed the continent to see these famous portraits. Arriving at the gallery, she found a lifelong illusion shattered.

"Do you mean to tell me that the Pink Lady didn't marry Little Boy Blue?" she asked a guard.

As gently as he could, the guard explained that those young people had belonged to different generations. The Blue Boy posed for Thomas Gainsborough during the year of Sir Thomas Lawrence's birth; Pinkie, the captivating child Lawrence painted in a flowing gown on a windy hilltop, died soon after posing at the age of 12.

The two are linked as companions in countless prints on the walls of homes and schools, but theirs is only a canvas courtship. In real life they were far apart in age.

Treasures Came in Carload Lots

I spent many days among such Huntington treasures. I turned the handwritten pages of Benjamin Franklin's *Autobiography* (page 267) and saw bits of the original manuscript of Jack London's *Sea Wolf*. Gingerly I fingered the morocco bindings of priceless Shakespeare first editions and examined the tapestries and furniture and porcelain of some of the finest artisans of 18th-century Europe. I wandered through 200 enchanting acres of flowers and trees collected from around the world, and I paused frequently before statues by great sculptors.

Like other visitors who have come here in the three decades since Henry Huntington left his collections to the public, I was awed by the scope of the hundred-million-dollar estate and repository of beauty.

San Marino itself lies largely on land once owned by Huntington. Early in this century he sold large tracts of his San Marino Ranch for the building of this residential city. He also donated a site for the city hall.

A spur from Huntington's southern California interurban railways once penetrated



252 "Pinkie," by Sir Thomas Lawrence, hangs in the Henry E. Huntington Library and Art Gallery, San Marino, California, where its wind-blown beauty is a favorite of all comers. The delicate child, Sarah Moulton-Barrett, died in 1795 at 12 years. She was an aunt of the English poet Elizabeth Barrett Browning.



"The Blue Boy," by Thomas Gainsborough, best known of the Huntington Gallery's canvases, is an 18th-century portrait of Jonathan Buttall, a London ironmonger's son. Like "Pinkie," which hangs across the hall, this handsome boy in blue satin floods the memory with all the fond dreams of childhood. 253

to the heart of San Marino Ranch, and over it came carload lots of books and art objects, garden fountains and statues purchased from European estates, and trees and shrubs from far continents and islands.

In one of his three private railroad cars Huntington could travel directly from San Marino to Manhattan. Part of the way he rolled over track built by his extraordinary uncle, Collis P. Huntington, one of the financiers who shaped the destiny of California during the last half of the 19th century.

People who live and work around San Marino take immense pride in the Huntington estate and collections. On my first visit my taxi driver gestured across a sea of ivy before a row of modern mansions.

"Thirty years ago," he remarked, "all this was Huntington orchard land."

"There was where the railroad spur ended," he said as we passed through wrought-iron gates and entered the grounds of the library and art gallery. Gardeners were wielding palm branches like brooms, flicking fallen leaves from lawns and sidewalks into the path of a motorized raking machine.

To care for gardens and buildings, a staff of some 60 men toils around the calendar. And to keep the lawns green for the 150,000 pairs of visitors' feet that wander over them every year, the grass is annually "renovated," which means virtually ripping it up and re-planting.

Gardener Recalls Half-century of Effort

Curiously enough, it was during a walk in the gardens that I learned most about the library's founder, Henry Huntington, born 108 years ago in Oneonta, New York.

With me was William Hertrich, 80-year-old gardener emeritus who planned every inch of the 200-acre estate in company with Huntington (page 273). Lean and muscular, Mr. Hertrich strode off before me toward a garden corner of the estate where stands the world's largest collection of mature cactus. Already, he said, he had walked three miles through the gardens, just as he had every day for 50 years.

Many were the mornings he had walked with Huntington before the gardens existed. Together they had foreseen the shaded vistas that stretch away toward the San Gabriel Mountains to the north or across the San Gabriel Valley to the southeast. Together they had planned and planted from seed the grove of redwoods now towering high over the massive library building. They had planted the first commercial avocado orchard in southern California and nurtured one of the finest botanical collections in America.

Pennies Grew into Millions

What sort of man, I wondered, was this Henry Huntington, who poured his wealth into rare books, rare flowers, portraits by English masters, and decorative objects by French artists? Was he eccentric?

"Yes," Mr. Hertrich replied, "he was!"

"It's true, you know, that he spent millions with his right hand and saved pennies with his left. His wife once pointed out that at one moment he would pay \$10,000 for a rare book and then walk the length of the mansion hall to turn out an electric light. 'My dear,' Mr. Huntington said, 'if I did not save the pennies, I could not buy the \$10,000 book.'

"I myself remember Mr. Huntington's picking up nails that the carpenters dropped when they were building the library."

Huntington was congenial with his workers. It was difficult to gain his confidence, but once he had placed his trust, an employee became an executive with authority beyond question.

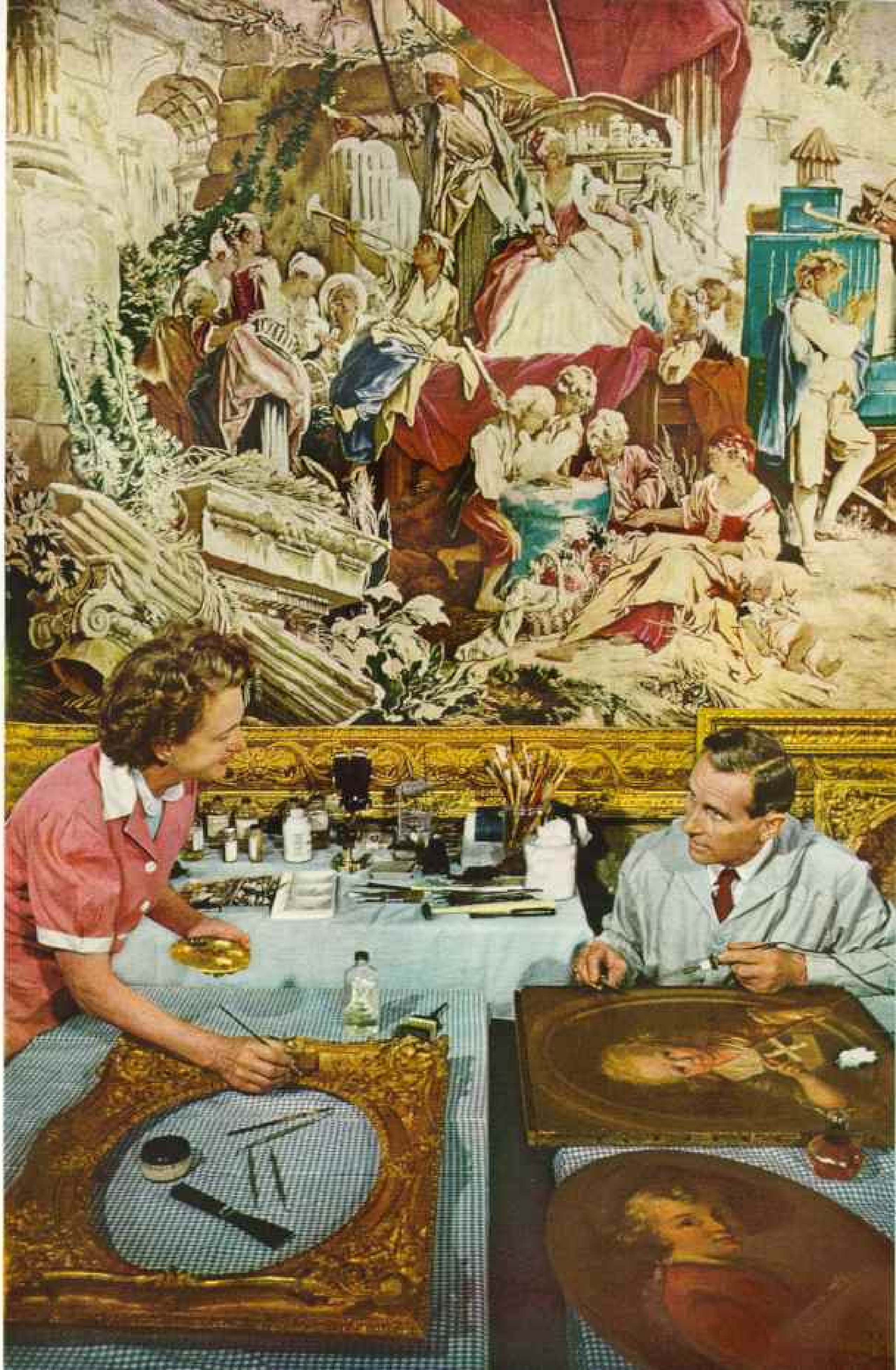
I asked Mr. Hertrich: "Did you ever feel that Mr. Huntington was selfish, spending millions to beautify his own gardens?"

"I knew it was not always to be Mr. Huntington's garden," Mr. Hertrich said. "In 1906, before this house was built, the San Francisco earthquake and fire destroyed the beautiful home of Collis P. Huntington. Furnishings, paintings by Rembrandt and Van Dyck, everything was lost.

"One evening after that, Henry Huntington

Ailing Masterpieces Brighten Under a Restorer's Delicate Touch

When railroad titan Henry E. Huntington died some 30 years ago, he left to the people of California his 200-acre estate, his marble home, and a collection of art objects and rare books valued at many millions. The tapestry shown here was designed by François Boucher and woven under the patronage of Louis XV. Part of a set, "Italian Village Scenes," it depicts a trumpeter assembling a crowd for a turbaned quack, who flourishes a bottle of elixir. The restorers, working at the gallery, gild a frame (left) and eliminate tiny blisters on a portrait's surface.



Visitors Outside the Gallery Start a Stroll on the 200-acre Estate

Henry Huntington left this marble Georgian mansion to house his art collection. Garden ornaments were purchased, mainly abroad, and shipped to San Marino in carload lots. Bronze stag and hounds, created by Jacques Houzeau in 1680, came from France. Red tiles in the terrace were imported from Wales.

told me he would build here in San Marino a place substantial enough to withstand both fire and earthquake. He would build something that would be an asset to the people of California. You see, I knew from the beginning that this would one day be part of California's heritage."

We were walking along graveled paths among 1,500 varieties of cactus and as many more of other succulents (page 274).

"All cacti are succulents," Mr. Hertrich said, "but not all succulents are cacti."

He cut into the stem of a succulent with his knife. White latex oozed out. When cut, a cactus gives up water like the reservoir it is; those in the Huntington gardens are watered only two or three times a year.

From Cactus Grove to Japanese Garden

The cactus garden had been Mr. Hertrich's own idea. At first Huntington had opposed it. The master of San Marino admitted that his grudge against the spiny plants dated back to the time he supervised construction work for the Southern Pacific railroad on the Arizona desert. While hacking away from a grading machine, he had been severely punctured.

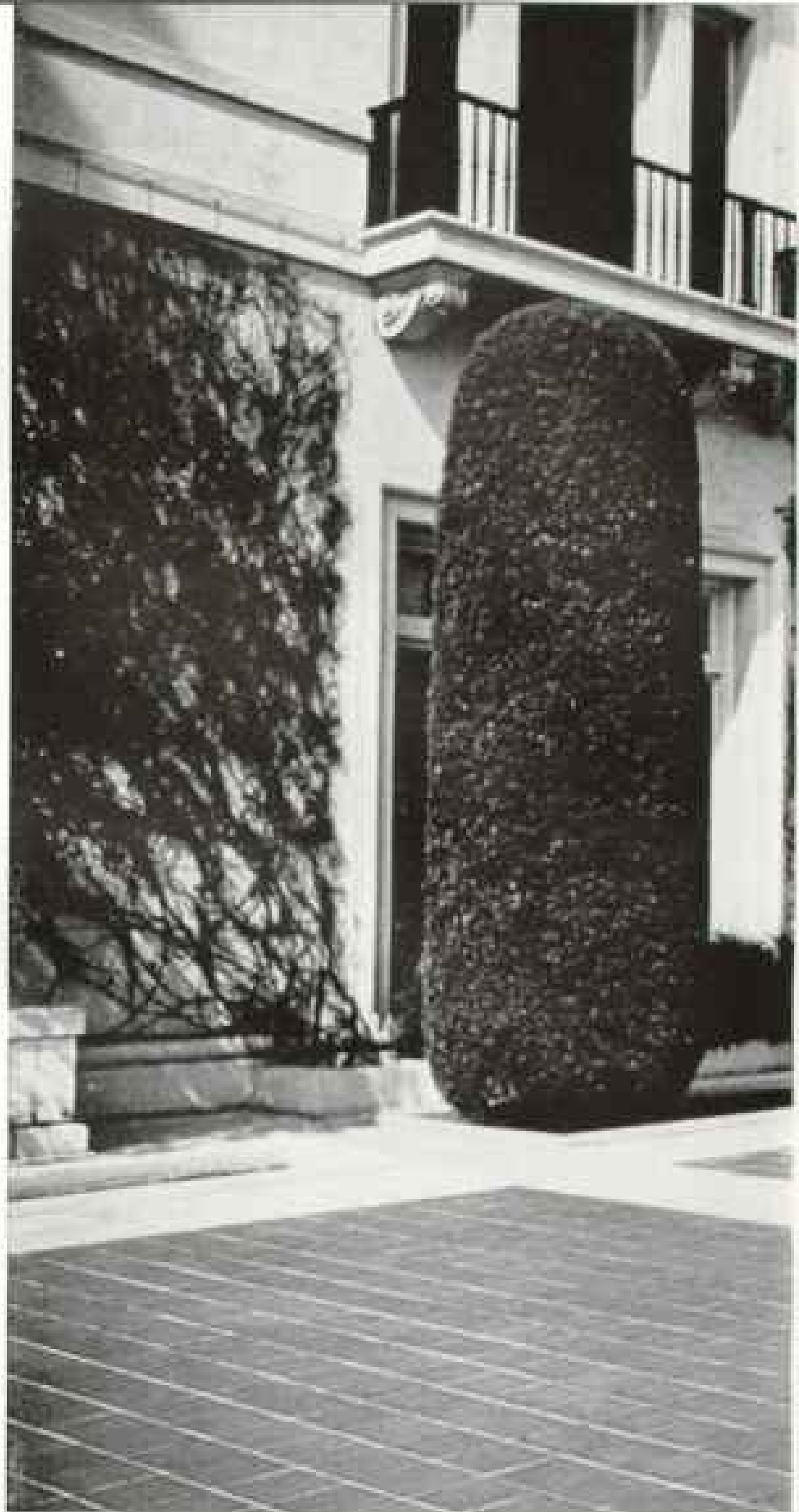
But Mr. Hertrich's persistence prevailed over his employer's poignant memory. Later, in a single shipment, the gardener of San Marino imported three railroad carloads of cacti from that same Arizona desert. To show them in natural surroundings, he added five carloads of volcanic rock. Other shipments followed, finally converting an eroded hillside into a living cactus fantasy that draws admirers from all the world.

We walked through rose arbors and down flights of steps into a pergola.

In springtime this miniature canyon is ablaze with blossoms from a thousand varieties of camellia. Every plant is labeled.

"In the blooming season," Mr. Hertrich remarked, "people come with notebooks, write down the names, and rush off to nurseries."

At a bend in the path we were transported across the Pacific to a garden in Japan. A moon bridge arched a flowering lily pond, and



a pagoda sheltered a temple bell. Water tumbled down a hill below a Japanese house and splashed into a series of lily ponds surrounded by Oriental garden ornaments (page 272).

This garden grew practically overnight. From New York City Huntington had approved the idea. That was in 1912, and the California mansion had just been completed. The garden was to be ready by winter, when the owner and his wife planned to move in.

"I searched desperately for Oriental plants, through every nursery in California," Mr. Hertrich recalled. "As a last resort, I turned to the owner of a commercial Japanese tea garden in Pasadena. He wouldn't sell me single plants. But he agreed to sell the whole garden. We transplanted the entire enterprise—buildings, bridges, and ornaments."

Today, next to the cactus display, the Japanese garden is the estate's most popular corner.



National Geographic Photographer J. Taylor Roberts

Luncheon at the Huntington Library is an occasion shared with gardeners, guards, librarians, scholars from all parts of the country, and curators of paintings and rare books. The meal is served cafeteria style in a long building where Henry Huntington and his friends used to bowl and play billiards.

Why Is "The Blue Boy" Blue?

Over a salad and ice cream, I got acquainted with William A. Parish, an expert on rare prints and Acting Curator of the art gallery until the appointment recently of Dr. Robert R. Wark. Later he guided me through his domain. Huntington had designed his house as an 18th-century Georgian palace, and here, on permanent display, are "Pinkie," "The Blue Boy," and some 40 other life-size portraits (page 261). The mansion is a shrine for the school of British painters that immor-

talized the elegance and charm of English aristocracy during the century that closed with the American and French Revolutions.

It is ironic that the most renowned canvas of this era of extravagance, wealth, and leisure should be "The Blue Boy." The model for this familiar canvas was Jonathan Buttall, son of a London ironmonger. Of the nine lavishly costumed Gainsborough models that grace the hallways and salons of the art gallery—so reminiscent of Versailles and other mansions of its day—only "The Blue Boy" portrays a person who lacked rank, title, or social position (page 253).

Some believe that Gainsborough painted the portrait as a reply to famous Sir Joshua Reynolds, who once contended that no portrait in the cold color of blue could possess the merits of a painting done in warmer tones.

Gainsborough's motive could not, however,



An Elegant Era Comes to Life Again
in an 18th-century Library

This ornate room reveals the skill with which Mr. Huntington re-created the rococo period, whose art and furnishings particularly fascinated him. The



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mantelpiece copies one at Versailles; vases are Sevres porcelain; and the carpet was woven for the Palais du Louvre. Boucher designed the Beauvais tapestry,

one of a famous set known as "The Noble Pastoral." The extravagant age that reveled in these treasures ended with the French Revolution.

have been to refute Reynolds, for Sir Joshua made his statement years after completion of "The Blue Boy."

Whether or not Gainsborough deliberately demonstrated that cold colors could be successful as the predominant tone in a portrait, it is true that thousands of Huntington visitors—no matter how many prints of the famous painting they may have seen—stand silently respectful before the portrait's compelling appeal.

At one time "The Blue Boy" and "Pinkie" were hung on either side of a hand-carved door in the drawing room.

Now they look at each other across the large air-conditioned New Gallery, built in 1934. Thus the visitor can devote himself to them alternately. It is an unforgettable experience to turn from one to the other of this famous pair—from Master Jonathan Buttall to Miss Sarah Moulton-Barrett, whose gown streams as loosely as her counterpart's costume fits snugly, and whose radiation is as pinkly pink as "The Blue Boy" is blue.

Huntington Library



"Pinkie" is one of the finest paintings by Sir Thomas Lawrence, who became President of the Royal Academy in 1820. It is one of six portraits by Sir Thomas in the Huntington galleries. One added reason for its glamour is that the child model was a sister of Edward Moulton-Barrett, the dour, tyrannical father of Elizabeth Barrett Browning, portrayed in the play *The Barretts of Wimpole Street*.

Landscape Lies at Pinkie's Feet

Many times I managed to pull my attention from "Pinkie" herself to concentrate on the quality of third dimension that Sir Thomas achieved in the clouds and the landscape behind his hilltop subject.

Only a few inches of canvas at Pinkie's feet show the hills rolling away behind her. But in those few inches, Sir Thomas leads the eye, through light and shadow and with exquisitely fine brushwork, on a journey that wanders 20 miles into the picturesque English countryside (page 252).

Henry Huntington, feeling that no one could master the entire history of art, limited his effort to the paintings of one brief but brilliant period, the British 18th-century school. He surrounded his canvases with furniture, tapestries, statuary, porcelain, and other art objects that would contribute to a concept of that century.

A divided marble staircase descends in two sweeping curves into the main hall. This, I thought, would be the proper backdrop for the entrance of a lady of nobility. And, sure enough, at the foot of one side of the staircase appeared Gainsborough's portrait of Penelope, Viscountess Ligonier (next page).

Embraced in the encircling arms of the stairs stood a life-sized bronze of the famous statue of Diana the Huntress by Jean-Antoine Houdon. Gleaming darkly against the white hallway, she seemed ready to leap from her pedestal with bow and arrow. A marble Diana by Houdon is in the Hermitage in

Sabine Houdon's Eyes Sparkle; Cold Stone Reflects Lifelike Light

Jean-Antoine Houdon achieved this remarkable effect by leaving slender stilettoes of marble that simulate the pupils' natural highlights. He created the realistic shadowy irises by cutting them concavely; conventional sculpture leaves the entire eyeball convex. By accident or design, the French sculptor left dark smudges on his daughter's cheeks; a retoucher removed them from this library photograph (page 263).



Diana the Huntress Commands the Entrance Hall in the Gallery

South Pasadena art-appreciation students, on a field trip, admire this bronze by Houdon; his marble Diana in Leningrad carries a quiver. Thomas Gainsborough's Penelope, Viscountess Iigonier, across the hall, expresses the luxury and leisure of the Georgian era.



Leningrad. Another bronze graces the Louvre in Paris.

Several other statues by Houdon are in a special collection dedicated to the memory of Mr. Huntington's wife, Arabella. One is the remarkably lifelike marble bust of Houdon's young daughter.

I had first seen a photograph of this statue, and it had haunted me. A retouching artist, I detected, had been at work on the negative of the child's face. I wondered why. I also suspected that the eyes had been retouched, for they seemed to sparkle with life.

Angelic Statue with a Dirty Face

Mr. Parish and I went to the gallery to examine the original. The white marble of the statue has brown smudges in the cheeks, just as if this angelic little girl might have had a dirty face. The overzealous retoucher evidently could not abide this defect.

It may never be known whether Houdon unhappily ran into these smudges in the stone when it was too late to discontinue the work, or whether he chose a piece of blemished marble as a whimsical bit of realism.

The eyes of the photograph, however, had not been tampered with, the statue itself proved. Unlike most marble figures, Houdon's faces do not have blank, convex eyeballs. Instead, the iris and pupil are indented so that shadows make the eye seem natural.

To complete his craftsmanship, Houdon also left protruding from the darkness of the iris a pinpoint of white marble that creates the uncanny effect of a highlight (page 260).

I was curious about the care, cleaning, and preservation of these fabulously valuable art objects. Mr. Parish helped me understand this problem when I several times proposed moving a painting or a statue to take a photograph. His face would cloud with indecision as he considered the restrictions laid down by insurance companies for handling the art treasures.

"Sometime soon," he said, "we're going to remove 'The Blue Boy' and the others in the New Gallery. We need to treat the backs of some of the canvases to make them impervi-

ous to moisture. And when we take them down, I'll want six men handling each picture!"

I found that almost every piece of furniture, of porcelain, of bronze was bolted down or glued inside an earthquake-proof case. Fine wire made the glass of showcases shatter-proof. When paintings came off the walls for repair or cleaning by professional restorers, Mr. Parish hovered over them with anxious concern.

To avoid the hazards of moving them even to the estate's workshop, some art objects are cleaned and restored in the galleries. I was able then to photograph this operation in the French room of the Arabella Huntington memorial collection, and to include as background one of five tapestries after designs by François Boucher (page 255).

Altogether, there are more than 500 pieces in the art gallery and the memorial collection. In addition there are nearly 200,000 rare books in the library, and more than a million rare manuscripts, letters, and maps in a separate section of the stacks. The library also contains more than 150,000 reference works, which scholars use to assist their studies among the rare books.

Books Keep Cool Behind Bars

Rare books are issued to readers through a grill in heavy steel doors for which only a few keys exist. After scrutiny of my credentials, the attendant allowed me to enter these doors, and I signed the same declaration to abide by the rules that is signed by the researchers who come here to work.

Even Dr. John E. Pomfret, Director of the institution, is subject to the rules for care and preservation of the rare books and documents. One day he was reprimanded by an alert librarian in the rare-book reading room when he absent-mindedly pulled from his pocket a ball-point pen. Readers may use only pencils or, preferably, noiseless typewriters as they take notes from the volumes.

Curator Schad admitted me from the stifling heat of a summer day into the delicious coolness of the rare book vault.

Silks, Wig, and Pinch of Snuff Mark a Georgian Dandy

In the 1700's snuff taking was as common as smoking is today, and the snuffbox was indispensable to the gentleman. Costly snuffboxes, enameled and jeweled, became a sign of rank; they were a king's favorite gifts. Europe's finest goldsmiths and miniaturists lavished their talents on the containers. Some of the boxes here were used for ladies' sweetmeats.

Graydon Spalding of Huntington's staff mimics the drawing-room manners of the era.



Library Visitors Admire Three Madonnas from the Renaissance

Annabella D. Huntington, the collector's wife, was especially fond of Italian and Flemish art of the 15th and 16th centuries. As part of a memorial to her, the paintings she loved have been gathered into a



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wing of the library. The display includes 12 Madonnas, a favored subject of Renaissance painters.

Here, from left, are "Madonna and Child, with St. John," by a relatively unknown Florentine, Michele

Tosini (1503-1577); "Madonna and Child," by another Florentine, Sebastiano Mainardi (1450-1513); and "Madonna and Child," by the celebrated Flemish painter, Roger Van der Weyden (1399-1464).

"The air conditioning is not primarily for us human bookworms," Mr. Schad said, "though we do enjoy coming back here on hot days. The temperature is maintained at 68° F., primarily to discourage the work of real bookworms. They remain dormant below about 70°" (page 270).

Bookworms—actually a wide variety of insects and their larvae—are a constant menace to libraries. Particularly do they infest old books. What the bookworm likes most is the glue in bindings.

"Every new item is fumigated in a vacuum chamber," said Carey S. Bliss, Assistant Curator of Rare Books. "The vacuum ensures that the deadly methyl bromide will reach every cranny in the bindings and between the leaves."

Then he unlocked a steel-and-plate-glass case and withdrew, from between cardboards that prevent rare books from scratching each other, a small, musty volume published in London in 1880. The author was a bibliophile named William Blades; the title was *The Enemies of Books*.

These enemies Blades listed as "fire, water, gas and heat, dust and neglect, ignorance and bigotry, the bookworm, other vermin, bookbinders, collectors, servants and children."

Aged Volumes Seldom Rebound

Blades waxed eloquent and extremely caustic over the depredations of bookbinders.

"Dante," he wrote, "in his 'Inferno,' deals out to the lost souls various tortures suited with dramatic fitness to the past crimes of the victims, and had I to execute judgment on the criminal binders of certain precious volumes I have seen . . . I would collect the paper shavings so ruthlessly shorn off, and roast the perpetrator of the outrage over their slow combustion."

Mr. Bliss agreed with Blades that bookbinders, under certain circumstances, could be classed as enemies of books. The Huntington Library maintains its own bindery, but very seldom is a really rare or valuable book repaired in any way. Much of its value lies

in its remaining unaltered and in its original binding, however deteriorated that may be.

As we talked, the owners of two other keys joined us in the vault. They were Head Librarian Leslie E. Bliss, father of Carey, and Herbert C. Schulz, Curator of Manuscripts.

Librarian Bliss told me he devotes much of his time to making further acquisitions for the Huntington collection. At an annual cost of nearly \$100,000, books and manuscripts arrive from all over the world.

Mr. Schulz pushed aside a sliding steel door and led me into a corridor lined with cages of steel mesh.

Some Manuscripts Still Uncatalogued

Behind the locked doors were letters in the handwriting of Mary Queen of Scots, Sir Walter Raleigh, George Washington, and Abraham Lincoln. In another cell were manuscripts by Shelley, Keats, Byron, Kipling, Conrad, and Poe. In still others were documents signed by such men as William Penn and John Hancock.

"It is easy to come back here and become completely lost in these people," Mr. Schulz said. "If the building were not evacuated and put under burglar alarm at night, you might forget to come out. You follow a man's letters, his daily hopes and plans. You get all excited. Then the story is suddenly cut short: the next letter is missing!"

"Mr. Huntington, in his purchase of large private collections, gathered a million such manuscripts," Mr. Schulz went on. "So many we still do not have them all catalogued."

"It is remarkable that so many old manuscripts have survived. During the Reformation of the 16th century, when monasteries were abolished in England, shiploads of manuscripts—mostly on animal skins in those days—were moved to the Continent. There they were boiled down to make soap, made into polishing cloths, and put to other strange uses. As for paper manuscripts, they often became wrappings for the wares of butchers and fishmongers, and linings for the pans of bakers.

(Continued on page 275)

Children Examine Handwritten Pages of Franklin's *Autobiography*

At 65 Benjamin Franklin began writing for his son the memoirs that have become famous. For years only copies or translations, filled with errors and euphemistic alterations, were available.

Here Dorothy Bowen of the Huntington staff tells how the library spent more than 20 years studying various editions before it published the first complete and reliable version of the *Autobiography*. The portrait is a pastel by Joseph Sifrède Duplessis, who knew Franklin as United States Minister to France.

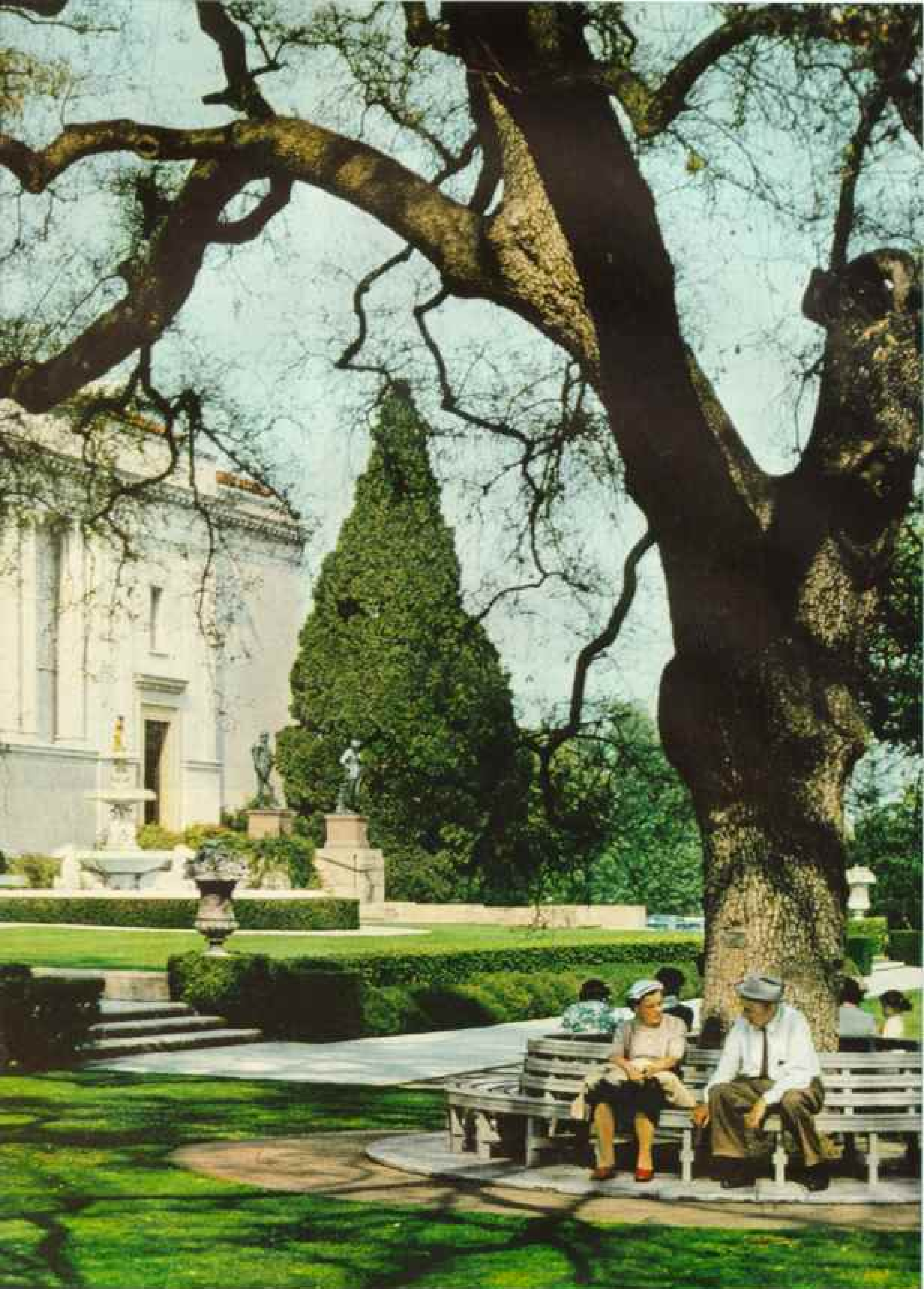


Benjamin Franklin's Autograph



Spreading Mesa Oak Shades Visitors
Outside the Huntington Library

Bibliophile A. S. W. Rosenbach said of Henry Huntington that he was "without doubt the greatest collector of books the world has ever known." In his



National Geographic Photographer J. Barthe Babotta © N.G.E.

last 17 years the millionaire bought entire libraries and assembled one of the world's finest storehouses of early English and American history and literature.

His collection of incunabula (books printed before 1501) includes 5,309 items and is surpassed in this country only by the Library of Congress.

Priceless Books Live in an Air-conditioned Sanctuary

Among Huntington's many rare volumes is the finest Shakespeare collection outside the British Museum and Folger Shakespeare Library in Washington, D. C. This vault holds first editions of the plays and collections of the plays, most in modern bindings. Temperature and humidity are controlled to discourage bookworms.



Painstaking Labor Copies a Portuguese Chart of the 16th Century

Fernão Var Dourado, most noted of Portuguese cartographers, produced this sea atlas about 1570. Drawn on fine vellum and richly bordered, it shows the Caribbean area with surprising accuracy. Of seven Dourado atlases still existing, this is the only one in America.

Gold Tracery Illumines a Book of Hours

This book of prayers was handwritten in France about 1450. It reveals the highest refinement in the art of manuscript decoration and gold illumination.

Dustin S. Beyer and J. Barber Roberts (opposite lower), National Geographic Staff © N.G.S.







A Moon Bridge in Vermilion Brings Japan to California

Mrs. Huntington, an easterner, dreaded moving to the Far West. To make San Marino Ranch acceptable to her, Mr. Huntington imported trees and shrubs from all over the world. He purchased this Japanese tea garden in Pasadena and transplanted it bodily.

A thousand camellia varieties grow in Huntington's gardens. In season, choice blossoms are displayed around this miniature Japanese temple gate at the gallery entrance.

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William Hertrich planned every inch of Huntington's landscaping for nearly half a century. Retired as curator of the gardens, he continues his work with plants. Here he dissects blossoms of a night-blooming cereus for a botanical treatise.

J. Bayler Roberts (opposite and above) and David E. Boyer, National Geographic Staff © N.G.S.





Illustration by Ralph D. Cornell © National Geographic Society

Giant Century Plants Burst into Bloom, Climaxing 15 Years' Growth

Huntington's grounds devote 12 acres to the world's most comprehensive collection of cacti, aloes, yuccas, agaves, and other desert plants. Some 25,000 specimens include most of the varieties that can be grown in southern California. The century plant is common in Mexico, where it provides fiber and drink. Leaves of this species, *Agave lisa*, may weigh 150 pounds.

Fortunately for the cause of scholarship, many medieval writings were somehow preserved."

For some of their most esteemed work, manuscript writers used squirrel or rabbit vellum, reduced to the thickness of onionskin. Skins of unborn calves and lambs also made fine vellum. On such fragile sheets, monks of the Middle Ages penned books with filigree tracery that remains as brilliant today as it was 500 years ago (page 271).

Italian craftsmen made the finest manuscript vellum. They washed, scraped, and pumiced the skins, and often used only the flesh side as a writing surface.

A Workshop for Scholars

Mr. Schad wanted me to visit the entire library before losing myself among the fascinating first editions of the rare book stacks and among the scribblings of great authors in the manuscript files. We took a last deep breath of cool air and went out into the rare book reading room.

Here were shirt-sleeved doctors of philosophy doing research for books on English and American letters. Some were digging into the kind of material for which the Huntington Library is particularly renowned—the history and literature of the American West.

A reader from a California university was studying the dime novels of the early West. Another was researching soldier life in the Mexican war. A third was looking into the life of Jack London.

Subjects here range widely over the Anglo-American scene. Some scholars were interested in one or more of the facets of Shakespeare. The Huntington Library holds one of the world's finest collections of Shakespeare first editions and related materials. In this country only the Folger Shakespeare Library in Washington, D. C., has a larger collection.*

Lyle H. Wright, Head of the Reference Department and Reading Room, showed me the library's extraordinary collection of Americana. On these shelves one may find copies of 20 percent of the books published in the United States before 1801—plus a large collection of books published elsewhere concerning the Americas up to that time.

With their importance to serious scholarship, the library's facilities have to be limited to those qualified readers interested in what Henry Huntington called "the advancement of learning . . . study and research in original sources. . . ." More than 600 scholars use the

library each year. Most of them produce books or doctoral theses from their researches.

The library also offers fellowships and grants to help researchers pursue their studies. In addition, books, magazine articles, and pamphlets are written by members of the library staff.

Mr. Wright showed me shelves of bound facsimiles of rare books, used as substitutes to protect extremely valuable items from excessive handling. At least a thousand volumes in the Huntington vaults are unique. In an average year the library's photographic staff makes 70,000 microprints and photographs of rare volumes, primarily for other libraries and research students.

Though shelves are not open to the casually interested public, some of the finest of the library prizes are displayed in glass cases for general view. Representing the Shakespeare collection is a copy of the First Quarto of *Hamlet*, published in 1603, twenty years before the First Folio, the earliest collected edition of Shakespeare's plays. The British Museum has the only other known copy of this *Hamlet*.

The first editions of Shakespeare's individual plays are known as the Quartos; the Huntington Library has copies of all but one (page 270).

Gutenberg Bible a Prime Attraction

Among the most fascinating items are those venerable volumes known as incunabula—books printed before 1501. Of these the Gutenberg Bible is the primary attraction to visitors. The two volumes are printed on vellum, probably sheepskin, and bound between heavy wooden boards. Over the boards is stretched the original 15th-century stamped leather, held fast by metal bosses.

This Bible takes its name from Johann Gutenberg, the reputed inventor of printing in Europe, and is generally conceded to be the first important book printed with movable metal type. There are some 40 other surviving copies, although most of them are on paper rather than vellum.

As I photographed the wonders of the Huntington Library and Art Gallery, I began to feel the fascination that lures scholars ever deeper into secrets of the rare book and manuscript vault.

* See "Folger: Biggest Little Library in the World," by Joseph T. Foster, NATIONAL GEOGRAPHIC MAGAZINE, September, 1951.



Artist Brings a Tattered Manuscript Back to Life

Each year Huntington restores thousands of old manuscripts. Ronald E. Tank has washed this page from a monastery's financial accounts. Now he traces the jagged edges on a transparent backing sheet. Feather-edged and coated with paste, the sheet will reinforce the crumbling manuscript. Tweezers and knife will separate the next sheet from the bundle.

There was, for example, the strange manuscript of Edgar Allan Poe's essay, "About Critics and Criticism." It is written on pieces of paper four inches wide and fastened together in 14 places by adhesive wafers; the whole is 144 inches long. Poe's parents were actors. Possibly they used scrolls like this in rehearsal; such a rolled manuscript was called a "part." Poe may have tried adapting this theatrical device to his writing.

Even more intimate an insight into a private life was a little manuscript from the girlhood of Charlotte Brontë, author of *Jane Eyre*.

Charlotte, her brother, and her sisters (Emily wrote *Wuthering Heights*) had little contact with other children. Their amusements they found within themselves and with one another. Once they started a magazine for an audience of Lilliputian subscribers,

their own wooden soldiers. For such tiny readers they learned to write in a miniature hand.

The Brontë manuscript I saw almost requires a microscope. It is called "Corner Dishes—Being a Small Collection of Mixed and Unsubstantial Trifles in Prose and Verse," by Lord Charles Albert Florian Wellesley. The name was one of Charlotte's pseudonyms. There are—we measured them—16 lines of handwriting to the inch. As the space between her lines is of an equal depth, it means that Charlotte's penmanship is only 1/32 of an inch tall. And, when you examine her work closely, it is eminently legible!

Yes, I thought, one might easily become lost among the people whose books, manuscripts, and portraits live on in San Marino, California, in air-conditioned immortality.

Exploring Our Neighbor World, the Moon

A Noted Astronomer Foresees the Day When Man Will Set Foot
on Our Satellite's Eerie Moonscape

BY DONALD H. MENZEL, PH.D., D.Sc.

Director, Harvard College Observatory

Shelley's "orb'd maiden with white fire laden, whom mortals call the moon" has always been synonymous with the remote, the unattainable. Yet today the development of powerful rockets and earth satellites has brought close the time when man will send a missile to the moon—and later a human passenger.

Here a distinguished scientist describes our nearest neighbor world and tells how it will appear to the first true "man in the moon." The author, Dr. Menzel, is the Paine Professor of Practical Astronomy at Harvard University and an international authority on the sun. He has written 10 books, edited 20 others, and contributed to the *National Geographic* the notable article, "The Heavens Above," in the July, 1943, issue.—*The Editor.*

MAN is about to embark upon his greatest adventure, the conquest of space. Satellite launchings, particularly the Russian Sputnik II with a canine passenger, clearly forecast the imminence of manned space flight, bold forays into the realm just beyond our atmosphere.

Moreover, travel to neighbor worlds at some future time cannot be dismissed as a Jules Verne fantasy. Though many difficult problems lie ahead, we may now contemplate exploration of the nearer planets and, especially, of our moon.

The poets' lovely "Queen of Night" is by far the closest of all the heavenly bodies. Its distance from earth averages 238,857 miles—an inviting proximity for the first step into our solar system. Rockets powerful enough to reach the moon with a small payload exist today. Very likely, therefore, man will dispatch robot missiles to the moon before venturing there himself. Sensitive electronic gear will report lunar conditions.

Moon Yields Secrets to Telescopes

Meanwhile we already know a great deal about our celestial next-door neighbor. It is not, you may be sure, a mirror in the sky that reflects earth's surface features, as many medieval scholars supposed. Instead, we see the moon for what it really is: an independent world, though one admittedly mysterious in origin and controversial in the interpretation of its surface features.

Even a small amount of optical aid—binoculars or opera glasses—reveals some of the moon's more conspicuous features. But one's first lunar view through a telescope is far more revealing, a never-to-be-forgotten ex-

perience-comparable to one's first air view of the Grand Canyon, Yellowstone National Park, or the Greenland Icecap.

Let us assume that you have access to a large telescope. Your first impression is that the moon seems to be chalky white, as if the surface were of limestone. However, careful measurements of the brightness of the moon's reflected sunlight disclose that your senses are wrong.

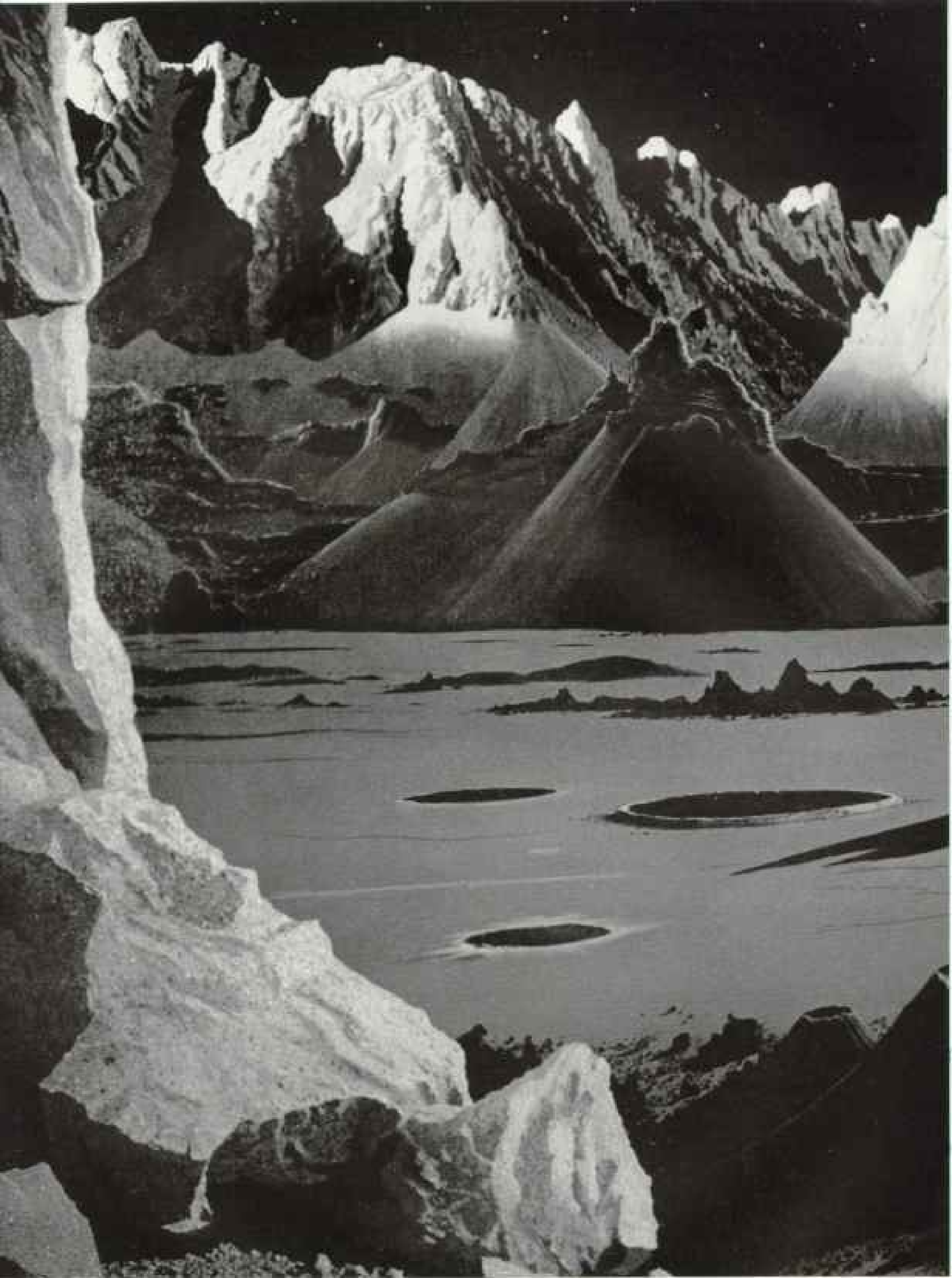
Dazzling and blinding though the moon may seem, these quantitative studies prove that the surface is a dull, even a very dark gray, with a distinctly yellow cast. The darkest areas of all—shadowy markings so familiar to the naked eye—are relatively smooth regions in an otherwise rugged and mountainous moonscape.

"Seas" Without a Drop of Water

Early astronomers, with their imperfect telescopes, noted the lack of detail in the dark areas, and it required no great stretch of imagination for them to visualize these regions as vast expanses of sea and ocean, coastline and bay. They called them *maria*, or seas.

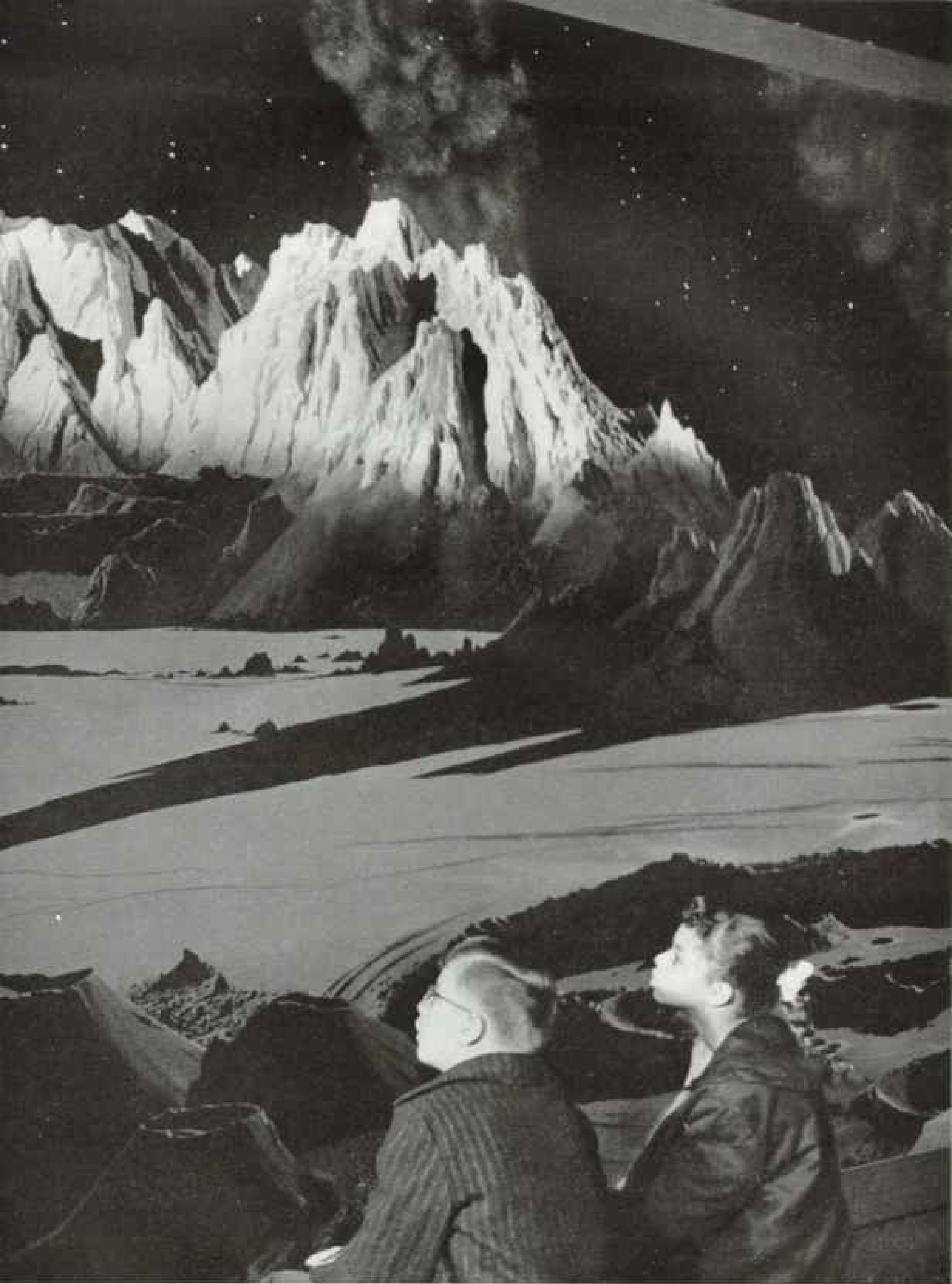
But your own telescopic observation readily convinces you that these "seas" comprise an extensive system of relatively smooth plains. We still call them by their 17th-century names—Mare Nubium (Sea of Clouds), Mare Serenitatis (Sea of Serenity), Mare Tranquillitatis (Sea of Tranquillity), and so on, even though we now realize that they contain no water. Our conclusion is that the maria are ancient lava flows.

Almost equally apparent is the moon's tremendous disarray of craters. Astronomers count more than 50,000, ranging from a few



**Awed Explorers Survey a Dead World,
the Scarred Surface of the Moon**

These youngsters peer into the depths of an imaginary lunar crater, eons old, blasted by a giant meteorite. Sunshine bathes the distant mountaintops, some of them 16,000 feet high, that wall the tremendous depression. Eerie earthshine, much brighter than moon-



David S. Bove, National Geographic staff

light, reveals a lava-encrusted floor pocked with smaller meteoric craters and volcanic cinder cones. Devoid of air, the sky is a black curtain sequined with the stars and planets. Our Milky Way traces a delicate embroidery. The 10-by-40-foot mural stands in the

Museum of Science, Boston, Massachusetts. Based on scientific studies, it is the work of Chesley Bonestell, a leading illustrator of space themes. The painting, copyright by the museum, is reproduced with the permission of Dr. Bradford Washburn, museum director.

thousand feet to 150 miles across and as much as four miles deep. Most of the larger craters have rough, terraced walls, both inside and out. A number, however, such as the huge pockmarks Plato and Archimedes, possess relatively smooth floors. These we call "walled plains" (page 293).

You also see distinct mountain ranges and occasional isolated peaks, at least one higher than earth's lofty Everest. Here and there you note that the lunar surface seems to have suffered from a severe moonquake, if we interpret some of the cliffs, cracks, and crevasses as caused by the breaking and sliding of one block of rock against another.

Tycho's Rays Resemble Meridians

Of all the craters Tycho is probably the most conspicuous. You may comment that this crater looks like a pole on a terrestrial globe and that the streaks radiating from it resemble meridians diverging from the pole. These streaks, or rays, possess astounding regularity, crossing high country and lowland, dark areas and light, in seemingly unbroken great-circle lines radiating from the crater. In some cases the lines extend more than a thousand miles.

Large telescopes disclose that lunar rays are not as sharply defined as they seem to the observer with a small instrument. Their edges appear somewhat indefinite, consisting of blotches or irregular, overlapping patches, not unlike the pattern from the shovel of a farmer who spreads lime with an unsteady hand (opposite and page 283).

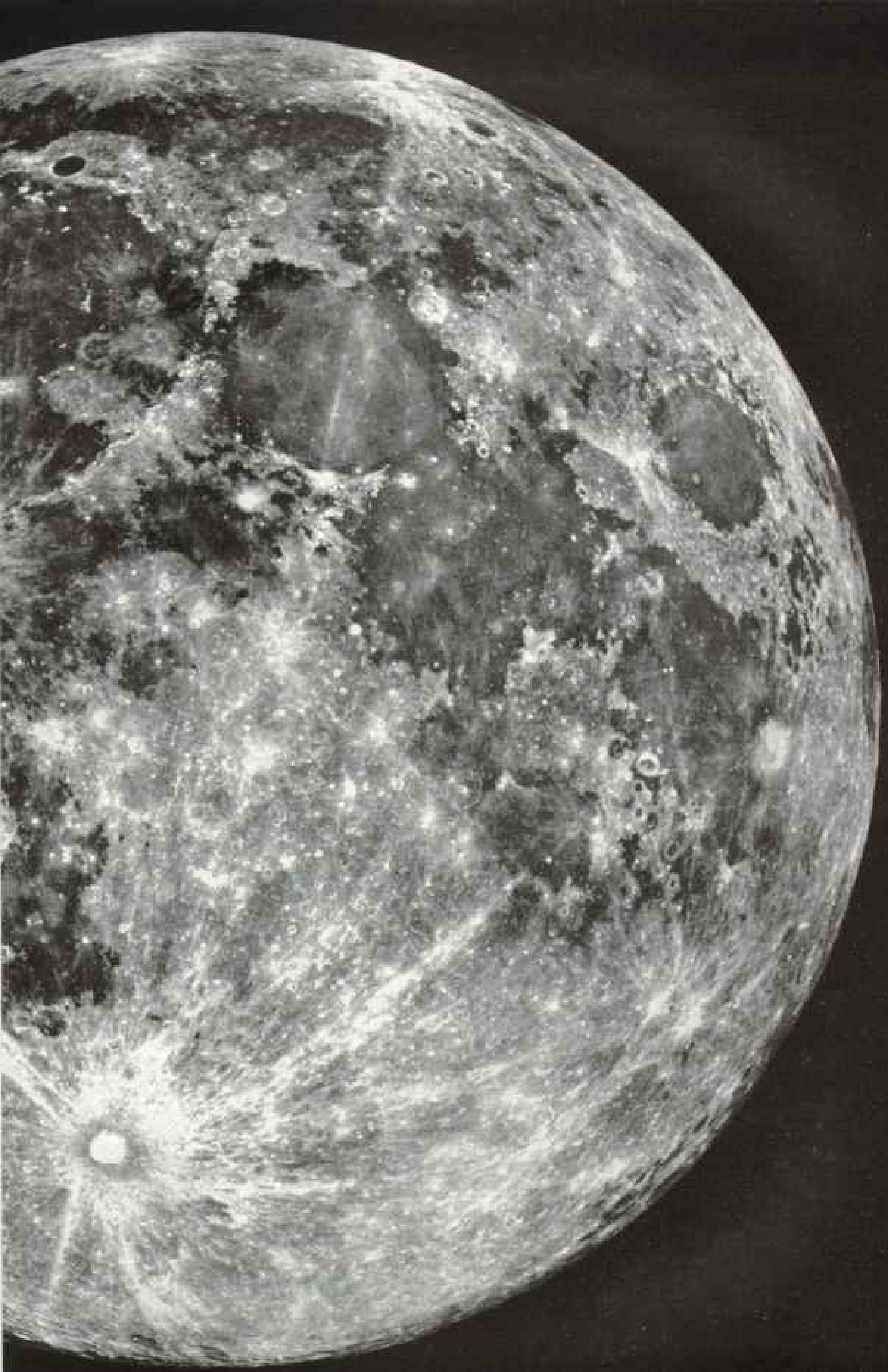
Close-up Portrait of the Moon Reveals a Pitted, Ravaged Face

Viewed through a powerful telescope, the luminous face that has moved poets and lovers becomes a wrinkled visage. Lava flows form the dark "seas." Some 30,000 craters scar the face that the moon always shows to earth. More than a dozen jagged mountain chains, and at least one peak higher than Everest, tower above dust-covered lowlands. Unprotected by an atmosphere, the moon endures constant bombardment by meteoric material and cosmic radiation. Its diameter is 2,160 miles, as compared with the earth's 7,927 miles.

Lick Observatory's 36-inch refracting telescope obtained this view. Images are upside down in such instruments, so this photograph, and those that follow, have been "righted." They appear as they would to the naked eye or through binoculars.

When seen by telescope, the conspicuous crater Tycho (bottom) suggests the north pole of a terrestrial globe. Meridianlike rays from Tycho are believed to be splashes of rock dust from the explosive impact of a meteorite.





Although Tycho's ray system is the most extensive, several other large craters possess significant ray patterns, and literally hundreds of minute systems occur. The character of these rays gives an important clue to the origin and evolution of their craters. Most of the rays, we conclude, are splashes, material spurted radially from holes produced by meteorites that smashed explosively into the lunar surface.

Although the most outstanding irregularities in the moon's surface consist of intermingled and overlapping craters, your telescope discloses a dozen or so distinct mountain chains. Also you see a number of separate peaks and note that nowhere does the lunar surface seem to be absolutely level. Even the flattest areas are rolling, with elevations and depressions of a few hundred feet.

Photographs taken through the 200-inch telescope at Palomar Mountain show the moon as though it were only 200 miles away.*

With this instrument and others, astronomers have photographed the entire face in great detail. They have given names to approximately 700 features (see moon maps, pages 285 and 287).

Moon's Far Side a Mystery

The moon requires exactly the same time to circle the earth as it does to make one complete turn on its axis. As a result it always turns toward us the same pocked, familiar face. Slight wobbles in the moon's motion, however, enable us now and then to peek first over one edge of the disk, then over another, so that actually we see about 59 percent of the total surface.

Any given point on the surface receives sunlight continuously for almost 15 days, then remains in darkness the same length of time (see phases, pages 290-291).

The earth contains approximately 81 times as much matter as the moon. Nevertheless, although we loftily refer to the moon as our "satellite," its diameter is a very impressive 2,160 miles, or more than one-quarter that of earth. Natural satellites abound in the solar system, but none bulks so large in relation to its primary planet as does our moon. If astronomers should exist on Mars, they undoubtedly would regard the earth-moon system as a "double planet."

Some scientists have suggested that the moon may have been part of earth originally and split off from it, but no credible evidence

supports one popular idea that the Pacific Ocean basin is the scar left by such a cataclysm. A more tenable theory holds that the moon, as well as earth and other bodies in the solar system, may have formed through the gradual accretion of a mass of dust and gas in space.

Why Go to the Moon?

To the casual observer the moon might seem an uninviting world devoid of economic value. However, a manned station on the lunar surface would have definite potentialities. For instance, it could relay world-wide television programs or perform other communications services, and, by observing earth, accurately forecast our weather to an extent now impossible.†

Conceivably the moon may contain valuable minerals, but the costs of extraction and of shipment to earth would be literally out of this world. If establishment of a sizable scientific base—perhaps in pressurized plastic buildings—should prove practicable, some exploitation of minerals might be justified for local use.

But one cannot evaluate the importance of a lunar station in terms of an immediate dollars-and-cents "pay-off." Scientific research by station personnel would yield a vast amount of knowledge, and from it would emerge new concepts and new challenges.

Lunar Station Would Probe Universe

Astronomers, for example, might use the moon as an observation platform in space. Free from atmospheric interference, they could get a clearer look into the depths of the universe than ever before.‡ Stars would yield secrets regarding their composition, and the atmospheres of neighboring planets, such as Mars and Venus, would be better analyzed.

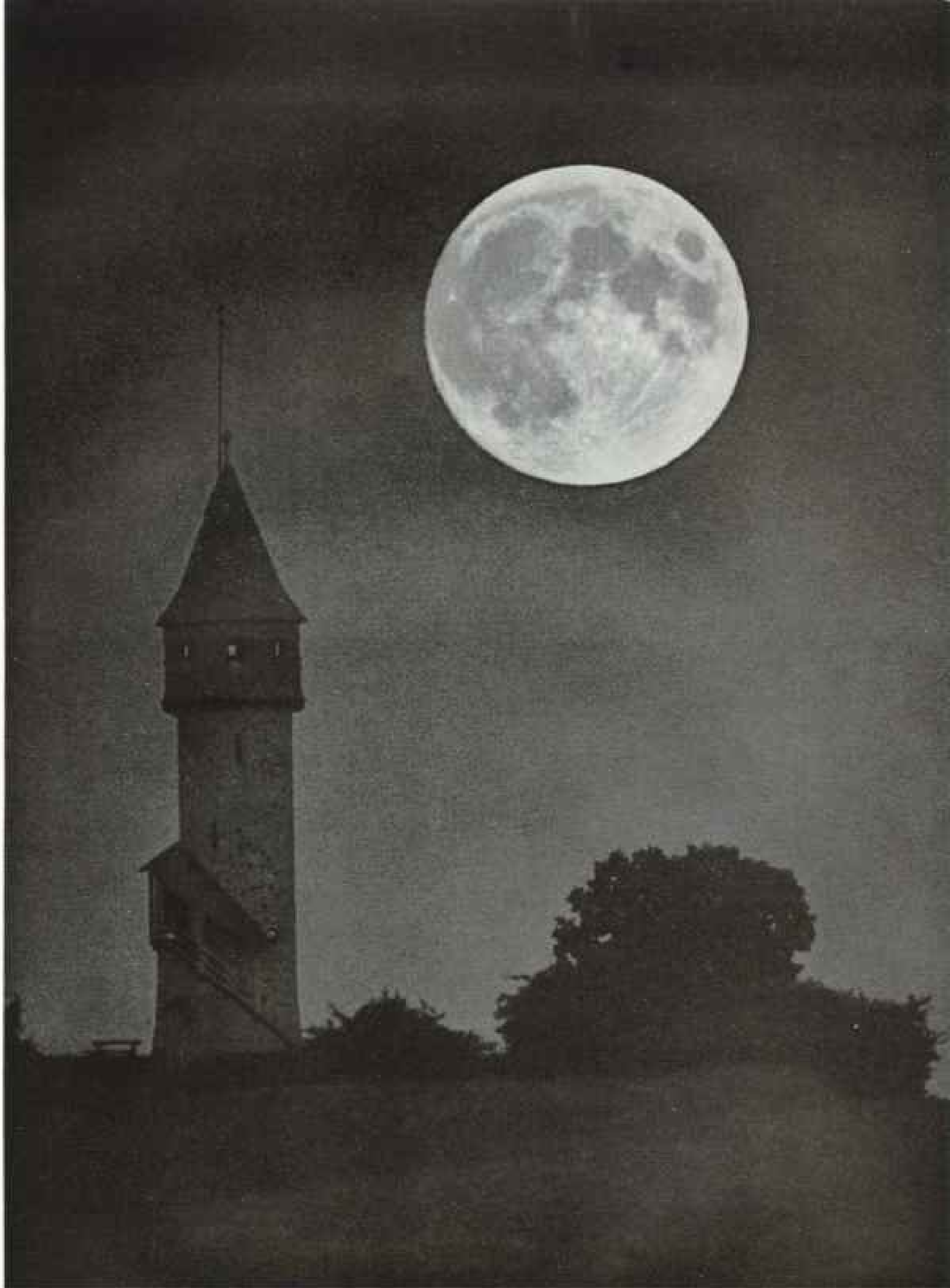
Our sun also would undergo searching inspection, and the interaction of its radiation with the terrestrial atmosphere would be

(Continued on page 288)

* See "First Photographs of Planets and Moon Taken with Palomar's 200-inch Telescope," by Milton L. Humason, NATIONAL GEOGRAPHIC MAGAZINE, January, 1953.

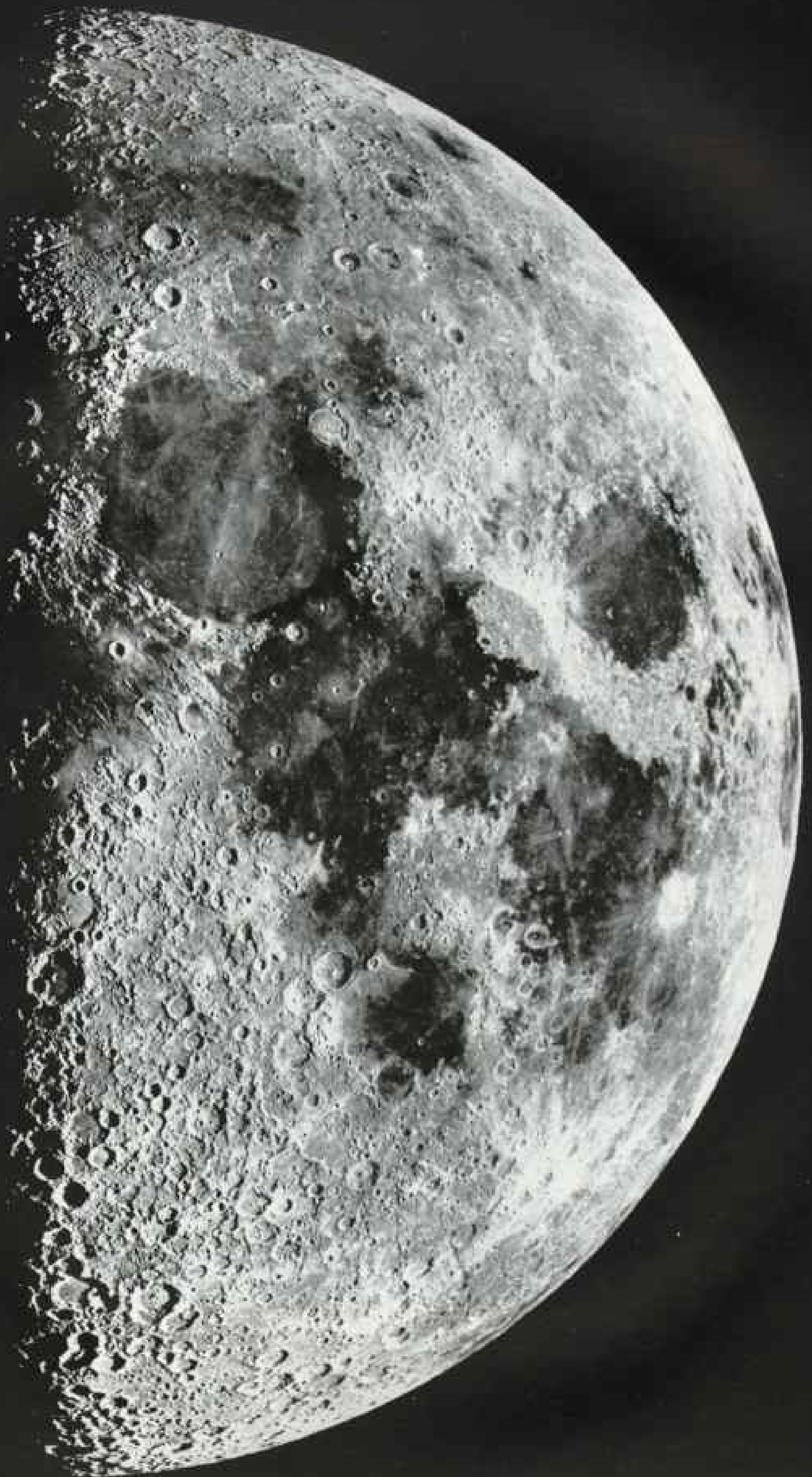
† Similar potentialities of artificial satellites are set forth in "How Man-made Satellites Can Affect Our Lives," by Joseph Kaplan, NATIONAL GEOGRAPHIC MAGAZINE, December, 1957.

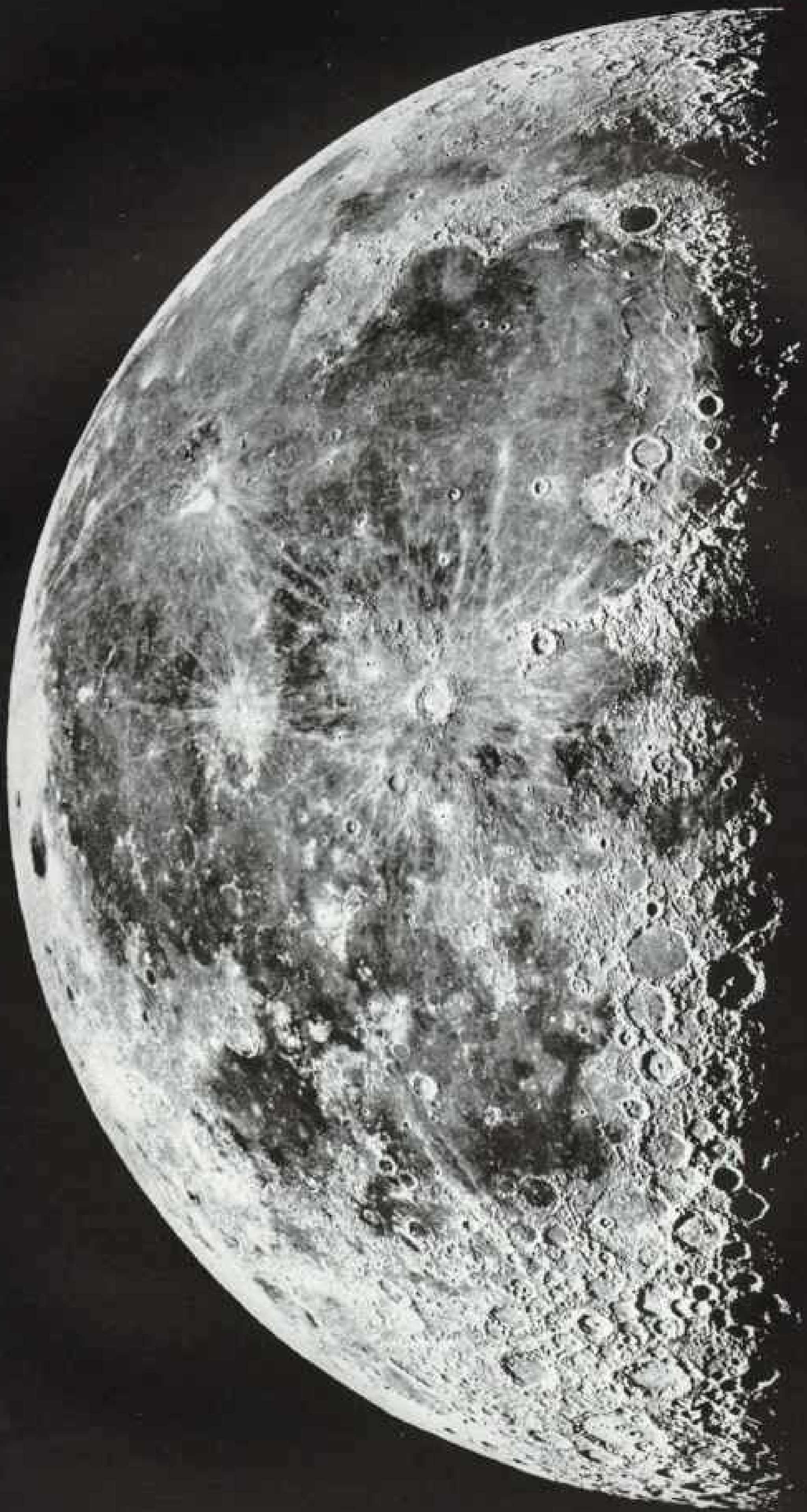
‡ See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Sky Survey Charts the Universe," by Ira Sprague Bowen, and "Exploring the Farthest Reaches of Space," by George O. Abell, both December, 1956.



Swollen Moon, Afire with Sunlight, Hovers over Wetzlar, Germany

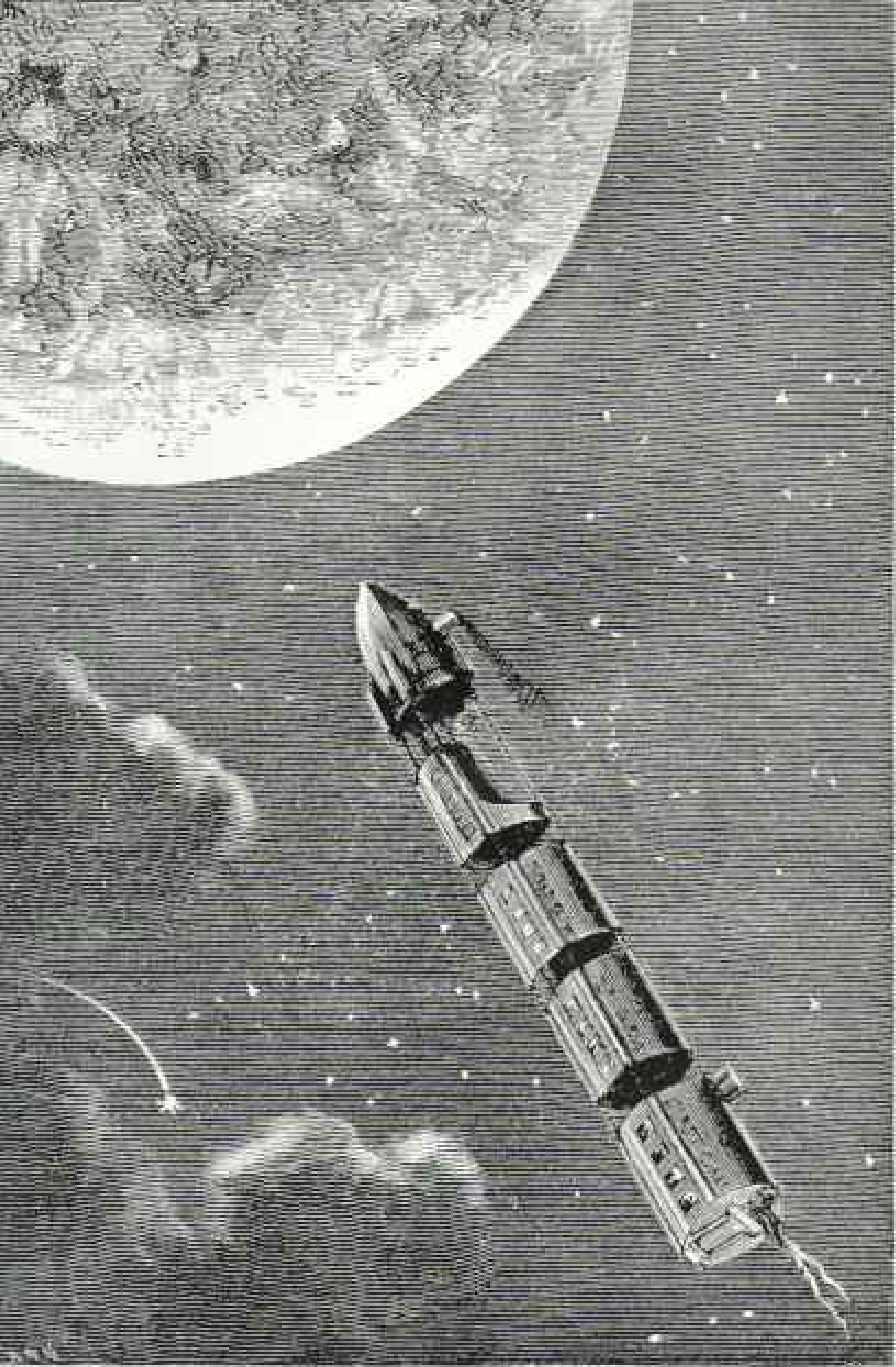
Julius Behnke waited patiently for just the right light, then made this photograph at twilight with a 600-mm. telephoto lens, which brought his subjects up close. Actually, the tower stood a mile away; in medieval times it belonged to the city fortifications. Bright streaks radiate from the crater Tycho, not far from the moon's south pole (pages 280-281).





Last Quarter





"Projectile Train" to the Moon—from a Jules Verne Novel

Jules Verne, father of science fiction, visualized lunar exploration in his companion novels, *From the Earth to the Moon* and *Round the Moon*, published in the 1860's. His three heroes, encased in a 20,000-pound aluminum projectile, were fired from a massive cannon near Tampa, Florida. This space-train illustration from the book, with coaches labeled "First Class" and "2d Class," bears little relation to the text.

better understood. Meanwhile other scientists, by studying the lunar surface, might deduce new facts concerning the origin of the solar system and of the universe itself.

The moon, should a base be established, would also provide a launching platform for robot missiles dispatched to Mars. Eventually the moon might become a way station for space travelers who would follow the exploratory missiles.

Let us now consider the moon's surface as you might see it from an approaching spaceship. Your first impression is that of utter desolation. Mountains are jagged, plains rough and barren, although the sharpness of jet-black shadows tends to overemphasize the ruggedness of lunar peaks.

Landing on the surface, you perceive a host of new and weird phenomena. The sky, even in broad daylight, is black as night and crowded with stars, bright and faint. Earth's sky is blue because particles in the upper atmosphere, such as gas molecules and dust, scatter the shorter or blue wave-lengths of the light coming from the sun. However, the moon possesses no detectable atmosphere, and hence no scattering of light relieves the darkness of shadows. Above you the sun displays an iridescent halo—the solar corona.

How Earth Would Look from the Moon

Earth is a striking sight—almost four times as large in diameter as the moon and relatively very much brighter, because clouds are far better reflectors than lunar rocks. Earth gleams a sapphire blue, with the deepest shades at the edges. It will exhibit phases like the moon, but at different times. For example, "new earth" corresponds with "full moon" and "full earth" with "new moon."

Our earth appears as a blue planet because its dominant color comes from the atmosphere—our sky seen from outside. Continent outlines show vaguely, if at all, partly because of atmospheric haze and partly because of vast storm areas obscured by clouds. Where visible, the continents add pastel shades of green in jungle or fertile country, yellow for desert areas, gray or brown for rolling,

undeveloped land, and vast expanses of white in the polar regions. Ocean areas add a slightly deeper shade to the over-all blue.

Just as the moon provides light for the terrestrial night, so does earth illuminate the lunar darkness. But since earth is bigger and more brilliant than the moon, earthshine on the scarred landscape far exceeds the intensity of moonshine on earth.

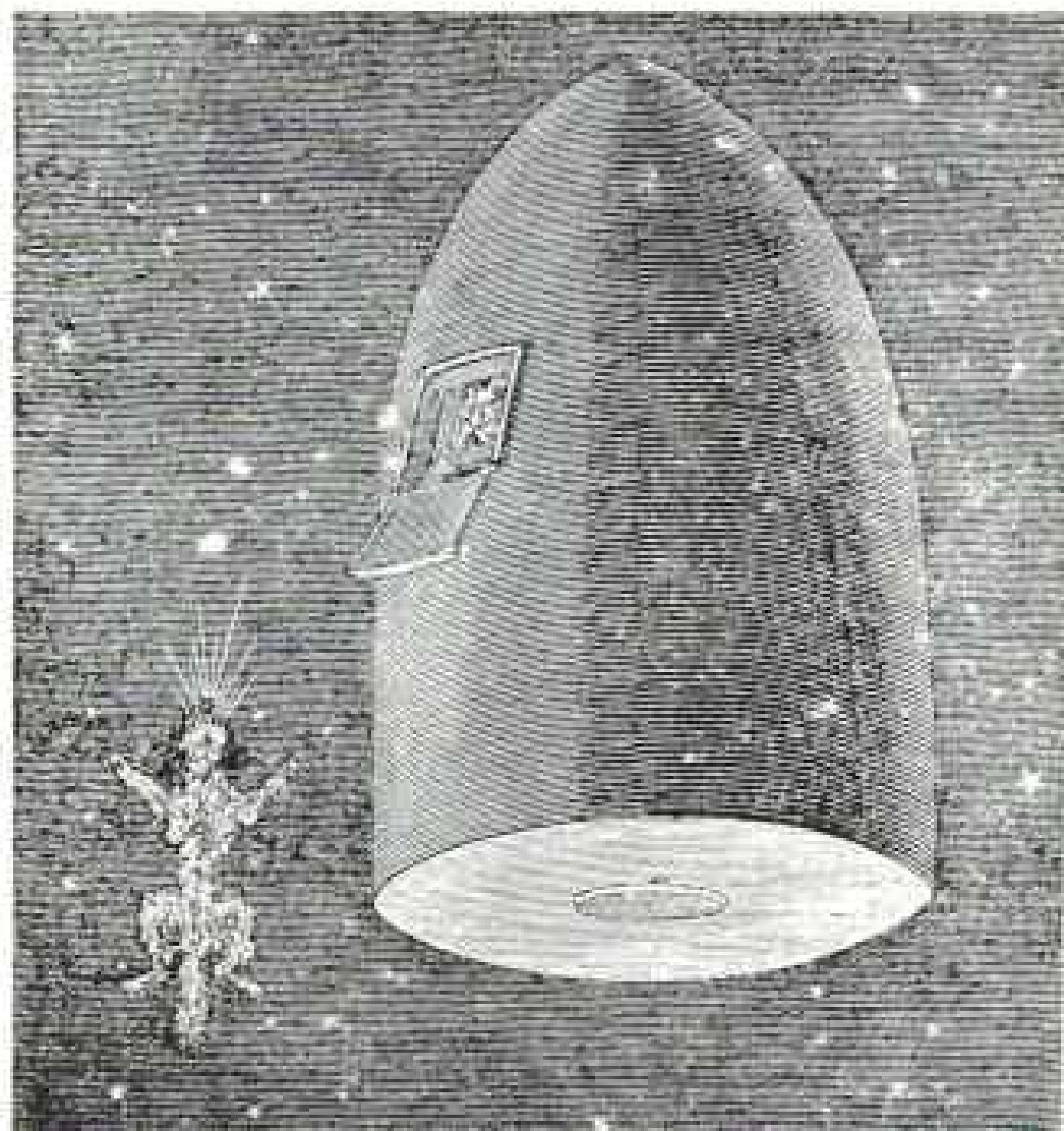
You may witness a most striking and startling phenomenon—an eclipse of the sun by the earth, the reverse of an eclipse of the moon as seen from our own planet. Lunar eclipses occur when the earth moves between sun and moon, casting its shadow on the latter. But if such an event occurred while you were exploring the surface of the moon,

Weightless Riders Dance in Mid-air in Verne's Spaceship

Free of gravity, Captain Nicholl, Barbicane, and Ardan float about the cabin with their dog, Diana, and two chickens. Verne thought weightlessness would occur at a point of "neutral gravity" between earth and moon. Actually his heroes would have been weightless from the time they left earth's atmosphere. Since their projectile traveled a celestial orbit, the forces of inertia would have balanced the pull of gravity, rendering the passengers feather light.

Space Debris: a Dead Dog
Aptly named Satellite, the ship's second canine passenger suffered a fractured skull at take-off and died. Pushed from a hatch into space, the body traveled near the ship, like a spent rocket accompanying a modern satellite. Verne's projectile circled the moon and fell back to earth, landing safely in the Pacific off Baja California.

Bettman Archive





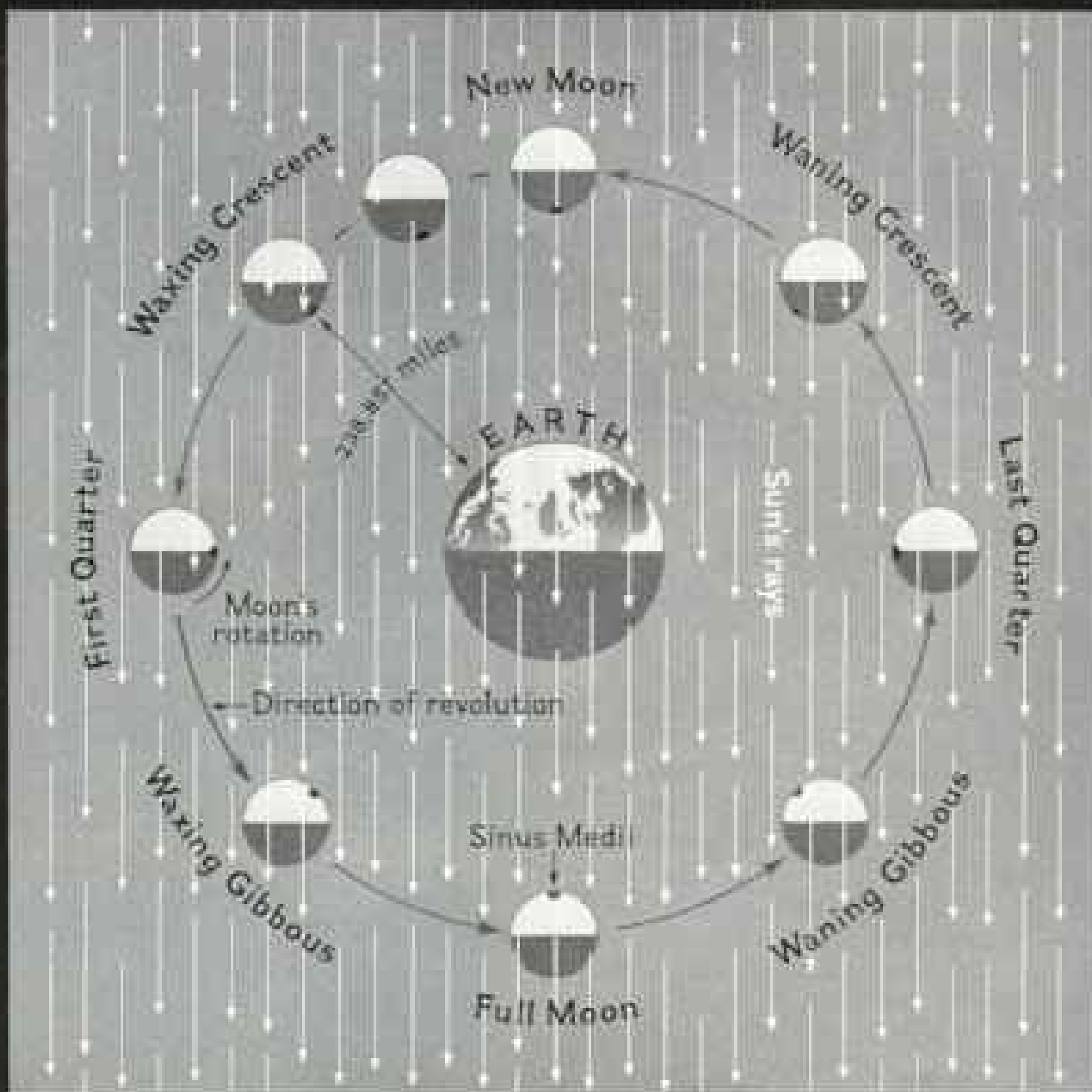
Waxing Crescent



New Moon



First Quarter



Waxing Gibbous



Full Moon



Waning Crescent



Last Quarter



Waning Gibbous

you would see the sun eclipsed by earth, a dramatic spectacle. Our planet's darkened circle would be rimmed with a coppery glow, where sunlight trickled through the earth's gaseous shell, emphasizing the red shades of sunset.

Dressed as a space traveler, burdened with oxygen tanks, space helmet, and other protective devices, you might weigh on earth as much as 300 pounds. On the moon, because of its smaller size and reduced gravity, you would weigh only one-sixth as much, or 50 pounds.

An athlete who on earth high jumps over a six-foot bar elevates his body's center of gravity an average of about three feet. On the moon he could leap 21 feet with similar effort (page 295). And, from this height, he would fall with a shock or impact no greater than that associated with the six-foot jump on earth.

To feel normal on the moon, the space traveler would have to wear leaden shoes weighing at least 300 pounds each.

Powder Masks the Moon's Wrinkled Face

A thin layer of dust covers the lunar surface from a depth of several inches to perhaps several feet. One prominent scientist has argued convincingly that the dust cover may be miles in thickness and that the craters themselves are dimples in this layer.

As you kick the dust upward, no billowing cloud remains behind, because even the finest particle, free of any atmospheric buoyancy, falls back as rapidly as it rises.

The dust surface is marred by indentations ranging in size from tiny impressions no larger than a dime to pits many feet across. These grade in turn

Moon's Position Relative to Sun and Earth Determines Its Phases

To primitive man, the waxing and waning of the moon was one of nature's most puzzling mysteries. Astronomy, oldest of sciences, long ago explained the phenomenon. Like the earth itself, half the moon is always in sunlight, half in shadow. As the moon journeys around earth, the lighted portion visible to us varies according to the moon's position. Astronomers recognize eight such variations, or phases. They occur within a period of 29½ days, the interval from new moon to new moon.

In the diagram (center) you are looking directly down on earth and moon. You see the moon in nine positions. Now note the ratio of light and shadow that the lunar face presents to earth in each phase. What astronomers call the new moon (top) is invisible to earth because it turns its back directly to the sun. About three days later the poets' new moon (slightly left) shows an ultrathin crescent of light. On the opposite side of its orbit, the moon presents its sunlit face to earth and is full.

Photographs of the phases correspond to positions shown on diagram. "Gibbous" (from the Latin *gibbus*, hump) refers to the moon's swollen aspect between the quarter and full phases. Sinus Medii (Middle Bay) is a central point on the face of the moon (see map, page 287).

into the giant craters. Such marks result from the continuous rain of meteoric material. This produces, in addition to dust, many small chips and fragments, most hazardous underfoot.

Beneath the continuous sun of the moon's two-week daylight, the top layer of dust exceeds the temperature of boiling water, 212° F. In the darkness of the long lunar night the temperature falls to minus 243° F. Extreme as these ranges are, the variation is only skin-deep. Layers of pulverized rock in a vacuum comprise excellent insulation, and the highly heated or highly cooled layers extend downward scarcely more than a few inches. Scrape away the top layer of dust, and the thermometer will read approximately minus 40° F. both day and night.

A Cosmic Missile Gouged Chubb Crater, Earth's Largest Meteorite Scar

Unlike the moon, earth displays few pockmarks attributed to meteorites. Our atmosphere consumes most "shooting stars," and erosion usually obliterates the scars left by those that survive the fiery plunge. There are, however, a few remarkable exceptions. Northern Quebec's Chubb Crater, 11,500 feet in diameter, has an area eight times greater than Arizona's more famous Meteor Crater. To determine its origin, the National Geographic Society and the Royal Ontario Museum sent an expedition to the site in 1951. Scientists headed by Dr. V. Ben Meen found evidence of a magnetic anomaly, indicating a buried meteorite.



No ordinary heat-measuring device of earth-bound scientists will penetrate these layers. Radio emissions from the moon, however, arise in layers a few inches below the surface and have been received on earth. The uniformity of this radio energy, from full moon to new, proves the contention that these emitting layers are constant in temperature throughout the lunar day, $29\frac{1}{2}$ earth days long.

Moon Could Not Retain Air

Earth has an atmosphere because its gravity is strong enough to retain the constantly moving molecules of air. But if ever the moon possessed air or water, the molecules of these substances in time would have acquired velocities in excess of the $1\frac{1}{2}$ miles per second necessary to escape from the moon's weak gravitational pull. Thus the moon's atmosphere and water would have literally evaporated into space in the relatively short period of 1,000 years or less.

Two other tests show the moon has no detectable atmosphere. We see no clouds floating above its surface, and when the bright orb passes in front of a star, the star disappears suddenly. If the moon had an atmosphere, the star would go out of sight gradually, because of refraction of its light passing through air at the edge of the lunar face.

Though some early students regarded the maria as dry ocean beds, and thought some worn-down craters had been eroded by water, in all probability the original lunar atmosphere, if any existed, was neither dense enough nor permanent enough to cause any perceptible aging of the rock surfaces.

A few observers have reported seeing occasional minute flashes of light against the night-darkened hemisphere of the moon. They have interpreted these flashes as meteorites or shooting stars, extremely small rocks heated to incandescence by friction with the rarefied remnants of lunar atmosphere. The observations are difficult and still not confirmed. They may be merely optical illusions.

It is by no means impossible that the moon may possess a mere vestige of an atmosphere, perhaps consisting of xenon, krypton, and other gases too heavy for escape. Detection will be difficult, but there seems to be some chance that such an atmosphere, during intense solar activity, might glow like a faint aurora borealis.

The moon must be devoid of life of all sorts, animal or vegetable. Not even bacterial organisms could survive the extreme alternations of heat and cold, the absence of water and atmosphere, the searing touch of ultraviolet light and X rays from the sun, and the continual peppering of the surface by small meteors.

Some observers have tried to interpret apparent changes in shadow or color within various lunar craters as an effect of vegetation. This phenomenon, however, must be due wholly to the variable angle of illumination from the rising and setting of the sun.

You, as our hypothetical lunar explorer, are gathering many bizarre impressions of the desolate moonscape. Early among them is an awed realization of the terrain's extreme ruggedness. You may decide that the moon, for its size, appears to be several times rougher than earth—and you are quite correct.

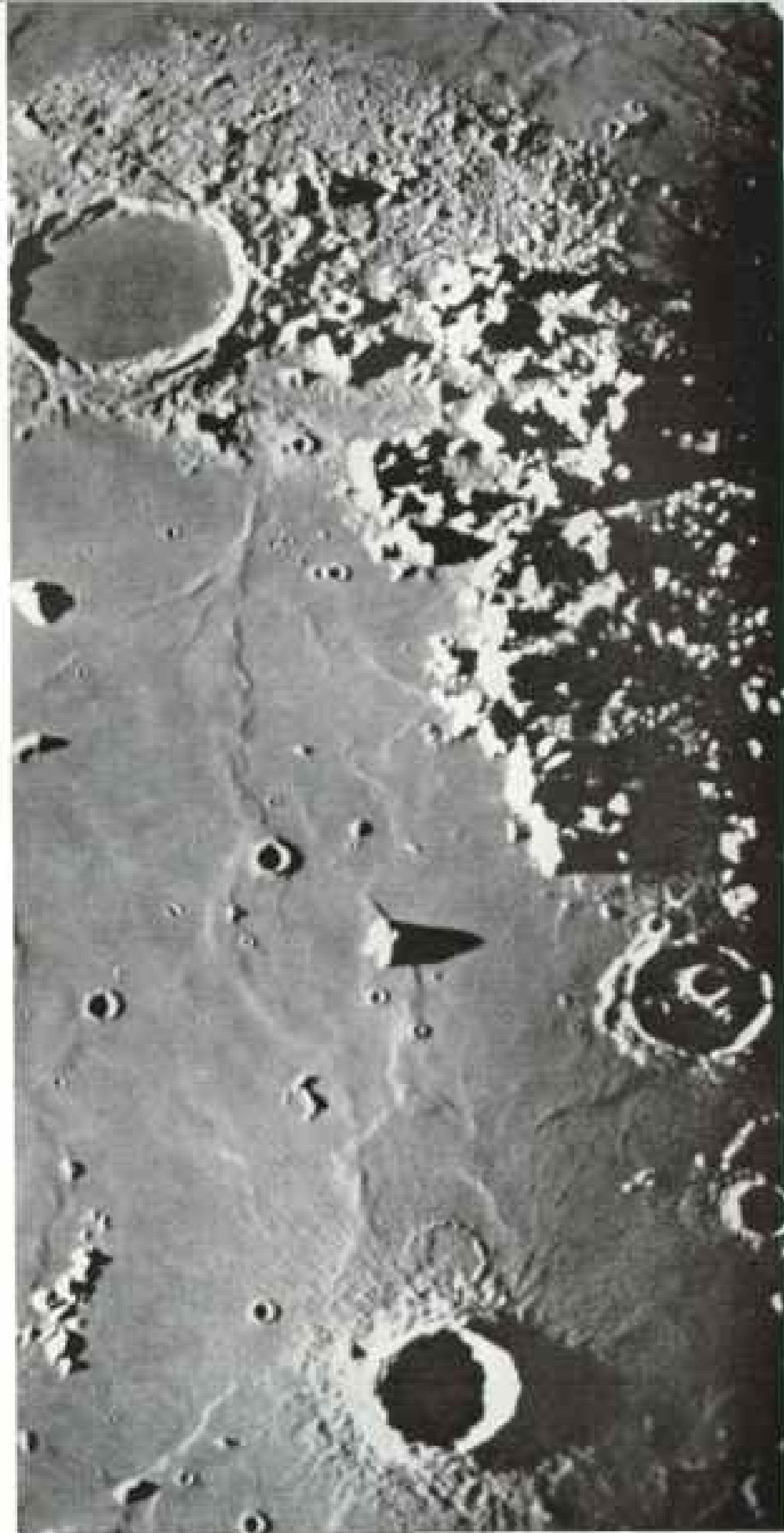
One Peak Towers Six Miles High

Principal lunar mountain ranges take their names from a fancied resemblance to terrestrial counterparts: the Alps, the Caucasus, and the Apennines. Some points in these ranges attain 12,000 to 18,000 feet above the neighboring plains. The Doerfel Mountains, on the moon's extreme southern edge, may contain peaks in excess of 20,000 feet. Moreover, recent measurements of the moon's profile, by Dr. C. B. Watts of the U. S. Naval Observatory, have revealed a mountain standing six miles above a near-by valley.

It may seem mystifying that we can measure the altitudes of lunar peaks, but the principle involved is simple. On the moon, as on earth, mountains cast their longest shadows at dawn and dusk, and we calculate heights from the shadows (see photograph at right).

Sunlight probably never penetrates into the depths of a few craters or some other regions surrounded by high mountains near the lunar poles. These are the coldest areas on the surface. Although liquid water doubtless does not exist on the moon, "ices" composed of frozen water, methane, or carbon dioxide conceivably might lie in these sunless depths.

Craters hold the key to the moon's surface features, including the dark seas as well as the bright rays. Even the most casual study of the surface convinces observers that craters differ greatly in age. Some are crumbling like ancient ruins; others appear as crisp and new as a modern apartment building.



Lick Observatory

Like Bomb Blasts in a Desert, Meteoric Craters Pit the Sea of Showers

Lunar craters visible to astronomers range from a few thousand feet to 150 miles in diameter and as much as four miles in depth. This dramatic view shows two major depressions, Plato (top) and Aristillus (bottom). Plato's floor, unlike the debris-cluttered interiors of most moon craters, is relatively smooth—a "walled plain." Waves of congealed lava from Mare Imbrium, the Sea of Showers, ripple to the base of the lunar Alps.

Piton (center), a rocky rampart rising 7,000 feet from the "sea," casts a spearhead shadow in oblique rays from the sun.

Astronomers see the moon to best advantage when sunlight strikes at an angle and craters and mountains stand out in bold relief. Measurement of the resulting shadows enables the scientist to gauge the height of mountains and of crater walls and to estimate their steepness.

One factor in the aging process is the savage sandblasting effect of fine meteoric material. Another factor is the moon's sudden and extensive changes in temperature, which cause even the strongest rock to expand and contract, resulting in the sloughing off of fragments.

Some of the older craters, especially those bordering on the giant maria, often appear as half circles or smaller arcs, as if the original large crater had sunk into a morass of quicksand. Here and there we note an occasional clear, relatively new crater, generally smaller than some of the older, inundated ones. In my opinion the sharpness of their outlines proves that these new craters must be in rock and are not mere dimples in a dust-filled desert.

Craters completely cover some areas, small ones encroaching upon or actually breaking into the edges of larger ones. Craterlets com-

pletely or almost completely destroy the obviously older, underlying craters. Other regions, notably the maria, are relatively unpitted. Some natural process has removed the holes over large areas, but dust is scarcely the answer.

Lava Flood Engulfed Vast Areas

Many astronomers conclude that the major force in the disappearance of craters from the seas was a flood—not of dust, water, or mud, but of lava. This inundation must have occurred millions of years ago.

Of course the flood may have been gradual rather than all at once, occurring at different stages to create the different seas. As the lava flowed over the lunar crust, mountains and craters tended to topple and sink, some of them lopsidedly, into the plastic mass. Then the moon's surface gradually cooled, leaving lava-encrusted darker areas relatively free of craters. Some craters appear, however, in the lava regions and do not display the ravages of time exhibited by craters elsewhere, suggesting that they probably are the newest of all lunar formations.

Some years ago astronomers believed that most of the moon's craters were volcanic. Now the majority of scientists will agree that these pits originated almost wholly from the impact of meteorites, large and small. Such cosmic missiles have blasted the lunar face since the moon first acquired a solid surface.

The visible craters range in size from Clavius, about 150 miles in diameter, with an area as large as Massachusetts and New Hampshire combined, down to pits only a few thousand feet across, barely discernible in telescopes of the highest power. So large are some of these craters that a person standing in the center of one of them would be unable to see the crater walls, which would be out of sight beyond the general curvature of the surface.

Some lunar craters possess central peaks, which would seem to indicate a possible volcanic origin. However, the moon's craters have one marked feature distinguishing them from terrestrial volcanoes and proving them an altogether different type of formation.

Light Silhouettes the Author as a Waxing Crescent

When Dr. Donald H. Menzel consented to be photographed peering through a telescope at the Harvard College Observatory, he suggested that his face be lighted in a manner that would illustrate one of the phases of the moon. "Make it a waxing crescent instead of a waning one," he laughed (diagram, page 290). One of the world's foremost astronomers, Dr. Menzel provided the monthly star charts and sketches for the constellation drawings on the NATIONAL GEOGRAPHIC MAGAZINE's Map of the Heavens (December, 1957).

David S. Hoyer, National Geographic Staff





World Records Would Topple at a Lunar Track Meet

Octogenarians could high jump like champions in the lesser gravity of the moon, one-sixth that of earth. The crossbar's height would be determined by the distance a man could elevate his center of gravity, which is found about three feet above ground level. An athlete competing on earth might raise his "c.g." three feet, enough to clear a six-foot bar. A similar effort on the moon would achieve 21 feet ($6 \times 3 + 3$), provided we ignore the encumbering space suit.

Our own volcanoes, with rare exceptions, possess craters that are relatively small compared with the altitude or diameter of the volcanic cone. On the moon, however, the crater comprises the major portion of the formation, and the walls are an almost incidental feature. The material in the walls and surrounding regions usually has just about enough volume to fill the depression of the crater itself.

On the earth volcanic cones contain vast quantities of material transported from the interior and piled up outside. This material exceeds by many times the volume of the relatively tiny craterlet at the top.

New Craters Reveal Telltale Clues

Where old and new lunar craters are intermingled and overlapping, it is difficult to get a clear picture of their true nature, but three newer, unbroken ones, in the vast plain known as the Mare Imbrium (Sea of Showers) provide better clues. These pits are named Timocharis, Autolycus, and Aristillus.

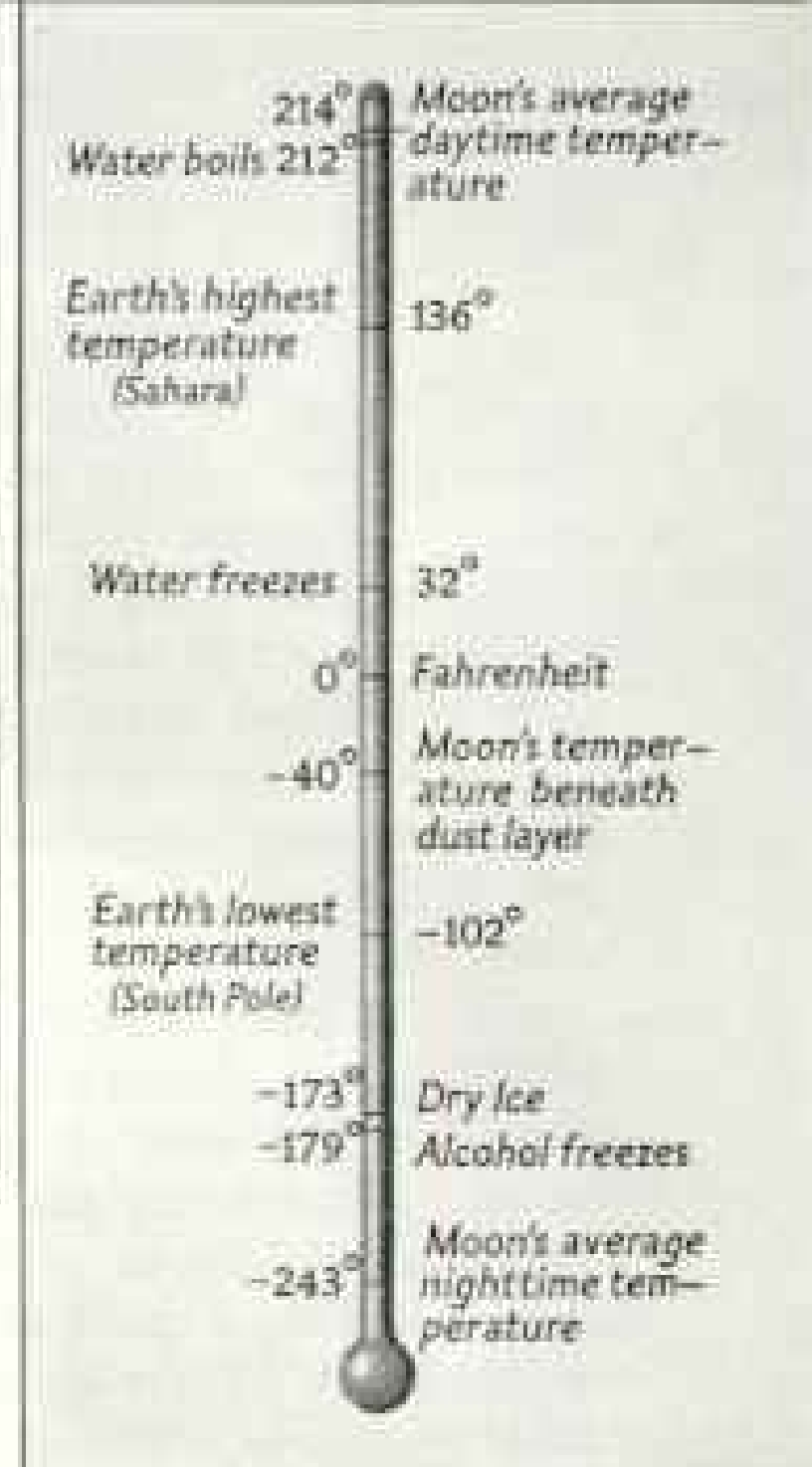
Aristillus, called by many astronomers the most perfect crater, is 35 miles across, 10,300 feet deep, and has a rim height of 4,400 feet. A sharp mountain peak rises in its center, and its interior is roughly terraced with shattered rock. Radiating outward from the crater are a series of valleys and ridges, extending in some cases for 100 miles. Since these mark-

ings cut right through a ruined crater just north of Aristillus, it seems probable that the radial streaks represent grooves gouged out by debris ejected from Aristillus at the time of meteoric impact (page 293). Autolycus, too, shows this phenomenon.

On the top of the mountain that rises in the center of Timocharis is a small craterlet, hinting that this peak may have shown volcanic activity. About ten other craters also have central peaks containing such craterlets, which conceivably could be the result of chance hits by small meteors. It seems more probable, however, that they are due to the meteor impacts that formed the original, much larger craters. A huge mass, striking the moon with devastating force, would melt and perhaps partially vaporize in the process. Small-scale volcanism might persist for a time thereafter, long enough to produce a modest crater pit.

Near the edge of Mare Imbrium lie the two large walled plains named for the Greek scholars Plato and Archimedes. Evidence for a heavy lava flow over them at some time in the history of the moon is extremely strong. Buried craters abound, with horseshoe rims still peeking through the surface. Lava infiltration has formed a relatively level floor, quite unlike that of the average crater.

Various astronomers have suggested that Mare Imbrium, and perhaps other seas as



**Moon's Heat Range:
Water-boiling Days,
Alcohol-freezing Nights**

well, were formed from lava created by the terrific impact of flying mountains or even minor planets. Such bodies were plentiful in space during the youth of the solar system.

Picture the celestial drama that resulted in the formation of Mare Imbrium untold hundreds of millions of years ago.

In these inconceivably remote times the Mare Imbrium resembles its present form only slightly, if at all. Craters of all sizes clutter the area.

Suddenly there appears a body of unprecedented size, a planetesimal, or small planet, more than 100 miles in diameter, shining in the sun and heading for the Imbrium area.

This cosmic missile crashes into the lunar surface, but its impact at first seems to be an anticlimax. There appears to be no appreciable resistance. The moon's crust buckles and gives way as the projectile bores its way down, like a bullet in a butter box, leaving a gigantic gaping hole in the surface.

Tremendous Blast Rends Lunar Crust

For several seconds nothing further happens. Then the edges of the hole begin to rise. Rocks and even mountains fly upward. From the hole a geyser of hot lava, created by the melting of the giant missile, spews upward to a height of perhaps 50 miles. Rock melted by the force of the impact sprays to a distance of several hundred miles.

Layers of the moon's crust tear jaggedly and then stand on end as a tremendous explosion—perhaps the most violent in the entire history of the planetary system—causes the entire region to crumble. Millions of tons of rock rise from the center of the blast area, to be hurled outward by the violence of the shock. This flying debris carves deep canyons and gouges valleys from distant mountain chains—the so-called "splash craters."

A pool of molten lava forms in the center and rapidly spreads outward, engulfing the older craters and melting away their structures until the area becomes relatively smooth. A thick crust of dust and volcanic pumice settles on the lava, hampering its cooling for years, or even centuries. The great lava flow spreads outward; finally the seething mass cools and forms a solid crust. Eventually a few smaller meteorites fall, and we get Mare Imbrium in substantially its present form.

The blast equaled many billions of the atom bombs that leveled Hiroshima. Several other maria resulted from the great lava flows accompanying the explosive collision.

The moon's Alpine Valley, a tremendous gorge from three and a half to six miles wide, 80 miles long, and some 10,000 feet deep, may have been cut by a mountain-sized fragment of the explosion that created the Mare Imbrium. The gash is comparable in appearance to the Grand Canyon of the Colorado, but unlike this earthly gorge the Alpine Valley slices directly through a major ridge of mountains, strong evidence that it was gouged by some tremendous force.

Since a lava flow destroys or at least partially obliterates all craters in the region it covers, any feature atop the lava system must be relatively new. Craters with extensive ray systems fall into this category. Among the most conspicuous ones are Tycho, Copernicus, Kepler, Byrgius, Anaxagoras, and Aristarchus.

About fifty other medium-sized craters and several hundred smaller ones have ray systems. Some of the smaller holes would be difficult to find were it not for the minute rays. Their whiteness attracts our attention.

These rays probably consist mainly of finely powdered rock, blasted out by the impact of meteorites. With no air to disperse it, a cloud of rock might fly out hundreds of miles to form the radial splashes. Such fine dust reflects more light, so that the rays appear brighter than the rest of the surface.

Although most of the rays probably originated from these impacts, seepage of molten rock through cracks may be responsible for some related features. Two such clefts are Ariadaeus and Hyginus, large cracks in the surface caused by stresses within the moon. Several varieties of these cracks occur, some at least partially filled with lava.

Posthole and Far-side Enigmas

Among the most puzzling of lunar formations are the so-called "crater chains," long rows of small craters lined up like postholes. The most prominent lie in the vicinity of Copernicus. Their exact alignment shows that they cannot be ordinary meteor craters. Since most lie along clefts, they may be basins where hot lava oozed to the surface.

About the greatest enigma of all, what lies on the far side of the moon, we can only conjecture. The answer seems obvious—more of the same—but the details may well be spectacular. One of the greatest events of history will be the time when a rocket ship, or a guided supermissile, swings around the moon, records the view, and perhaps televises it back to earth.

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The lack of fanfare is typical of this 47-year-old son of John D. Rockefeller, Jr., donor of such national treasures as Colonial Williamsburg and Jackson Hole. Quietly, but with tremendous energy and imagination, he directs the many conservation projects originated by his father and himself.

Like the National Geographic Society, Laurance Rockefeller has long been dedicated to preservation of his country's scenic and historic heritage. "Man needs direct experience of nature—of sea and soil and living things," he says. It is most appropriate that he has been elected to The Society's Board of Trustees and thus will help guide its great work for the increase and diffusion of geographic knowledge.



Laurance S. Rockefeller (left), new Trustee of The Society, with construction director Henry Beebe at Caneel Bay, St. John.

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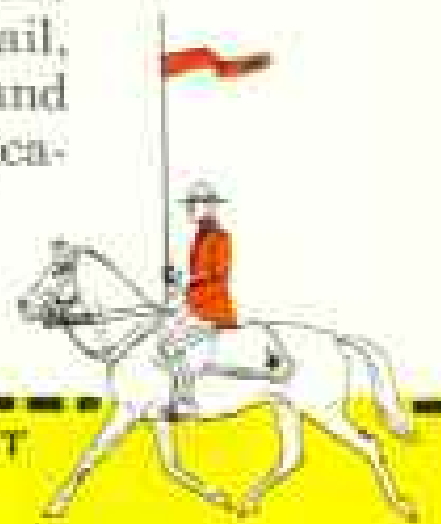
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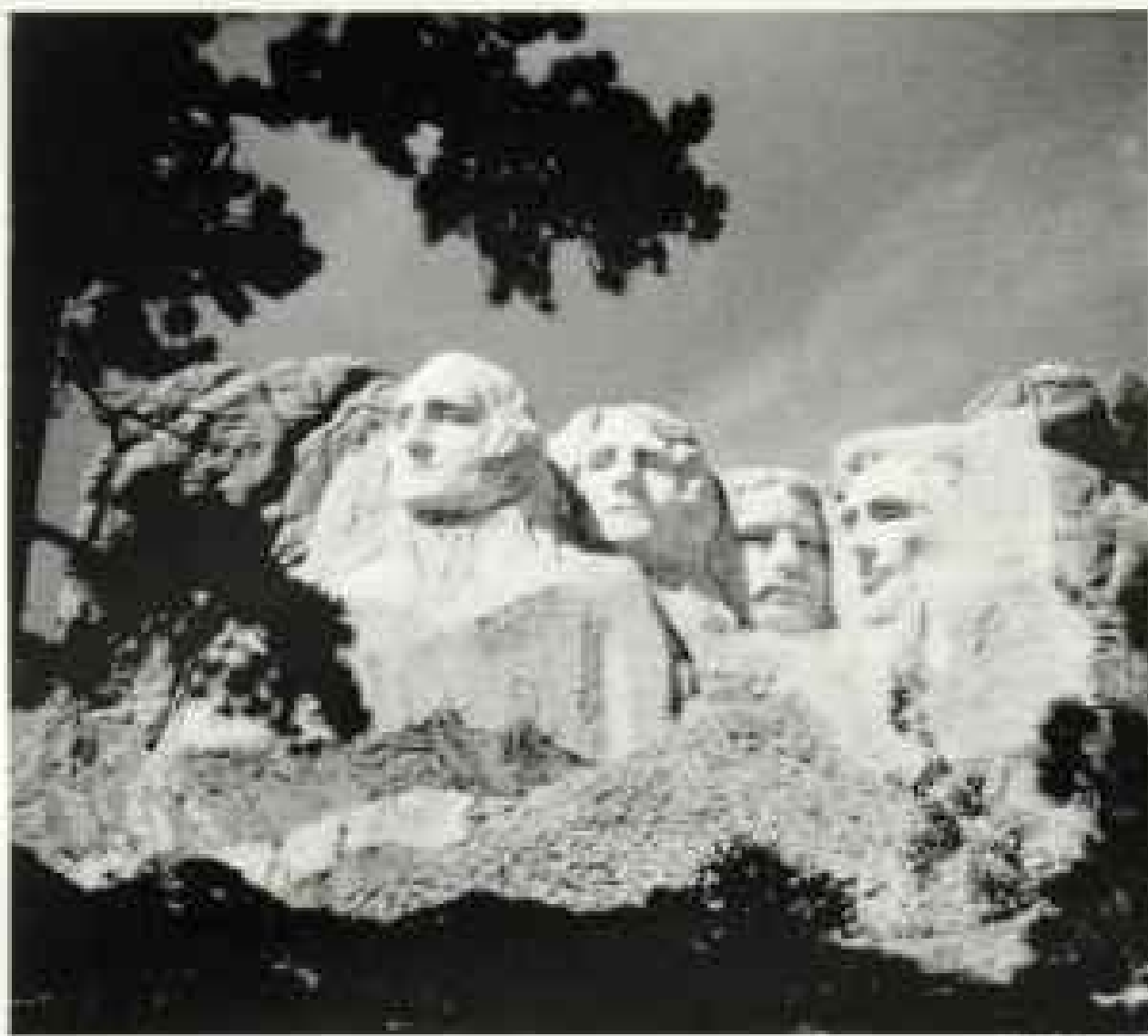
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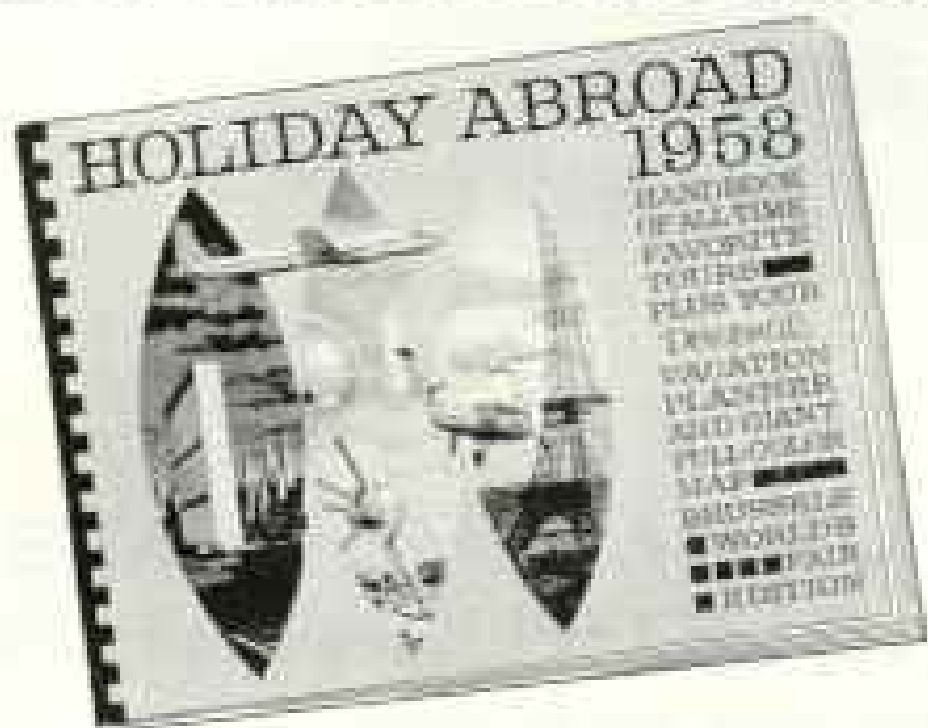
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★ A cardinal feature of the plan is **GUIDANCE**. The Society has a Selection Panel whose sole business it is to determine "must-have" works for members. Members of the panel are:

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HOW THE SOCIETY OPERATES

EACH month, three or more RCA Victor Red Seal Records will be announced to members. One will always be singled out as the record-of-the-month, and unless the Society is otherwise instructed (on a simple form always provided), this record will be sent to the member. If the

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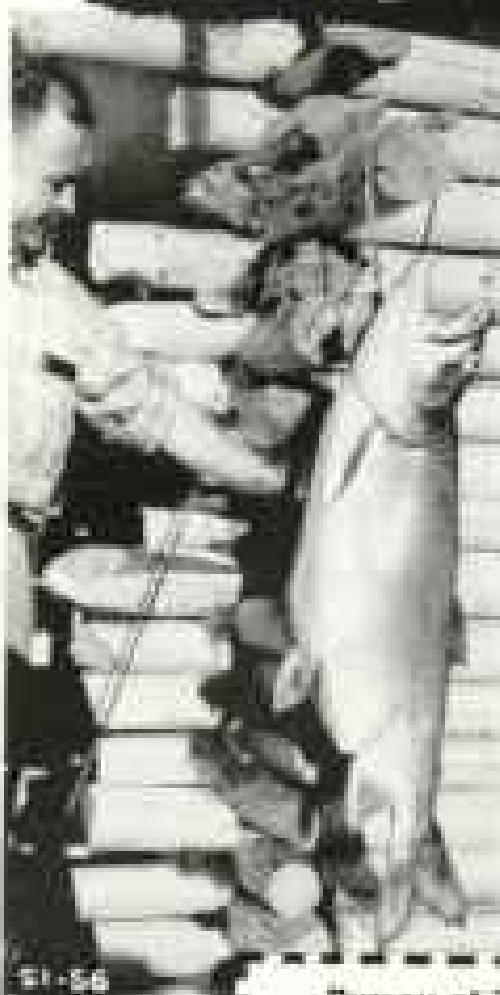
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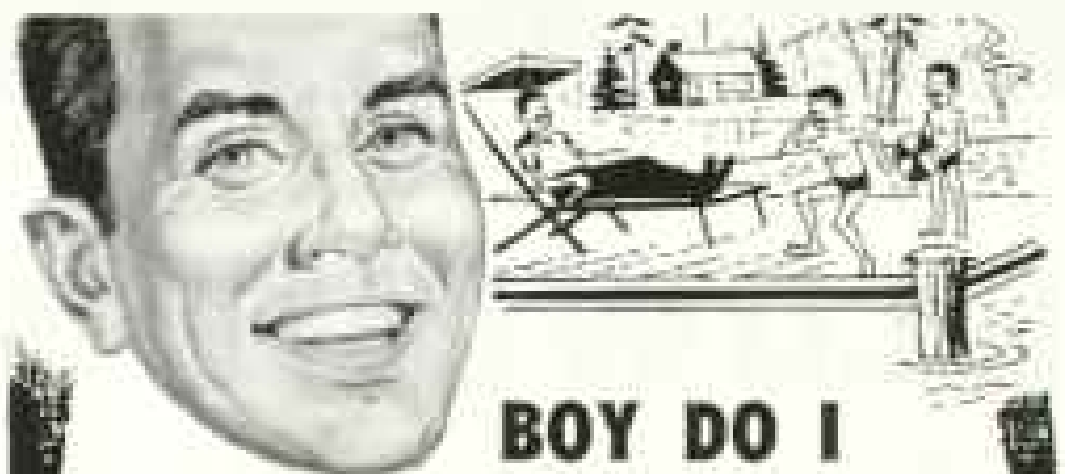
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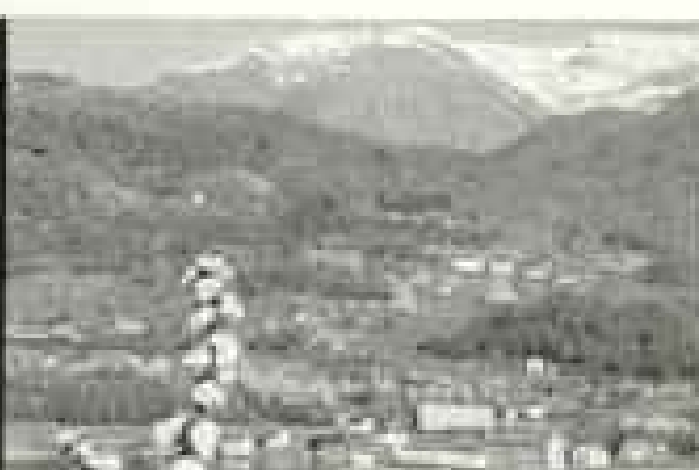
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1. Changing of Guard, Stockholm, Sweden
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2. Port of Reykjavik, Iceland
 Walled City of Dubrovnik, Yugoslavia
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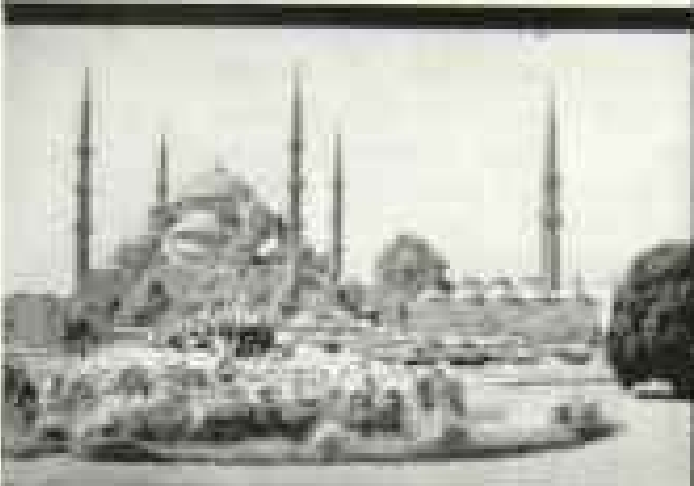


3. View of Hardanger, Norway
 Lake of Lucerne, Switzerland
 Harbor of La Condamine, Monaco



4. Ancient Vianden Castle, Luxembourg
 Olavinlinna Castle, Finland
 Tower of Belim, River Tagus, Portugal

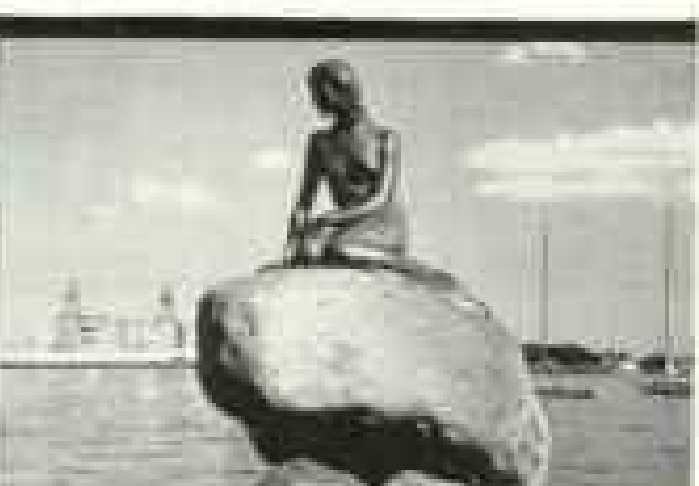
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5. The Mezquita (Mosque), Cordoba, Spain
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6. The Old City, Amsterdam, Netherlands
 Canal Scene, Bruges, Belgium
 The River Liffey, Dublin, Ireland



7. The Lorelei, River Rhine, Germany
 Venus de Milo, Paris, France
 "Little Mermaid", Copenhagen, Denmark

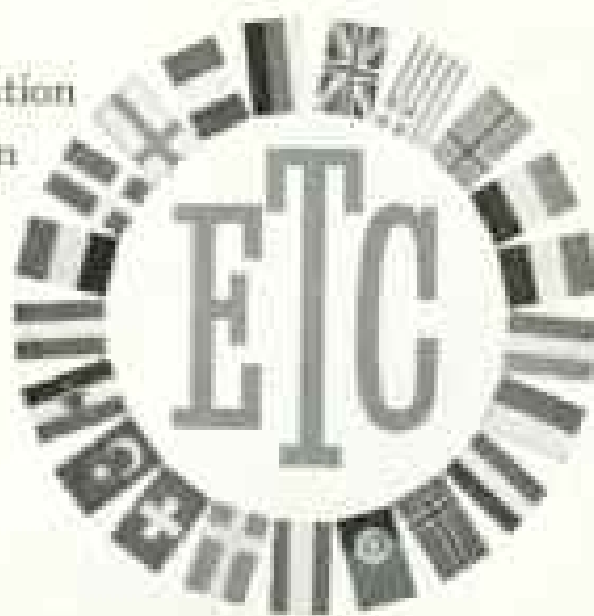
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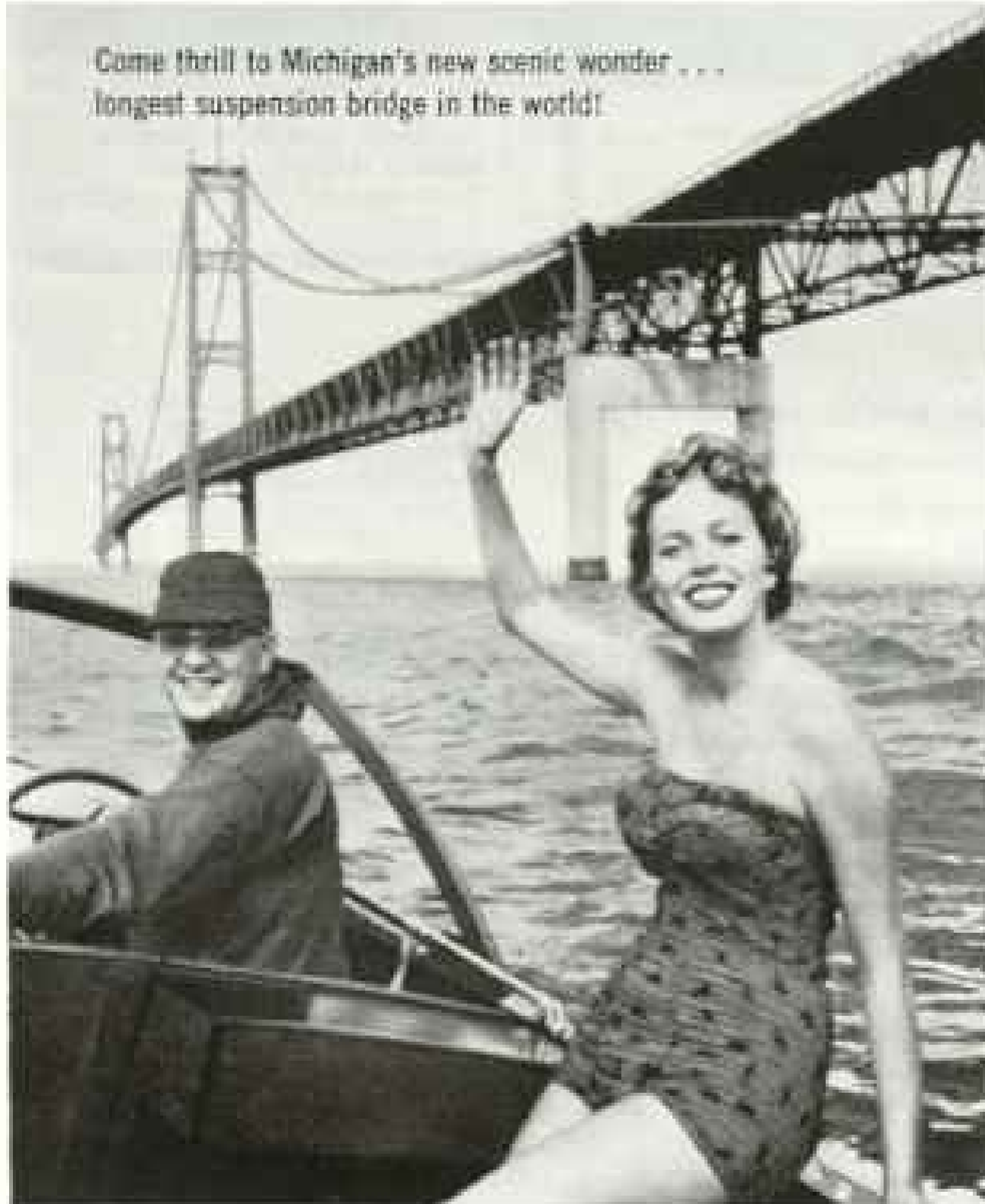
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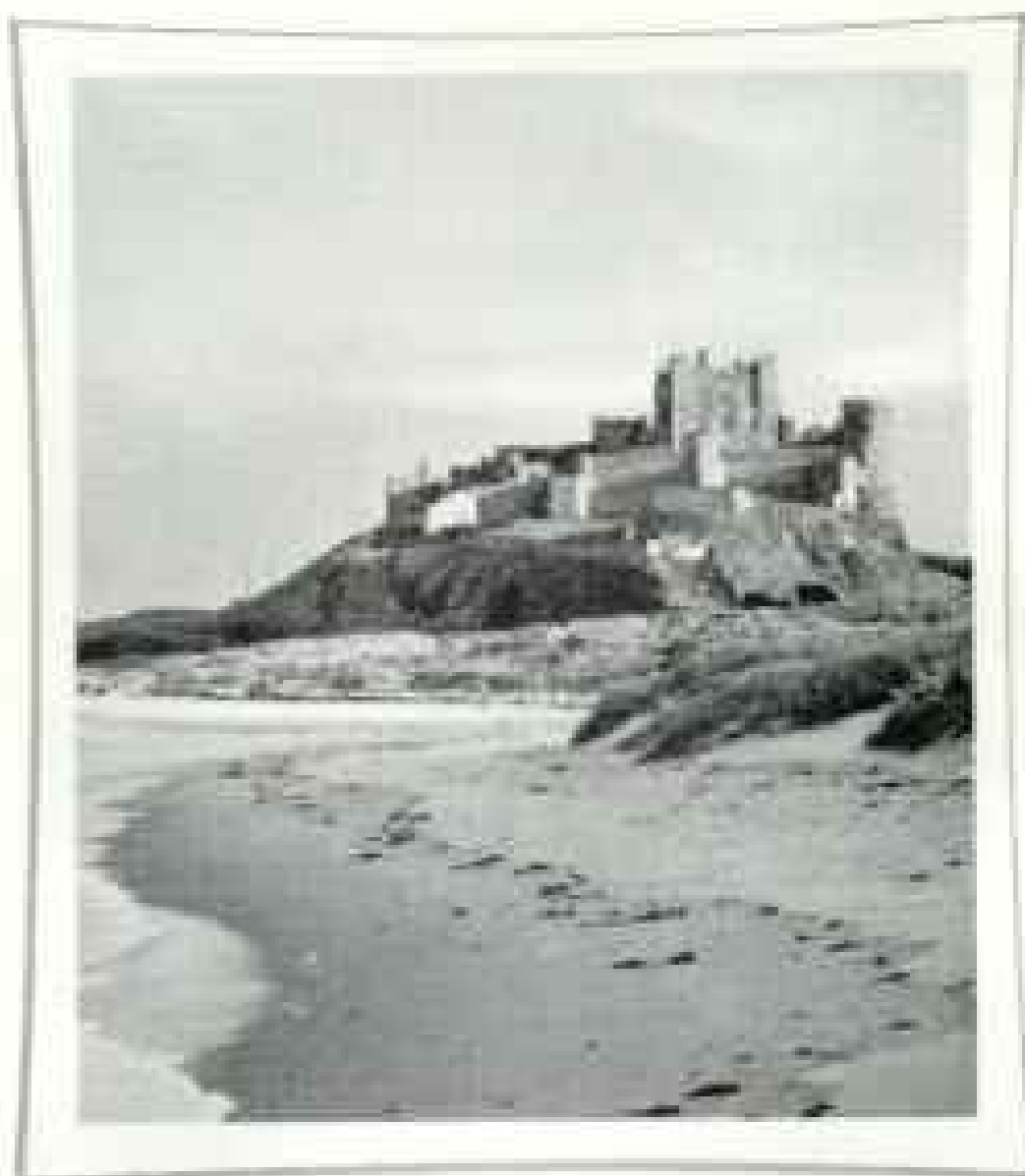
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The truth is he's what he *should* be . . . and what most of us *could* be when retirement draws near. Better still, anyone who has reached this age in good health can usually look forward to many more useful years.

Although there is no definite point at which one slips into old age, some of us may begin to feel the "wear and tear" of life around age 40 to 45.

So, the time to start taking care of your health is *before you get along in years*. A thorough check-up every year is the surest way to uncover any chronic disorder, such as high blood pressure or arthritis, at its start.

Even if your retirement may be 20 to 25 years ahead, here are some things you should do:

- 1. Keep your mind open to new ideas.** If you always have something to do tomorrow . . . something you want to do . . . your mind will be alert, active. Working with and for others—in community, church and fraternal organizations—can also be a deep and lasting source of satisfaction at any age.
- 2. Select your foods carefully.** Your diet should provide *proteins* for body upkeep and repair, *carbohydrates* for energy and foods that supply protective *vitamins* and *minerals*.
- 3. Control your weight.** Overweight makes your heart, kidneys, lungs, liver and arteries work harder all the time. Overweight also tends to increase your chances of developing diseases of these organs.
- 4. Try to keep your emotions on an even keel.** It is unhealthy to keep emotional tensions "bottled up." Instead we should look for ways to work them out. For some of us just talking over problems with a friend or advisor helps to clear the air.
- 5. Plan early for your financial security.** Get competent advice about your future finances—to avoid "money worries" during retirement.



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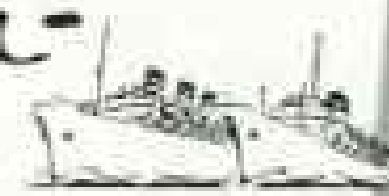
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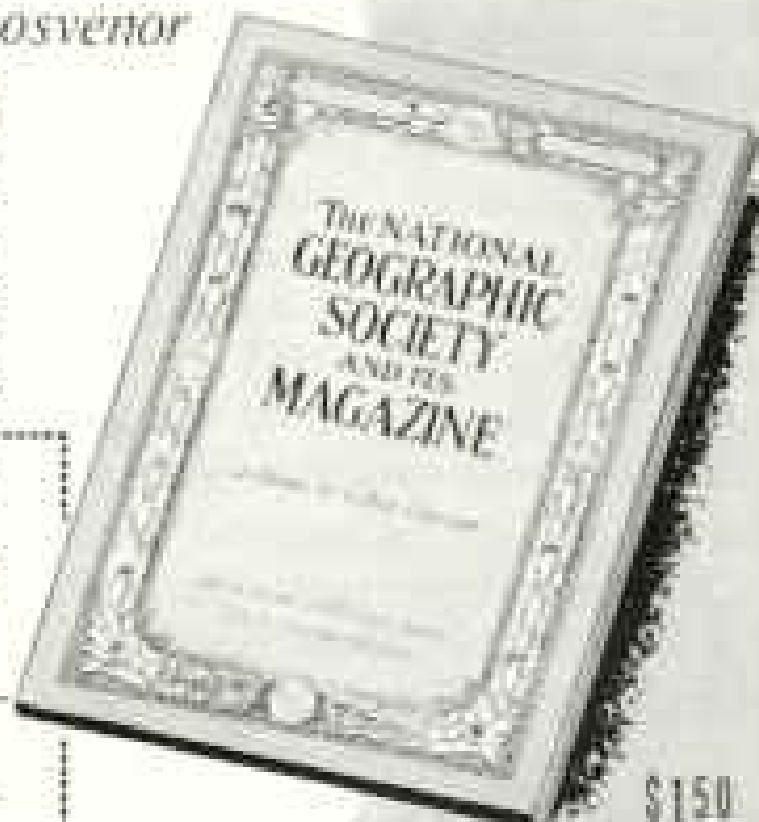
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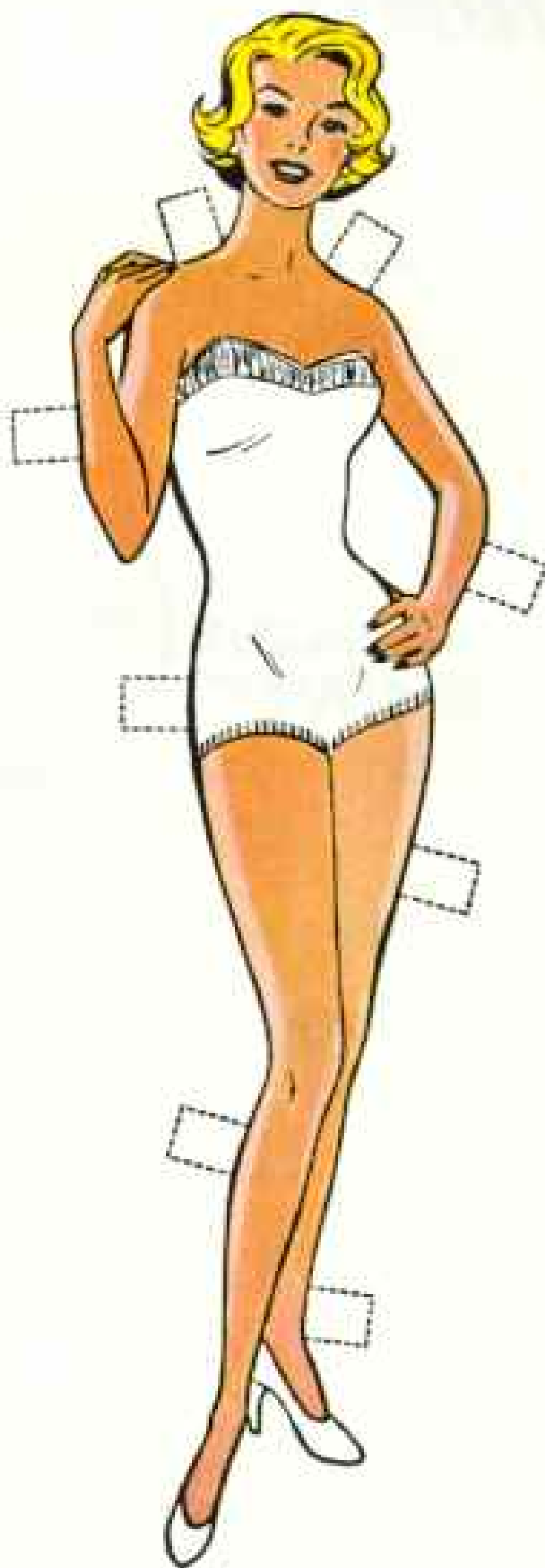
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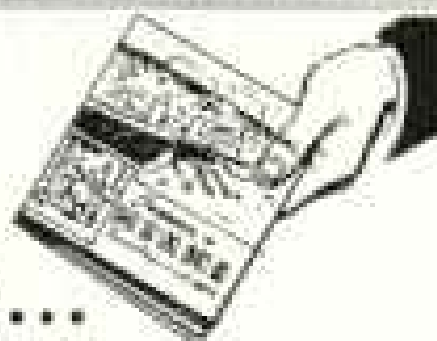
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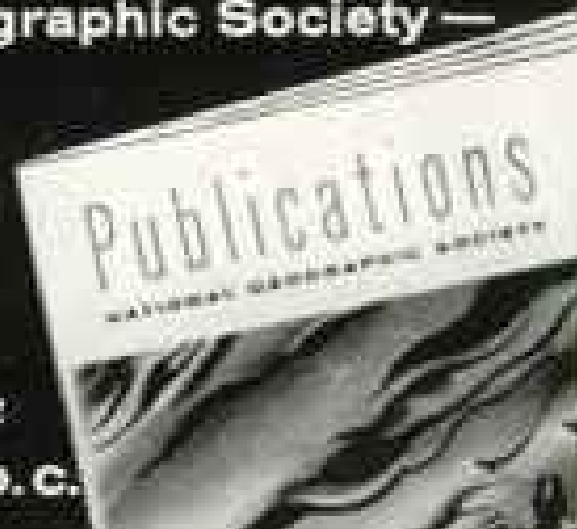
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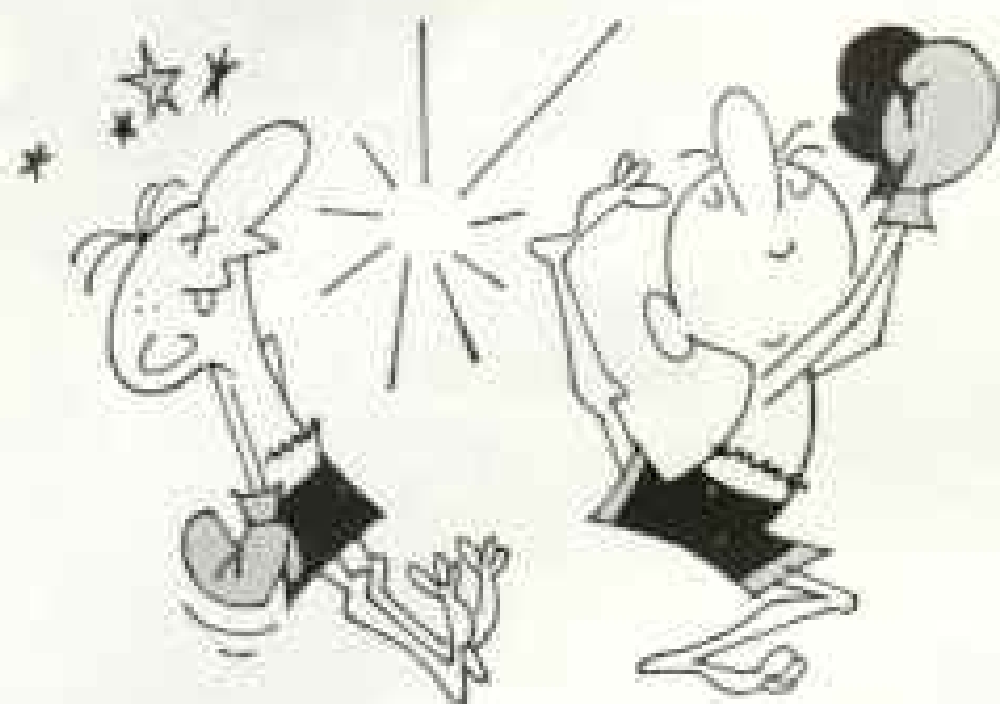
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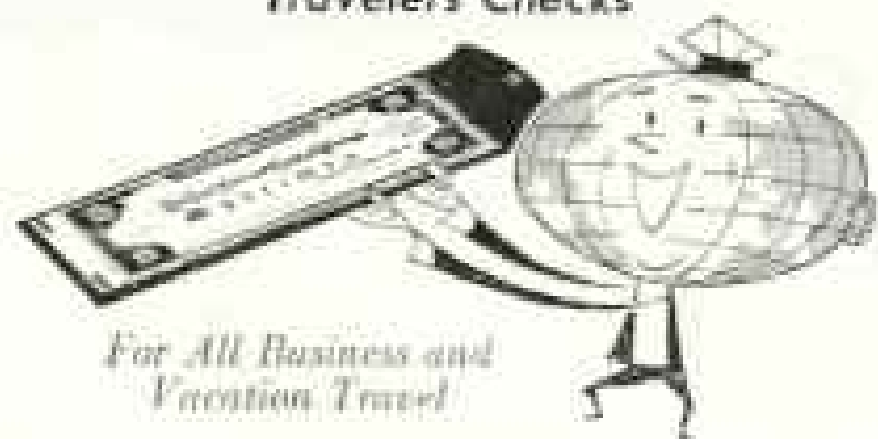
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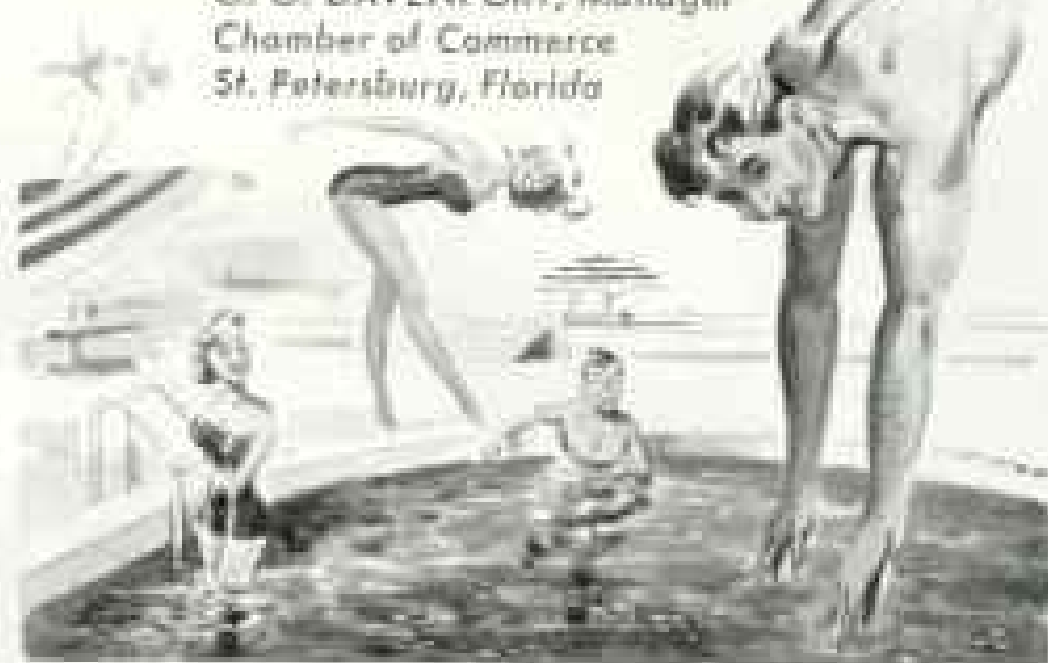
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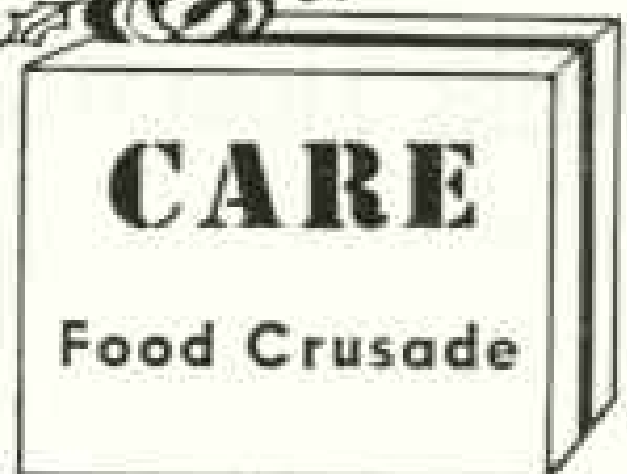


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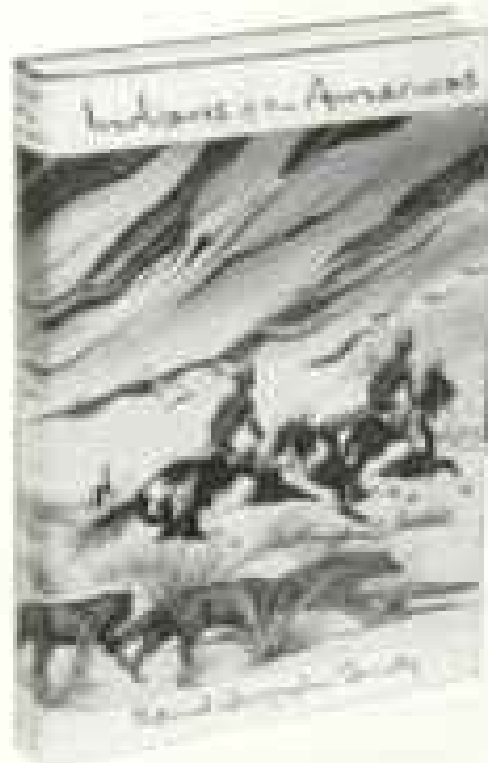
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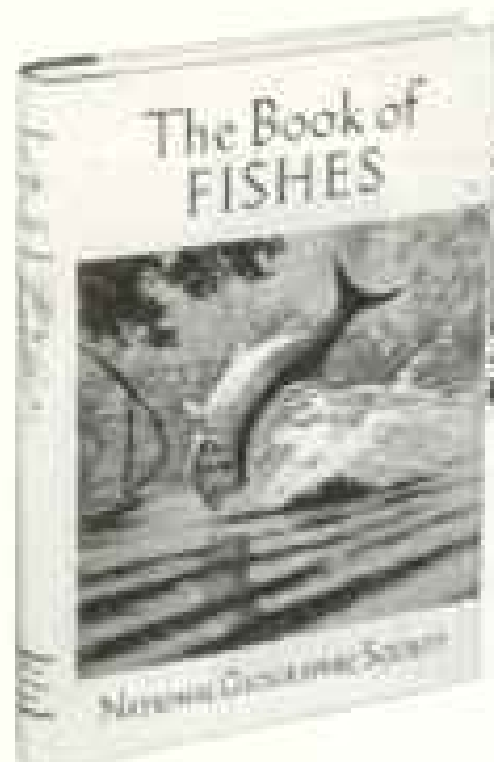
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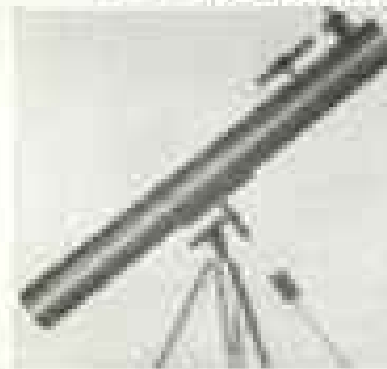
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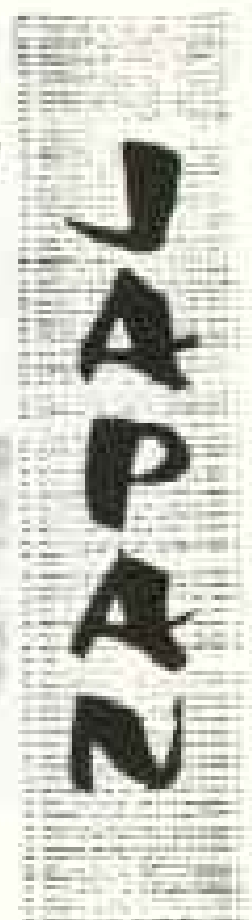
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Rose Marie's tribe, the Papagos, live in a barren desert country where 50 acres of land is required for one cow. Less than a third of them speak English and 40% of the children are not in school. These "first American" children very definitely need help.

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Rose Marie, like many other American Indian children, needs to find a friend and be "adopted" through Christian Children's Fund's Indian centers in four states. The cost of such an "adoption" is \$10 a month and the contributor receives the child's name, address, picture and story and can exchange correspondence.

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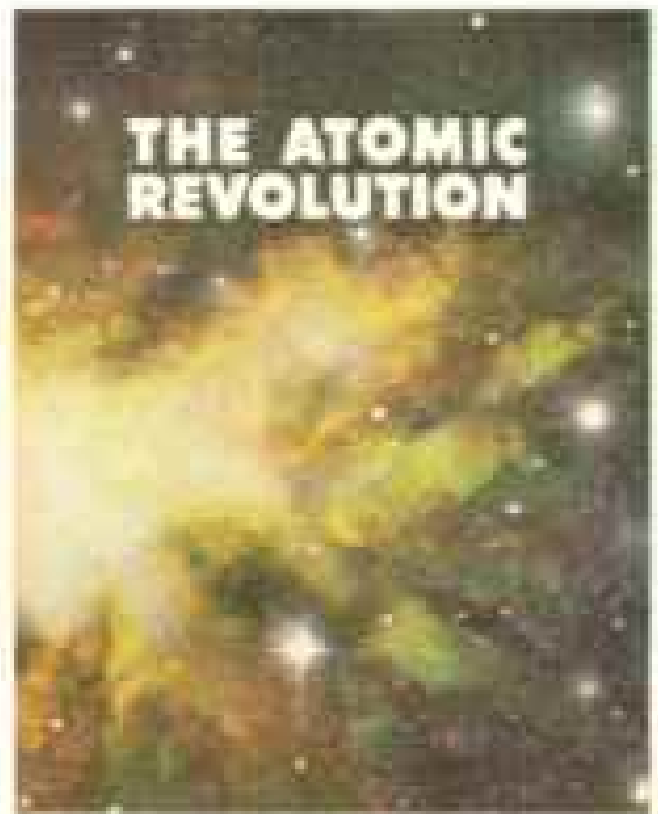
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