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NOVEMBER, 1959

THE NATIONAL GEOGRAPHIC MAGAZINE

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COVER: California's Highway No. 1 crosses jag-capped Golden Gate Bridge (page 604).



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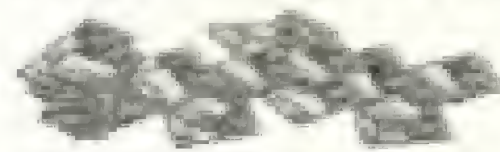
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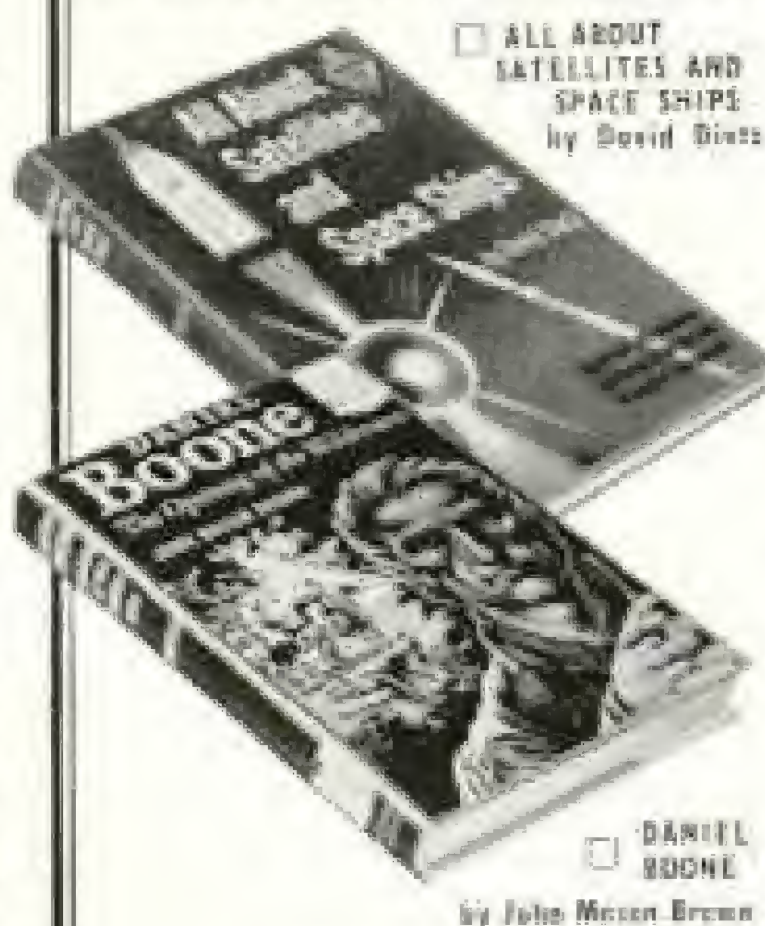


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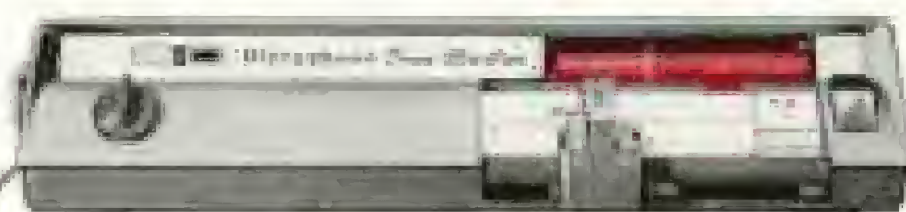
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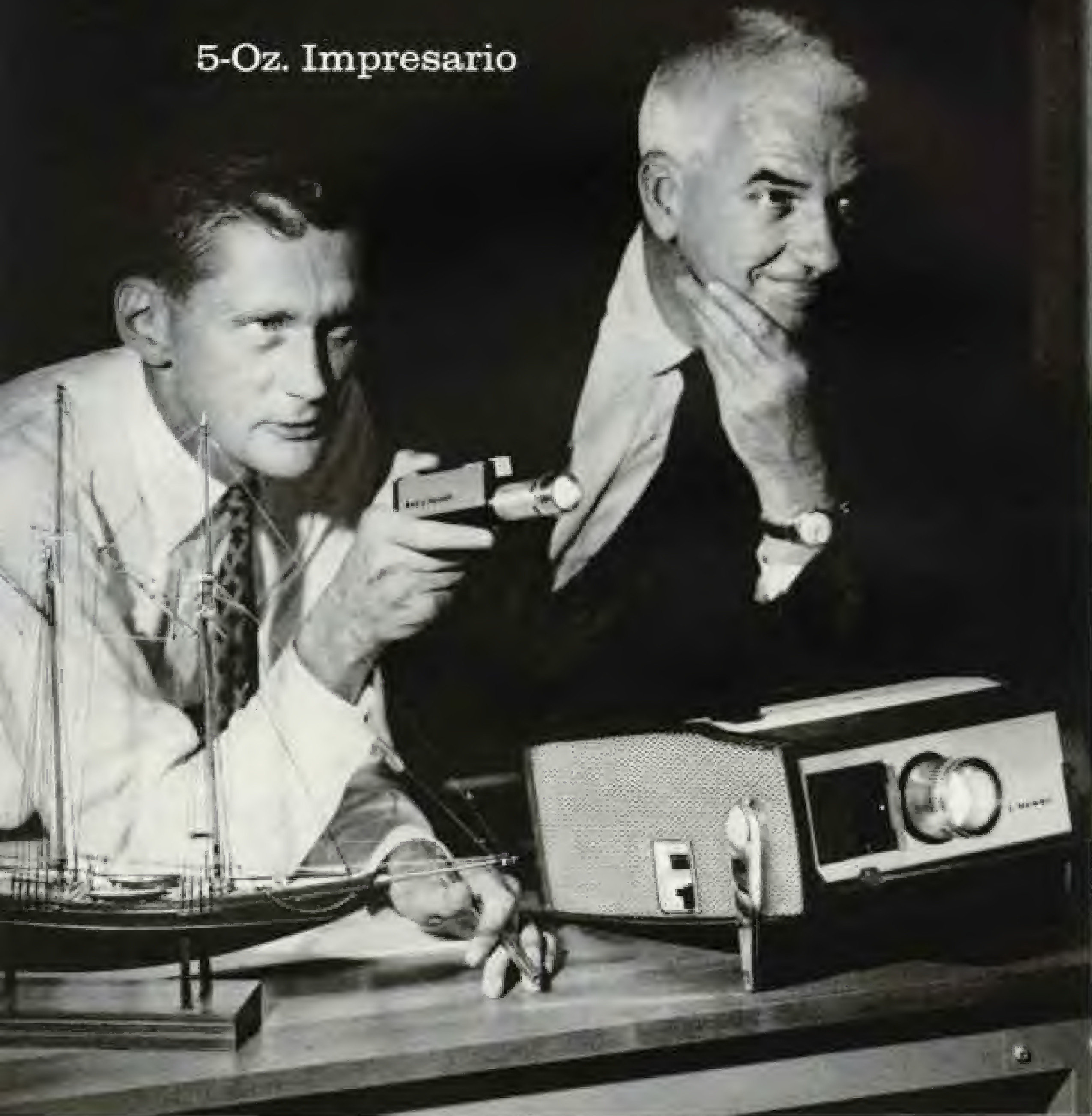
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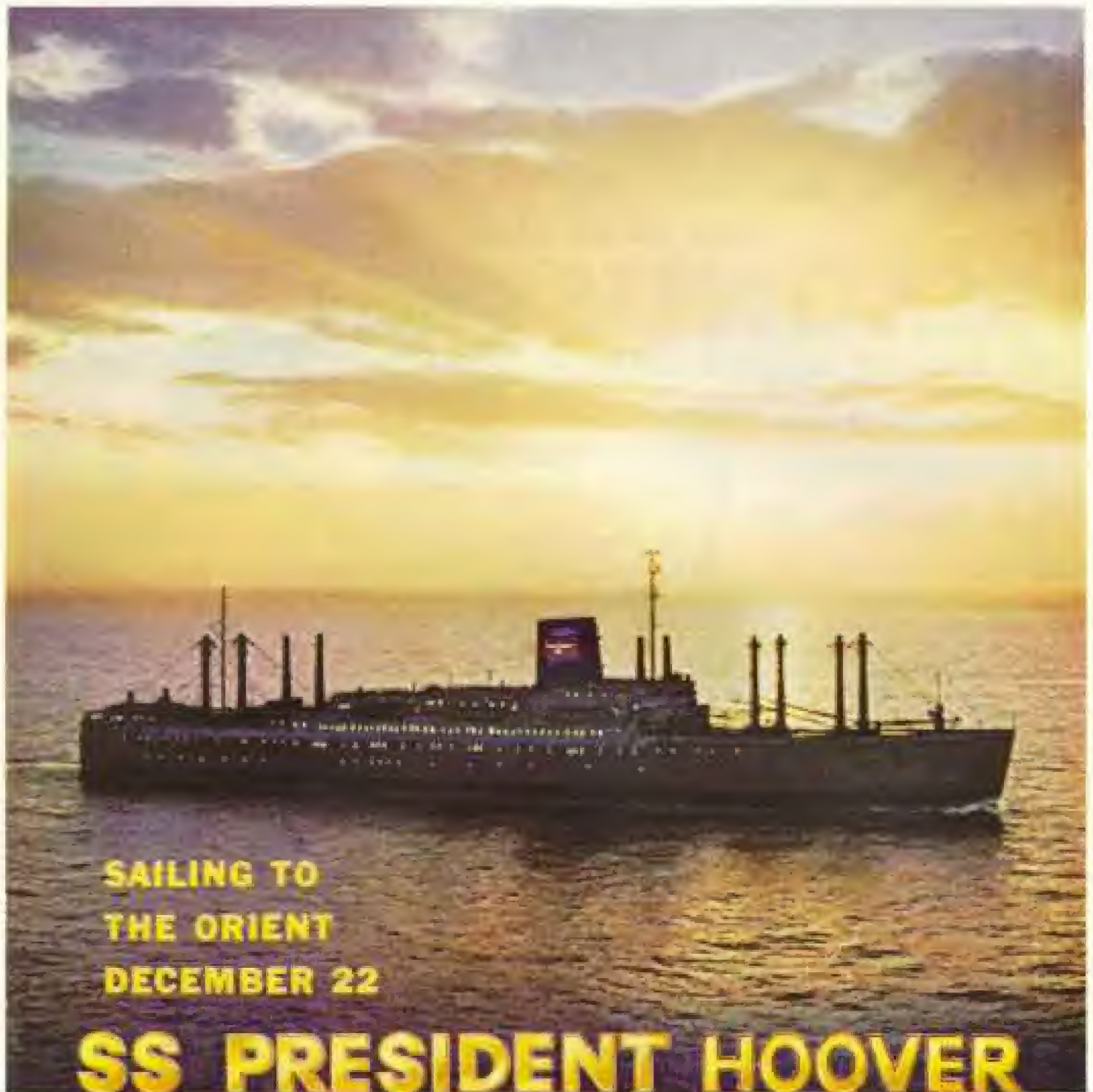
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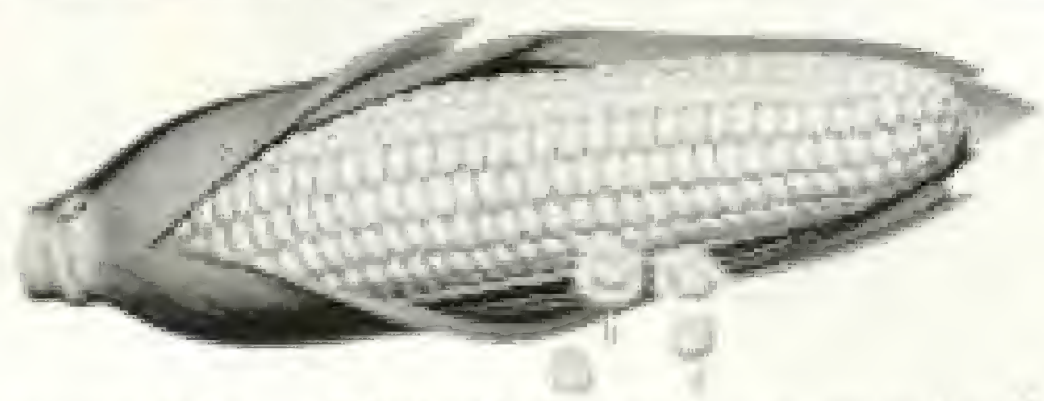
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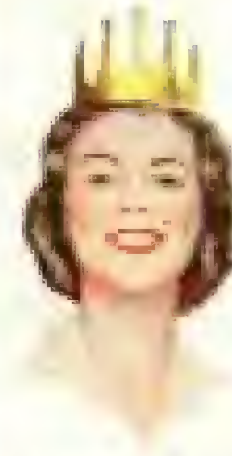
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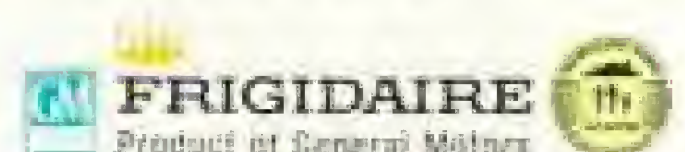
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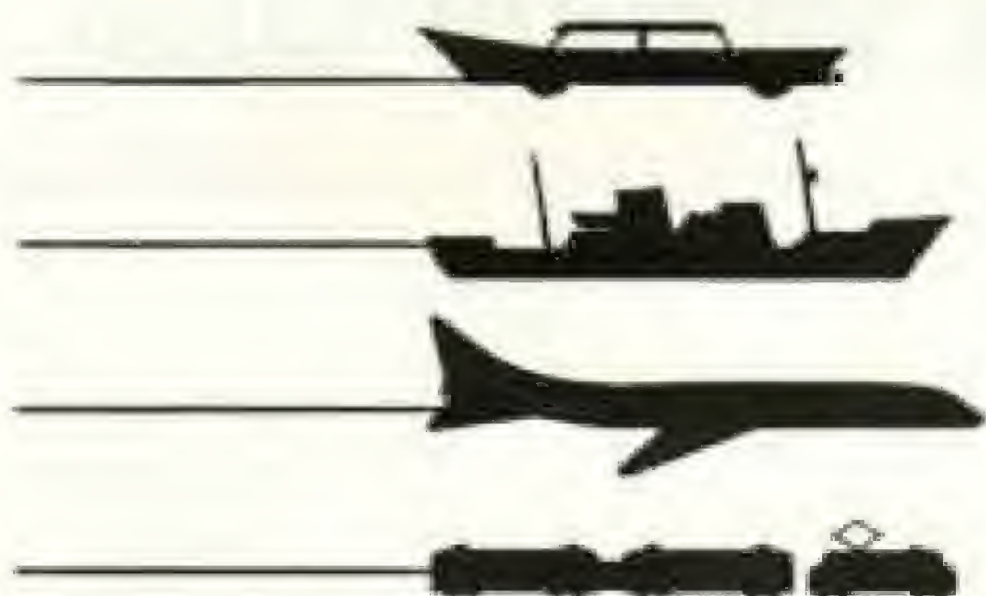
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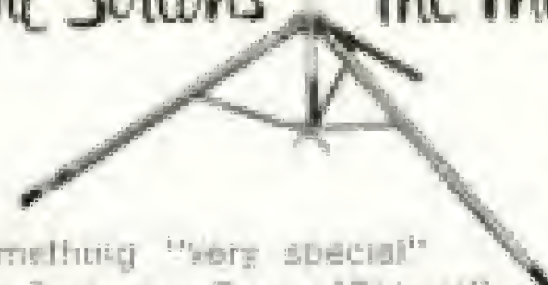
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It should include a quart of milk daily to meet the baby's needs for calcium. Meat, fish, fruits, vegetables, at least one egg a day, bread, cereals and a moderate amount of butter are recommended.

2. Watch your weight. Too much weight strains the heart and other organs. Normal increase is around 16 to

20 pounds. Your doctor will decide and instruct you as to how much you should gain.

3. Get needed rest and exercise. Walking is one of the best exercises and it's usually all right to play golf and dance in the middle months of pregnancy.

Get plenty of sleep and at least an hour of relaxation every afternoon.

4. Keep in touch with your doctor. No serious problem develops during pregnancy without a warning signal. Your doctor can foresee and act to avoid difficulties—if he's consulted early and as often as necessary.

5. Take care of your teeth. Have your dentist clean your teeth and do whatever repair work is necessary.

6. Make your hospital reservation early. The maternity wards of most hospitals are crowded nowadays. The sooner you make your reservation, the better.

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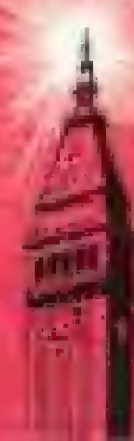
Never before has there been a year like 1959—when birth is so free of risk, so likely to turn out happily.

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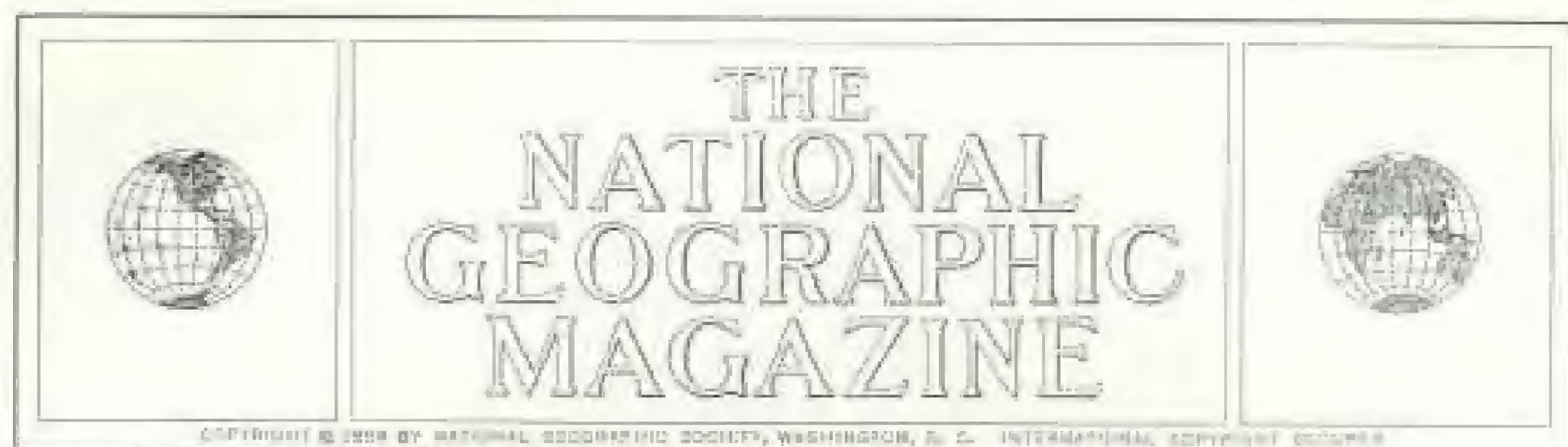
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Winding along the Golden State's Pacific shore, a fabulous highway offers sea lions, whales, giant flowers, and an enchanted castle

California's Wonderful One

By FRANK CAMERON

Illustrations by National Geographic photographer B. ANTHONY STEWART

IN CALIFORNIA there is always a visiting relative from back East, wearing a triumphant grin of discovery.

"Do you mean to say you've never seen your own loveliest scenery?" asked our visitor, Aunt Retta Buchanan. "You've never driven the length of that glorious coast road?"

My wife Leslie and I fought down the temptation to ask her whether she'd visited the Empire State Building or Niagara Falls.

"Well," sniffed Aunt Retta. "I must say."

"She'll be back next year," Leslie mused when our relative had left. "Wanting an answer."

"Never argue with aunts," I said. "Get out the road maps."

So we discovered for ourselves "Wonderful One," a wild and beautiful highway through history. Of all the roads that bear travelers up and down this broad land, none offers more sheer excitement per mile than California's spectacular State Highway No. 1, which swoops and soars along the very western brink of the North American Continent.

Wonderful One starts its headlong career

with deceptive quiet at Las Cruces, in California's southern elbow some 30 miles west of Santa Barbara, and wanders northward through the flower-decked valley around Lompoc. Veering to the northwest, it gets its feet wet for the first time in blue water at Pismo Beach, haunt of the majestic and succulent pismo clam. Thence, State One strikes inland briefly to call at the town and mission of San Luis Obispo.

Road Soars Like a Roller Coaster

After that, committing itself almost irrevocably to the shoreline at Morro Bay, State One becomes a sea-skirting roller coaster built to a giant's scale. For about 500 miles of its 557-mile length, it twists and winds within a stone's throw of the heaving Pacific. (See the Atlas Map, **Southwestern United States**, distributed with this issue.) The traveler becomes a willing captive, hemmed in by the ocean on one hand and haze-shrouded mountains on the other.

North from towering Morro Rock, State One's sights offer a bewildering potpourri.

California's Wonderful One Unlocks
a Masterpiece of Mountain, Sea, and Sky

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State Highway No. 1 links past and present as it skirts Spanish mission, Russian fort, art colony, gold camp, redwood forest, and queenly San Francisco. Here near Lopez Point, in a mid-June



view, the highway curls north toward distant Partington Ridge. Poison hemlock (left), an Old World emigrant that spiked Socrates's death cup, overhangs a foam-scalloped beach and a small

waterfall tumbling down from the Santa Lucia Range. National Geographic photographer B. Anthony Stewart, in red shirt, strolls the distant strand; his wife took the picture.

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PHOTOGRAPH BY B. ANTHONY STEWART © NATIONAL GEOGRAPHIC SOCIETY





Sea Lions on the Rocks and People on the Sward Share the California Sun
Uproars of barking interrupt the seals' long siestas at Point Lobos Reserve State Park,
which was set up in 1933 to protect wildlife and the vanishing Monterey cypress.

Seen from a Monterey pier, a begging sea lion awaits a handout from visitors.





Leslie and I, setting forth on a July morning, came quickly upon an extraordinary way stop at San Simeon, 42 miles out of San Luis Obispo. From a distant hill rose the twin towers of a dazzling white castle that suggested a vision spun from the sugar of childhood dreams (next page).

This was La Cuesta Encantada, The Enchanted Hill, home and headquarters from which the late William Randolph Hearst ruled a far-flung publishing and communications empire. Here Mr. Hearst lived among art treasures for which he and his agents combed Europe, sometimes buying at the rate of \$1,000,000 a year. Here, too, he maintained a private zoo of animals from all the world, some caged, others roaming freely through 165,000 acres of ranchland.

Closely guarded during its owner's lifetime,

The Enchanted Hill became legendary as the most mysterious private estate in America. Presented to the State by the Hearst family in 1958, it is now the Hearst San Simeon State Historical Monument, open to anyone for a \$2 admission fee.

Zebra Herd Roams Castle Grounds

Turning off State One near the village of San Simeon, we parked on what had been the estate's private airstrip and embarked on the five-mile bus ride to the castle-crowned heights. Rounding a curve, Leslie gripped my arm. "Look! Zebras!" A small herd of the striped beasts grazed placidly in an adjoining field. Though the zoo itself has been closed since World War II, the zebras and a number of mountain goats and antelopes still roam the area.

From the courtyard of La Casa Grande, as the castle itself is called, we plunged into the cool, awesome depths of the Assembly Room, hung with priceless tapestries and dominated by a gigantic French Renaissance overmantel of carved stone.

Here of an evening the publisher greeted his guests as he stepped from the wooden can-

The Author: Before settling down as a writer, Michigan-born Frank Cameron made his living as cannery worker, seaman, and chief purser on a freighter plying the Pacific. With his wife and daughter he now lives within a few miles of California's State One, his favorite highway.

fessional that served as the elevator to his living quarters overhead. From here he led them into the second most magnificent of the castle's scores of chambers, the Refectory.

Candelabra and Ketchup Bottles

This mighty hall, impressive as the nave of a basilica, served as a dining room. Informal dress was the rule for guests assembled beneath the 400-year-old Italian palace ceiling of elaborately carved wood panels and a double row of silken banners bearing the glowing crests of medieval Siena's nobility (page 579).

On the massive tables silver candelabra gleamed beside homely ketchup bottles, mustard jars, and paper-napkin dispensers. For it was in this paneled and tapestry-hung room—his favorite—that William Randolph Hearst was careful to preserve reminders that The Enchanted Hill had once been a family camping ground and La Casa Grande only a collection of tents.

Leslie and I paused, fascinated by a small anvil that stood at one end of the Refectory. Once it had helped forge knightly armour, Mr. Hearst, we were told, kept a supply of walnuts





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Zebras run wild at San Simeon, having escaped William Randolph Hearst's private zoo before it was discontinued. They mingle freely with cattle on Hearst ranchlands. Other naturalized animals: North African wild sheep and Himalayan goats.

San Simeon, a Dream Come True, Draws a Quarter-million Visitors a Year

Publisher Hearst's three loves, art treasures, architecture, and a hilltop above the California coast, produced San Simeon, a \$30,000,000 monument to his taste and pocketbook. Carrying out Hearst's wishes, heirs and trustees presented the property to California, which opened it last year to guided tours.

These visitors approach marble steps leading to La Casa Grande, Hearst's Spanish-Renaissance "ranch house," whose towers gleam atop La Cuesta Encantada—The Enchanted Hill.

at its base and seldom passed that way without cracking and eating a few.

In the game room hung a Gobelin tapestry notable for its lively hunting scene set in a "thousand-flower" design. Mr. Hearst knew the history of each of the treasures in San Simeon, but he never allowed them to be catalogued during his lifetime.

"This is my home," he once said. "I don't want anybody poking around in it." Now people poke by the busload.

Enchanted Hill Remains Unfinished

Our tour of the castle's interior ended with a visit to the turkey-red and gilt 50-seat theater. Here Mr. Hearst entertained his guests with motion pictures every evening at eleven o'clock. (The castle staff saw the same program earlier.) The host always sat in a front-row seat beside a telephone that enabled him to give orders to the movie projectionist.

Before leaving, we strolled around the rim of the immense indoor swimming pool, paved and walled with Venetian mosaic by Italian workmen imported for the job. It was built to provide sport when the Pacific breezes made swimming uncomfortable in the breath-taking classical elegance of the outdoor Neptune Pool (page 580).

As is proper for a castle, La Casa Grande is unfinished. An incomplete wing gives mute evidence of expansion plans interrupted by Mr. Hearst's death. The estate includes three magnificent guesthouses, and a fourth had been planned before the publisher's death.

Leslie and I could cheerfully have spent days marveling at the treasures stored in such careless profusion on The Enchanted Hill, but State One was beckoning. On the ride back down to the village, we passed our zebra friends again.

"In such a setting," Leslie murmured, "I wouldn't be a bit surprised to see unicorns and a dragon or two."

Leslie had put her finger on it. There is an almost eerie fairy-tale atmosphere about the great echoing castle, its splendid furnishings adorning deserted halls. It would have seemed perfectly natural if we had come across the Sleeping Beauty in one of the tapestry-hung chambers.

Rocks Dislodged by Pacific Storms

Just north of San Simeon the flavor of the next lap was set by a roadside sign:

NOTICE

ROAD DANGEROUS DURING STORMS. WATCH FOR FALLING ROCKS FOR NEXT 60 MILES. NO NIGHT PATROL MAINTAINED.

On this stretch engineers have chiseled two lanes from the abrupt western descent of the rugged Santa Lucia mountains as they plunge into the Pacific.

At some points the road zooms almost 1,000 feet above sea level. Suddenly it sweeps around a promontory to reveal a noble rock-strewn coastline; against its ragged edges the bottle-green Pacific charges endlessly in thin,

white battle lines. Then the highway dips down to within 50 feet of the crashing surf to pass a sugar-sand cove, while mountains rise high behind it (page 584).

At Limekiln Creek, about midway between San Simeon and Carmel, we met Tom Neff, District Maintenance Superintendent of California highways. His chief difficulties, he told us, were winter washouts from above and slip-outs from below, for here the road was blasted from solid rock. But the worst damage to State One occurred in August, 1952.

Slide Blocks Road for Six Weeks

"That was almost a month after the Te-hachapi earthquake," Neff said. "A landslide happened right here, just north of Limekiln Creek. For six weeks the road was closed, right in the middle of the tourist and vacation season."

Happily, no one was caught in the slide. Workmen had to remove more than 200,000 cubic yards of debris before the road was opened; in this craggy country no detour was possible. We shuddered at Neff's accounts of the hazards of maneuvering heavy road machinery along this narrow ledge, 150 feet above the sea.

Leaving Tom Neff, we drove on north, crossing that redwood masterpiece, the 150-foot-high Dolan Creek Bridge, which lies near the gateway to the Big Sur country.

Big Sur is a river, "Sur" referring to south of Monterey. In recent years the name has been associated with an art colony centering around a dozen or so families living above the highway on Partington Ridge.

At Andersen Creek we stopped at the roadside studio and gallery of Emil White, a painter of primitives and a determined partisan of the region's rugged beauty.

"Even the highway hasn't spoiled it," the artist said. "We've had electricity for only three years, and the telephone, until recently, was eight miles away. Where else can you find so much beauty and peace in such a climate?"

From Mr. White we learned that this por-

Flemish Tapestry and Festive Sieneese Banners Deck Hearst's Refectory

Furnishings read like a roll call of nations: from Italy, a palace's carved ceiling, a convent's dining tables, and monastery choir stalls; from Ireland, covered silver platters, and a parliamentary mace in the display case; from France and Spain, huge silver candlesticks. Much of San Simeon's design stems from the publisher's wish to live among his treasures. One of his sons, William Randolph Hearst, Jr., told author Frank Cameron, "We grew up in a museum, but a comfortable one."





tion of State One had come into existence only after a 30-year struggle led by Dr. John Roberts, of Monterey. Traveling his rounds on horseback, the physician had sketched and photographed possible routes to convince a dubious State Legislature. In 1919, a bill authorized the construction. But almost 20 more years passed before the job was done.

Coast Redwoods Grace State Park

A few miles north of Andersen Creek the road swerves inland to follow the luxuriantly wooded Big Sur Valley. On either side of the highway, lofty coast redwoods formed a stately processional wall of green as we drove through Pfeiffer-Big Sur State Park, 784 scenic acres watered by the Big Sur River.

Beyond the park State One rejoins the Pacific near Point Sur, a huge rock that marks the continent's end like a monumental period.

580 A causeway links it with the mainland. Often

this low connecting strip is obscured by fog, giving the mighty rock the appearance of an island rising through the mists.

"Mont St. Michel, Monterey County style," Leslie exclaimed.

"Shipwreck Rock might be more appropriate," I told her, motioning toward the light atop Point Sur. "Just a few miles offshore is where the Navy dirigible *Macon* collapsed and went down in 1935."

Moving a few miles on from Point Sur's grim beauty, we wondered what new scenic trick State One would next produce. We found the answer at Bixby Creek. Across its rocky mouth, celebrated in Robinson Jeffers's poem "Thurso's Landing," arches one of the most exquisite bridges in the West, 718 feet long and 260 feet high. It soars above the shoreline, spanning in one graceful curve the steep-walled canyon formed by the creek.

Beneath the bridge occurred a curious inci-



Hearst's Roman Temple Adorns the Neptune Pool

To entertain his guests, Mr. Hearst built two \$1,000,000 pools—an enclosed sea-water bath and this outdoor oval filled with fresh water kept at 70° F. Tiles of white and antique-green marble create the lattice pattern seen beneath the breeze-rippled surface.

The façade of the temple, reconstructed from ancient fragments, depicts Neptune.

The Three Graces, by Italian sculptor Antonio Canova, commune dreamily in a bower near La Casa del Mar, a San Simeon guest villa.

dent in American natural history, one of those little-known vignettes that reveal to the traveler some of California's past.

The drama at Bixby Creek had its roots in the 18th and 19th centuries, when gold and fur were mainly responsible for the early development of North America's western rim. No fur was more highly prized than the sea otter's, so thick, lustrous, and durable that a single pelt has fetched as much as \$1,700.

Sea Otters Drew Ships of Five Nations

The mandarins of imperial China were among those who esteemed sea otter fur most highly. Spanish missions shipped thousands of pelts in galleons to China, where they were exchanged for quicksilver.

This valuable fur played a leading role in Russia's settlement of Alaska and the northern coast of California. It helped spark the extension of a chain of Spanish missions north from southern California to serve as outposts of religion





Bells and Swallows' Nests Bespeak the Carmel Mission's Warm Serenity

Beginning in 1770, this famous mission served as headquarters for zealous Father Junipero Serra, who founded California's chain of Franciscan outposts.

Many of San Carlos Borromeo's buildings fell into ruin after 1854, when the Mexican Government secularized the missions, scattering the padres and their Indian charges. However, the church's thick sandstone walls defied weather and vandals. History-conscious Father Angelo Casanova began Carmel's restoration in the 1870's.

From April to August cliff swallows nest on the church walls. The large bell sounds routine calls to worship; small ones ring on festive occasions.

Moorish dome and star window tie the mission to early Spanish architecture. Redwood gates admit all who come to admire, to worship, or to visit the tomb of Father Serra. Geraniums, yews, and broom border the archway, which bears the shield of St. Francis.

and the fur trade. It lured ships of five nations, ships that left mutiny, murder, and destruction in their wakes. Men hunted the sea otter so greedily that for almost 100 years the species was believed doomed to extinction.

Among the most populous otter grounds were kelp beds a few hundred yards off the California coast. From here, as from Alaska's shores, the sea otter was thought to have vanished, and commercial hunting came to a virtual halt about 1830. A few Monterey Peninsula old-timers, however, claimed that the sea otter still existed, deep in hiding.

At any rate, one day in 1938, after the opening of State One, the news spread that a small herd of sea otters had been discovered at the mouth of Bixby Creek.



Protected by law, the herd has now multiplied to about 600 and ranges from the kelp rafts off Carmel Point south almost to Piedras Blancas Point. With luck, patience, and binoculars, you can see these indomitable survivors of a harassed species (page 599).

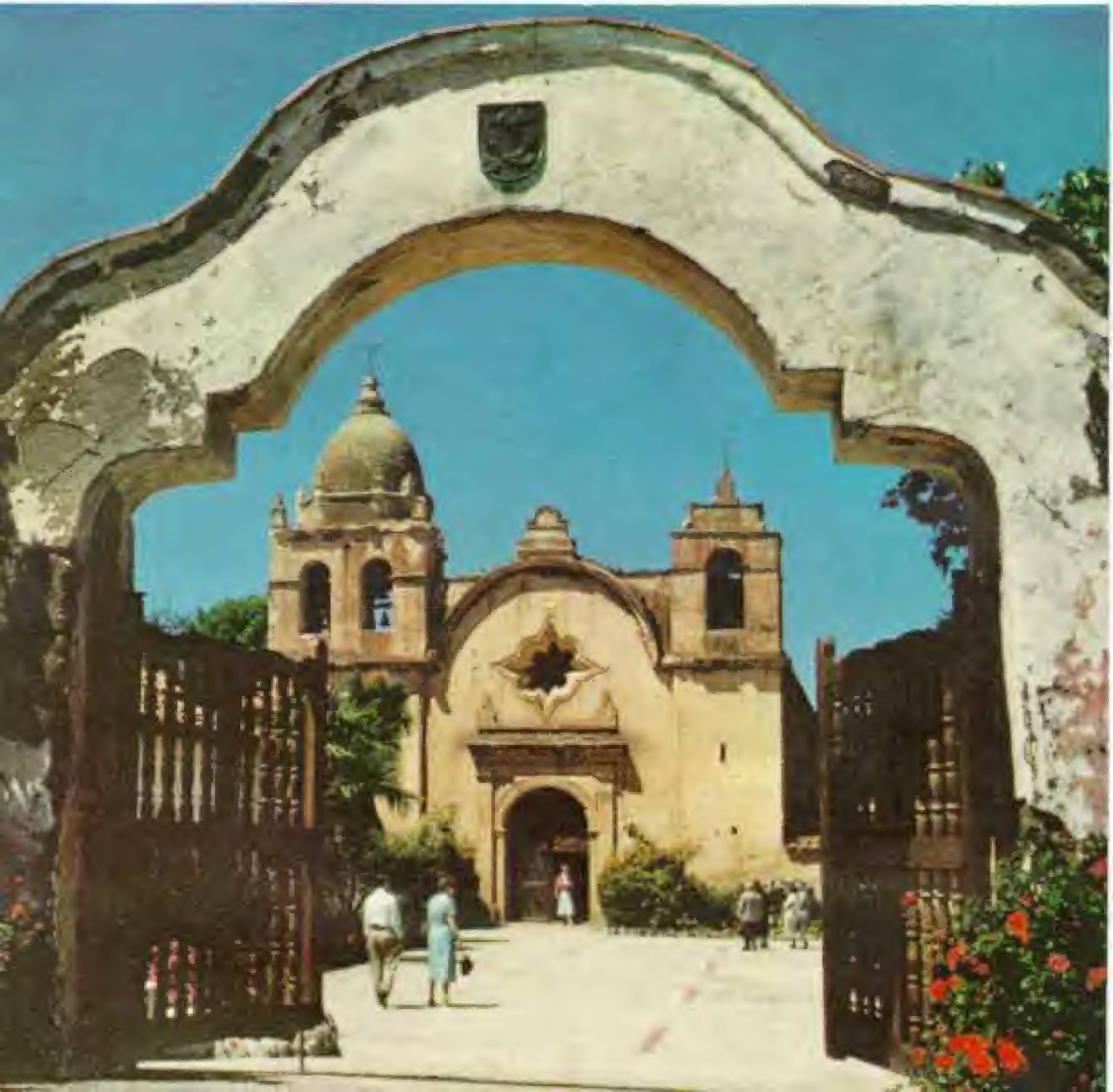
Disease Threatens Monterey Cypress

Ahead of us now lay one of the most fascinating wonders our highroad has to offer, the 355-acre Point Lobos Reserve State Park (page 574). In this outdoor museum live 300 species of plants, including the finest natural stand of the picturesque Monterey cypress.

In recent years these gnarled, wind-blown trees have been threatened with destruction by cypress canker. Foresters have examined

and destroyed cypresses for miles around Point Lobos, lest spores from infected trees be transmitted to healthy ones by wind and birds.

Point Lobos also contains 178 species of vertebrate animals and 88 of marine invertebrates. But it is the sea lions that have the greatest appeal for most visitors. The Spaniards knew them and named the place Punta de los Lobos Marinos, or Point of the Sea Wolves. Here two species of sea lion still meet and live in apparent harmony; the Steller, largest and least tractable of their kind, and the California, most intelligent of all sea lions. It is the California species which, despite the small ears distinguishing him from the true seal, usually appears as the "trained seal" of circus and vaudeville.





*Surf's lathered assault on timeless cliffs parallels
the highway's gentle curves near Garda;
miners' trails meander down from the Santa Lucias*

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Watching the huge, absurdly amiable-looking beasts basking on the rocks, Leslie said: "Somehow I feel as if I'd been here before."

"Maybe you have," I told her, "between the covers of a book. The story is that Robert Louis Stevenson, who lived here in 1879, used this very point as the model for Spyglass Hill in *Treasure Island*. But I didn't know girls ever read *Treasure Island*."

"That shows how much you know about girls," replied my wife, and we returned to watching the sea lions.

Brass Buttons Tell a Strange Story

Soon we were in the resolutely picturesque town of Carmel, chatting with a man engaged in one of the most unusual jobs in California. He was Harry Downie, restorer of missions. A Downie masterpiece, Mission San Carlos

Borromeo, stands less than a mile off State One in Carmel (page 582).

While bringing San Carlos back from hollow-shelled oblivion, Downie uncovered a number of mysterious brass buttons on the mission grounds.

"The puzzler was a phoenix emblem with the French inscription: '*Je renais de mes cendres*' meaning 'I arise from my ashes.' Yet almost everything around here derives from a Spanish culture; so these buttons stumped me, until I got my first clue in a book on military emblems.

"Seems they were made for Napoleon's regiments on his return from Elba. After Waterloo, some good salesman shipped them to Emperor Henri Christophe of Haiti.

"Anyhow, by the time the ship reached Haiti, Christophe, too, had fallen. So the ship



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Working from a sketch made in Alamos, Sonora, Leslie Emery paints a Mexican girl. The artist's sunny studio looks across Carmel Bay, his "most beautiful spot on earth."

Like a Stage Setting, Carmel Unfolds Vistas of Galleries and Tearooms
Homes in the art colony emphasize Old English, Spanish adobe, and Hansel-and-Gretel architecture. To preserve its flavor, residents banned street lights, neon signs, billboards, bowling alleys, trailer camps, used-car lots, mortuaries, and mail deliveries.

Gallery

INN
STEAK
HOUSE

STEAK
HOUSE

City
Hall



proceeded to the California coast, and along here, in all probability, the captain traded the buttons with the mission Indians for food and furs."

Monarchs Alight on Butterfly Trees

Carmel's determined pursuit of art and beauty extends even to the flower-bedecked garbage trucks we saw as we drove down the narrow, winding streets (page 587). A bewildering variety of domestic architecture, from Old English to ultramodern, demonstrates Carmel's sturdy nonconformity. Carmel residents are still proud that a city trustee

once won a resounding victory on a platform dedicated to nonboasting.

From Carmel we departed from State One to follow the private Seventeen Mile Drive maintained by the Del Monte Properties Company, a real estate firm, around its various land developments on the Monterey Peninsula. Here is a golfer's paradise, with four of the world's finest courses: Cypress Point, Pebble Beach, Del Monte, and the Monterey Peninsula Country Club. And almost within a driver's shot of these playgrounds we discovered another of nature's curious displays—California's butterfly trees.



In southern California San Juan Capistrano has its famous phenomenon of the swifts' return. Less well known, however, is the annual migration of monarch butterflies to Pacific Grove on the Monterey Peninsula. They come from the northern Pacific States, British Columbia, and southern Alaska.

Every fall, with but two exceptions in the past 90 years, the monarchs have swarmed by the tens of thousands across Monterey Bay to alight on the pines of Pacific Grove. On sunny days many flit around peninsula gardens like kids around a soda fountain. At night they return to their trees where, resting, they look

like autumn leaves. Our motel operator told us that the butterflies used to swarm over the rigging of slow-moving sailing ships off southern Alaska—hitching a ride part way to their destination.

"Come back in October," he urged us. "That's when we hold the butterfly parade. You'll see a couple of thousand kids dressed up as butterflies and flowers. If the kids misbehave, it's O.K. for their parents to spank them. But nobody better touch a butterfly."

"Why?"

"Mistreat the butterflies around here, mister, and you could get slapped with a stiff fine or a jail sentence."

Empty Windows Line Cannery Row

Next door to Pacific Grove lies California's colonial capital of Monterey with its Cannery Row, made famous by novelist John Steinbeck. Once a lively, colorful street, "the Row" now wears a forlorn, deserted air.

Gone are the days when California purse seiners, operating chiefly from Monterey, reaped fabulous sardine harvests that reached a 1936 peak of a billion and a half pounds. In those days a fisherman might invest as much as \$500 to share in a seiner's profits. Helping to haul the nets, he might earn \$5,000 in a five-month season. During the 1930's the west coast sardine industry, including Monterey's fisheries, accounted for the largest commercial catch in the Western Hemisphere.

Suddenly sardines disappeared from these waters. Scientists believe changes in ocean temperatures drove the fish away.

"All I know," said Nino Bruno, ex-fisherman, "is that one year we had plenty; the next, nothing. It wasn't really that quick, of course. We saw it coming."

"When was that?" Leslie inquired.

"Just before World War II," Bruno replied. "There used to be 84 big purse seiners sailing out of this port. Now, maybe there are 20, and they go mostly after tuna and squid."

Artists Judge Ceramic Vases in the Patio of Carmel Craft Studios

Sculptors, jewelry designers, mosaicists, glassworkers, and dealers make their headquarters in the art center. Glenn Minshall fashioned the vases. Emile Norman created the butterfly mosaic with bits of glass held between sheets of clear plastic. Clarence Bates sculptured the pelican on the post. The mural, work of the late Mary Miller, depicts Father Junipero Serra and other historic figures.





Pink Ice Plants Feast the Eyes
of Pacific Grove Shore Dwellers

Along the jagged coast from Carmel to Monterey,
Californians carry on a love affair with nature.
Houses hug beaches or perch on crags, their ter-



© MONTELEONE PHOTOGRAPHY

faces facing vistas of ocean and folded hills. Seventeen Mile Drive, a toll road, threads the Monterey Peninsula's wind-wracked cypresses:

Clumps of Marguerite chrysanthemums and Lady Washington geraniums dot this carpet of blossoms above Monterey Bay.



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La Favorita, in Spanish Costume, Reigns at Monterey's Birthday Party

Each June the colonial capital salutes the days when it ruled California. Last year the city celebrated its 188th anniversary with the traditional *merienda*—fiesta and barbecue rolled into one. La Favorita, always the daughter of a pioneer family, presides as queen. Diana Davison, with fan and lace mantilla, greets her subjects.

They're manned by the old hands, the ones who know fishing best. They still can make good money, but we younger men have found other jobs ashore."

"What kind of work do you do now?" I asked.

"Hod carrying," said Bruno sadly.

A few of the dozen big sardine-canning plants lining Cannery Row have turned to the packing of other food fish. Some of the rest stand empty; others serve as warehouses and shops. In 1958 some schools of sardines returned, bringing hope to the few survivors in the industry.

Orange Path Leads to the Past

Lovely old Monterey is a living history of California.* Spaniards explored the coastal waters just 50 years after Columbus set sail and before the New England colonies had even been named. Monterey passed from Spanish into Mexican hands while the United States, England, France, and Russia jockeyed for an opportunity to own it.

For one incredible week in 1818 it was occupied by the French-born Hippolyte Bouchard, a privateersman in the service of Argentina. And here, on July 7, 1846, Commodore John D. Sloat's bluejackets and Marines raised the flag of the United States above the old Custom House. It has flown there ever since.

Monterey makes its splendid past easy for the visitor to grasp. Leslie and I learned as we walked the "Path of History." This is an orange stripe, painted on streets, which encloses most of the downtown area and leads the history-hungry past almost 40 points of interest.

Here is Colton Hall, built by the first American alcalde, or mayor, Yale-educated Walter Colton. And Jack Swan's theater, where bored Yanqui soldiers produced such dramas as *Putnam, the Lion Son of '76*, as they awaited shipment home from the Mexican War. A local company now stages old-fashioned hiss-the-villain melodramas, such as *Bertha, the Sewing Machine Girl*, on the venerable stage. Swiftly the centuries unfolded as we followed the orange line.

Footsore but aglow, we decided we deserved to sample Monterey's reputation as a gourmet's delight. Seated cross-legged on floor mats at the Ginza, a Japanese restaurant, we listened while a young American couple at a near-by table conversed easily with a

kimono-clad waitress in her native tongue. They were Capt. and Mrs. Frank Trinkle. He was, we discovered, a student at the Army Language School in Monterey (next page).

"It's America's unknown college," Captain Trinkle told us. "There are 2,000 students enrolled, and 28 languages are taught. Most of us just learn one, though. But we work hard, six hours a day, five days a week. I don't count tonight as homework, even though I came here to get some practice.

"Learning Japanese hasn't been so hard," he added as the waitress brought the beef sukiyaki to the table. "It's these chopsticks that throw me."

A few miles from the Hispanic atmosphere of the Monterey Peninsula, State One turns Italianate. On both sides of the road stretch fields of artichokes—an Italian vegetable grown on a large scale in the United States only along this coast. Here the road passes through Castroville, whose many Italian-American residents call their town the "Artichoke Center of the World."

The title was strengthened when a successful process for trimming and quick-freezing the delicate vegetables was finally developed. Speed is the secret, G. W. Perkins, manager of a freezing plant, told us; otherwise, the artichoke becomes discolored.

We posed a question: "Artichokes taste good and have high food value. Why aren't they more popular?"

Perkins shrugged. "Not enough people know how to cook and eat them," he said. "Now, trimmed and frozen, they'll be easier to prepare. Several years ago we started to market frozen 'chokes in the East, and I'm told the housewives went wild about them."

Berries Grow Where Redwoods Towered

In Pajaro Valley we drove between vast fields of luscious scarlet strawberries to find the town of Watsonville very properly rejoicing in its title of "Strawberry Capital of the World" (page 600).

On these rich fields that grow a huge share of the Nation's produce, the coastal redwoods were first sighted by white men in 1769. The man who recorded this momentous discovery was Father Crespi, a member of Spain's Portola expedition. He named the trees *palo col-*

* For more about Monterey, see page 754 of "New Rush to Golden California," by George W. Long, NATIONAL GEOGRAPHIC, June, 1934. This entire issue is devoted to the Golden State.



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Army Folk in Monterey Sample Japanese Cooking and Conversation

Authentic atmosphere and menu of the Ginza restaurant attract students from the United States Army Language School. Wielding chopsticks, Capt. and Mrs. Frank Trinkle test their Japanese in a chat with their host, K. Nobusada. Waitress Kaori Urata, in kimono and obi, pours tea. Platter at left holds *sukiyaki*, a mixture of onions, mushrooms, soybean cakes, vermicelli, bamboo shoots, and beef slices.

urada; later they were labeled *Sequoia sempervirens*.

"This is capital country, and the pun was intended," I told Leslie as we entered Capitola, which calls itself "Begonia Capital of the United States," and with good reason. To pass through Capitola without visiting the hybridizing gardens of Vetterle & Reinelt would be like a trip to the Netherlands without seeing the tulips.

Begonias Grow 10 Inches Wide

"Tonight I'll dream in Technicolor," Leslie said. "All I'll see will be plate-sized flowers."

Around us in rows of greenhouses was a dazzling exhibit of begonias in bloom. The colors ranged from pale yellow through a red so gaudy it seemed neon lighted. Small wonder these gardens draw 100,000 visitors yearly, or that seeds produced here bring at least \$2,500 an ounce!

We found Frank Reinelt in one of his greenhouses (page 602). A former Czech citizen, Reinelt told us that he was, at the age of 21, head gardener for Queen Marie of Romania. We pointed to some of the nine-inch blooms and asked if he was responsible.

"I'm only a link in a chain," Reinelt said humbly. "Begonia culture goes back at least 150 years to Bolivia and Peru—cool, foggy climates like ours. We've bred the blooms from six inches to as wide as ten inches, and made the stems sturdier for shipping. Now we're breeding for more attractive foliage, not just plain green leaves."

For the next few miles into Santa Cruz, State One follows the old stage route on which one-eyed Charley Parkhurst won fame as one of the toughest, most daring drivers of all, a reputation enhanced by Charley's black eye patch and truculent expression. Only at "his" death in 1879 was it learned that Charley was

a woman, a former New Hampshire girl named Charlotte Parkhurst. More than 50 years before the introduction of woman suffrage, Charley had been a registered voter of Santa Cruz County.

At Half Moon Bay, State One proves itself once more a cosmopolite among roads, for this small town is as Portuguese as Castroville is Italian. Each spring it celebrates a centuries-old festival in honor of the Holy Ghost. After a colorful religious procession, everyone enjoys a monumental barbecue.

As the highway approaches San Francisco, it turns spectacular again, hugging a mountainside high above the sparkling ocean. Suddenly it rounds a bluff and becomes a city street! Even San Francisco comes as a surprise on this highway of surprises. Here, for a few miles, State One tames its tempestuous manners and modestly adapts itself to civilized ways in the residential districts of Ingleside, Sunset, and Richmond.

By mutual agreement, Leslie and I had determined to resist being sidetracked by the myriad temptations of our favorite city.*

"We'll never make it," Leslie said as we followed the State One markers through town. "I can see you weakening every second."

"I was just thinking that we might add another flavor to our international bouquet," I replied. "I'll bet you've never sampled Basque cooking."

Half an hour later we were seated beneath one of the bullfight posters that form the principal decorations of Martin's Español, in San Francisco's North Beach section. At our host's suggestion, we tried a Basque specialty, rice cooked with succulent clams, and found it magnificent.

Then it was time to resume our explorations. State One shoots across the Golden Gate on one of the world's most beautiful bridges (pages 604 and 608), merges briefly with U. S. 101, and cuts through the rugged Marin County hills.

Before beginning this lap of the journey, we turned off at Vista

Point, at the northern end of the bridge, to admire the sweeping view of San Francisco Bay.

Whalers Hunt 50-ton Quarry

"What's that?" Leslie asked, pointing to a small vessel coming in under the bridge.

For a moment I was stumped. Then I knew. "That must be one of the whalers. See there alongside—that dark patch bobbing

*The Golden Gate city has been memorably described in "Boom on San Francisco Bay," by Franc Shor, NATIONAL GEOGRAPHIC, August, 1956.

Dogs displace golf as the attraction at Pebble Beach when Del Monte Kennel Club holds its show. Afghan hounds, once hunters for Asian kings, compete in the 33d event.

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*Jockeying for Position, Racing Sloops
Stud Stillwater Cove's Azure Haven*

When venturing from bay to ocean, California sailors often face tricky currents that test their seamanship. Old hands know when to tack shore-



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ward on helpful swells and when to veer away from rocks and shoals. The bathers sun on the sand of the Stillwater Yacht Club while 18-foot

Mercury-class racing sloops maneuver for a dash out of the cove into Carmel Bay (next page). Carmel homes appear on the far shore.



Mercury-class Sloops on Carmel Bay Sled Past Pebble Beach Golf Course

in the water? She's towing in today's catch."

As the 120-foot ship drew nearer, we could easily make out the bulk of a 50-foot whale snuggled alongside. This vessel and four others on contract for two processing plants comprise the only active whaling enterprise in the United States today.

From early spring until late fall, the whalers go out each weekday, weather permitting, from stations on San Pablo Bay, north of San Francisco. They take most of their catch in the vicinity of the Farallon Islands, 30 miles off the Golden Gate. The average whale captured here weighs perhaps 50 tons.

Once harpooned, the finback, humpback, and sperm whales are towed in to Point San Pablo and hauled up on a sturdy wooden flensing deck to be prepared for rendering. Using a long-handled knife that looks like a

hockey stick, the flenser cuts the blubber in long, narrow strips, which are then ripped from the carcass by winch. Practically all the whale is used in such products as oil, meal, and food for pets and ranch-bred minks. For reasons best known to themselves, minks love whale meat.

When Water Was 50 Cents a Bucket

"They may be useful," Leslie commented as the whaler passed from view, "but I much prefer those." She pointed to a covey of fleet-hulled little sailboats, skimming past like white-winged butterflies. These are superb sailing waters, and on regatta days or whenever the weather is fine and the wind fair, it appears that the entire population of the Bay area has taken to the sea (page 604).

Ascending Golden Gate Bridge Freeway,



NATIONAL GEOGRAPHIC PHOTOGRAPHERS: ANTHONY STEWART © N. G. S.

we found a view at every turn. The most spectacular is that of Sausalito, cascading tier on tier downward to meet Richardson Bay.

Sausalito, which enjoyed a boomlet in gold-rush days by selling spring water to the forty-niners across the bay at 50 cents a bucket, today prides itself on its ceramics, jewelry design, writing, and painting. So art conscious is the town that its Bank of America branch manager, Frank Bosl, sees nothing unusual in staging a continuous rotating exhibit of locally produced oils and water colors along the walls of his money mart.

State One's union with U. S. 101 ends abruptly just north of Sausalito. Here the road reverts from the modern divided freeway to its old-fashioned two-lane status. In this more familiar guise it crosses one shoulder of 2,604-foot Mt. Tamalpais.

Giants Tower Above City's Doorstep

Deep in the folds of a large Tamalpais ravine lies Muir Woods, a national monument and the beginning of the redwood empire. The Mt. Tamalpais & Muir Woods Railroad has long since vanished; now buses from downtown San Francisco bring hundreds daily to

A sea otter, afloat in his kelp salad bowl, dines on sea urchin, a favorite dish. Ignoring its spines, he cracked the urchin and drank the juices. Now he munches one half and balances the other on his belly for a second helping later. He also likes mussel, abalone, and fish, occasionally garnished with kelp.



Watsonville. Fields Produce Strawberries
by the Carload From April to November

Refrigerated express cars speed the crop to Chi-
cago, New York, Washington, D. C., and other
major markets. This field, within sound of the

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Pacific's breakers on California Farm Products' Ranch No. 8, yields Shasta strawberries in late May. Santa Cruz Mountains loom beyond the

valley. Last year Santa Cruz County shipped 1,496,500 trays of fresh berries and 14,265 tons of frozen ones, a yield worth \$7,100,000.





Frank Reinelt's Begonias Earn World-wide Acclaim

Czech-born Mr. Reinelt came to California in 1926 in hope of joining Luther Burbank, but found that the famed plant breeder had just died. He stayed on to produce the first successful begonia seed grown in the United States. Vetterle Brothers, a nursery at Capitola, was so impressed it made him a partner. In 75 years Reinelt has doubled the size of the blossoms—up to 10 inches in diameter. His creations include the Ruffled Apricot at left and the roselike blooms opposite.

Overhead laths filter sunlight. Too much sun burns begonias; heavy shade may cause plants to be flowerless.

Visitors to the Vetterle & Reinelt sales yard carry colored ribbons to mark plants they wish to buy. Attendants deliver their choices at the gate.



see, on the city's doorstep, redwood trees that were thriving when the Battle of Hastings was fought (page 610).

So popular has Muir Woods become, since the completion of the Golden Gate Bridge in 1937, that conservationists fear for the trees' safety. Trod by thousands of pairs of feet, the woodland paths are slowly wearing down to the roots. The traffic in many instances threatens the life of the trees.

After its flirtation with the mountain and the redwoods, State One heads again for the sea. Once more it turns into a craggy ledge for six miles until it drops down to skirt the long sandspit of Stinson Beach, a State park. From here until its end, 205 miles to the north, the road spreads its favors impartially, now seaward, now landward.

Riddle Clouds History of Drake Visit

Near Point Reyes Station, State One brushes an intriguing riddle of history. At his home near the town we met Capt. Adolph Oko, retired merchant skipper and a founder of the Drake Navigators Guild.

This group, whose honorary chairman is Fleet Admiral Chester W. Nimitz, maintains that Sir Francis Drake made the first English landing in what is now the western United States just a few miles from State One. The presumed spot lies in a five-fingered lagoon, or estero, which, in turn, opens into a bay with white cliffs reminiscent of England's Dover. All these—beach, bay, estero—bear Drake's name.

Guiding us to a lonely cove in Drakes Estero, surrounded by wind-swept, tufted hills that resemble English moorland, Oko pointed to the spot where Drake may have careened the *Golden Hind* for 36 days of repairs.

There are those who dispute the guild's claims. Some historians believe Drake first landed inside the Golden Gate; others that he first set foot ashore on the Monterey Peninsula. But in addition to the guild's study of old charts and records there is the evidence of the plate of brass. The plate's authenticity has been established to the guild's satisfaction, according to Admiral Nimitz.

The notes of Drake's chaplain, Francis Fletcher, refer to a "plate of brasse, fast nailed to a great and firme post" at Nova Albion on the western coast of North America.

"One day in 1933," Oko related, "a banker went hunting near Drakes Bay. His chauffeur picked up an old piece of brass with—as he described it—'foreign writing of some sort' on its surface. Both men considered it some



Yellow Roseform Begonia: 8 inches



Apricot Picotee radiates beauty



Scarlet Roseform glows with warmth



Yachts Parade Beneath Golden Gate Bridge, State One's Water Leap

Senside daisies in San Francisco's Presidio frame a view of Marin County's hills and some of the 600 craft that streamed out of San Francisco Bay at the opening of last year's sailing season. Fog eddies about the tops of the bridge's 746-foot towers.



NATIONAL GEOGRAPHIC PHOTOGRAPHERS B. BRUNST AND GARY © & S.S.

Span's chief engineer, Joseph Strauss, stands in bronze near the south approach. Red cylinder is a sample cross section of the main cables, the bridge's yard-thick steel clotheslines.

worthless piece of debris, and the plate a few weeks later was tossed from the car near San Quentin, about 16 miles back toward San Francisco."

There it lay undiscovered until 1936, when a picnicker found it. He cleaned it off and took it to the Bancroft Library of the University of California at Berkeley. The chiseled inscription turned out to be dated June 17, 1579, and was signed by Francis Drake. In the name of "Herr Majesty Queen Elizabeth of England and Herr Successors Forever," it took possession of the land called Nova Albion. The plate is now on display in the Bancroft Library.

Today Drake's presumed landing point is part of a dairy ranch. Someday the guild hopes to have a monument marking the spot.

New England Styles Mark Bay Towns

We left Captain Oko in his study, surrounded by charts and old armor, and followed State One along the shore of Tomales Bay, a finger of water poking into Marin County. The towns and villages here lack ranch houses, patios, and the tile roofs typical of southern California; prim, gabled midwestern and New England styles predominate.

Beyond Tomales Bay lies Bodega Bay, which supports a brisk fishing industry. Thereafter, for the next 10 roadside miles, the State has created a continuous strip of park from the saucerlike bays and bold headlands that scallop the Sonoma coast.

Fog-fed succulents display their waxy petals everywhere—red, yellow, and dusty blue that together gave the appearance of a bright tweed carpet. Offshore lie great boulders that, when partly obscured by fog, make the sea landscape a fit setting for prehistoric monsters.

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But the dangers come not from dinosaurs. At Duncan's Landing grim signs and barbed wire emphasized Park Ranger Emmet Crisp's warning to steer clear of the shore. At least 50 persons have been swept from the rocks and ledges around this headland, and no bodies have ever been recovered, he told us.

"Has something to do with the depth of water just offshore," Crisp said. "There's a pocket there, and somehow a big wave builds up out of crosscurrents and comes sweeping right in up over those biggest rocks." He pointed to a ledge of boulders well inland from where the surf was breaking. "Takes 'em by surprise, and then it's too late."

Soon after Duncan's Landing we crossed the wide mouth of the Russian River. Inland for a score or more miles the Russian is bordered by resorts, including the Grove of San Francisco's Bohemian Club. The Grove is opened each summer to a distinguished membership which includes former President Herbert Hoover. In July the members gather for their famous "High Jinks" camp-out.

Russians Gather on Fourth of July

North of the Russian River's mouth the highway climbs and turns back on itself in a tortured, introspective way along the face of a high sea cliff (page 616). Then it stumbles into history again by breaching a stockade and projecting itself straight through the partially restored enclosure of Fort Ross. This was a southern outpost of the Russian-American Fur Company, and the name may derive from the early spelling, "Rossiya."

Inside the high stockade, and also restored, are two Russian blockhouses, the commandant's house (now a museum), and a Russian Orthodox church, believed to be the oldest in the United States outside of Alaska. The fort's original armament consisted of American ships' cannon and Napoleonic weapons supposedly captured during Bonaparte's retreat from Moscow.

Since 1925 members of the Holy Trinity Russian Orthodox Congregation in San Francisco have gathered here each Fourth of July to celebrate the freedom they enjoy as citizens of the United States.

Begun in 1812, Fort Ross was intended as a source of food and supplies for the Russian-American company's outposts in Alaska. When the fur trade waned, the fort fell on evil days. After repeated crop failures and an unsuccessful fling at shipbuilding, its colonists withdrew at the tsar's orders, and the fort

(Continued on page 611)

Red Cynthia Rhododendrons Blush
in San Francisco's Golden Gate Park



Dreary, wind-swept wasteland a century ago, Golden Gate Park today is a sylvan retreat of lakes, rolling hills, and meadows. The man-made playground cuts a green four-mile swath from the

heart of the city to the Pacific. Spacious Kezar Stadium stands on the edge of the park. Model Yacht Club in background houses miniature boats, whose owners race them on Spreckels Lake.

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San Francisco, on a Magic Carpet of Fog,
Beckons Dreamily Across the Golden Gate

Capt. John Charles Frémont named the strait after viewing sunset's flame on its waters, but the passage often cradles rivers of mist. The interplay of open sky and fog makes San Francisco a city of fickle mood, as sparkle under sun



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or starlight but muffled and remote in ground-hugging clouds. When sun and fog mingle, fragments of the city gleam or melt as in a fantasy. Here motorists at the north end of Golden Gate Bridge see the city seemingly adrift. Nob and

Russian Hills merge into one, Mark Hopkins Hotel crowning the former and Bellaire Apartments (extreme right) the latter. Coit Memorial Tower tops Telegraph Hill on the left. Distant Bay Bridge flings a misty arm across the harbor.



and other northern California holdings were sold to John Sutter in 1841 for produce and 30,000 Mexican dollars. Yet, in its way, Fort Ross helped make United States history. John C. McKenzie, Curator of this State Historical Monument, told us how.

"In 1821," he said, "with the Russians at Fort Ross, the tsar issued a proclamation closing the Pacific coast north of the 51st degree of latitude to all but Russian ships. President James Monroe decided that the Russians had become a menace to the security of the Western Hemisphere. This, together with the threat of Russia, Austria, and Prussia—the Holy Alliance—to invade Latin America in behalf of Spain, led to promulgation of the Monroe Doctrine in 1823."

Abalone for Home Use Only

Several miles northwest of Fort Ross we came upon a group of goggled young skin divers searching for abalone in a rocky, sheltered cove.

"Sure the water's cold," they told us, "but look what we got."

Spread out on the sand was a baker's dozen of green abalone, each about the size of half a melon. These giant mollusks, once scorned by the early Caucasian settlers of California, are now considered a delicacy. Sliced into steaks and pounded to the right degree of tenderness, they combine the flavor features of the oyster and clam with the texture of the scallop. The commercial haul amounts to 4,000,000 pounds yearly, none of which may be shipped outside the State lest demand exceed supply.

The abalone's iridescent shell once served California Indians as money. Early Chinese residents sent it to their homeland, where it was made into jewelry and souvenirs to be sold back to the Californians at high prices.

How are abalone taken? A red-haired youth showed us a tire iron.

"With a very low tide," he explained, "you can just wade out and feel down among the rocks and pry them off with this. It takes a good, strong pull to bring them free. But

today, with this high water, we have to dive down, find them, and pry them off."

"Aren't there octopuses and things down there, too?" Leslie asked.

"Sure. Little ones. But they're timid. Sometimes we see sharks, but so far they've never caused us much trouble."

Shark attacks along the California coast are rare but not unknown. Last summer a skin diver searching for abalone near La Jolla was devoured by a rapacious 20-footer.

"I think," said Leslie, "I prefer to do my abalone hunting on a restaurant menu."

Pushing on from our intrepid skin divers, we drove through the wonders of the Kruse Rhododendron Reserve, where rhododendrons grow from 20 to 30 feet high, blossoming in late May and early June. Beyond lay the Gualala River and the lumbering and fishing town of Gualala.

"When does the steelhead season start?" we asked a venerable resident sitting on the porch of the white-frame Gualala Hotel.

"November 1," he replied. "They lie out there off the mouth of the river until the first rains wash the sand bar out. That lets the fish come in and go upriver to spawn. We catch 'em both coming and going. Steelhead aren't like king salmon, you know. They're big seagoing rainbow trout. The female salmon dies after she lays her eggs. The steelhead, though, lives to spawn again."

A sign at the hotel's entrance was a clue to Gualala's way of life: PLEASE DO NOT ENTER BUILDING IN CALKED BOOTS. From here northward we would be traveling through lumbering country.

Dull Life of a Lightkeeper

After Gualala we crossed many steelhead streams flowing down from the hills to huti their way against the surf into the Pacific. Near the mouth of the Garcia River we found a tall white shaft, topped by a 400,000-candlepower beacon. This was Point Arena Light, which warns shipping to stand clear of off-lying reefs (page 615).

Harold Hansen, a young Coast Guard man,

Sun-dappled Foliage and Curving Path Draw Visitors Into Muir Woods

"The redwood is the glory of the Coast Range," wrote naturalist John Muir, champion of western forests, "and in massive, sustained grandeur and closeness of growth surpasses all other timber woods of the world." Just north of the Golden Gate, Muir Woods National Monument honors the man whose writings crystallized public sentiment to save a national heritage. Half a million people a year enter reverently, as into a cathedral, and walk among the coastal redwoods.



was on duty when we called at the light. He made it clear that even in this electronic age the lot of a lightkeeper hasn't changed much. The nearest motion-picture theater was five miles away in the village of Point Arena; television reception was doubtful.

"But you should be here in winter," he laughed ruefully, "when the fog closes in. Maybe a big storm slams us from the Aleutians. You sit in here for six hours straight with the foghorn blasting three seconds on, then one second silence; two seconds on, then fifty-four seconds silence. Everything shakes and rattles. The wind howls. The only way to stretch your legs is to walk 135 steps up to the top. Me? I'll take a ship, next tour of duty, I hope."

Along this untamed and lonely section north of Point Arena the road sometimes eschews bridges and snakes back to where a gulch narrows down to ravine size before crossing. At Elk Creek, for example, it takes a double

switchback to cross and climb out again.

One dramatic crossing takes place at the mouth of the Navarro River, and we found this worth a stop as the southernmost of the region's good driftwood beaches. After the first winter rains, driftwood swirls down the rivers to gather on the sandspits around which the watercourses curl into the sea.

Net Floats Become Garden Ornaments

The collector's greatest prize is not always driftwood. Often along the Pacific coast come the green and blue glass globes—some the size of basketballs—used by the fishermen of Japan to buoy their nets. Many of these break free to float eastward across the Pacific and onto west coast beaches, where they are eagerly seized for house and garden ornaments. In recent years their popularity has resulted in commercial shipments from Japan. Net floats in many colors and sizes can now be bought in souvenir shops.



Loggers' Truck in a Redwood Grove Pulls Loads Weighing up to 100 Tons

Men revere the coastal redwoods for their height and age—some stand more than 300 feet and attain more than 2,000 years—but they also prize the wood for lumber. Straight as ships' masts, the trees yield a building material valued for its rich color and durability. Tannin in the wood resists termites, fungi, and disease.

Parks protect the biggest, most venerable trees, but lumberjacks with chain saws, huge boom loaders, and mammoth trucks harvest the lesser giants. Cutters fell only mature or damaged trunks, sparing others to sustain the yield. Bulldozers pile up dirt cushions so that the timber will not splinter when it crashes.

This stump in Horsetail Gulch near Tenmile River will sprout new trees. Two Douglas firs lie in the middle; larger logs are redwoods.

A 16-ton log slides into a 60-foot band saw in the Union Lumber Company's Fort Bragg plant. Previously peeled in a hydraulic barker, the log comes to the sawyer to be cut according to his judgment for maximum use.

Highest paid man in the mill, the sawyer shears wood that was already a young tree when King John signed the Magna Carta. Lumber from one tree would build a sizable frame house.

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PHOTOGRAPH BY LARRY AND SUZIE ANDERSON FOR LIFE





Point Arena's Light, Horn, and Radio Beacon Warn Coast-hugging Ships to Change Course;

At the Navarro's mouth a roadside sign directed us to a tavern owned by R. Q. McCorkle. Entrance to the driftwood area, the sign pointed out briskly, cost 50 cents, payable to Mac himself.

Midgets Grow Near Giant Trees

"We used to let anyone go out there who wanted," he told us. "Finally it became a problem to keep up the road. Some people come in trucks and haul away wholesale lots. They get good stuff. After the wood is buffed and oiled, some pieces bring a pretty high price down in San Francisco."

State One offers another bit of the grotesque in wood just beyond the Navarro, where the pygmy forest begins. This horticultural rarity extends in broken sections along a strip not far inland from the coast. At full growth some of these pines and cypresses may measure perhaps two feet in height. At the ripe old age of 60 years their trunks in many cases may be only half an inch in diameter.

Some biologists have suggested that acid soil conditions and poor drainage might account for the phenomenon. Others have noted that rhododendron, azalea, Labrador tea, and huckleberry grow to normal size among the



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Earthquake Toppled the Original Tower in 1906. These Waters Hide At Least Three Hulks

midgets. And most disconcertingly, around Little River flourish coast redwoods, the tallest trees of all, sharing Van Damme Beach and Russian Gulch State Parks with the pygmies.

In the deep canyons of the parks, ferns grow to giants, easily topping six feet in their leafy luxuriance. We drove into Van Damme and marveled at its green privacy.

We found nature still in a mood for giantism farther on at Fort Bragg, named for the Mexican War hero who achieved later and greater renown as Confederate General Braxton Bragg. With a population of only 5,000, Fort Bragg is the metropolis of the coast between San

Francisco and Eureka, 100 crow-flight miles farther north.

Despite its modest size, Fort Bragg thinks in Brobdingnagian terms, well becoming the big-boned Swedes and Finns who supply and help to operate one of the largest redwood lumber mills in the country (page 613). The lumbering company also operates the California Western Railroad, whose daily one-car passenger train to Willits has achieved national fame. It is called, with stark simplicity, "The Skunk."*

* See "The Friendly Train Called Skunk," by Dean Jennings, NATIONAL GEOGRAPHIC, May, 1959.

Naturally enough, Fort Bragg's civic symbol is Paul Bunyan, the Jove-sized figure who once stalked the forests of Maine, Michigan, and Minnesota. Each September the town celebrates Paul Bunyan Days with log-rolling, tree-climbing, and wood-chopping contests.

As an indication of lumbering progress, townspeople enjoy pointing out the site of a tree nursery intended to supply seedlings to replace trees cut down in normal operations. It was abandoned in 1931, when improved cutting methods made natural reforestation more efficient and desirable.

Beyond Fort Bragg, State One parallels the

coast for another 30 miles and then leaves the sea for good when it crosses forested hills to rejoin U. S. 101 at Leggett.

Before it does so, it dangles one final charm seaward in a series of beaches where, from April to October, surf smelts can be handily dip-netted at the waterline. Along this section of the coast the smelts spawn in the sand by the millions. How prolific they are may be judged by the legal limit: 25 pounds a day per fisherman.

In a store near by, I rented a net, removed my shoes, rolled up my trouser legs, and clumsily imitated the dipping motions of half

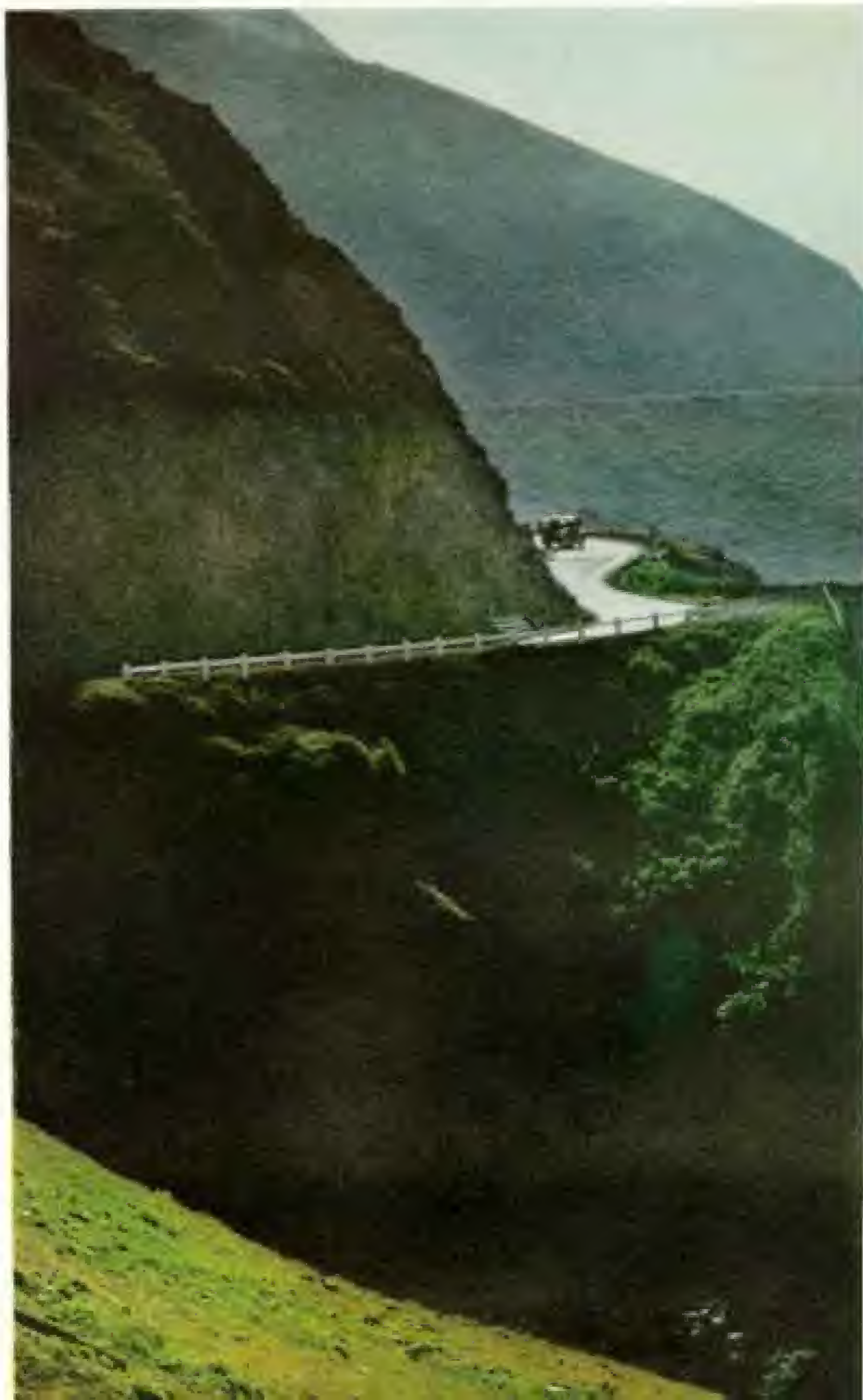
Wonderful One Notches the Western Ramparts of the Continent

Jutting up from the ocean, northern California's coast achieves a grandeur rivaled by few shorelines.

Civilization has left only a feeble imprint here. Often State One's awed travelers are the sole witnesses to changing moods of a coast that has its feet in the surf, its head in the clouds.

Sunlight contends with mist in this view southward between Fort Ross and Jenner. Here the road climbs to 600 feet, its highest elevation except for short inland passages across mountain spurs.

Bodega Head and Point Reyes thrust hazily into the sea.



a dozen other fishermen strung out along the beach.

Sensibly clad in rubber waders, these sportsmen could afford to be patient until the next run commenced. I, however, rapidly turned blue in the chill water.

Postcard Pays Off an Obligation

Leslie laughed at me. "What a funny way to leave all this," she said. "We started our trip in a castle fit for a king, with our heads in the clouds. Now you're ending it on a beach, with your feet in the surf. What a road!"

What a road, indeed! It had carried us

through California's long and colorful history; shown us glimpses of Italy, Spain, Portugal, and even tsarist Russia. Above all, Wonderful One had enchanted us with magnificent vistas of mountain and sea.

At the little northern California town of Leggett, where our amazing road finally loses its identity in a dead-end intersection with 101, we stopped at a general store. We had an obligation to meet. Leslie wrote a postcard to Aunt Retta Buchanan, ending it with the words: "Thanks. Thanks for the nicest trip we've ever taken."

My wife has a gift for understatement.

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ESKETCHED BY WILLIAM BECKER, JR. © NATIONAL GEOGRAPHIC SOCIETY

Surveyors Map a Cliff-dweller Ghost Town Abandoned 700 Years Ago

This team, part of a National Geographic Society-National Park Service archeological project, explores Long House, one of the 13th-century Indian cliff ruins at Wetherill Mesa in Mesa Verde National Park, Colorado. Ledges in the 100-foot-high vault gave the owners an impregnable refuge against marauders. Rain water streaked the roof.

SEARCHING FOR

Cliff Dwellers' Secrets

By CARROLL A. BURROUGHS

Staff Archeologist, National Park Service

NOT since their Pueblo Indian builders disappeared so mysteriously nearly seven centuries ago have the high-perched cliff homes of Wetherill Mesa seen so much determined energy.

In this remote corner of southwestern Colorado's 80-square-mile Mesa Verde National Park, scientists seek the answers to a whole series of riddles. Here in action is the National Park Service-National Geographic Society Wetherill Mesa Project, its first year of operations just completed.

Ruins Long Silent Hum With Activity

Over a trail passable only in good weather, I visited Long House camp, named for the first of the major Wetherill Mesa cliff dwellings to be examined in this project.

Amid the bustle it was easy to understand why the area has been closed to the public until the work is complete. This is purely and simply a working camp intent on two aims: To increase our knowledge of Wetherill Mesa's history and to prepare it as an alternate attraction for the swelling tide of visitors to the park, which is literally wearing out the ruins at near-by Chapin Mesa (map, page 622).

At the lip of the awesome cliff overhanging Long House (page 623), a sweating Navajo crewman strained at the hand winch of a crane jutting into space. Pulleys squealed as he lowered cement to archeologist James Allen Lancaster's stabilization crew. Their job was to rehabilitate the crumbled ruin nestled in the cliffside. Below, in the ruin itself, other crewmen carefully stacked stones, once part of the original dwellings, now to be used again in the stabilized walls.

His arm waving wildly, a surveyor squinted through his transit at a distant marker. Long House was being mapped topographically and architecturally. I learned after a dusty, breath-stopping scramble down the steep path leading from the mesa top.

Here in the great cave nature carved into the cliff, rooms deserted for centuries echoed to the trowels and shovels of excavating crews. Often there was a triumphant yell as the sieved earth gave up a bit of pottery, a hunter's snare, or some other relic.

On the steep slope beneath the eastern end of Long House fresh trenches probed the massive trash heap piled up by the original residents. Already this slope has yielded a number of burial sites, and supervisory archeologist Douglas Osborne has noted a number of trends in burial methods. Such discoveries will provide new clues to the customs of the people who once lived here, and may help link them historically with present Southwestern Pueblo Indian tribes.

Everywhere there was tense, purposeful activity. No one could be sure what the next spadeful of earth would uncover; what these debris-filled rooms would tell us of the fate of their vanished builders—and why they came to these cave shelters from the mesa top.

Moving Day Came Often for Indians

These were some of the questions Al Lancaster and I pondered after a hearty camp supper. The broad mesa lay around us, slashed irregularly by the rugged canyons. Al gestured toward the south.

"From about A.D. 600 to 1100," he said, "most of the Mesa Verde Indians lived in small farming villages scattered over the lower elevations of the mesa top. Then gradually, during the 12th century, the smaller villages were deserted. More and more of the people moved into large, compact communities higher on the mesa top. More easily defended, true, but less productive for a farming people. Why did they do it?"

Some new influence was at work, but what was it? The sequel is just as puzzling.

About A.D. 1200 the mesa-top communities were abandoned as the Indians moved again,

this time into caves in the canyon walls. The building problems must have been enormous. Just to terrace some of the steeply pitched cave floors must have taken as much work as building a good-sized village on the mesa top.

More than 800 cave and ledge ruins have been found in the park. Yet this prodigious investment of time and labor was abandoned within the century. By the year 1500 the Indians of the Mesa Verde had moved again—this time right off the pages of history.

Indian Gave Clue to Discovery

Was this final move compelled solely by the drought at the end of the 13th century, or was there also the threat of some unknown enemy? And what happened to the people of the Mesa Verde afterward?

"Maybe what we're doing here will help relate the Mesa Verde people to some other Pueblo tribe and bring them back from oblivion," Al suggested. "They deserve it. They built well." So well, he added, that despite the ravages of six and a half centuries, the Mesa Verde ruins were still impressive when the first white men discovered them. The discoverers were the five Wetherill brothers—Richard, John, Alfred, Clayton, and Winslow—and their brother-in-law, Charlie Mason, all members of a near-by ranching family.

A friendly Ute Indian named Acowitz had told them of a huge cliff village in one of the canyons north of the Mancos River. They finally found it in December, 1888, while chasing stray cattle.

The discoverers and their successors exploited their trove in the fashion of the day, and for years thereafter the Mesa Verde was systematically looted of its treasures. Don Watson, long-time park archeologist at Mesa Verde,* and one who knows the details best, tells the story:

"The work of some of the diggers was careless and ruthless. They had no consideration for the ruins: their only thought was of the sales value of the artifacts recovered. A banker in a near-by town even grub-staked men to dig in the ruins in return for a share of the profits."

Then reaction set in, notably supported by the Colorado Cliff Dwelling Association. Finally, on June 29, 1906, Congress passed a bill creating Mesa Verde National Park.

In the years before it became a national park, only one archeologist had done scientific excavation in the area. This was Sweden's Baron Gustav Nordenskiöld, who dug into several of the cliff ruins in 1891.

* See "Ancient Cliff Dwellers of Mesa Verde," by Don Watson, *NATIONAL GEOGRAPHIC*, September, 1948.



Scientists Examine an Ancient Snare

Cliff dwellers had turkeys, but raised no other meat. They hunted steadily to supplement their diet of corn, beans, and squash. Trappers set snares of braided yucca fiber. A web of cords bagged the struggling victim when the noose drew tight.

Dr. Douglas Osborne, supervisory archeologist of the Wetherill Mesa Project and Mrs. Jean M. Pinkley, Mesa Verde National Park archeologist, study this perfectly preserved snare. Found in a cliff ruin, it is now in the park museum.



WILLIAM BOELNER, JR.

Masked Against Dust, Archeologists Sift Bits of Crumbled History

Pouring earth through wire screens, the men search a room in Long House. Pueblo masons formed the chamber by joining sandstone-and-adobe walls to the arch of the cave.



Cliff Dwellers' Caves Gape in the Mesa

This aerial view of Wetherill Mesa shows two of the park's 800-odd cliff communities. Long House, its huge stone portico suggesting the stage of an amphitheater, rises amid a carpet of juniper and piñon. A second cave village, Site 1249, shows on the left. Distant slopes reveal the scars of fire.

Mapping by radio, Alden C. Hayes, archeologist in charge of the National Park Service site survey, focuses his direction-finding antenna on a beacon in order to calculate his position.

For the scientific excavation and study of cliff dwellings on Wetherill Mesa, the National Park Service asked and received the National Geographic Society's support.

Mug House

← Dirt road not open to the public

7300' • Step House

Site 1249.

Field Camp
Long House

Wetherill Mesa

Kodak House

Double House

Square Tower House

Sun Temple

Cliff Palace

MESA VERDE NATIONAL PARK



6800' Spruce Tree House
PARK HEADQUARTERS

Chapin Mesa

6300'



Nordenskiöld's report of 1893 contained excellent descriptions, maps, and photographs. After his death, his collection of about 600 pieces was purchased by a Finnish industrialist—which explains why some of the finest Mesa Verde artifacts are now in the National Museum in Helsinki, Finland.

Among the baron's finds were several coils of two-strand cord, woven from yucca fiber, some as long as 1,300 feet. Their use remains uncertain. Perhaps, when plaited into heavier rope, they aided the cliff dwellers in raising and lowering objects to and from the mesa top. Or they simply may have been stockpiles for use in making hunting snares and for trading with other Indians.

Dr. Jesse Walter Fewkes, of the Smithson-

ian Institution, worked from 1908 through 1922 clearing debris from large cliff ruins and mesa-top villages, and strengthening and bracing weakened walls and foundations. After that, park development and management took precedence and scientific research was sporadic. Then, in 1958, the National Park Service and the National Geographic Society launched their joint Wetherill Mesa archeological project.

"In our excavations," Dr. Osborne told me, "we will search for even earlier people—the ancestors of the mesa-top village builders of the A.D. 600-1100 period, who may have occupied the caves as makeshift shelters. And in the excavation of the large cliff ruins we should be able to produce a better idea of com-

First Visitors Relax on the Porch of Two-Story Cliff House

Intrigued by rumors of mysterious ruins, W. H. Jackson, photographer for a Government survey team, decided to explore the Mesa Verde in 1874. Hiring a garrulous miner as guide, he led a party into the tableland. Just as they were losing faith in their guide, the men spotted a stone house clinging to the canyon wall 700 feet above the Mancos River. Next morning, September 10, Mr. Jackson scrambled up to the ruin and took this historic photograph, first ever made of Mesa Verde cliff dwellings.

WILLIAM H. JACKSON, COURTESY DENVER PUBLIC LIBRARY





OSBORN PHOTO

Canteens Refresh an Early Scouting Party at Cliff Palace

Scientists believe lack of water may have driven the cliff dwellers from their homes nearly seven centuries ago. Among the handful of Anglo-Americans to view the ruins around the turn of the century, these visitors packed in on horseback. Today more than 200,000 sightseers a year visit Mesa Verde National Park over modern highways.

Solid rock forms the top of the square opening in the background. Small holes held log roof beams, long since rotted away. The photographer caught this scene on a cumbersome glass plate, a forerunner of modern film.

munity life during the climax period of the 13th century.

"Studies of pollen and soil will show the manner and extent of the cliff dweller's agriculture. Examination of tree rings will tell how these were affected by changes in climate."

Project May Take Six Years

"From all this," Dr. Osborne summed up, "we may finally be able to understand why these people scurried about so during the last two centuries of their occupation, why they left the Mesa Verde, and what happened to them."

In addition to the work at Long House, two other cliff dwellings are scheduled for attention. Next to be excavated will be Step House and Mug House, so called for the pottery the Wetherills found in it.

The whole job will probably take five or six years. Evaluating the findings will undoubtedly take even longer.

Meantime, the vast canyons will continue to echo the sounds of 20th-century science at work as the past yields its secrets to modern techniques, and an almost lost way of life emerges from the shadows.



Boom Days in the Southwest

The Nation's fastest-growing corner sits for its portrait: an up-to-the-minute Atlas Map



A CENTURY AGO a doughty Army lieutenant led a Government-sponsored expedition deep into what is now the Southwestern United States. After exploring along the Colorado River, he made his report, "Ours has been the first," he observed, "and will doubtless be the last, party of whites to visit this profitless locality."

Lt. Joseph C. Ives was wrong on both counts. Others had been there before him. And just to see what Ives had called "an altogether valueless region"—the Grand Canyon of the Colorado—more than a million visitors came in 1958 alone.

The Southwestern United States, 1950 model, unfolds before members of the National Geographic Society as a supplement to this issue. Embracing California, Nevada, Utah, Arizona, and most of Colorado and New Mexico, the new map is Plate No. 12 in the Atlas Series and the fifth of eight uniform-sized maps that will cover all 50 States of the Union.*

The States that make up this region are mushrooming more rapidly than any other section of the country, with five million people added to their totals since 1950, according to Census Bureau estimates. In percentage, Nevada outpaces all other States with a growth of 66.7 percent. Arizona has gained 52 percent, and the whole region 39. California has grown by four million people, and by 1970, at present rates of growth, would surpass New York as the Nation's most populous State.

Land Where Three Cultures Combine

The Southwest has always been of particular interest to National Geographic families. Numerous Society-sponsored projects and Geographic articles have had their settings here. In this issue of the magazine, for example, the new map will help readers follow the fascinating windings of California's State Highway No. 1 (page 571) and in Colorado the explorations of Wetherill Mesa (page 619).

* Thirteen Atlas Maps have now been issued since the series began in January, 1958. For binding their maps and thus building up a home atlas, more than 200,000 members have ordered the convenient Atlas Folio, available for \$4.55. Single maps of the series, at 50¢ each, and a packet of the seven maps issued in 1958, at \$5, may be ordered from the National Geographic Society, Dept. 30, Washington 6, D. C.

An old Navajo and his cherished horse betoken a fading era as 80,000 tribesmen turn increasingly from sheep raising to irrigated farms, uranium, oil, and city jobs. Even reservation boundaries shift because of land exchanges to replace acres flooded by Glen Canyon Dam (opposite).

It is a land where three great cultures merge, as reflected in place names on the new map. The Yosemite of the Indians—its name means "grizzly bear"—mixes with the San Diego and Santa Fe of the Spanish and the Pancake Range and Jubilee Pass of a lusty young United States.

From a nose of land jutting into the Pacific, guided missiles are fired for military practice and satellites can safely be launched into polar orbit—one of the few places in the U.S. where this is possible. The map shows it as Vandenberg Air Force Base, near California's Point Arguello; nothing lies between it and Antarctica but open ocean. At Point Mugu, farther south near Los Angeles, the Navy has a missile test center.

Thickly settled San Francisco and sprawling Los Angeles—its 455-square-mile area makes it the Nation's largest city—are depicted in special map insets.

Ancient villages—still-inhabited Indian pueblos such as Acoma and Taos, already old when Jamestown was settled—bask in the sun near new towns. Page, Arizona, for example, was created in the building of Glen Canyon Dam. Page is one of scores of municipalities, shown for the first time in this Atlas Map, that have come into being in the Southwest's booming growth.

In large part that growth is tied to water. Glen Canyon Dam is one of the grandiose projects, newly depicted on the map, with which man is creating lakes and remodeling rivers to make the desert bloom.

This 325-million-dollar dam, tall as a 63-story building, will form a 100-mile-long reservoir on the Colorado River in Arizona and Utah. The dam is to be completed in 1964, but the lake, shown in dashed outline on the map, will be slow to grow up; similar-sized Lake Mead took six years to fill.

Probably Lieutenant Ives should be forgiven his unfortunate prophecy. Lacking maps, roads, and adequate transport, harassed by thirst and desert heat, he had reason to call the Southwest "profitless." Yet it would be interesting to see his report if he could take the trip again today.



U. S. BUREAU OF RECLAMATION

A huge cofferdam diverts the Colorado River for construction of Glen Canyon Dam, whose lake will change the face of Arizona and Utah. Twin slots carved into 700-foot cliffs will anchor the concrete. Initial crews avoided a 150-mile drive between rims by using a swaying footbridge, whose thin shadow lies on the river. Engineers later erected the 1,271-foot-long bridge, the Nation's highest steel-arch span. White water roars from the diversion tunnel below the dam site.



Firebrands fight forest demons and masked guests dance for half a week as Indians of the Amazon celebrate their festival of womanhood

Tukuna Maidens Come of Age

By HARALD SCHULTZ*

With photographs by the author

IT IS LATE OCTOBER. The long Brazilian dry season nears its end, and the water level is low in the Amazon. Here, 1,700 miles upstream from its mouth, wide sandbanks glisten white in the hot sun. Turtles lay eggs in holes in the sand; the dry mouth of a small stream looks out high above water level, like an abandoned road.

Two dugout canoes lie under the bushes overhanging the riverbank, and above them a narrow path leads up the slope through the tall forest. It winds to the top of a knoll where stands a large house, built on posts and covered by a gable roof of interlaced palm leaves. Chickens cluck softly in the shade, and in one corner of the house a parrot croaks from a small basket.

Children Frolic in Jungle Lake

Below the knoll the dried-up brook has left a small lake shaded by forest trees. Now, at midday, the sound of laughter floats up from the water. Two Indian girls, 12 or 13 years old, are splashing about with some younger children. They chase one another, dive to escape, seize and splash each other. Then one of them quietly leaves the game.

Anita goes to the shore. She draws her cotton dress over her wet young body. The warm air will soon dry both dress and body.

"Raimunda," she calls. Her cousin is like a sister to her. They whisper. Then Anita goes up the slope to the house and climbs the steep ramp that leads to the single dark room inside.

From around her neck she takes a necklace, a pretty string of hand-carved birds, fish, reptiles, and insects. She hangs it on

a crossbeam where it will be easily seen. Then she goes into the forest to hide.

She does not go far from the house, for the forest, she knows, is full of demons who wish to harm her. To be safe, she must act exactly according to tribal rules. She looks around, a little frightened. Finally she begins striking two small sticks together.

Later Anita's mother returns from tending the cassava crop. She sees her daughter's necklace and realizes at once what it means. She listens, and hears the sticks clacking. The mother follows the sound until she finds the girl. Then, lovingly, she places her arm around Anita and leads her into the house.

That night Anita's father, Joaquim, cautions his wife: "Now you must take care that the evil spirits have no opportunity to harm our daughter." The woman responds by leading Anita to a platform nestled below the roof of the big house (page 634). There the girl must stay, hidden from the eyes of men.

Two weeks pass. One afternoon Raimunda, too, hangs her necklace on a post and hides in the forest. Her mother finds her rhythmically striking two sticks together.

Summer Rains Turn Amazon Yellow

By nightfall both girls are secluded in the hideaway under the roof. There they will stay, in almost complete isolation and most of the time in silence, for three months. Then their family will celebrate a rare double festival, for Anita and Raimunda have become young women.

* Author of the poignant "Children of the Sun and Moon," in the March, 1959, *GEOGRAPHIC*.

Heads Bowed, Eyes Shut, Tukuna Girls Prepare for Their Debut

The author witnessed this ritual in an Indian village far up the Amazon. The two maidens have spent nearly three months in seclusion. Now, surrounded by relatives, they stand with eyes closed; to open them, they believe, would put them at the mercy of forest demons. Dye from genipa fruit blackens their hands; colorless when applied, it darkens as it dries. In a few moments, women will paint the girls' entire bodies, using corncob brushes. Then, after a brief return to the seclusion hut (page 653), around-the-clock merrymaking will mark their acceptance as adult members of the tribe.



Eyes glazed from lack of sleep, drummers maintain an unceasing, throbbing din throughout the three days and four nights of merry-making that mark the ordeal's end. Tukuna believe the girls would face dire peril if the rhythm stopped even for a moment.

Host embraces a guest concealed by a jaguar mask. The disguise represents a demon who, Indian legends tell, killed many tribesmen.

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Masquerading as Monkeys, Leaders of the Dance Thump Rattle Sticks

Many guests carry masks to the festival. These pranksters donned their regalia in the jungle, burst into the clearing, smashed pottery, uprooted small banana shrubs, and playfully attacked the hut where the two initiates lived in seclusion (page 633).



Now it is January. The summer rains have come, and the mile-wide Amazon gouges great clumps of earth from its banks. Swiftly, silently, the powerful current carries our dug-out canoe downstream. The Brazilian border city of Benjamin Constant, where I arrived a few days ago by river steamer, dwindles in the distance.

Uprooted trees and floating islands of grass clot the yellow flood surging to the east. Genesio, my Tukuna Indian guide and interpreter, scans the passing jungle for long minutes, then abruptly angles the canoe shoreward. He has found the *Paraná dos Guariba*—the howler monkey channel. At its end lies our destination: a Tukuna village where, Genesio has told me, the two Indian girls await the most important event of their lives.

Ritual Follows Ancient Custom

Two men greet us as we touch the steep bank littered with dugouts. In gay cotton shirts and trousers, they might be backwoods Brazilians. But they are Tukuna, some 2,000 to 3,000 of whom inhabit remote clearings along arms of the upper Amazon.

Most Tukuna live in Brazil, a few in adjoining Peru and Colombia (map, page 637). They cling to ancient tribal customs. As director of expeditions of the São Paulo State Museum, I have come to witness and photograph the festival of the *Môça Nova*—or coming of age.

Usually, at puberty, the Indian maiden faces the ceremony alone. This festival will be particularly impressive, since two will be feted at the same time.

"We are glad to have visitors," one of the men says graciously when I explain my purpose. "My name is Joaquim Correia. This is my brother Manoel."

The Tukuna tribal names are far too complicated for our ears. Most Tukuna bear Christian names, and the men speak Portuguese as well as their own tongue.

"The festival of our two maidens will begin in a few days, as soon as the moon is full," Joaquim tells me. "We will be honored if you stay with us."

We pick our way through the jungle to Joaquim's house on the knolltop. He ushers us up a steep ramp to a shaky floor of split palm trunks. All four sides are open, but the wide roof reaches far down to keep out wind and rain.

"Many people are coming," my host says. "Our house will be filled with guests. This

is why the Tukuna build houses so much bigger than those of their Brazilian neighbors.

"My father's house was even larger," he adds proudly. "But it becomes more and more difficult to find the palm leaves needed every five years to re-cover the roof. Too many people live here along the Amazon."

I notice women working over big cakes of baked cassava root. Gray and pasty, the unappetizing-looking cakes seem to be interwoven with fibers of mold.

One of the women pinches off a bit of the paste, mixes it with water, and presses it through a crude sieve of palm leaf stems. To my dismay, she offers me a calabash full of this liquid.

"Drink!" says the master of the house. "It is *paianarié*, our feast drink."

Politeness demands that I sample the thick, sour-tasting brew, in which I see solid particles floating. But Genesio eagerly takes the calabash from me and gulps down the contents with obvious pleasure.

To brew this beverage, the women for endless hours grind and boil cassava root, then pour the resulting paste into long wooden troughs. As they sit stirring the paste, they spoon small portions into their mouths, chew it, and spit it back into the troughs.

"Chewing the paste makes the drink sweet," Genesio explains.

Girls Remain Hidden From Men

Day after day goes by, and I see nothing of the two girls whose ritual I have come to watch. They remain hidden on the platform near the thatched roof. Finally I ask Genesio what they do there.

"They must work diligently the whole day long," he replies. "They dare come out of hiding only if no men are in the house."

"And if a stranger arrives unexpectedly?"

"Every Tukuna knows the houses where the maidens are hidden. If a man comes near, he whistles. Then the girl has time to run back to her hiding place."

Even now, I learn, Tukuna for miles around are preparing for the festival. Many will bring masks of *tururi*—cloth made from the pliable inner layer of bark from giant *sapucaia* trees.

"What do Tukuna masks represent?" I ask. Genesio replies with an ancient legend:

"Once the evil demons wished to celebrate a festival," he begins. "But they had no meat. Therefore one terrible night they fell upon a Tukuna house and killed everybody in it.

Covered with dye, maidens return to their hiding place. Only close relatives normally attend the painting ceremony (page 628). Because of the author's friendship with the Indians, he was allowed to make these remarkable photographs of the ritual.

Painted and Feathered Like Jungle Birds, the Maidens Emerge from Long Isolation

Climax of the three-month ordeal came on the third day of merrymaking. Relatives entered the seclusion but to dress the girls in full regalia. After dancing with the maidens, paternal uncles slashed an opening in the wall and led them forth in all their bizarre finery.

Here an uncle shakes a rattle while a father hovers close by. Hawk feathers decorate the men's faces and the girls' legs.

© NATIONAL GEOGRAPHIC SOCIETY 633





Cool and Roomy, a Split-level Tukuna Home Overlooks the Jungle

Built on stilts to escape frequent floods, the dwelling has no walls. A gabled roof of thatched palm leaves slopes far down to keep out wind and rain. Teen-agers sleep beneath the mosquito net on the upper level and maidens hide there during their three months of seclusion. When the festival starts, they move to a hut along one side of the big downstairs room. Most important event in a Tukuna girl's life, the coming-of-age ceremony takes place when she is 12 to 14 years old. A double festival is rare; usually a girl faces the ritual alone.

Pygmy Marmoset Hitches a Ride Atop Little Haktot's Head

Many children carry pet monkeys and parrots to the festival. Dogs accompany most families. Some guests, unwilling to leave their poultry behind, bring along cackling chickens.

Haktot loved to joke and play with the author. Her elin pet (*Cebuella pygmaea*) "talks" with high-pitched trills and twitterings. About six inches long, the pygmy marmoset is one of the world's smallest primates.

Sleepy child dozes in her father's arms. He relaxes before taking his turn on the ceremonial drums.

Each guest brings his own hammock and hangs it beside the dance floor. Tukuna families at home sleep on bark-cloth mats spread on the floor.





**Joyous Indians Escort
"Debutante" Daughters**

After making a single circuit of the house, celebrators file back inside for a day of dancing. The red-shirted man is one of the fathers.



Macaw feathers adorn diadems covering the girls' eyes; Tukuna believe the blindfolds ward off demons. Feather bracelets decorate arms; crimson dye streaks bodies. Indian artisans made the white tassels from the soft inner bark of a wild fig tree. A bird's wing dangles from the shoulder of the girl on the left.

"Neighbors trailed the demons to their mountain caves. There they sealed the entrances with palm leaves, except for a single small hole. Outside this hole they lighted a mighty fire and threw pods of pepper into it. The smoke wafted through the hole into the demons' caves.

"All the demons that had eaten human flesh suffocated. When the biting smoke cleared, the Tukuna entered the caves and looked hard at the faces of the man-eating demons. Later they made masks to resemble these faces."

To this day, Genesio concludes, the Tukuna make ceremonial masks in the legendary image of the man-eating demons. No one will know who is hidden beneath the masks until the festival is nearly over.

Smoked Monkeys Speed Parting Guests

Near the house stands a hut where the family does its cooking. Carcasses of fish and monkeys crowd racks above the fireplace. Tukuna preserve meat by smoking until it is as dry and hard as a piece of wood (page 647). Joaquim and Manoel will give this smoked meat to the guests when the festival ends.

"Not yet do we have enough smoked monkeys for everyone," Joaquim says, and invites me to join him on his next hunt.

The following dawn we hear a deep rumbling, as if a train were racing through a tunnel. Somewhere, hidden in the jungle, the howler monkeys are "singing." Without delay we organize our hunting party and file into the forest.

Howler monkeys travel in small bands—several females with their young, a few young males, and a bearded old leader with frightening teeth. The peace-loving beasts have been exterminated in many areas where man, their most dangerous enemy, prizes their flesh as food.

As we draw closer, we can hear that the rumbling noise is, indeed, bass singing. But it stops as the monkeys detect our approach.

We halt in our tracks. Then Joaquim cautiously points to movement in the crown of a tall tree. His son, André, springs to the tree, drawing a long pole after him. He climbs to the summit and thrusts the pole into the tangled branches.

A monkey tries to flee by swinging over to



Tukuna Indians inhabit darkened area.



SOUTH AMERICA

the leafy top of a near-by tree. Joaquim throws his rifle to his shoulder and fires. The monkey stumbles, then tries to keep from falling by winding its tail around the limb. But the stricken animal cannot hold on and plummets to the earth.

Joaquim lifts the monkey and runs his hand over its body, fat from the superabundant food in the forest. Joaquim laughs contentedly, even though the rest of the band has escaped.

"When a hunter goes alone into the forest," he tells me, "he usually climbs with his musket into the crown of the tree. If he is lucky, he shoots many monkeys."

That evening the mosquitoes attack in swarms. Their stings even penetrate our clothing. The Indians casually slap the insects as they alight on each other's bodies. They pay little attention to what for me is unbearable torment.

Drums Tuned, Marching Begins

Hour after hour the men tune ceremonial drums, seeking a high-pitched staccato sound. When the pitch suits the men, they line up—Manoel, Joaquim, and Genesio—and begin flailing the drums with pencil-sized sticks; Tukuna never beat drums with their hands. On and on they drum, marching in a noisy circle far into the night (page 630).

Soon the guests will arrive; the clamor of the drums will go on. If a drummer grows tired or hungry, he must find a man to take his place. Tukuna believe evil spirits would harm the initiates if the drums fall silent at any time, day or night, during the festival.

Guests pour into the house as the festival begins at last. They come in dugouts—small boats 12 to 15 feet long. A thatched, rain-proof canopy of palm leaves covers the stern half of each dugout. Beneath this shelter the passengers pile rolled-up hammocks, bark-





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Initiates Submit With Silent Stoicism as Busy Hands Pluck Out Their Hair

A hair-pulling ceremony takes place during a break in the dancing on the festival's third night. As drumbeats boom louder, women with contorted faces begin to jerk out tufts of hair with feverish speed. Starting at the top of the head, they pull out three to seven strands at a time. Within an hour each girl is almost bald, except for a single red-dyed lock held by one of her relatives (above).

The ceremony ends with a shout when the paternal uncle plucks the final lock. Then he sternly lectures his niece on her future duties as a wife.

"Sometimes a girl faints from pain," reports the author. "Others weep. But on this occasion neither showed any sign of suffering. Both sat stoically, hands over eyes, a benumbed look on their faces."

Tokuna submit to depilation unprotestingly, believing they cannot attain womanhood without it. No one, says Mr. Schultz, appears to know the true reason for the act. "If you ask the Indians why they do it," he adds, "they're likely to shrug and tell you it makes the hair grow better."

cloth mats, baskets heaped with cassava roots, dried corn, sweet potatoes, cooking pots, and dishes. Guests at a Tukuna festival must bring their own food; the host merely provides the beverages. Most boats bear a basket of cackling chickens, since the Tukuna do not like to leave their poultry untended.

Joaquim and Manoel show the newcomers where they will sleep. Soon hammocks ring the big room. Only the center of the floor is clear. Here the guests will dance when the festival begins in earnest.

While the women unpack, men tune their drums and join an ever-widening circle of drummers. Many feet pound the swaying, creaking floor. The sound of revelry rises—singing, the children's uproar, laughter.

Twenty-foot Megaphones Amplify Voices

New sounds assault my ears as darkness falls. Ghostly voices, amplified many times, speak through the *uaricãna*—a 20-foot megaphone fashioned from a hollow palm log. Tukuna believe dangerous demons speak from this instrument.

Sacred trumpets fill the night with tones not unlike those of a French horn. Tukuna musicians make two of these *boo-boos* for each girl by rolling long strips of bark spirally. To tune the instruments, they painstakingly tighten or loosen the spirals or whittle on the wooden mouthpieces (page 642).

Both the *boo-boos* and the *uaricãnas* sound only at night. Before dawn Tukuna men hide them under water or deep in the forest away from the glances of women and girls.

The next day I watch the men build a semicircular hut of split palm-leaf stems along one side of the big inner room. Guests paint red figures on the hut's outer wall: stars, fish, birds, and, most important of all, a deer, the Tukuna symbol of vigilance.

At dusk women guide the two initiates from their platform near the roof into the seclusion hut. There they will stay until the festival's final day.

Two younger brothers of Joaquim and Manoel hang their hammocks close by the seclusion hut. Each is responsible for one of the girls. When I ask why the girls are guarded so carefully, Joaquim recounts an old legend:

"The festival of a young girl was almost at an end," he begins. "The guests were exhausted. All were fast asleep. No one watched, as the tribal rules demanded.

"Evil demons resembling giant grasshoppers

prowled around the house, awaiting an opportunity to harm the girl. When they saw everyone asleep, they threw themselves on the girl and sucked out her blood, ate her flesh, and left only bones in her hammock.

"Shortly before dawn, the irresponsible mother awoke. She stuck her hand through a crack in the seclusion hut and shook the girl's hammock, urging her to get up. But she heard only the rattle of bones."

Now the pace of the festival quickens. I watch women chop into pieces and pound to a pulp great quantities of green *genipa*, a jungle fruit similar to an apple. The pulp yields a colorless juice which turns black as it dries. The Indians use the juice to decorate their own faces and to paint the bodies of the initiates.

Through a small opening in the seclusion hut, the two girls step outside into an enclosure fenced by woven palm leaves. They are weak from the long seclusion; they can barely drag their feet along. Relatives support them tenderly.

The girls hide their eyes in embarrassment as they stand side by side, completely naked. Tukuna women are very modest; it is extraordinary for them to appear without clothes. But the girls have another reason for covering their eyes. They are forbidden to see the sun, and, certainly, their eyes are no longer accustomed to glaring sunlight.

Normally only the closest relatives attend this part of the ceremony. But Joaquim and Manoel graciously permit me to watch and take pictures (pages 628 and 633).

Dye Resists Soap and Water

Dipping corn-cob brushes in the *genipa* juice, the women paint S-shaped stripes down each girl's back. As each woman finishes, she cries "*Dye!*" I hear this word often during the festival; it means nothing specific, but is simply a shout of triumph.

Then the women quickly smear the juice over every inch of the girls' bodies. Once it darkens, no soap or water can remove it. Only after 10 days or so will the color fade away.

As soon as the painting ends, the girls climb back into their hiding place.

Suddenly I see figures bounding from the forest. Some brandish heavy cudgels.

"Here come the masqueraders!" Joaquim cries. Friendly and accommodating, he misses no opportunity to call new activities to my attention.



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Auntie Ends the Initiate's Ordeal by Daubing Scarlet on a Passive Face

Urucu dye is the favorite body paint of South American Indians of the tropical forests, who believe it wards off evil. Crushed seeds of the annatto tree yield the sticky, oily pigment. This girl's hips glitter with glass beads, a gift from the author. "A Tukuna never has enough beads," he says. "These will be passed on as a treasure."

Disguised as monkeys, these masqueraders wear bark-cloth garments topped by frightful masks—fang-filled jaws, protruding eyes, and long, crooked snouts. Red stripes decorate their foreheads and cheeks (page 631). Short, curled-up tails sway saucily from the rear of their costumes. Some imitate the whistling monkey's cry. Others carry small dolls—baby monkeys—which they will later give the children as toys (page 646).

The "monkeys" cavort around the clearing. Fragments fly as a club smashes an earthen jar. Some small banana shrubs next attract the pranksters' attention. A few powerful blows, and they are torn to pieces. Inside the house the masqueraders playfully storm the hiding place of the two girls. They strike at the walls with their cudgels before the girls' alert relatives can ward them off.

Dancers Cavort in Star Pattern

Away they go in a wild dance when women and children seize them from behind by their bark-cloth garments. A few steps forward, a few steps back, diagonally across the floor; change direction slightly and repeat the step—always in a star-shaped path.

Then they disappear into the forest, as unexpectedly as they came, whistling, swinging their clubs, leaping wildly.

But I find the parade of masqueraders has only begun.

Next come imposing figures dressed in snowy white. In their cylindrical costumes, fringed with palm branches, they tower eight feet or more. They fill the air with sweet fairy tones from curved flutes. These treelike figures, I learn, symbolize the demons of the forest.

"Here come the wheels!" Joaquim's voice again rises above the uproar.

As he speaks, I see masqueraders spinning colorful disks. Made of bark cloth stretched

over six-foot wooden hoops, the disks whirl in a symphony of color.

Soon I spy a giant of a masquerader with a huge head, saber tusks in gaping jaws, glittering eyes made from bits of mirror, and a long tufted tail. Black spots dot its body. This is the jaguar, king of the Amazon forest.

Joaquim approaches this fearsome figure and embraces it tenderly (page 630).

"Would you like a drink?" he asks. "Shall I give you a tasty roast monkey?"

But the fierce-looking jaguar does not roar;



Musician Tunes a Sacred Trumpet Made From a Strip of Bark

Blown nightly during the festival, the trumpet sounds much like a French horn. Tukuma make two for each initiate and allow only men to play them. During the day the instruments lie hidden from the eyes of women and girls.

Craftsmen comb the jungle to find the right bark. After peeling off a strip, they roll it into a spiral and tie the tube to a long stick to prevent bending. Canoe-borne messengers paddling from house to house blow the horn to tell guests when the festival is to start.

instead, he wails dolefully, just like an unhappy child. Yes, I think, Indians do indeed have a sense of humor.

"Lie down awhile," Genesis advises me, after all the masqueraders flee back into the jungle. "Nothing important will take place before dawn."

But sleep is out of the question. My hammock buzzes with mosquitoes. Who could sleep on a night like this, anyway? The floor trembles beneath scores of pounding feet. Men prop posts under rickety floor boards to pre-

vent them from collapsing. Throbbing of drums. Droning of the sacred trumpets. Singing. Shuffling of feet. Drums! Drums! I resolve to try at least to relax a bit.

Someone shakes my hammock: "Senhor Haroldo, would you like to take photographs? The dancers are imitating the maidens."

A new kind of singing fills my ears. Women shake rattle rods, and the pods of jungle seeds clink like glass fragments. The dancers surround two men adorned in the feathered finery of the two initiates. Singing men and women



Weary Girls in Feathered Finery Join
Monkey Masqueraders in a Final Fling

Following the hair-plucking ceremony, the girls—like debutantes the world over—dance the night away. Then the masked dancers throw off their



costumes (page 649), which become the property of the host. His wife will use the bark-cloth garments for sleeping mats. A few months later

guests will attend a ceremonial burning of the masks. Painted birds, animals, stars, and bows and arrows decorate the dancers' skirts.





Monkey masquerader bows before a grinning gallery. He rattles a bottle filled with pebbles. From his waist dangles a doll-like toy which he will give to a child when the festival ends.

hold them gently and protectively, as if they were the real initiates. It is a merry gathering.

This mock dance of the young girls continues for more than an hour. Indian dancers do not tire easily!

"Now you must be our *voreki* [maiden], Senhor Harald!" someone shouts. Before I can protest, the Indians paint my face, my arms, and the upper part of my body with oily red urucú dye. Then they dress me in the adornments prepared for the young girls.

Two dancers grab my arms and away we go—forward, then back. Soon I catch the rhythm of the dance, but after an hour I am worn out. The dancers release me.

As the dance resumes with other guests im-

itating the girls, I wonder about the significance of this part of the ritual. Does it have a deeply earnest purpose? Perhaps to ward off evil demons? Or is it all in jest? I incline to the view that the imitation is pure frolic—another example of the Tukuna sense of humor.

Dawn breaks on the festival's third day. Close relatives of the maidens creep to them through a small opening in the seclusion hut. After daubing the girls' bodies with bright-red urucú dye, they adorn them in ceremonial regalia—bead belts and necklaces, tassels of white inner bark, pendants of multihued toucan skins. A crown of macaw tail feathers covers each girl's eyes. The Tukuna believe evil spirits will harm the girl if she sees what is going on (page 636).

As guests press close to the gaily decorated seclusion hut, a man cuts an opening in the wall. Indians sing in falsetto voices. Old women thump rattle rods. Drums pound.

Moment of Greatest Peril

Then silence, as an initiate appears in regal splendor. Lovingly assisted by her mother and a paternal uncle, she crawls through the opening. Her cousin follows (page 635).

At this moment, says Tukuna superstition, the girls face their greatest danger from evil spirits. The tribe believes that bloodthirsty demons prowl around the house, awaiting any chance to attack the girls. Each Indian is convinced that the gravest consequences will follow any mistake in the ritual now.

The dance resumes. Leading the girls, unable to see through their feathered headdresses, the guests sweep back and forth across the floor. Beneath the blindfolds the girls' faces sag with weariness. On and on they dance, until the sun sets and the moon rises full above the trees.

Moonlight floods the clearing as the dancers, still leading the girls, wind out of the house. The guests follow in a noisy procession.

An old man approaches with two glowing firebrands. He is a witch doctor. Pointing to a near-by tree, he hands a firebrand to the first girl. "Throw it against your arch enemy!"

"Dye!" she cries. An echoing shout goes up from the onlookers.

The firebrand showers sparks against the tree trunk, symbolically destroying the evil demons that seek to harm her. Now her cousin throws the second firebrand. A final triumphant cry echoes through the forest.

"Now all danger has been banished," Genesio explains. "Our *vorekis* have thrown fire against the demon tree!"



Shorn and painted, initiates may marry at once, but most wait until their hair grows. A ceremony marks the trimming of the regrown hair, but a bride gets no wedding feast.

As Hard and Dry as Wood, Smoked Fish Go on the Rack for Feasters

A gift of cured meat or fish awaits each masquerader when he climbs out of his costume. For months the father has built up his larder by fishing for *tambaquí* in the Amazon and hunting howler monkeys, deer, wild pigs, and tapírs in the jungle.





Tired of Dancing, a Masquerader Takes Time Out for Refreshment

Masked dancers conceal their identity until the festival ends. This guest lifts his visor just enough to sip some cassava beer. The girls' seclusion retreat stands behind him. Made of split palm-leaf stems, the hut is decorated with drawings of the sun, moon, stars, and deer, the last a Tokuma symbol of vigilance.

Still to come, however, is the strangest part of the ritual.

While the girls continue dancing, women spread two bark-cloth mats in the center of the floor. The two paternal uncles step forward and suddenly jerk strands of hair from each girl's head.

"Dye!" the uncles cry. "Dye," the guests chant.

The girls at once sit on the mats. To the thump of drums and the whir of rattle-rods, women surround the girls and lift off their feathered crowns. Relaxed, the girls bow their heads with eyes half closed.

Then with rapid movements the women start to pluck out tufts of the girls' hair. Again and again, almost feverishly, they jerk out fresh wisps of hair—three, five, or seven strands at a time. Zeal, even fanaticism, con torts the women's faces. They seem indifferent

to the girls' pain or exhaustion (page 658).

"Does this plucking hurt very much?" I ask.

"Of course it hurts," Genesio laughingly replies.

"Do the girls cry often?"

"Some cry, but that is rare. Now and again one of them faints. . . ."

"And what do you do then?"

"The scalp may be rubbed with lemon juice to loosen the hair," my guide tells me.

Girls Bear Pain With Stoic Calm

Busy fingers continue to jerk out strands of hair. More than an hour of steady plucking passes. The girls show discomfort when hair is pulled from their temples, but they make no sound throughout the ceremony. Soon each girl's scalp is shorn, except for a single red-dyed lock at the top of the head. A relative

holds this lock while the women finish the depilation.

Then a shout as the paternal uncles jerk out the last red-dyed strands. The hair-pulling ceremony is over.

The masqueraders stand ready for their final fling. Women carefully paint the girls with scarlet and replace their feathered crowns, this time without interfering with their vision. Linking arms with the girls, the masqueraders dance away in the traditional star-shaped pattern (page 644).

After this merry play, the masked dancers step out of their costumes, which become the property of the host. In return, the host hands each masquerader a gift of smoked fish or meat.

Party Ends as Dawn Breaks

Day is breaking as the festival draws to a close. The girls by now are so tired that they cannot walk unaided.

Amidst a great hubbub, husky young men seize the maidens and enthrone them on straw mats. With grunts they hoist the mats high.

Then they bear the girls outside, and a noisy procession snakes its way to the riverbank.

Suddenly the girls, in a final burst of energy, leap from the mats to land softly on a pile of leaves far down the slope.

According to tradition, the girls should have thrown themselves into the water. Then the guests, in boisterous merriment, would have pushed each other into the stream. But the water has become black and evil smelling from flowing through the inundated forest.

The house is in an uproar as the guests take down their hammocks and pack for the homeward journey. But first they tear down the seclusion hut, grab brooms, and sweep the big Indian house clean of debris.

"If a guest didn't help clean my house, he would fall sick and die," Joaquim explains.

The maidens wrap kerchiefs around their heads. They will not be seen without a head covering until their hair grows long again. Perhaps they will marry then. But no special ceremony will mark that occasion. Never again, in fact, will they be honored with so important a festival.

After the Ball Is Over: a Valentine Face Grins From Discarded Disguises



Whooping Cranes Fight for Survival

Unprecedented color close-ups by a noted wildlife photographer illustrate a naturalist's report on a majestic bird struggling back from the brink of extinction

By ROBERT PORTER ALLEN

With photographs by FREDERICK KENT TRUSLOW

ACROSS the dun-colored marshes, more than half a mile away, we could see two white forms. Even against the wide, almost unbroken expanse of coastal Texas they seemed huge, too big for reality. Yet they were obviously birds, great white birds.

"There they are!" I whispered to Fred Truslow. "There's your first pair of whooping cranes."

Crouching and keeping out of sight behind a low screen of live oaks, we moved cautiously toward the couple. Whooping cranes stand about five feet tall, and in that flat, open country they can spot anything out of the ordinary as much as a mile away.

When we had shortened the distance to a quarter of a mile, we paused to take a good look. With a telescope we could see the carmine patch of bare skin on the crown, the broad mustache of stiff black feathers across the face and cheek, and the elongated tertial feathers that lie across the lower back and tail, exquisite and plumelike. We could even sense the

ADORNMENT BY H. Z. VIER AND WILDLIFE SERVICE



A whooping cry audible more than a mile names the whooping crane. *Kerloo, ber-dee-oo!*—the call bursts from a five-foot windpipe coiled like a French horn. This young whooper, of unknown sex, utters a piping, immature cry at the Aransas National Wildlife Refuge, Texas. *Grus americana* has long been close to extinction. Aransas counted 32 wild birds in November, 1958, an increase of 14 in two decades.

Downy chick at Audubon Park Zoo in New Orleans stands taller than a barnyard hen.

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Black wing tips slice the air over Saskatchewan as cranes fly south to winter

Author and Photographer

Robert Porter Allen, Research Director of the National Audubon Society, has long been prowling the haunts of shore and upland birds. His investigations have covered many species, notably the whooping crane, black-crowned night heron, roseate spoonbill, flamingo, and wood-ibis.

In 1946 Mr. Allen began the studies that have made him the foremost authority on the whooping crane. His monographs and books, such as *On the Trail of Vanishing Birds* (McGraw-Hill, 1957), have been recognized with prize awards. Based at Tavernier in the Florida Keys, he is currently at work on a survey of North American wading birds.

Mr. Allen's able teammate, Frederick Kent Truslow, retired as a business executive four years ago. Since then he and Mrs. Truslow, an artist, have painted and photographed many kinds of wildlife in all parts of the United States and in other countries. NATIONAL GEOGRAPHIC articles illustrated by Mr. Truslow's photographs include "Feathered Dancers of Little Tobago," in September, 1958, and "Limpkin, the 'Crying Bird' That Haunts Florida Swamps," in January, 1958.

gloriously wild, fierce nature of the big birds.

"Do you think we could get closer?" Fred whispered.

"Not a chance," I replied. "Just stand up and see what happens."

Fred stepped a few paces to one side, clear of the oak brush. Immediately the male whooper lifted his head and turned to glare directly at us. The female followed suit, and both birds took a step or two in the opposite direction.

Male Whooper Sounds Alarm

Suddenly the male bird whooped—a piercing luglike alarm note that sent a tingle along our spines. *Kerloo! Ker-lee-oo!* The female's voice echoed a split second later.

As Fred crept back to his original position, the birds spread their great satin-white, black-tipped wings, ran several steps forward, and took off. From past experience I knew that they would put at least a mile, and perhaps a stretch or two of deep water, between them and us. Then they would land with a slow, graceful flapping of mighty wings to brake their forward motion, running a few strides



FRED W. SARUMAN, THE SMITHSONIAN MUSEUM OF NATURAL HISTORY

on the Gulf coast. They cruise at 45 miles an hour but often stop to feed

with uncuffed poise. Fred stared in awe.

"What a bird!" he said. "What a bird!"

The time was mid-October, just a year ago; the place, the Aransas National Wildlife Refuge near Austwell, Texas, winter home of the world's only known remaining flock of whooping cranes (map, page 658). The U. S. Fish and Wildlife Service had kindly granted us special permission as representatives of the National Geographic and National Audubon Societies,* knowing that our work would contribute to appreciation and preservation of the birds. Until our visit no outsider had been allowed to observe and photograph in the closed portion of the refuge for 10 years.

We had reached Aransas a week earlier, before any of the giant birds had arrived from their northern nesting grounds. With the help of Claude Lard, Charles Kennedy, and others of the refuge staff, we searched each day along shoreline and salt flats for arriving whoopers. Not until the 19th—a clear, bright Sunday morning—did we spot this, our first pair.

The previous April the whoopers had left Texas on schedule and headed for their breed-

ing grounds in Canada's Northwest Territories, 2,500 miles away. Twenty-six birds had made up that flock—all the wild whooping cranes in the world. Now, almost six months later, they were on their way back. How many would there be? How many had survived the summer in the far northern wilderness, the hazards of the long migration?

Most important of all, how many youngsters had been hatched and reared, and what percentage of these would reach the Texas coast?

First of Freshman Class Arrives

Each morning we haunted the vicinity of Mustang Lake, climbing the observation tower with hopeful steps. We made at least two daily swings along East Shore Road, from which we could see clearly 5,000 acres of open flats and marshes where whoopers might appear.

Slowly the flock came in. On the 21st a pair arrived with one youngster—the first young whooping crane of the Class of 1958!

* The conservation activities of the National Audubon Society are vividly described in "Saving Man's Wildlife Heritage," by John H. Baker, NATIONAL GEOGRAPHIC, November, 1954.



Hungry whooper extends its wings as it snatches a tasty blue crab at Arkansas. The bird shakes the crab, sometimes sending legs and claws flying, then eats its prey, shell and all. When the whooper matures, russet feathers will drop off the head, exposing a patch of carmine skin (lower).

Beaks stab the bottom as three whoopers help themselves to Arkansas shore delicacies. Bird at left has not attained full growth, even though it displays the adult's vivid crown.

It is always exciting to watch the young birds arrive, for they spell survival or extinction for the whooping crane. Sometimes the future looks grim, as in those unhappy Novembers when only two or three young manage to get through. Even worse is a year like 1954, when not a single youngster reached the wintering grounds.

At the outset we are always hopeful, and so it was last fall. But when only eight whoopers had arrived in a week—and only one of them a fledgling—we began to worry.

Although we had small hope of success at this early date, we laid out corn and wheat at strategic places. This is one way, however unlikely, of pinning the birds down for photography. But an entire week went by with no action at any of our baits—and with no additional arrivals.

Clearing Weather Brings Results

During this uncomfortable period a steady norther was blowing, with heavily overcast skies and cold, chilling rain. Even if we had succeeded in getting close to the whoopers, there was no possibility of getting good pictures in such gray weather.

October 31 dawned still cold and wet. But then, about midmorning, the sky began to clear, and we saw the sun for the first time in a week. Thus encouraged, we spent most of the day searching for cranes and were rewarded late in the afternoon by the sight of one family with two young on Roddy Island, and another pair with a single youngster at the end of the Oil Road.

Just for luck we made one last run along East Shore Road. It was getting late, and the sun was riding close to the rim of the coastal prairie.

At this hour flocks of little brown cranes were piling into their night roosts in shallow ponds, their guttural notes rising and falling on the warm air. In the heavier oak clumps, horned owls called from the semidarkness.

I scrambled to the top of our truck and began the customary sweep with the telescope. On the west shore of Redfish Slough I saw a pair of whooping cranes with two rusty-plumaged young. I moved the scope to the left, scanning the shores of Mustang Slough. Immediately I spotted another pair, and in their wake, twin youngsters. Farther to the left I saw another adult whooper and, a moment later, two more youngsters!

Taking a deep breath I looked again. Mov-

ing the scope slowly from left to right, I rechecked my count—two young, then two young again, and across the slough, two more young. Three sets of twins—six young whooping cranes—in view at one time!

"Fred!" I yelled. "You'll never believe this unless you look. Tell me if I'm seeing things!"

He looked, and then I took the scope again. There could be no doubt about it—six young, right before our eyes. And within the last hour we had seen three others. Nine young!

"Do you realize what this means?" I shouted. "This breaks all records! It's the biggest whooping crane news in 20 years!"

More cranes continued to arrive until November 3. In all, there were 32 in the flock—23 adults and nine young-of-the-year. We learned later that a single, probably one of the previous season's young, had gone astray and landed in Missouri. It was the first sighting of a whooper in that State since 1913, and the cause of much comment and excitement. Thus, with 33 whoopers in the wild, and six more in captivity, the world population of *Grus americana* had reached 39, the largest number since we started keeping score 20 years ago.

By mid-November family groups and pairs had established themselves on eight territories on the refuge and three on Matagorda and St. Joseph Islands offshore. None of them showed the slightest interest in our bait, however, and we decided to call off our picture taking until later in the winter. Water levels should be lower then, and natural foods more concentrated.

Even Pioneers Seldom Saw Whoopers

As we sat around our quarters the evening before we left, we talked of the whooping crane's long struggle for survival and of the many dramatic incidents that are a part of its story. A good many years have gone by since Mark Catesby, the English naturalist and artist, made the first drawing and wrote the first description of this great bird. Shortly after Catesby's arrival in the Carolinas in 1722, an unnamed Indian brought him "the entire skin" of a large white crane, a species completely unknown to science.

It may seem astonishing that few early travelers encountered the whooping crane, but we now believe that it has been comparatively rare since the early Pleistocene.

Practically all pioneer observers emphasized



Youngster stretches its wings under mother's eye. Black tips appear at four months, but the gallant mustache of bristly feathers comes only with maturity.

Twins and parents walk an inland swale. Each family stakes out about 400 acres as its own territory and drives others away. This is an aerial view.

Birds preen for hours. The author reports that plumage care "is almost a ritual." The youngster scratches its head with a long middle toe, while the adult grooms its neck feathers.





this rarity. Samuel Hearne, the first civilized traveler to visit the Great Slave Lake region of Canada (1769-72), wrote: "They are generally seen only in pairs, and that not very often." Lewis and Clark noted migrating whooping cranes at the mouth of the Little Missouri River on April 11, 1805, and apparently this was the only time they saw them.

Not even John James Audubon, the foremost ornithologist of his time, had much per-

sonal experience with the whooping crane. His striking portrait of the bird, presented life size in his monumental elephant folio, was "drawn at New Orleans, in the month of April," in 1821.

Botanist Described Wrong Cranes

A lone exception was Thomas Nuttall, an English botanist. His stirring—and wholly inaccurate—description of a "mighty host" of whooping cranes migrating down the Mississippi River in 1811 has been quoted often, but the flocks that he heard and described were almost certainly sandhill cranes.

The rich prairie lands of Illinois, Iowa, Minnesota, and eastern North Dakota were the heart of the whooping crane's original nesting grounds. As settlers moved in with spade and plowshare, they drained the prairie

Whoopers commute 2,500 miles between their summer home in Canada and winter resort in Texas. Their only known nesting ground lies in Wood Buffalo National Park, an 11-million-acre wilderness 400 miles from the Arctic Circle. Nine youngsters, the biggest freshman class since the census began in 1938, glided with 23 adults into Arkansas last year. Circles show the territories occupied by individual crane families. Matagorda and St. Joseph Islands lie outside the refuge.



sloughs where whooping cranes had long built their nests, and the birds were driven off. Little by little their number dwindled.

In this major breeding area, the final U. S. nesting was recorded at Eagle Lake, Iowa, in 1894. The few migratory birds that survived nested in Canada's Prairie Provinces and farther north. But within another generation the last known nesting in a Canadian province was recorded at Muddy Lake in western Saskatchewan, in 1922.

The whooping crane seemed doomed. No other nesting areas were known, and nearly everyone agreed that the death of the last few migrating birds would sound the knell of a magnificent race.

New Hope Born When Young Appear

While they were being mourned, the cranes in their secret nesting grounds might have been whooping with avian laughter. They were rare, yes. But extinct? Not quite.

A wintering flock of whoopers was observed at the Aransas Migratory Waterfowl Refuge (as it was first known) shortly before the Federal Government established that sanctuary in 1937. Since the birds appeared with young, it was obvious that they must still be nesting somewhere. Wildlife conservation was gaining ground, and perhaps it would be possible to save a vanishing species after all. But to do that the nesting grounds would have to be found.

I got my first view of the Aransas flock in April, 1940. I was camped at Rattlesnake Point on the east shore of the refuge, studying roseate spoonbills. Jim Stevenson, the refuge manager, and I watched three whoopers moving across the salt flats. Jim remarked that 15 cranes had recently been found living year-round near White Lake, in Louisiana.

"We had 22 birds here this winter," Jim said. "Seven were young ones. Let's hope they have a good summer on the nesting grounds—wherever that is. Somebody's got to make a real study of the whooper one of these days."

"You're right," I said, "but I wouldn't want to be the poor soul who gets the job. It'll be a tough one!"

Jim nodded. "We don't know much about them," he went on. "How many are there? Do they winter anywhere besides the Gulf coast? What do they eat? And, most of all, where are they nesting?"

In 1945 the National Audubon Society and

the U. S. Fish and Wildlife Service finally set up the Cooperative Whooping Crane Project. As it turned out, I was the "poor soul" who got the job of studying the birds on their wintering grounds and, if possible, finding their breeding grounds.

During the winter of 1946-47, and again in 1947-48, I lived close to the whooping cranes at Aransas and tried to learn some of the many things we needed to know about their life in the wild.

In addition, I studied the behavior of a pair of injured captive birds. With them a start was made in the effort, still in progress, to produce whooping cranes from captive stock. To date, three young have resulted from this experiment—two raised in 1957 and one last year at the Audubon Park Zoo in New Orleans.

When I started my investigations, the breeding grounds of the wild birds remained as much a mystery as ever. A search had begun in the summers of 1945 and 1946, when field men from both United States and Canadian agencies covered thousands of miles in northern Saskatchewan and eastern Alberta by airplane and car. They found no sign of the whoopers.

I joined the hunt in the summer of 1947 and again in 1948. In those two years Bob Smith, flyway biologist with the U. S. Fish and Wildlife Service, and I flew a total of 20,000 miles, back and forth across an estimated 65,000 square miles of remote northern wilderness—practically all of it north of ground previously covered. We saw not so much as one feather of a whooping crane.

Not until 1952 did the first break come. That summer Bob Smith sighted two cranes north of Great Slave Lake. But they were 30 miles apart; it seemed unlikely they could be a nesting pair.

Fire Fighter Spots Breeding Ground

Still, we had a clue to the area. In 1953 a single whooper was observed in the same region, and that October eight whooping cranes were reported moving south along the Slave River, below Great Slave Lake. A pattern was emerging.

The actual discovery of the nesting grounds came quite unexpectedly at the end of June, 1954, when a forest fire broke out in a remote corner of Wood Buffalo National Park. This Canadian wilderness sprawls across northern Alberta and into the Northwest Territories.

Canadian forester G. M. Wilson was in a



Baby Sings a Plaintive Song for Supper

One of six whoopers hatched in captivity since 1950, this month-old youngster rests at the Audubon Park Zoo.

Half the size of an adult robin, a newly hatched whooper wobbles on wire-thin legs to a snug retreat beneath its mother's wing. A young crane's cry resembles the peep of a baby chick, though it is louder and more piercing. Not until full-grown can the newcomer match its parents' whoop. A fledgling takes to the air at about 90 days and after six weeks practice can follow the adults on their 2,500-mile trek to winter quarters.

EDGAR BERGEE

Josephine Stands Guard Over Her Fuzzy Offspring at the New Orleans Zoo

Whooping cranes once ranged from the Arctic to central Mexico, from New Jersey to the Rocky Mountains. Never plentiful, they numbered no more than 1,400 in 1870. Driven from their nesting grounds by settlers, the bird seemed fated to follow the great auk and the passenger pigeon into extinction.

To bolster the dwindling whooper population, conservationists breed captive birds.

Josephine and Crip, the birds at the Audubon Park Zoo, hatched twins in 1957 and raised them to maturity. A third youngster, hatched in 1958, also survives. Eggs laid in 1959 failed to hatch.

Rosey, the only other whooping crane in captivity, leads a lonely life in a zoo at San Antonio, Texas.

Here an attendant offers food to Josephine. In custody since 1940, she is unusually tame.



helicopter returning from the fire. Just before five o'clock on the afternoon of June 30, Wilson called Fort Smith by radio and said that he had an urgent message for Bill Fuller, the biologist on duty there. Bill hastened to the radio room. In a calm, matter-of-fact voice, Wilson announced that he had just seen two adult whooping cranes and one rusty-plumaged juvenile!

The excitement that followed those words can readily be imagined. The long search was almost over.

Aerial observations were continued on a limited scale, to avoid disturbing the cranes. It was decided, however, not to send a ground party in for detailed exploration until the following spring.

The region in which the birds had been observed is one of the most isolated and least known in that part of Canada. Wood Buffalo National Park covers 17,500 square miles—more than Massachusetts, Connecticut, Rhode

Island, and Delaware combined. Over the park's vastness roam some 16,000 bison, the largest wild herd remaining in the world. The area where the whoopers were found—a section north of 60° latitude between the Little Buffalo River and Buffalo Lake—is a land of broken, uneven surfaces, gouged and torn by the death throes of the Keewatin Glacier.

Flight Reveals First Nest Since 1922

Bill Fuller, with Ray Stewart of the Canadian Wildlife Service, flew over this wilderness the next spring, 1955. Near the Sass River, a small stream that empties into the Little Buffalo, they looked down on a pair of whoopers and a rough circle of weeds and rushes with a hollow in the center—the first whooping crane nest seen by anyone since the Muddy Lake nest of 1922.

Since Bill Fuller was unable to join us because of other duties, I was appointed leader of a ground expedition. My companions were

Heels Kicking, Wings Flailing, a Limber Infant Twists Into a Swastika





Author scatters corn to lure cranes into camera range. Though corn is not a staple of a whooper's winter diet, the bait attracted one family, plus ducks, geese, and raccoons. Cranes tolerated the other diners.

Ray Stewart and Bob Stewart (no relation) of the U. S. Fish and Wildlife Service.

Our first attempt to reach the whoopers was a dismal failure. The best route seemed to be down 44 miles of the swollen Slave River to Grand Detour portage, by foot to the Little Buffalo, and then upstream to the Sass. We set off on May 23, traveling in two boats and towing an 18-foot canoe. With us were 10 Indians, packers for the first leg of the portage, from the Slave to Long Slough.

The portage required nine hours of back-breaking work, but it took us through beautiful country—spruce forest, swamp, and wide, level prairies where we saw our first herds

of buffalo. The next day we crossed more prairieland dotted with hundreds of the great shaggy animals. By nightfall we were on the banks of the Little Buffalo.

The following day we paddled upstream to the mouth of the Sass. Immediately we ran into trouble. Every twist and turn of that winding stream was clogged with debris. Log jams completely blocked the way, and we found it impossible to clear them with axes. Wearily we made our way back to our starting point at Fort Smith.

On June 5 we made another try in a helicopter borrowed from an oil exploration crew. Luck was still against us. The landmark we were looking for was a high limestone cliff. But the pilot, a newcomer to the north country, failed to allow for compass variation. He put us down near a high limestone cliff all right, but it was the wrong one.

After the helicopter left us and we set up our camp, it took us a couple of days to get our bearings and find out the bitter truth. We were lost. We counted 40 log jams and three beaver dams along one seven-mile stretch of river, which turned out to be the Sass. It took us 13 hours of hard slogging to make good a straight-line distance of only one and a half miles. Sixteen days after leaving Fort Smith, we were back. It was getting to be a habit.

Wary Birds Elude Searchers

Tired but undaunted, we were ready for one more try, even though Bob Stewart had to return to Washington. It was up to Ray and me to finish the job. Another helicopter landed us within half a mile of the nearest whooping crane nest. There were three other nesting pairs almost within shouting distance. We had finally done it.

For 10 wonderful days Ray Stewart and I explored the bulrush bogs and muskegs and the tangles of dwarf birch, tamarack, and black spruce of that amazing region. We walked around the rims of countless little lakes, collecting mollusks, small fishes, frogs, and water insects, and taking samples of water and soil.

We came across the tracks of whooping cranes many times, but in the dense thickets that encircle every body of water the birds usually slipped away unseen. Our object was to see all we could, but without disturbing the whoopers in any way; so we made no effort to obtain close-up photographs.

Many other wild creatures besides whoopers shared that solitude with us, and also kept



Lens Shade Juts Like a Machine Gun From the Photographer's Blind

To snap his remarkable photographs at Aransas, Mr. Truslow hid in this shelter. Made of Fiberglas rods and canvas, the blind overlooked a crab-crowded pond visited regularly by a family of whoopers. A telephoto lens brought the birds into close-up range.

out of sight. We heard wolves howling in the brief northern night and saw the tracks of moose and black bear. A herd of buffalo with newborn calves roamed a small patch of prairie not far off. But with the exception of one family of whooping cranes, we met none of these wild neighbors face to face. They were minding their business, and we minded ours.

So the breeding ground of the whooping crane was no longer unknown. More than 60 percent of the known whooper population was observed within the Sass area during the summer. When they returned to Aransas that fall, they brought with them a record crop of eight young, including two sets of twins.

I look back on these hard-working days with the whooping cranes in Canada and at Aransas as among the most rewarding of my life. Few birds, and for that matter few animals of any kind, can match their nobility and natural dignity. Everything we learn about them adds to our respect and admiration.

Whooping cranes mate for life, and the

family group lives within a pattern of privacy and decorum that is almost unique among birds. The male is the undisputed head of the family. He is ceaselessly alert and always willing to challenge real or imagined enemies.

The female spends most of her time until late in the winter looking after the young. With the male constantly on watch, she is free to devote her attention to the ungainly but rapidly developing youngster. She finds him choice tidbits, breaks up large crabs, and teaches him all the tricks of whooping crane existence. When there are twin youngsters, the male helps care for one.

Male Whooper Provides and Protects

Although the male and female whooping crane have the same plumage, there is a noticeable difference in size, as well as in carriage and behavior. The larger male is more bluff and aggressive. There is a docility and gentleness about the female, for she depends entirely on her lord and master for protection and leadership.





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A Male in the Prenuptial Ballet Springs Skyward, Toe-dancing on Air

One of the bird world's greatest dramas, the courtship dance cements anew the bond between each pair of whooping cranes.

Starting in mid-December, the dance marks the beginning of a new breeding cycle. The majestic birds bow to each other with exaggerated formality, then pirouette gaily. Bobbing back and forth, they arch their necks and twirl round and round. Some seven feet from tip to tip, their wings flap continuously. Singly and in unison, the couple bound four feet or more into the air. Occasionally one leaps over the other's back.

This whooper soars stiff-legged before his entranced mate at left. Their offspring takes note before practicing a few steps (below).

A full-grown male stands nearly five feet tall. He mates for life and never tries to woo another's wife. While the female keeps an eye on the young, the male stands guard duty. "His head," says the author, "is always snapping up to attention, his cold yellow eyes scanning the horizon. He reminds you of the old-time actor who doted on heavy roles."

Junior gets into the act by mimicking father's dance. When the prenuptial prancing grows more intense, Mr. and Mrs. Whooper will chase their offspring away.

Young cranes do not wean easily. They return to the family circle in time for the spring flight to the northern breeding grounds.



When the young whooping crane arrives at Aransas Refuge in late October or early November, it is nearly five months old. Its plumage is a calico mixture of grayish whites and brownish reds. Some young appear almost pink, and as a matter of fact, old-timers in Aransas County say that common names once applied to the young whoopers included "pink crane" and "red crane." The young birds begin to lose their rusty feathers by February or March, and by the time the spring migration gets under way in April, it is difficult to distinguish them from the adults.

Cranes Go Crabbing Every Winter Day

Very few birds go as far as the whooping crane in isolating the family group from others of their kind. When they reach the wintering grounds, each pair picks out a territory and defends it. The area selected must provide all the essentials of winter life—food, water, preening ground, bathing place, and a safe roosting pond. In the Aransas wintering area, these territories average about 400 acres for each whooper family. They are lined up along a mile-wide strip of ponds and salt flats that stretches for 14 miles along the bay shore.

During the winter months the whooping crane family lives a somewhat uneventful existence. The birds move out of the roosting pond just before sunset, walking slowly and probing for food as they go. Their morning stroll may be over the same route each day, ending at a favorite crabbing hole. Blue crabs are the most important food, but various other marine crustaceans, worms, fish, mollusks, and a few vegetable items, including acorns, have their place in the winter diet.

After an hour or so of feeding, the cranes stand about on a slight elevation, often a patch of salt-flat grass, and quietly preen. The next move may be a short flight to the shore of the nearest bay, where they search for fish and crabs. More preening sessions follow. At the end of the day they ramble back to the pond where they sleep. All this takes place within their prescribed territory.

Occasionally the cranes will move from their home grounds, but always with a special purpose. When an unusually severe norther sweeps across the marshes and exposed salt flats, some may seek the cover of heavy live-oak clumps farther inland. During a prolonged drought, some whoopers leave their territory to look for fresh water. A sudden burgeoning of frogs at an inland pond frequently

brings outsiders to feast on this delicacy.

From year to year these territorial situations vary, as old birds die off and fail to return to a former claim, or as one pair without young gives way before the irresistible force of a strong family group.

A trespassing bird is challenged with loud bugle calls. Then the defending male lowers his head and charges, his mate and offspring bringing up the rear. Just before the head of the household meets the trespasser head on, he halts, then struts toward him with a show of injured dignity. By this time the intruder has usually left the field, and who can blame him? The sight of an outraged 25-pound whooper must be terrifying. I am sure I would run too!

As the winter advances, the mated pairs renew the bond between them by leaping and gyrating in a magnificent courtship dance. A performance begins when one of the pair, usually the male, suddenly approaches his mate with a series of grave head nods, at the same time flapping his wings and skipping around in a half circle and back again. Then he leaps several feet off the ground, his legs stiff, bill pointed skyward, and neck arched over his back (pages 664-5).

Usually the female responds at once with similar nods and leaps. The two birds then gyrate together, the leaps taking them higher and higher, the little side runs and head nods getting more and more frantic. It is over as suddenly as it began, with both birds quietly resuming their endless preening.

Youngster Forced to Fend for Himself

The parent birds dance with increasing frequency as spring migration time approaches. If they have a youngster, one of them may suddenly, without warning, turn on him in a rage and drive him away. Naturally, the youngster can't understand what is happening. When he tries to return to the security of the family group, he is unceremoniously driven off again. In this abrupt fashion the young bird is weaned and forced to meet the world on his own.

Only one final concession is made. When the adults are ready for the spring migration, they relent and temporarily readmit junior to the fold. This enables the youngster to find his way back along the migration trail in the direction of the nesting area. But he is driven off again, this time for good, before the adults actually reach the nest site.



PHOTOGRAPHS BY JULIAN H. HOWARD (ABOVE) AND W. F. BURRIDGE, FOR U. S. FISH AND WILDLIFE SERVICE © NATIONAL GEOGRAPHIC SOCIETY

Josephine inspects her egg in a 150-acre enclosure at Aransas. Old injuries keep her grounded. Lone survivor of a nonmigratory flock that once nested in Louisiana, she and her mate Crip have bred regularly.

Chick sticks up a periscope. When Josephine had fed the youngster all it could hold, the nestling rested under its mother's wing at the Audubon Park Zoo. Whooping cranes have lived almost 40 years in captivity.

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Since we had been unable to get photographs in the fall of 1958, Fred Truslow and I returned to Texas in January of 1959. By this time the various pairs and families had pretty well settled down for the season; so our chances looked better. Still we were none too sure what luck we should have, for it is no easy job to bring a pair of these wary creatures up to a blind.

Then we came across a setup that appeared perfect for our purpose. We found evidence that a crane family was feeding daily at a spot near where an old road crosses Camp Pond. Apparently a pair of adults with a single youngster were using that particular territory.

Corn Lures Birds to Camera

Up went Fred's blind, and then out in front of it, at just the right distance, we scattered corn as bait (pages 662-3). Now—would the birds come to it?

They would, and did. For five seemingly endless days we watched our birds take the bait while we waited for the sky to clear. All we needed now was sunshine. Instead there were rain, fog, and temperatures down to 40°.

All this time we had to keep the supply of corn replenished, and that meant setting up a rigorous early-morning routine. To avoid making our birds suspicious, we had to take great care not to associate ourselves openly with either the bait or the blind. This we accomplished by leaving our quarters, 10 miles away, at six o'clock every morning and reaching our hideout near the Oil Road by 6:30. We then had 10 minutes in which to walk through the semidarkness to the blind, put out a fresh supply of corn, and retreat.

By 6:45 it was fairly light, and the family group would be moving from their night roost toward the bait. Fred had to be settled in his blind with all equipment by 6:40 a.m. If and when the sky cleared, we were ready. But

bad weather seemed to dog us relentlessly.

On February 4 I awoke at 5:10 a.m. and saw stars shining outside. I shook Fred awake and told him the news; this was our day.

The sky was clear, and we were on our way. By 6:40 Fred was installed in his blind, and five minutes later I was back behind the oak brush. We were on schedule.

It was now up to the whoopers. And Fred!

By 7:15 the sun began breaking through, and the glare was blinding after the long days of steady overcast. Behind the oak-brush screen I paced back and forth to keep warm, feeling somewhat like a football coach striding nervously up and down the sidelines while his team is out there giving its all. Meanwhile, Fred was about to meet the big birds at very close range for the first time.

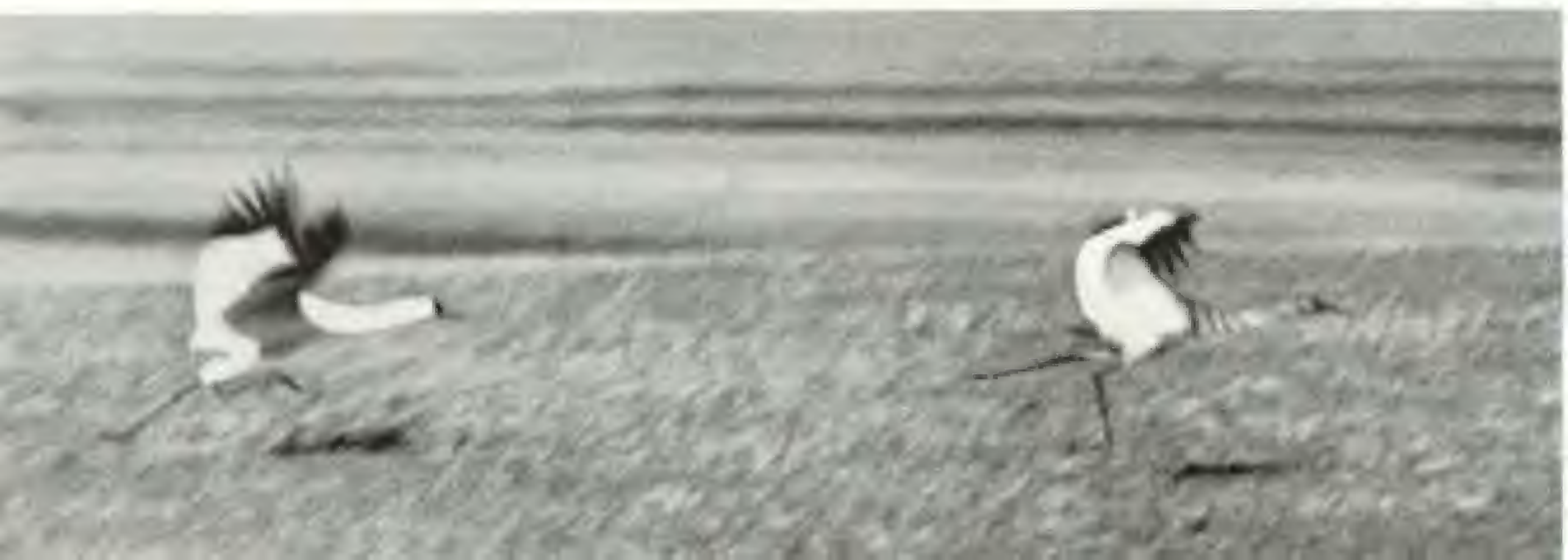
Since Fred could see only a narrow field through the peepholes in his blind, he had no way of knowing when the whoopers were approaching until they were on the bait about 100 feet away. So we had arranged a system of visual signals which I would raise from my vantage point half a mile away on the higher ground of East Shore Road.

We had prepared two long bamboo poles with a red pennant that meant, "Don't move! Whoopers approaching or in area!" and an orange pennant that meant, "All clear. You can step out of blind."

Bright Sun Foils Signal Plan

A simple enough plan, but not very successful. The morning sun, when it broke through, was so brilliant it blinded me, and I could not see the birds until they were almost at the bait. And in the same bright light Fred could not tell the orange flag from the red one.

At 8:20 a.m. the family group came walking majestically along the road directly past Fred's blind. Had he seen them? I had no way of knowing. But then the male bird resolved the question. Standing only a few





FRED W. LINDMAN

Weary Whoopers Gliding Into a Saskatchewan Marsh Lower Their Landing Gear

feet from the blind, he bugled so loudly that Fred could have had no doubts.

All day the birds moved to and from the bait, and each time they reached it, I could visualize Fred in the blind working furiously. But not until late afternoon could I find out how well he had done. Here are a few of the notes I jotted down as I waited:

4:14 p.m.—With the young one leading the way, the family has now come back to the corn, which is still irresistible.

4:40 p.m.—Birds still on bait—but there! Off they go, moving a short distance east.

5:21 p.m.—On bait again. As they approached, the male made a few brief leaps, the beginning of the courtship dance. His example followed by female, but without much enthusiasm. The youngster, however, joined in with youthful exuberance. A young whooping crane may not know what this is all about, but the profound head bows and the stiff-legged

leaps are inherent in the species and readily released even in a bird of only eight months.

5:30 p.m.—Family off the bait and moving toward the roosting pond to the east.

Results Justify Long Vigil

As soon as the birds were a safe distance away, I moved in and joined Fred at the blind. His broad grin spoke volumes. All told he had made more than 140 exposures, nearly all at close range.

The results are the best pictures of *Grus americana* I have ever seen (pages 651, 654, 656, and 664).

It should be apparent to anyone why we are so dedicated to the preservation of these regal birds. The fight to save them has become an inspiration to the millions of Americans who believe that wildlife and our remaining wilderness areas such as Arkansas have a vital place in our way of life, valuable beyond all price.

SASKATCHEWAN MUSEUM OF NATURAL HISTORY



A running start launches four whooping cranes into the air. On their migration flights, whoopers average 100 miles a day. Beating twice a second, their powerful wings flick quickly on each upstroke.

With lancelike necks outstretched, these birds take off from a field near Melval, Saskatchewan, where they stopped to feed.



Islanders fish for mackerel off Mahé, largest of the Seychelles. Houses of Victoria

Seychelles, Tropic Isles of Eden

I WAS SURE I hadn't heard quite right. "But why?" I asked the captain. "Why should a clock strike the same time twice?" "That's the way people like it here," he said, as our ship approached Victoria on the island of Mahé, queen of the Seychelles archipelago. "When you hear four chimes from the cathedral, it's four o'clock. Three minutes later you'll hear four chimes again—in case you weren't quite awake the first time, or lost count."

Just the sort of oddity you might expect in

the Seychelles, I thought. These 92 bits of land dot hundreds of miles of ocean between Africa and India—balmy waters that excite the imagination. To the Arabs this was the perplexing Sea of Zanj, where Sindbad found a magnetic mountain and birds so big they fed their young on elephants.

Like Peaks of a Drowned Continent

Some 60 of the Seychelles are coral, but the rest, including Mahé, are granite. They reach up from a vast bank averaging from 150 to



ORGANIZATION BY JOHN MALLS (BELOW) AND QUENTIN KEYNES © R. G. L.

dot the mountainside. Gaudy denizens of the Indian Ocean lie on the deck below

By QUENTIN KEYNES
Photographs by the author

200 feet beneath the surface. Some scientists call them the peaks of a sunken continent. But General "Chinese" Gordon, the ill-fated hero of Khartoum, nursed an even more intriguing notion. He thought that here once flourished the Garden of Eden.

My visit to the Seychelles soon brought home to me things more easily verified. I learned



that coconuts and plenty of fish may not make for Paradise, but certainly do make for an unhurried life, no matter how often the clocks strike.

I heard about a British colonel, for example, who enjoyed his retirement here but was baffled by the number of holidays. He suggested that the government might simplify matters by announcing not the holidays but the few remaining working days of the year. "Then," he said, "we shall all know where we are."

Seychelles, a British Crown Colony, has no airport. Newspapers from London arrive at least two months old, and for years Great Britain has exiled troublesome colonial leaders to the remote capital, Victoria.

Thus early in this century came Chief Prempeh of Ashanti from West Africa. He brought three of his wives and his favorite executioner. Other exiles have included the Sultan of Perak, Malaya; King Kabarega of Bunyoro and King Mwanga of Buganda, from Uganda; and most recently, Archbishop Makarios of Cyprus.

Two-masted Ghost Goes Island Hopping

Just how remote the Seychelles really are I discovered when I decided to visit them myself (map, page 678). The only means of reaching the islands is by ship, and passage must be arranged well in advance. Once or twice a month vessels of the British India Steam Navigation Company and the Eastern Shipping Corporation, leaving Mombasa, Kenya, for Bombay, swing southward from their regular courses to call at Victoria.

After a week of waiting in Tananarive, capital of the Malgache Republic, as Madagascar is now called, I wondered if I should ever obtain a reservation. Then I was handed a cable from the Governor of Seychelles on Mahé: AUXILIARY SCHOONER REVENANT PRESENTLY AT NOSY BÉ MADAGASCAR RETURNING SEYCHELLES VIA ALDABRA SECOND DECEMBER.

I immediately took an old German Junkers transport plane to the island of Nosy Bé off the northwest coast of Madagascar. As we descended to the lush green bay of Hellville, I spotted the two-masted *Revenant*—her name means "ghost"—conspicuous by her gleaming white paint and proud bearing among many lesser craft bobbing in the harbor.

Serge d'Unienville, a cheerful French Seychellois, met me on the pier.

"We got a message to wait for you," he said, identifying himself as agent for the ship's

owner. "It'll be a pretty slow trip because we must stop at so many outlying islands."

He said this apologetically, but I looked forward to seeing the scattered dependencies of the colony. Their very names conjured up old pirate tales: Astove, Cosmoledo, Assumption, Aldabra. I was particularly eager to explore the Aldabra Islands, one of the few places where the giant land tortoise survives in its natural state.*

A rowboat with a husky crew in straw hats took me out to the schooner. As soon as I had climbed a rope ladder to the deck, the skipper gave orders to start the 160-horsepower engine. The 107-foot *Revenant* chugged out of the harbor in a flat calm.

"Under full canvas and with a good wind, I can get about seven knots out of her," the skipper said. "But we seldom have that good a breeze in these waters. The engine alone barely gives me six."

Our first port of call, tiny Ile Glorieuse, came upon us suddenly. One moment it wasn't there, and the next moment it was.

"These outlying islands, they are all so flat," said an elderly, mustachioed Seychellois at the rail. "Nothing but sand and palms."

Revenant anchored a few miles offshore, outside the reef that guards the island. We were to drop off laborers from Madagascar to work the plantation for copra—the dried white coconut meat that yields an oil used in making soaps, cosmetics, margarine, and many other products. Along with all the rest of Glorieuse, which is a dependency of the Malgache Republic, the tract had been leased to an absentee Seychellois landlord.

Copra Workers Lead Easy Life

I rowed ashore with the mustachioed gentleman, who proved to be the plantation's new manager.

"Fortunately I am used to solitude," he said. "This may be the last ship I will see for a year." He seemed to have no regrets.

As we strolled past thatched cabins in a palm grove, a coconut thumped the ground.

"It makes for an easy life," the manager smiled. "The workers do not exert themselves climbing the trees here. They simply pick up a few hundred nuts, put them in sacks, and bring them to the main camp. Then they are through for the day."

* For an account of a related species, see "Lost World of the Galapagos," by Irving and Electa Johnson, NATIONAL GEOGRAPHIC, May, 1959.

Work usually begins about five in the morning. I learned, and ends four hours later. The laborers plant small gardens with vegetables or tobacco, and keep a few chickens. But women and children usually attend to these chores. A man *could* go fishing—the company would lend him a boat and even buy his catch. But why go to such lengths? Food is abundant anyway, with pumpkins, spinach, and papaws growing wild. So why not just stretch out and look at the sky?

"Any danger in falling coconuts?" I asked.

"Not much," replied the manager. "I'd say 85 percent fall at night, when the temperature drops."

Guano From Ice Age Birds?

I followed local custom and dozed pleasantly for the rest of the afternoon. Toward evening I returned to the schooner. *Revenant* set sail for Astove Island, 100 miles north.

Enormous quantities of guano have been found on Astove's two square miles. But it

is still a mystery how so much valuable fertilizer was deposited here and on many other small islands of the Seychelles. Present-day bird life cannot account for it all.

Some authorities believe the guano deposits were left during the last Ice Age, when millions of marine birds fled south to breed in a warmer zone. When the ice receded, they returned to their former haunts.

The Seychelles government has leased Astove to an Indian firm in Mahé until 1961. I found 30-odd laborers in the guano pits. Freighters anchor offshore and take the fertilizer to New Zealand and other parts of the British Commonwealth.

Our schooner dropped off several workmen, and in a few hours we left for Cosmoledo, an atoll of eight islands and countless islets. Here the British colonial government once maintained a station for drying fish and capturing the plentiful giant green sea turtles, *Chelonia mydas*. They yielded *quitouze*, dried flesh sold for local consumption, and

Translucent Plates of the Hawksbill Make a Butterfly of Tortoise Shell

Islanders weave hats, carve miniature canoes, and create shell novelties for sale in this Mahé handicraft shop. Named for its hooked beak, the hawksbill turtle wears horny plates that overlap like shingles on a roof. Heated, the shell can be molded and welded into ornamental articles. A polished *coco de mer* rests on the counter.





calipee, the yellow fat from the lower shell, dried and exported for making turtle soup. Nearly 6,000 green sea turtles were caught in Cosmoledo waters annually.

Still, after four years, the government considered this venture a failure. Our captain was instructed to close down the station and remove every living soul from the islands.

While *Revenant* lay at anchor for two days, I toured the enormous lagoon in one of the schooner's dinghies, accompanied by four islanders with harpoons.

We chugged into the shallow lagoon early in the morning, at high tide. Even at that hour it reflected every conceivable shade of blue. The atmosphere was uncannily peaceful. Suddenly the man at the bow called out: "*Tortues de mer!*"

Turtles!

He pointed to a wild thrashing in the calm water. Two surprised-looking armored heads appeared between splashes. We had disturbed a mating pair of enormous green sea turtles.

Our men quickly hurled two harpoons into each of their shell backs. After a struggle the heavy animals were hauled on board, helplessly waving their flippers.

As the harpooners pried the blades from the turtles' backs, they showed me why such a weapon hardly harms a turtle. Its flexible horny shell contracts around the barb, preventing the iron from reaching the animal's vitals.

Trouble Haunts the Patient Booby

On an island at the southern extremity of the lagoon we encountered hundreds of booby birds, both the masked and red-footed varieties (page 688). Perched on every bush, they gave us glazed looks, as if to demonstrate their proverbial stupidity. Perhaps this reputation is not fairly deserved; the booby is just an easygoing bird born to much trouble.

All day the males float on the water, far from land, to catch fish for the family. When work is over, father booby flaps homeward,

but sure enough, there's a big, lazy frigate bird waiting for him. It dives at the poor booby so viciously that all the fish boarded in the victim's gullet spill out—an easy meal for the frigate.

It's the same story every day, and the few boobies getting through unrobbed have to feed the whole colony. No wonder the female boobies will hatch only two babies per season. And no wonder boobies look as if they would prefer to be some other bird for a change.

When we returned to the *Revenant*, the entire population of Cosmoledo crowded her decks. Men, women, and children sprawled among mattresses and bedding, crates containing cats, and personal belongings in brick-red boxes made from the local *takamoka* wood. Our arrival with the turtles heightened the pandemonium.

Tortoises Hiss at Morning Caller

Next morning off Aldabra we were greeted by a large pirogue—a dugout canoe painted black with an orange stripe. Nine men worked alternate paddles; a tenth stood at the stern with a long pole, deftly steering toward our ladder.

Ashore, I arranged with Aldabra's manager for a smaller pirogue with a guide and crew of three to visit the large southern island of this 19-mile-long atoll. There I hoped to find Aldabra's giant land tortoises living in contented solitude.

We started from the schooner at 2 a.m.—the tide made it impossible to enter the vast lagoon any later—and crossed the reef in eerie moonlight. Only the heavy breathing of the boatmen and the gentle swish of their paddles punctuated the silence. As dawn broke, I saw that the lagoon was heavily fringed with mangrove. The pirogue had to be carefully maneuvered through this dense growth.

Following the guide, I picked my way across jagged, pock-marked coral and through waist-high bushes.

"This rock—we call it *champignon* [mushroom]," said the guide. "Look at my shoes

Sea Coconuts, a Fable That Became a Fact, Grow on 100-foot Palms

World's largest tree fruit, the coco de mer has fascinated men since they found the nuts washed ashore long ago on the coast of India. Since no one had seen the fruit growing on land, men assumed it had originated in the sea. Potentates prized the nuts, and one cult worshiped them. Edible jelly filling the globes sold as a love potion. Speculation did not end until 18th-century explorers discovered the palms on Praslin Island. A mature coco de mer weighs 40 pounds. Shaded by stiff leaves that rattle in the sea breeze, the nuts ripen for seven years.

Islander Washes the Fish Emptied From His Trap

Baited with coconut oil and land crabs, the bamboo-and-palm-leaf cage lay submerged overnight among the coral crevices of a Mahé lagoon, where fish mistook the funnel-shaped entrance for sheltering arcades of coral. Once inside they could not find the way out.

Originally uninhabited, the Seychelles were colonized by Frenchmen after 1770. Most of the 45,000 inhabitants descended from African slaves. Though they have been British subjects since the end of the Napoleonic Wars, they still speak a lilting French patois.

Fisherman and boy are natives; the girl is the daughter of a British official.

Other islanders in homemade canoes seine for mullet or catch mackerel on hook and line (page 670). Back in port, they sell their catch for a penny apiece.

Sapphire-striped Fish Glides Past a Stinging Coral

For variety and abundance of marine life, few places rival Seychelles. In the water, many of the fish resemble birds of brilliant plumage. If taken to the surface, they fade before one's eyes. Most have coarse flesh and little taste, but this variety of porgy (*Gasterin*) makes good eating.

To photograph the colorful fellow, Luis Marden of the National Geographic staff dived into 40 feet of water off Assumption, an outlying Seychelles island, where the French research ship *Catypso* investigated marine life. He took care to avoid the wavy wall of *Millepora*, a coral armed with stinging barbs.

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—they're all cut!" My sneakers, too, were almost in ribbons.

We made slow progress in almost unbearable heat. Suddenly from beneath a large-leaved *mapou* bush came a loud hiss. I nearly jumped out of my skin. A great wrinkled head peered angrily at me, as if resenting my invasion of a last stronghold of the giant tortoise (page 680).

Farther on I spotted about a dozen of them, two and three feet high, dozing beneath bushes. Occasionally one poked its head out from under its shell to take a slow-motion bite from a bright-green *mapou* leaf, seemingly willing to devote the entire day to chewing it.

Aldabra Veteran Lives 180 Years

Giant tortoises, of course, are in no hurry. On St. Helena in the South Atlantic I photographed a veteran named Jonathan, taken there from Aldabra and said to be about 180 years old.*

Despite stories of 500-year longevity, no record lists a giant tortoise more than two centuries old. But these tortoises are quite possibly the animals that live longest of all.

I asked the guide how much a grown tortoise might weigh. In reply, he and the three other men tried to hoist a large one above their shoulders. They couldn't do it. Mature specimens, I learned, reach 500 to 600 pounds.

For centuries giant tortoises were slaughtered for food by ships' crews, until at last British scientists persuaded the authorities to

proclaim Aldabra a sanctuary for this colony of *Testudo elephantina*.

Revenant visits Aldabra four or five times a year. Between trips the islanders may spear as many as 90 green turtles for shipment alive to Victoria. They are kept in a special enclosure within the lagoon until the schooner arrives (page 682).

The last day of our visit was spent loading 90 flapping and protesting turtles. Teen-age boys caught them in the pen for transport by pirogue out to *Revenant*. The boys pretended great difficulty in roping the reptiles' flippers. By thus prolonging the capture, they enjoyed long turtle-propelled swimming matches.

When all our turtles had been hoisted onto the schooner, there was not a square foot of turtleless deck space left. Every time I left my cabin I had to step on slippery upside-down turtles. They sighed deeply. Sometimes they shed gummy tears. It was heartbreaking, but all hands assured me that the turtles didn't really mind—without provocation they sighed just as much.

During our 700-mile voyage to Mahé the crew frequently hosed the turtles down with sea water and spread palm leaves over them during the heat of the day. But two died en route. The ship's cook converted them into juicy, greenish steaks that tasted rather like veal, and thick brown soup.

At last we saw the steep sides of Mahé to

* See "St. Helena: the Forgotten Island," by Quentin Keynes, NATIONAL GEOGRAPHIC, August, 1950.

PRINCIPAL ISLANDS OF Seychelles Group

0 10 20
STATUTE MILES



Jutting From a Submarine Bank, the Seychelles Dot the Indian Ocean

Mahé, largest of the British Crown Colony's 92 isles, lies 5 degrees south of the Equator. No airline serves it; steamers call irregularly. Neighboring Madagascar, home of the Malgache Republic, retains its ties to France.

the east, one great green mass of exuberant vegetation. As we sailed along its entire length of 17 miles, several members of the crew tried to tell me about the more important sights. I could understand only those speaking English, for the island patois is pidgin French mixed with Swahili and Hindustani.

The island's highest point, 2,993-foot Morne Seychellois, was hidden by clouds. So was most of the high central ridge, but small houses were plain to see clinging to the sides of the green slopes and dotting the shore.

Mahé varies in width from two to seven miles, and in the north a narrow strip of land juts out to North Point. This we now rounded to sail down the eastern coast and enter the harbor of Victoria.

Houses Stand Far Above Sea

White-clad islanders walked along the pier, and small English cars slowly nosed their way between them. Farther inland, scores of red-and-white houses with corrugated-iron roofs nestled among palm trees, some more than a thousand feet up in the hills (page 670).

As we docked, a smart white launch flying the Union Jack rumbled up to the stern of the schooner. Two uniformed islanders, wearing caps marked "Port Victoria," threw a line to us, and the lone passenger of the launch

came aboard. I was introduced to Gordon Hector, then assistant colonial secretary.

"So glad you could catch *Revenant*," he said. "H.E."—he meant His Excellency, the Governor—"was afraid you'd miss it. Then heaven only knows how you'd have got here. I've taken a room for you at the Pirates Arms, right at the foot of the jetty. Meantime, come along with me to Beau Vallon."

Swordfish Loses a Duel

We walked down the pier to his car and drove through the outskirts of Victoria. The wooden houses with their rickety porches gave way after a mile or so to a road winding between great granite boulders interspersed with palms.

Reaching the Beau Vallon Beach Hotel, a series of thatched houses beneath rustling coconut palms, we sat down and looked out over the smooth beach. The temperature was a humid 86°. It was mid-December.

"H.E. wants you to come up to Government House for Christmas dinner," Hector said. I told him I planned a trip on the *Revenant* to the Farquhar Islands but would try to be back in time.

Before the schooner left, she was beached near the pier. For days she had been taking

(Continued on page 684)





Giant Tortoises Search for Rain Water Trapped in Aldabra's Pitted Coral

Prized by sailors as meat on the hoof, Seychelles tortoises faced extinction in the last century; today they thrive under government protection. Found wild on the Aldabra Islands, *Testudo elephantina* may weigh 600 pounds and live 200 years. A related species survives on the Galapagos Islands, halfway around the world.

Big enough to ride, Aldabra's tortoises litter a meadow like boulders. Lunching crewmen from Capt. Jacques-Yves Cousteau's research ship *Calypso* use them as living stools. When first disturbed, the reptiles drew in their heads. Some stand 3½ feet high.

Tortoises park in the shade during the heat of the day. "I saw nearly 200 under bushes on a short walk," the author reports. "I felt they should have license plates fastened to their tails, so much did they remind me of parked cars." 681





Коралловый риф. © Национальное географическое общество





Aldabra Men Cage Sea Turtles in a Watery Prison

Famous for their flavor, green turtles (*Chelonia mydas*) abound in Aldabra atoll's glassy lagoon. Their flesh tastes somewhat like a tough beefsteak. Dried and salted, it becomes *guttanze*, a Seychelles delicacy. Chefs make soup from the greenish cartilage that joins the reptile's top and bottom shells, but the shell itself has no commercial value.

On spring nights the females waddle ashore to lay their eggs on Aldabra's sloping beaches. Each makes two to five trips, laying up to 200 eggs a time in a sandy hollow scooped out with flippers. Coin-sized babies hatch in a few weeks. Birds take a heavy toll when the young crawl to the ocean.

Law protects female turtles on the beach, but hunters may harpoon both sexes at sea. Penned in shallow water, these captives await a ship to carry them to Mahé. They have little in common with Aldabra's giant tortoises.

Soft-shelled eggs the size of ping-pong balls came from the body of a slaughtered green turtle. Islanders relish the yellow eggs hard-boiled; by laying time the eggs turn a dirty white.

Stacked like dishes on a drainboard, green turtles crowd an Aldabran's dug-out canoe. Block and tackle at left will lift the shellbacks to the deck of a schooner, on which they will ride upside down to Mahé.

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water mysteriously. Now we found the answer: the broken bill of a swordfish, lying in the bilge. The fish had rammed its "sword" completely through the hull, leaving a one-inch hole to be patched.

Serge d'Unienville was resident manager of Farquhar as well as agent for *Revenant*. He and three of his children sailed with us. After a three-day voyage southwest from Mahé, we sighted their atoll, cut off from the outside world.

"No telephones here—not even a radio," D'Unienville said cheerily. "But we have no traffic problems either." He gestured toward the atoll's only automobiles—two relics of a quarter-century ago.

Doomed Turtles Wave Farewell

One afternoon our host cranked up his bright-red Model-A Ford and we sallied forth for a bumpy ride to his coconut groves.

"Besides coconuts we grow some maize and salt a bit of fish," he said. "My wife and I find plenty to do, even though the children are away at school much of the year. They come home during school vacations, or rather, between trips of the *Revenant*."

Farquhar exports a few green sea turtles, also. I watched as islanders carried the latest catch on wooden litters to the pier. As each turtle rode by on four husky shoulders, it waved a flipper solemnly, like a queen acknowledging the homage of her subjects.

Back at the Pirates Arms on December 25, I got into my dinner jacket and walked through the tidy gardens of Government House to dinner with Sir Frederick Crawford, then Governor, and his wife.

Government House typified the early Edwardian magnificence of British colonial architecture (page 694). Strong white pillars ornamented the twin-storied portico. Heavy, glistening furniture in paneled rooms with life-sized marble busts of Queen Victoria and Edward VII harked back to the more stately days of empire.

A servant, unseen beyond the dining room, pulled a rope to operate a punkah on the ceiling, circulating the humid air as we ate our Christmas turkey and plum pudding. For dessert we had fudge made by Lady Crawford.

In the garden the Governor showed me the

historic Stone of Possession. The Seychelles were known to early Arab and Portuguese navigators, but the first exploration is credited to Lazarre Picault, a French sea captain. He was sent from Mauritius, then held by France, to chart the northwest Indian Ocean.*

Picault landed on the main island in 1742, loaded up with tortoises and coconuts, and returned to Mauritius. Two years later he came back with a hydrographer and named the island Mahé, after the governor of Mauritius, Mahé de Labourdonnais. A later governor decided that France had better take formal possession and dispatched Capt. Corneille Nicolas Morphey in 1756.

"He brought this special stone carved with the arms of France," said Sir Frederick. "Unfortunately, vandals later defaced the carvings.

"Morphey renamed the islands in honor of the finance minister of Louis XV, Vicomte Moreau des Séchelles. When the British took over, we anglicized the name by adding a 'y.'"

France did not colonize the islands until 1770, and its tenure was brief. A British squadron forced the commandant, Chevalier Jean Baptiste Quéau de Quincy, to surrender in 1794. But no British troops occupied Mahé, and for the next 20 years De Quincy remained pretty much his own boss, hoisting the Tricolor whenever a French ship hove into view, and another flag, bearing the words "Seychelles Capitulation," when a British ship came along.

Britain Honors French Official

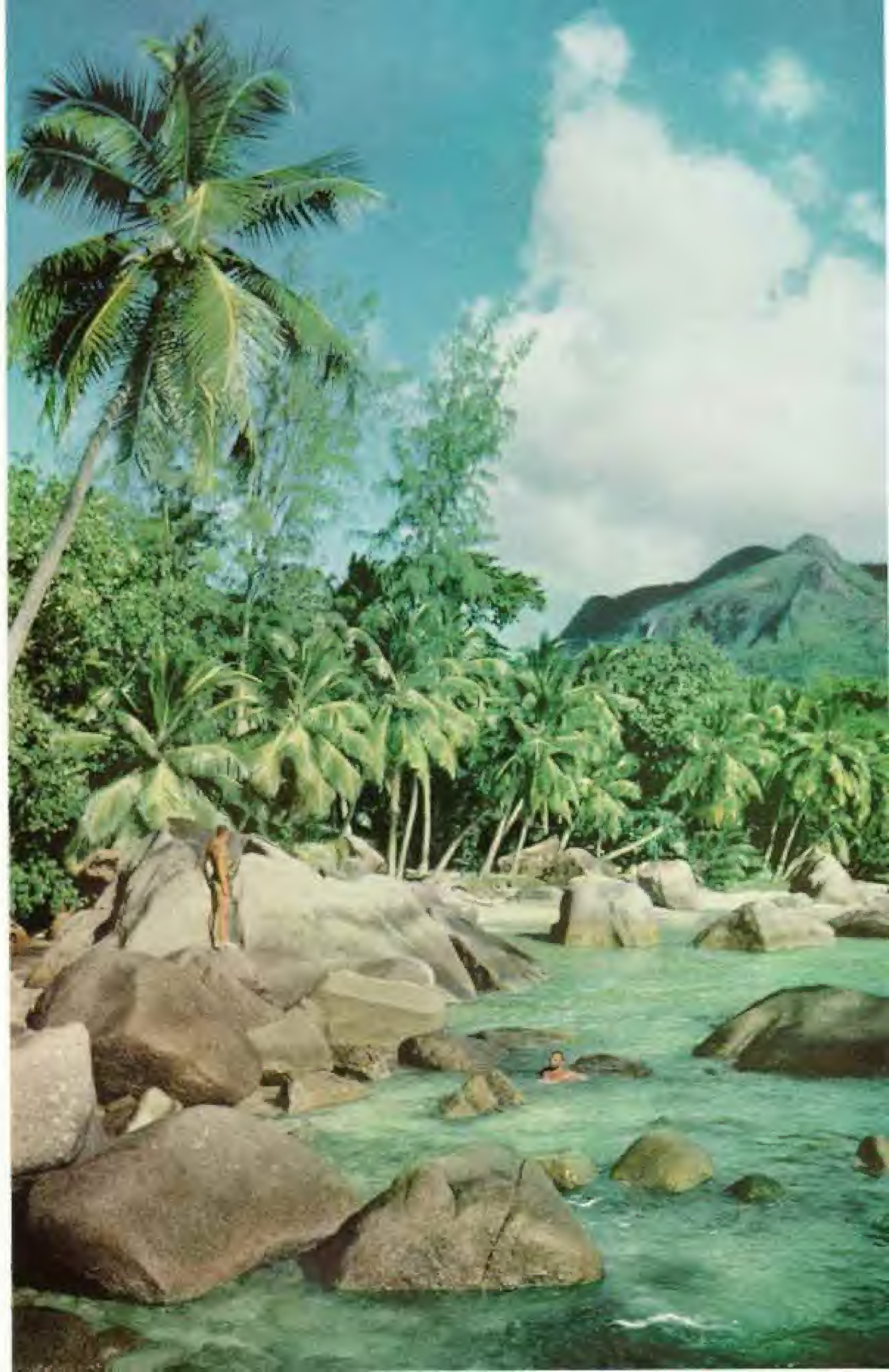
The Seychelles were formally given to Great Britain in 1814 by the Treaty of Paris, but De Quincy—who amiably anglicized his name—remained as the Crown's administrator.

"On his death in 1827, we honored him for faithful service to us by interring him in a splendid tomb," continued the Governor, pointing to an impressive sepulcher in the corner of his garden.

The nimble switching of flags that kept De Quincy prosperous was typical of 18th-century turmoil in this corner of the Indian Ocean, then a pirates' playground with fine hiding places near the trade routes to the East. Portuguese, English, Dutch, French, and occasional

* See "Mauritius, Island of the Dodo," by Quentin Keynes, NATIONAL GEOGRAPHIC, January, 1956.

Swimmers splash among granite boulders along Mahé's palm-lined beach. Often described as the Tahiti of the Indian Ocean, Mahé sparkles like a storybook isle.





American merchantmen could never be sure of any approaching ship's nationality, no matter what flag it flew.

Even pirate hunters might overnight turn into pirates themselves, and back again into trusted servants of the state, with a pardon and a commission to catch and hang their old comrades.

A misunderstanding about who was who cost the Seychelles most of their precious spice trees. The French had prepared to burn each tree if an enemy came. The alarm sounded in 1780—an English warship was approaching! The spice trees went up in smoke. But the ship proved to be a French slaver, shrewdly flying a British flag.

Only the cinnamon trees survived the blaze. Cinnamon-leaf oil remains a valuable Seychelles export, and the islands have idled in peace through wars of late. In one instance, however, the hazards of warfare came dangerously close.

War Souvenir Gives Islands a Bang

In World War II a live mine washed up on the reefs surrounding the Poivre Islands. Islanders decided to cut this big metal ball in two, to make troughs for pigs. But the mine was tough. Knives, hammers, and tempers were ruined before it was left to rust. At last the Royal Navy towed it to sea and blew it up—to the mighty surprise of the residents.

Of the colony's population, estimated at 43,000, four-fifths live on Mahé. Most are descendants of liberated African slaves, Indians, and Chinese. The greater number of the white inhabitants are French-Seychellois, plus a relatively small number of English settlers and government officials.

Though the colony has belonged to Britain for more than 160 years, the old landholding Seychellois still speak 18th-century French. The government has been at pains not to offend their fierce pride in all things French.

At the Seychelles Club I met André Dauban. With his brother Henri and a Seychelles Indian merchant, he owns one of the biggest,

richest, and most beautiful islands of the group—Silhouette, 12 miles northwest of Mahé.

Henri Dauban is a bachelor, a graduate of the London School of Economics and Political Science, and the sole European on the eight square miles of Silhouette Island. Lean and bronzed, he believes in the simple life and rarely wears anything but khaki shorts. When I arrived on his wooden jetty, he greeted me cheerfully: "Come over to the house and have a 'Silhouette Special.'"

A servant padded in with two tall glasses. Dauban squeezed some lemon juice into the glasses, poured in a few other ingredients, and then called for some honey. "A scoop of this and you'll never forget Silhouette. The bees here know their business!"

Near Dauban's cool and spacious house were several sheds with long rows of halved coconuts stretched on racks. "This is to dry out the coconut meat," he said. "It usually takes four days before the meat peels off." Copra provides the Seychelles' chief income, equivalent to more than a million dollars a year. Other but smaller money earners are cinnamon oil and bark, salted fish, vanilla, and shell from the hawksbill turtle (page 673).

"I've got 2,000 acres of coconuts," Henri said. "That means five submanagers, 250 laborers, and about 200,000 nuts a month."

I watched a boy husking green nuts. He brought them down sharply on a pointed stake and deftly wrenched off the tough covering.

"He does 2,000 nuts in four hours," said Henri. "Not bad, eh? But look at the women over there. Each can break about 3,000 nuts in an hour and a half!"

Pigs Thrive on Coconut Milk

I could barely follow the quick movements as they halved each nut with a single slash of a machete. I feared that the hand holding the nut would be cut in half, too (opposite).

"The milk runs off for my pigs," Henri explained. "We burn the shells and husks to speed up the drying operation. So you see, every part is used."

Machete-swinging Women Split Coconuts for Drying Into Copra

In Seychelles the coconut is king. The palms are private property, and police may question any man found carrying one of the nuts. Dried, the meat becomes copra, a source of oil for cooking, margarine, and soap. Islanders weave mats from the husks and fashion drinking cups from the shells. Servants use the nuts to polish floors. Placing one bare foot on a half shell, they skate around the floor; enough oil squeezes out to bring a high polish to the wood.



Later, on Mahé, I saw another ingenious use of the husks. They were shredded, twisted into long strands, and turned into rope.

One evening Dauban shot a flying fox—actually a species of fruit bat—which had been chirping in a tall fig tree outside his house. I measured its wing span: three feet nine inches.

"Islanders consider the meat a delicacy," Dauban said. "Amazing how those little faces and peaked ears remind one of a fox. How'd you like to come and film them tomorrow, in their hideaway?"

The next day was for me one of the most memorable in the Seychelles. In a pirogue with two islanders we paddled around to the northern tip of Silhouette and clambered up the steep sides of huge granite boulders. The heat was oppressive. Whenever one of us slipped, an extra bead of sweat ran down my cheek. Soon we stood nearly a thousand feet above the ocean, amid a colony of flying foxes.

Trees Wear Garlands of Bats

Every tree among the granite blocks was festooned alternately with black lozengelike objects, when the bats' wings were folded over their bodies, or with bright-orange, diamond-shaped tufts of hair, if their breasts were exposed.

Sometimes a flying fox would release the grip of its dainty black feet, as it hung upside down from a branch, and take off.

Its gliding flight, with wings glinting like patent leather in the sun, seemed to outdo a bird's. The creatures looked like reincarnations of prehistoric pterodactyls.

My host loaned me a small sailboat for the return to Mahé. At the Pirates Arms I found an invitation from Maxime Ahyave, the subinspector of police. Knowing of my interest in recording local music, he was asking me to a party at his house. The dance went on until the small hours to the strains of Ferdinand Sauzier's band—piano, fiddle, banjo, guitars, and drums; Quadrilles and other 18th-century dances predominated.

But my favorite was a sort of samba danced to a tune called "Ton Ton Pierre," apparently No. 1 on the Seychelles hit parade.

I was also invited one morning to accompany four island fishermen headed for a huge school of Spanish mackerel that had appeared close to the western shore of Mahé. My straw-hatted friends paddled out to join a dozen other pirogues already bobbing gently on the lovely turquoise shoal. Fish shimmered as they darted back and forth below us.

Each man had a line with a dozen hooks baited with the mackerel itself. Frequently I saw a man haul up a line with a fish on every hook.

A single pirogue may hook 700 mackerel in a day. To catch other fish, the islanders lower wicker fish traps called *casiers* (page 677). What a variety they come up with! Translating some local names literally, they may get a white cobbler, a toothbrush, a flag, a moon, a big-eyed lion, a port captain, or a fallen lady.

Fish, coconut meat, and rice form the islanders' staple diet, and they drink *bacca*. I went down to the southwest coast to watch Creoles produce this sweet drink.

Four old men rolled a heavy eucalyptus log over bunches of sugar cane to squeeze out the juice, which ran along a bamboo trough into a wicker basket. Allowed to ferment for one, two, or three days, according to taste, the *bacca* costs 20 Seychelles cents (about four cents) a pint. It is forbidden to sell *bacca* older than three days, because of the potency it gains with age.

Big Fish Lure in Seychelles Waters

The next invitation I "angled" for myself. It concerned big-game fishing, whose greatest exponent in the Seychelles is Harry Savy, a French-Seychellois member of the International Game Fish Association. A trip with him in his ex-seaplane tender to Frigate Island, which he owns, is something all visitors to the islands appreciate.

Harry's son George was my go-between, and one weekend the three of us set off for

Masked Boobies on Cosmoledo Islands Nest at Water's Edge

Sea birds crowd the sky above the Seychelles. This species, *Sula dactylatra melanops*, takes its common name from the narrow band of dark skin around its beak. Boobies lay two eggs, but few succeed in raising both chicks. Clumsy on land, the birds dive gracefully for fish, but often lose their catch when waylaid by piratical frigate birds. Tangled mangrove trees, growing in salt water, support the nests. In some places, oysters cling to the roots.



Mantas Provide Sport and Steaks for Frigate Island Fishermen

Often called devilfish, the manta ray takes its name from hornlike fins that thrust out from the head. Big mantas weigh more than 3,000 pounds and measure 22 feet from one hornlike wing tip to the other.

Despite its size and ferocious appearance, the ray avoids danger. When harpooned, it may upset small boats with its thrashing. In water it propels itself with waving fins.

Sighting a manta, native fishermen in the dugout at top pull hard to draw within harpoon range. After a bitter struggle, hunters in a second boat close in for the kill (center). The motorboat's catch (bottom) weighed an estimated 600 pounds and had a wingspread of 11½ feet. Six men, two of them using oars as levers, strained half an hour to haul it aboard.

Pulled open, a manta's mouth suggests a jet's air scoop. Seychellois consider devilfish steaks a delicacy.



BOBACHROMER © GETTY IMAGES 2004/44402-2/1/97 691



Frigate, 34 miles from Victoria. Bonefish of more than 20 pounds—the official world record being considerably under this mark—have been caught in Seychelles waters. But I was eager to go after a giant devilfish, or manta ray.

Before tackling a ray, however, Savy wanted to show me what he called run-of-the-mill big-game fishing. He and George rigged their rods and dropped their lures astern of the boat. These waters teem with sailfish, bonito, dorado, kingfish, tuna, barracuda, and shark. Even the great whale shark is often seen.

A big sailfish cruised by—"at least a hundred-pounder," said Savy—but it wouldn't take the lure. Nevertheless, in three and a half hours we caught 24 fish weighing a total of 300 pounds, including many sharks and barracuda. Our success reminded me of what I had heard at the Seychelles Club: 50 miles southwest of Mahé a single boat had landed 83 sharks in 35 minutes!

Asiatic Deer Wander in Hills

That evening in Savy's guesthouse by the shore, we dined on venison cooked in red wine.

"There are quite a few wild sambar roaming around in the hills here," he explained. "These Asiatic deer came from Mauritius a century or more ago."

Savy breeds ducks and geese, goats, pigs, turkeys, and guinea fowl. He grows market vegetables for sale to ships of the British India line. And he harvests some 60,000 coconuts annually on Frigate, an island barely more than a square mile in size.

Next day, towing a couple of small boats, we set out after a devil ray. Within an hour we spotted a huge one close to the surface in shallow water. Harry and George Savy went after it in one of the dinghies. I followed in an outboard motorboat.

Paddling silently to within four feet, Savy hurled a harpoon into the ray's huge black-and-white back. Immediately the ray plunged to the bottom with a swish of its mighty "wings," dragging the harpoon's rope with it. Showing terrific strength, it pulled the boat completely about and tugged it at a steady six knots.

Gunning the outboard, my crew tried to come abreast of Savy's boat. Gradually the ray flagged. Savy struck another iron into its back as it surfaced. It was 20 minutes before the creature lay alongside, exhausted. A dozen jabs of a spiked pole finished it off.

The ray's last movement was a vicious whip of its three-foot-long tail. A crewman cut off the tail as a souvenir of the hunt. The job took some minutes since the membranes were exceedingly tough. "It'll make a good whip," he said.

Hauled ashore, the monster was tied between the limbs of a tree: it measured nearly 12 feet from wing tip to wing tip and weighed some 600 pounds (page 690).

Back in Victoria I met a local member of the National Geographic Society, a Moslem Indian shopkeeper named Suleman Adam Moosa. There are about 250 Indians in the colony, most of them either owners of the cluttered shops along the capital's main street, or salesmen and clerks. The Indians transact much of the capital's commerce.

Suleman Moosa offered to take me on a one-day trip in his fast launch to several granitic islets I could hardly visit otherwise.

First we called at Félicité, a small island about the size of Frigate, with fewer than 100 residents, most of them laborers on a coconut estate. From here we went for an hour to The Sisters, two islets with an even smaller population of plantation laborers; and lastly, out to Aride, a wild, rocky island about a mile long, harboring myriad sea birds.

At each place we anchored offshore and blew our foghorn to attract attention, so that a pirogue would come to pick us up. At Aride the surf was particularly heavy, but the helmsman skillfully steered our canoe through boiling foam without wetting my camera equipment.

I clambered to the 443-foot summit of this seldom-visited island. Great frigate birds swooped around me. Smaller terns, noddies, and petrels darted among the bushes. Foot-long lizards scampered on the pink rocks, looking for birds' eggs.

Magic Nut Used as Love Potion

Before leaving the Seychelles, I visited other granitic islands such as La Digue, Cousin, and Curieuse, the latter a lonely leper colony that, happily, has few patients these days.

I saved until the end my visit to General Gordon's "Eden" and a look at his "forbidden fruit"—the *coco de mer*, the famous double, or sea, coconut.

This gigantic nut weighs as much as 40 or 50 pounds. The largest tree fruit in the world, it has a history full of legend and superstition (page 674).



PHOTOGRAPH BY LUIS MERRIN, NATIONAL GEOGRAPHIC STAFF © R.S.P.

Victoria's Memorial Clock Commemorates the Reign of Its Namesake Queen

Islanders admire the cast-iron tower, a miniature version of London's Big Ben. Their term for a country bumpkin is *il n'a pas vu l'horloge*—he hasn't seen the clock.



Government House Dominates Victoria, Capital of Seychelles

Near the villa, home of the British governor, rests the Stone of Possession, which marked the claim of the early French settlers. Seychelles often plays host to political castaways. Prempeh II of Ashanti, West Africa, went there in 1900 in a leopard skin; he left 25 years later in top hat and morning coat. Great Britain banished Archbishop Makarios of Cyprus to the Crown Colony in 1956; he stayed a year.

In the Middle Ages the coco de mer was exceedingly rare. Princes and potentates paid fantastic sums, believing that its whitish meat would neutralize any poison in food or drink, that it could cure gallstones and paralysis, and that it made a powerful love potion.

Where did the coco de mer come from? No one knew, really. Old accounts related that every so often one would wash up on the shores of the Maldivé Islands, or on the beaches of Ceylon and India.

One story said the tree bearing the cocos de mer grew deep under water near Java, and that a diver trying to reach it would drown.

Another tale claimed that all the cocos de mer in the world came from a single tree

whose top grew through the surface of the sea. All the currents of all the oceans converged at this spot, and ships were drawn to it inexorably, never to return.

Market Glutted, Value Declines

Occasionally nuts would drop and float away—they had the magical power of moving against currents. When they reached some distant shore, they would walk up on the beach. So the stories went.

But when the Seychelles island of Praslin was discovered in 1768, so also was the true source of the coco de mer. A Frenchman, Brayer du Barré, shipped large numbers of Praslin nuts to India.

That proved to be a mistake. The sudden abundance of what had been so scarce ruined the price for all time. Today a few "domesticated" coco de mer trees grow on Mahé, and a few more in Jamaica, in Trinidad, and at Coconut Grove, Florida. But only on Praslin and a neighboring island do they grow plentifully and in a wild state.

Now I headed for Praslin in the government launch *Alouette*. It crosses in three and a half hours from Mahé twice a week. I could imagine Chinese Gordon's excitement as he set out on this same trip, to return fired by a magnificent flight of fancy.

That was only four years before his fatal battle in the Sudan against the dervishes of the Mahdi. Charles George Gordon had won his nickname "Chinese" when he scotched a rebellion in China. When he came to Mahé in 1881, he was a colonel of sappers, sent to see if the island could be effectively fortified in case of another war with France.

Gordon's Theory—Paradise on Praslin

Gordon recommended against fortification. But he also sent home notes and sketch maps to support his conviction that he had found the Biblical Paradise on Praslin, in the Vallée de Mai—the May Valley.

Gordon considered the Seychelles part of a continent submerged by the Flood. In London I had looked up his speculations on prehistoric geography in one of his letters to the director of the Royal Botanic Gardens at Kew. His musings about the coco de mer were especially intriguing.

He had written, in part:

"As we generally believe that there was a tree of Knowledge of Good and Evil, and a tree of Life, actual trees, set aside for a time to be imbued with mystic powers, there is no reason why these trees should not exist now . . . relegated back to ordinary trees. . ."

Gordon also drew a coat of arms for the Seychelles. The design—a coco de mer palm and a giant tortoise—remains in use today.

On Praslin I met France Jumeau, formerly the owner of the Vallée de Mai.

"I'll take you there," he said. "I sold it to the government a few years ago, but I still look on it as my . . . what shall I say? . . . my stepchild!"

I followed along a sunlit path through his estate to the bottom of a hill and climbed up mossy steps.

"This is primeval forest, left as it has always

been," Jumeau said, as the path abruptly entered a dark tunnel of trees. A recent rain-storm had left the ground damp, and the air was rank with decay. Somewhere a stream gurgled over hidden rocks, the only sound in a vast stillness.

As we pressed on beneath the canopy of pandanus trees, Jumeau suddenly seized my arm. "Hear that whistle?" he asked.

I listened intently. From far away I caught one or two silvery notes.

"That's the black parrot," Jumeau explained. "Ornithologists have a fancier name for it—*Coracopsis nigra harklyii*. It exists only on Praslin Island."

A few minutes later the rare bird darted overhead. With its dark-gray feathers and hooked beak, it was as somber and silent as the forest.

Gradually our path brightened, and soon we emerged into the filtered daylight of a grove of arboreal giants.

"We are here," Jumeau announced simply. "These are the coco de mer trees."

The great palms towered toward the sky, many of them more than 100 feet tall. At their very tops, the straight and elegantly slender trunks exploded into clusters of rustling leaves.

Stiff and fanlike, the leaves clashed and moaned in the light breeze. I easily distinguished the male trees, with their long, drooping catkins, from the female, which bore huge double fruits beneath their ten-foot-wide fronds.

Nuts Ripen for Seven Years

A female coco de mer tree bears no fruit until it is at least 25 years old, and even then full maturity is far away. While no one knows the life span of these graceful titans, several specimens in the Vallée de Mai are known to be in their second century of existence.

A nut does not ripen and fall until it has clung beneath its parent's fronds for seven years. Immature nuts contain a white, jelly-like substance much prized by the Seychellois. To Gordon, this was the "forbidden fruit" of Eden.

Splitting a green nut, I sampled some of the jelly. It was mild and sweet on the tongue. Then I gazed through the peaceful grove. There was grandeur here—and serenity.

The Garden of Eden? Perhaps Chinese Gordon had not been totally wrong after all.





*An army 160,000 strong prepares
to count noses across the land,
chronicling the growth and life
of the United States*

Census 1960: Profile of the Nation

By ALBERT W. ATWOOD
and LONNELLE AIKMAN

ONE bright Sunday morning last summer a whole town stepped out from homes and churches and stood in the square on Main Street. Then, from a helicopter overhead, a National Geographic photographer snapped the symbolic picture you see at the left.

In it the people of Poolesville, Maryland, obligingly pose in the hot sun to turn a dry statistic into flesh and blood. Their number (298) represents the population increase of the United States in approximately one hour—to be precise, 54.6 minutes.

Count Launched Every 10 Years

To keep track of this growth and to assemble an amazing array of facts about the people who cause it—who *are* it—the United States Bureau of the Census next April will turn Poolesville's residents back into a statistic. They will do the same in every town and village in the land.

Each year that ends in zero, the Bureau, biggest fact-finding organization in the country, faces again the fantastic job of physically counting, one by one, the entire population of the United States. Not only does it record numbers—the total is expected to exceed 180,000,000 in 1960—but it gathers billions of figures on family relationships, living standards, occupations, and ages, some sixty details.

For the 1960 census some 160,000 enumerators—men and women—will fan out across the country, over the new States of Alaska and Hawaii, the Commonwealth of Puerto Rico, the Panama Canal Zone, the Virgin Islands, Guam, and American Samoa.

They will knock at the doors of some sixty million homes, from thatched huts and discarded streetcars to luxurious penthouses and lonely lighthouses. They will visit monasteries, carnivals, houseboats, and the secrecy-bound communities where atomic research is conducted. They will call, of course, at the White House—and at every jail.

To satisfy the Nation's curiosity about itself, roving interviewers will trudge country roads, brave dark alleys, ride mules, row small boats, and bounce in jeeps and snowmobiles. They may journey by ferry, helicopter, or dog sled.

Hazards: Dogs, Turkeys, and Bears

If census experiences repeat, some will trip on rickety stairs, climb steeples, blow out tires, break axles, and become seasick. Some will be bitten by dogs or chased by turkeys. Others will meet bears or fall into creeks.

In 1950 one woman had to cross a stream by log to reach a group of mountain cabins. She made the trip twice and fell in both times.

There was the musically inclined census taker who bought an old violin he noticed hanging in a farmer's smokehouse. Experts at first pronounced it a Stradivarius, then dispelled the golden dream by finding it merely a fairly good fiddle.

Householders' doors have opened to scenes of birth and

Census taker on New York's Lower East Side questions a shopkeeper about her sales. Facts gathered from a sample of the Nation's stores go into a monthly report on retail trade.

Poker-wielding housewife and her dog challenge an 1880 census taker while children cower under the table. In that year all but 200 of the 31,387 interviewers were men; in 1960, 65 percent of the 160,000 will be women.

Since the head count began, dogs have regarded census takers as fair game, as shown in this old woodcut.



STETSON ARCHIVE





NATIONAL SCIENTIFIC PHOTOGRAPHY THOMAS J. REYNOLDS

death, violent quarrels, formal parties, and sudden fires requiring bucket-brigade service. The inquirers themselves have faced proposals of marriage and enough surprising remarks to keep the job interesting.

"So you're the man who increases the population!" was one housewife's greeting.

"That man you're hunting for is not my husband," said another when the census caller showed her his identification card.

"What man?"

"The man in the picture you showed me."

"That's a photograph of me," he replied.

Such incidents hint at the problems and compensations of a census taker. But for the most part the national roll call proceeds smoothly and efficiently.

Many citizens go out of their way to help census takers. In Alaska a housewife drove into town over dangerously icy roads to give her report because she feared the enumerator

could not get through. An elderly woman once walked seven miles to the district office at Macon, Georgia, to correct by one year the age she had given the "census lady."

Occasionally citizens refuse to answer questions. Some rebel because of temporary annoyance at the Government over a real or fancied grievance. Usually they cool off and give the requested information; or in any case, they do so when the enumerator's superior calls a few days later.

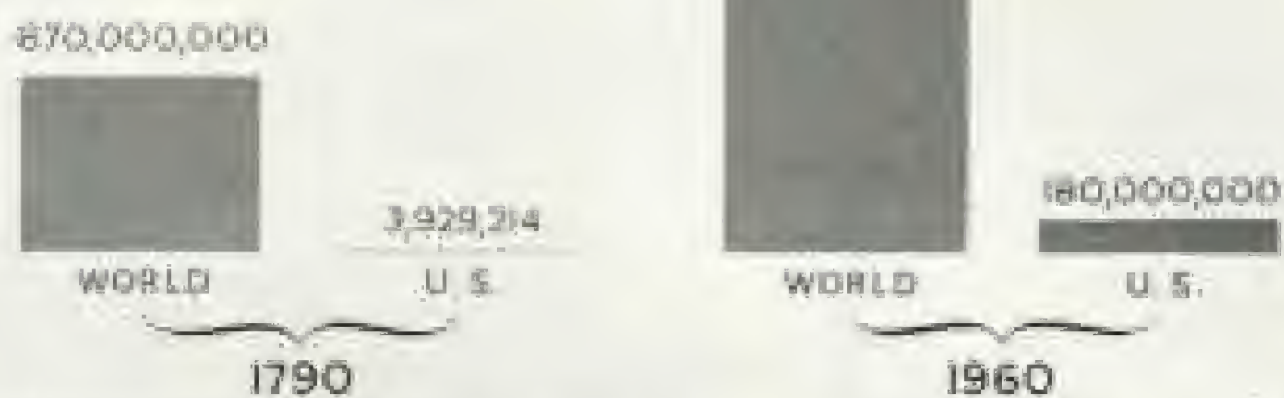
Heiress Located in Census Records

Adamant refusal to cooperate could lead to a possible 60-day jail sentence or a \$100 fine or both. But census authorities seldom need their legal powers. An explanation that personal identities vanish in the compilation of statistics usually ends resistance.

Moreover, answers collected remain confidential by law. Once in the files, informa-

World population shows a three-fold increase in 170 years, reflecting the gain of births over deaths. In the same period the U. S. total has multiplied 46 times. Tides of immigrants and a declining death rate have counteracted America's lower birth rate.

190 Million
180 Million
170 Million
160 Million
150 Million
140 Million
130 Million



1861 to 1890. High birth rate and increasing immigration vastly offset casualties in the Civil War.

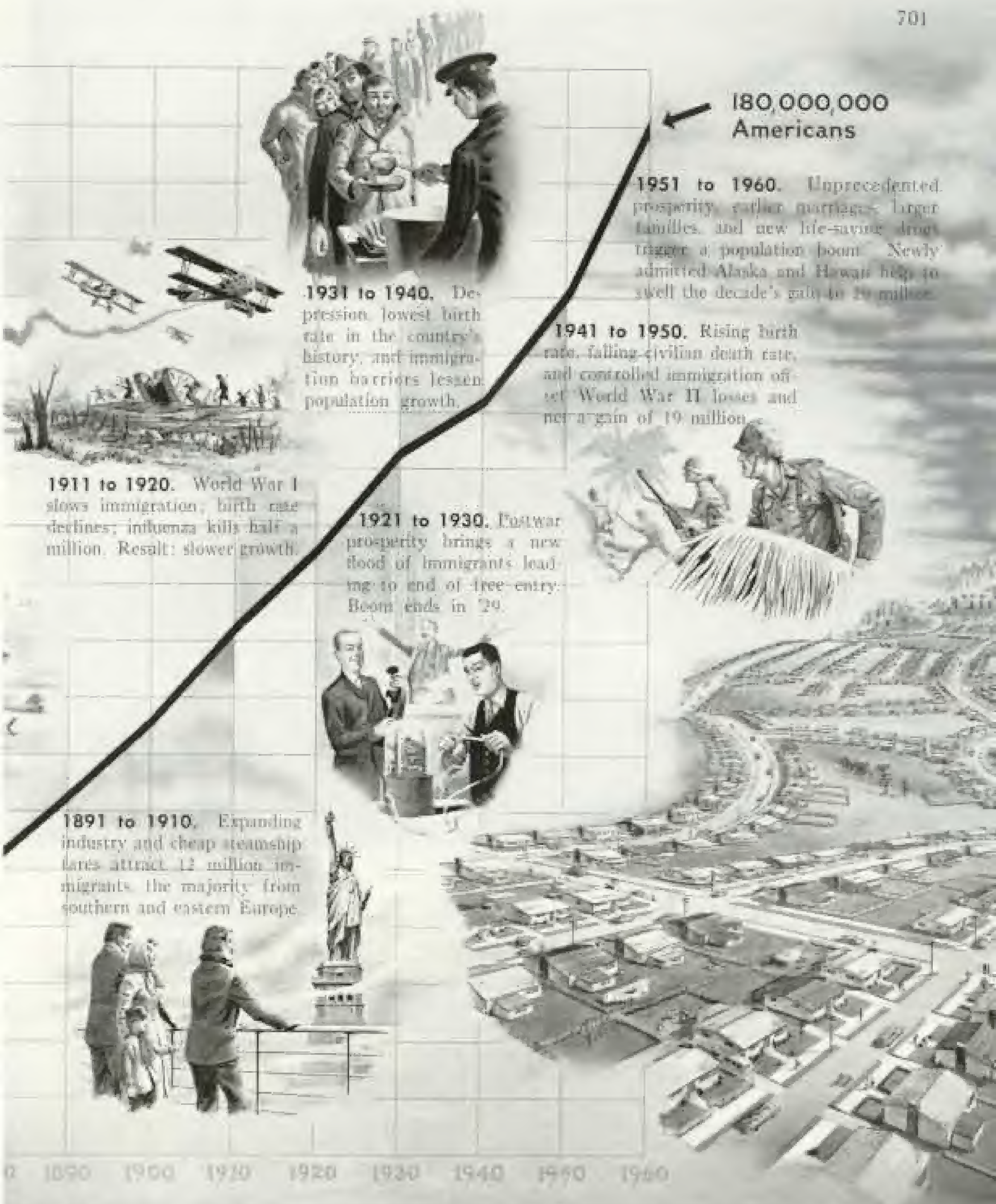
1790 to 1830. Early marriages and a high birth rate swell the young Nation's population. Boundless soil averts famines. America's isolated homesteads limit spread of epidemic diseases.



1831 to 1860. Famine in Ireland and unrest in Germany send 5½ million immigrants; other countries contribute 1¼ million.

3,929,214
Americans







1949

Trees blanket Langley Park, Maryland, a suburb of the Nation's Capital. Fingers of Washington's overflow growth already stretch out miles beyond the District of Columbia line. New Hampshire Avenue carries two lanes of traffic across narrow University Boulevard.

tion is released only to the person directly concerned or his legal representative; or, in case of death, next of kin or the administrator of the estate. Not even the President, the FBI, or tax-collecting agencies can tap census records for their own purposes.

On rare occasions, however, specific details have been given to qualified authorities when it was apparent they would be to the interest of a person whose whereabouts was unknown. In one recent instance, the heiress to a fortune could not readily be located. Through a search of census records she was found living in modest circumstances, unaware of her inheritance. She received a check for nearly half a million dollars.

Much more than a nose count, the census

includes questions dealing with a wide variety of subjects. The sixty-odd questions to be asked in 1960 cover two broad categories—housing conditions, and the personal and family characteristics of the population. In addition, an agricultural census being taken this fall will help round out the picture.

Whatever else is on the list, a count of U. S. citizens every 10 years is required under the Constitution. With the first census in 1790, the Founding Fathers provided for an individual, nationwide tally to keep State representation in Congress up to date.

The 1790 census obtained little more than the number of free white men and women, plus slaves, in each State. As the country's interests and economy expanded, Congress



PAUL DEBAMMETER, III.

1959

Shopping centers and housing developments displace trees; highways double in width. Following a national trend, Washington's suburbs grow much faster than the city. Between 1950 and 1957 New York's suburbs gained 55 percent, while Manhattan Borough lost

authorized further statistical explorations. The first record of manufactures was made in 1810. Farming, mining, and fisheries were investigated in 1840. Inquiries about income first appeared 100 years later, in 1940. Although objections were raised at first, they have become an accepted and valuable source of information.

To speed the staggering task of the 1960 decennial census, authorities have developed a new do-it-yourself technique. Late next March, paper forms will be mailed to all households and lived-in institutions under the American flag. The recipients will be asked to fill in the blanks: name, address, relationship to head of household, date of birth, race, sex, marital status, and type of home—house,

apartment, trailer, coal barge, or whatever.

Then the enumerators will call in person to check and collect the answers. The innovation will not only save interviewing time, but also will allow for family or group consultations that will make replies more accurate.

While picking up these questionnaires, the census legmen will leave other, more detailed forms—to be returned by mail—at every fourth home. This procedure follows the Bureau's modern sampling practice, based on the axiom that you don't have to eat all the soup to know how it tastes.

The 45 sampling questions will highlight such personal details as the amount of education, number of times married, occupation, and income. Housing queries will disclose

how Americans live today in terms of the number of bedrooms and the presence or absence of hot and cold running water, telephones, television, heating systems, elevators, and washing machines.

"Everything but the kitchen sink?" That item was omitted as needless, since the 1950 survey showed that virtually all city dwellers and more than half the farm families owned one.

Clock Ticks Off the Nation's Growth

The nerve center of all census activities throbs in two huge buildings at Suitland, Maryland, just outside the Nation's Capital. There more than 2,000 men and women use the latest electronic devices to produce assembly-line figures that show the changing forms and facets of American life.

Quietly clicking and blinking away in the entrance lobby of one of the headquarters buildings is a duplicate of the famous Census Clock on display in the downtown home of the Department of Commerce (opposite).

It looks a bit like an upended pinball machine as colored lights flash across its face, symbolizing the plus-and-minus human equations of birth and death, immigration and emigration. Above, the net result of the sum is recorded on a perpetually turning population meter: one more person every 11 seconds.

Actually, this statistic is only an educated guess, or "projection," as Bureau people prefer to call such estimates. But the figures are so carefully calculated from up-to-date records and logical probabilities that the Bureau's total population estimate for 1950 came within one-tenth of one percent of the door-to-door nose count.

To those who think all statistics are dull and of concern only to readers of musty reports, Dr. Robert W. Burgess, Director of the Census and former professor of mathematics at Brown University, offered some clarifying information.

"Our staff people are not only statisticians," he said. "Many of them are also trained in economics, education, civics, the social sciences, and psychology. We deal in so many different kinds of facts that you might say it takes a college faculty to handle it all. Even we are sometimes surprised at the number of ways people use our findings."

New factories, schools, supermarkets, and hospitals are built because of what census figures tell about concentrations of people,

their needs and wants. Employment figures, housing, and health reports guide legislation. Federal aid to States and State assistance to cities are based largely on population. Export-import facts assembled by census shape national trade policies. War's military and industrial mobilization depends on knowing about available people and skills.

Visitors to Bureau headquarters this fall find preparations for the 1960 decennial overshadowing everything else.

"The 10-year counts are our biggest jobs," one of the director's assistants explained. "We've been getting ready for this one for nearly three years. To select the questions, Dr. Burgess traveled all over the country for conferences with his advisory committees and interested government and business groups."

Planning a national census is a little like organizing a military campaign. It involves setting up a chain of command, mapping terrain, and solving complex problems of logistics—the science of getting people and supplies together at the right time and place.

Over-all strategy is decided by the supreme command at Suitland and carried out through 17 regional offices. To make the 1960 survey, regional directors will set up some 400 district offices, each to be headed by a temporary district supervisor. The supervisors will recruit a total of about 10,000 crew leaders, who in turn will see that the 160,000 enumerators are ready to take off as foot troops on April 1, when decennial D-day dawns.

Job Looses Blizzard of Paper

For ammunition, Operation Census will use printed instructions, reports, and questionnaires turned out in multiples of millions. Already, a central supply and processing office is busy at Jeffersonville, Indiana, where incoming carloads of papers and portfolios will be sorted, packaged, and sent on to district and local subdivisions.

Training enumerators to get accurate and essential facts in the first place is the responsibility of crew leaders, who are themselves coached in census definitions and needs by instructors sent out from headquarters. Each crew leader holds classes for his own group of 15 to 18 prospective enumerators, using official lecture guides, film strips, and record players, to show how the public should, and should not, be interviewed.

For people who have had no teaching experience, the leader's job can be a tough one.



NATIONAL GEOGRAPHIC PHOTOGRAPHER HAYES SETTLENALES

Each $7\frac{1}{2}$ Seconds the Census Clock Flashes a Light: an American Is Born! Standing in the lobby of the Department of Commerce Building, Washington, D. C., the population meter gives a running count of births, deaths, immigration, and emigration. Each 11 seconds the figure at the top shows a net gain of one person. Reflecting Census Bureau estimates, the total is close but not exact. Next April 1 the meter will register 180,000,000. Adjustments will be made after the new census.



As for the students, some drop out rather than face such complicated situations as unraveling relationships in a household of 18 people—including aunts, cousins, grandchildren, wives, husbands, and in-laws.

Tact and common sense are not listed among a census taker's qualifications, but they are no less essential than the specified good health and high-school education.

Questioning a housewife's age, for instance, can be a ticklish matter. When the information is not forthcoming or is obviously out of line, as when a woman reports a daughter nearly as old as herself, interviewers are expected to make estimates. Some extract the correct birth date by musing aloud on a much higher age than seems likely.

"Describing jobs is another problem—sometimes amusing," said David L. Kaplan, Chief of Occupation Statistics in the last census. "Among some 300 categories you'll find egg breakers, who do just that in mass-production bakeries; the thumb cutters and elbow patchers who work in glove and clothing factories; the screen ape, who tends the shaking screens, or tables where newly mined coal is sized; and the whistle punk, in the lumber industry, who relays the foreman's orders by blowing signals on a whistle."

Wherever possible, census officials fit the enumerator to the district: a college pro-

fessor's wife in a university town, or Spanish- and Chinese-speaking people in Puerto Rican and Chinatown sections of New York and San Francisco.

During the last census an Indian guide was assigned a remote mountain area in southern Utah. He was gone a month, but had every name covered when he came out.

An enumerator sent to a nudist camp in 1950 was denied admission—too many clothes. The problem was finally solved by hiring an interviewer who was willing to follow the customs of the community.

Many Forget to Mention the Baby

In an undertaking as vast and complicated as a decennial census, it is impossible to reach everybody. The Bureau estimates that it missed at least 2,000,000 people in 1950. Perhaps they were on the move as migrant farm workers, or were changing rooming houses, or were simply away from home, day and night, each time the enumerators called.

Babies, curiously, are often not reported as members of the household.

"What's that?" asked one interviewer as a wail issued from a back room. The family had forgotten its nontalking, nonwalking latest addition.

On the other hand, the census taker cannot count an infant born after April 1. The law

Map Men in Stocking Feet Plot Census Districts

Census officials divide the country into 250,000 districts, ranging in size from a single apartment building to hundreds of square miles. A staff of more than 400 employees, at headquarters and in the field, prepares a separate map for each district. Based on aerial photographs, building plans, and surveyors' charts, the sheets show each dwelling to be visited.

Here geographers making such maps pore over source materials in the Census Bureau at Suitland, Maryland. Man in foreground locates district boundaries on a carpet-sized plan of Sacramento, California. To spare the paper, he removed his shoes.

The Society's headquarters in Washington, D. C., shows on the census taker's map. Because it is not a home, it will not be visited.



NATIONAL GEOGRAPHIC PHOTOGRAPHY BY JESSE LITTLEDALE (HOUSE) AND THOMAS A. BRIDGEMAN



Great-grandfather seeks information about himself. James C. Kelly, 86-year-old immigrant from England, consults Ruth Fitawater, a clerk at Suitland, regarding his status in a previous census. Confidential files help those lacking birth certificates to qualify for passports, pensions, and citizenship. Mr. Kelly, a resident of Washington, D. C., has 9 children, 20 grandchildren, and 9 great-grandchildren.

asks for a population figure as of that date, and any deaths and births occurring afterward must wait till the next time.

The Departments of Defense and State and other Federal agencies cooperate with census by forwarding questionnaires to military families or to civilians assigned abroad. Through the Maritime Administration, masters of ships in port and on the high seas collect the necessary information from crews and officers.

Transients Sought in Special Hunt

Next year, on the night before D-day, and again 10 days later, two great nocturnal hunts will be carried out all over the country.

On March 31, called T- (for transient) night, census representatives will descend

on hotels, motels, trailer camps, YMCA's—any place housing temporary lodgers. In addition to conducting personal interviews, they will distribute "T-cards" to be filled in by incoming and outgoing guests.

The other supplementary hunt, on M- (for mission) night, calls for special ingenuity and tact. Then squads of enumerators will comb skid-row flophouses, mission shelters, and the shantytowns on the edges of cities. In 1950 more than 1,250,000 transients and flouters were counted across the country.

An average enumerator finishes his job in 10 days to two weeks. By the end of the month virtually all cards and questionnaires are in. Then comes the hardest part.

Before today's billions of living facts can be marshaled into neatly printed tables of statistics, they must be microfilmed, converted to electrical pulses, and shot through intricate machines. Indeed, without automatic equipment the national head count

would have choked to death long ago on its own undigested paper work.

The original census report of 1790 was published in a 56-page booklet dealing with fewer than four million people (page 713). By 1880, when the population had passed 50 million, the information filled 22 volumes with a total of more than 17,000 pages and took seven years to tabulate by hand. By then the figures were out of date, and it was almost time for another census.

In digging out of the predicament, two inventive census employees—the late Herman Hollerith and James Powers—created tools that not only revolutionized census procedures, but laid the foundation for the modern business-machine industry.

Between the mid-1880's and 1910, Hollerith and Powers developed ingenious punch-card systems that automatically sorted and computed facts and figures by code arrangements of holes in paper cards.

Both men went into private industry soon after the success of their inventions, and founded separate enterprises that still lead the field in producing increasingly versatile business and scientific machines.

Electronic Brains Meet 1960's Challenge

Their punch cards, however, had given the census a new flexibility. Improved and multiplied, they slashed processing time for decennials from years to months. Punch-card machines served through 1950 and are still used on other projects.

The challenge of 1960 will be met by the latest and fastest electronic devices. And again the Census Bureau pioneered. During

the 1950 count its technicians made trial runs of the world's first Univac (universal automatic computer), built to census specifications on advice from specialists at the National Bureau of Standards.

Univac can add, subtract, multiply, and divide at speeds ranging from 250 to 5,000 calculations per second.

Univac I performed so well that the Bureau acquired another a few years later. Yet even these lightning computers could not cope with the mountains of information expected next year. So two larger and even faster Univac models have been installed at Suitland.

Together with auxiliary aids—plus two more Univacs to be operated under contract with the University of North Carolina and the Armour Research Foundation of the Illinois Institute of Technology—the new team is ready to put its electronic brains to work on a project that would have taken manual work-

Fabulous Fosdic Writes 180,000,000 Biographies on Magnetic Tape

Robert W. Burgess, Director of the Census Bureau, shows an enumerator's work sheet to Bertie Lee Rogers, a clerk at the Bureau's Suitland headquarters. Fosdic will read the sheet in microfilm form and relay the facts to Univac (page 711).

NATIONAL GEOGRAPHIC PHOTOGRAPHY THOMAS WEBER

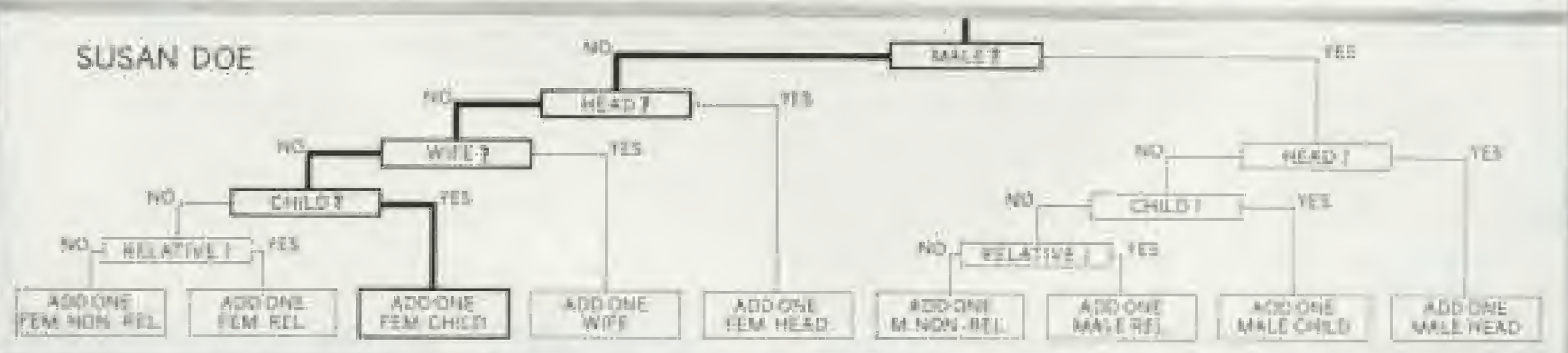
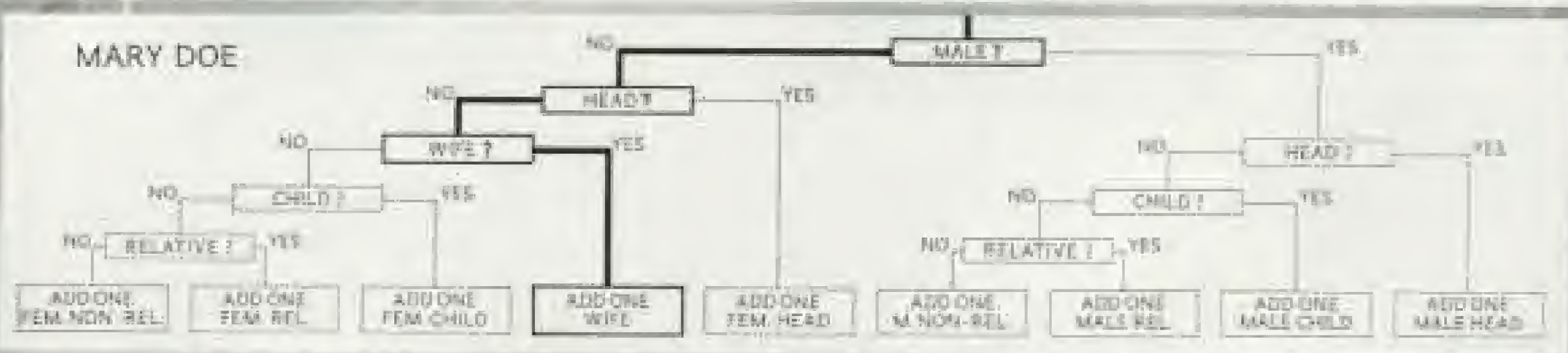
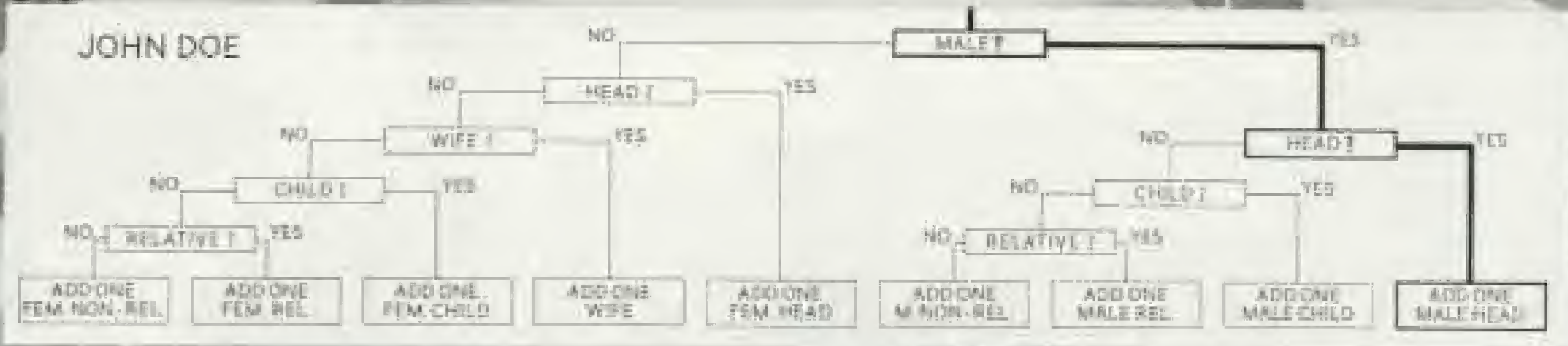




STEP I

Census takers record data on work sheets such as this one, which describes the mythical Doe family. On the top line the enumerator lists the head of the household. Next he jots down the other family members and fills in circles to show their relationship, sex, race, age, and marital status. Every fourth family gets a detailed questionnaire for return by mail.

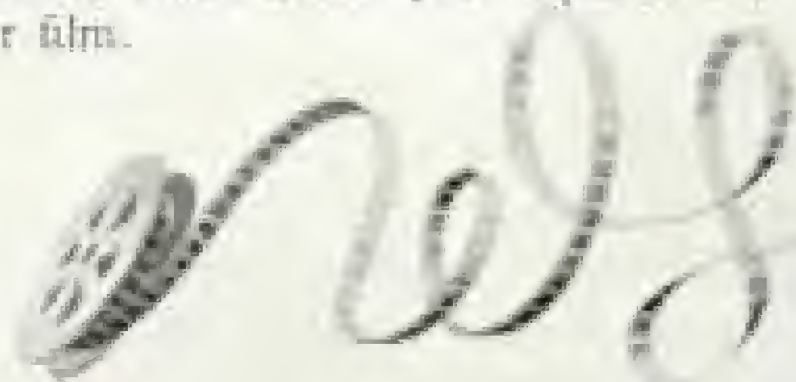
Man's Electric Slaves Analyze Census Data With Lightning Speed



STEP 2

Thirty cameras at Jeffersonville, Indiana, photograph the work sheets. Microfilming shrinks each 15-by-17½-inch sheet to a bit of acetate no bigger than a thumbnail.

For the entire Nation, the job requires 950 miles of 16-millimeter film.



STEP 3

Fosdic, an electronic scanner, translates microfilmed pencil marks into the language of electronic computers. Using a cathode-ray tube similar to television's, its cyclopean eye reads two microfilmed work sheets a second and registers each fact on tape. When this step ends, John, Mary, and Susan Doe become invisible magnetic dashes on a strip of tape. Four Fosdics will be installed at the Census Bureau's Suitland, Maryland, headquarters. They eliminate the punch-card machines used in 1950 to feed census data to computers. Each is expected to do the job of 500 punch-card operators and cut months off the time needed to get census information ready for computer analysis.

Susan Mary John



STEP 4

Univac, a giant brain, counts and classifies the people symbolized by dash patterns on magnetic tape transferred from Fosdic. Although it reads 20,000 characters a second off the tape, Univac cannot think. Instead, the computer depends on coded instructions fed into its memory by its mortal masters.

Univac makes only one of two choices at a time. Its answer must be "yes" or "no"; it cannot be "maybe." Charts on the opposite page illustrate the process.

Obedient memorized orders, Univac asks itself questions when it considers the magnetic dashes representing a person. Question one: Is the person a male? For John Doe, the answer is yes. Then Univac asks question two: Is he head of a family? The answer—yes—tells Univac to add one male family head to the running total in its memory. Univac asks the questions again when it sees the dashes representing Mary Doe. The answers—no—lead to a third question: Is she a wife? The answer—yes—leads Univac to add one to its count. By the same question-and-answer method, Univac records Susan as a daughter.

Each Univac decision takes 17-millionths of a second. In six minutes the computer can digest the data from 1,200 census work sheets, each covering one to twenty persons.

Four Univacs will analyze the 1960 census. Every Fosdic tape will run through the computers until billions of facts are stored on summary tapes for the high-speed printer (right).

STEP 5

Two high-speed printing machines at Suitland turn out tables of statistics at the rate of 600 lines a minute. Electrical impulses obeying the orders of magnetic tape drive invisible keyboards. Offset lithography later reproduces the tables in bound volumes. Sample table below reduces John, Mary, and Susan Doe to digits in a column of figures and brackets them according to age. The totals below are Census Bureau projections for 1960.



TABLE 1. CHARACTERISTICS OF THE POPULATION

SUBJECT	1960	1950
	TOTAL	
BOTH SEXES	180,125,000	151,663,000
UNDER 5 YEARS	19,891,000	16,320,000
5 TO 9 YEARS	19,159,000	13,299,000
10 TO 14 YEARS	17,217,000	11,144,000
15 TO 19 YEARS	13,408,000	10,680,000
20 TO 24 YEARS	11,311,000	11,620,000
25 TO 29 YEARS	10,946,000	12,514,000
30 TO 34 YEARS	11,676,000	11,612,000
35 TO 39 YEARS	12,434,000	11,298,000
40 TO 44 YEARS	11,549,000	10,271,000

ers of 1880 a quarter of a century to complete.

"These machines can't think," remarked James L. McPherson, Machine Development Officer at Suitland. "But they religiously follow instructions, store information, and report what we want them to. They even call attention to mistakes."

To laymen like the authors the accomplishments of these machines seem miraculous. Walking through a series of processing rooms, we saw long lines and clusters of metal cabinets faced with glass panels behind which tiny multicolored lights blinked incessantly. Inside were whirling reels of magnetic tape, tangled coils of colored wires resembling dyed spaghetti, and rows of vacuum tubes, transistors, and other devices that guided and controlled the racing surges of electrons—lifeblood of all operations.

Fosdic Feeds Data to Univac

Simply stated, the machines are grouped into three major units—Fosdic, Univac, and the high-speed printer (page 711).

Information processing starts with Fosdic (film optical sensing device for input to computers). Fosdic scans microfilmed copies of enumerators' work sheets and converts the marks on each tiny frame into magnetic-tape pulses (page 709).

Operators then feed the tape into Univac. Its pulse patterns are inspected, analyzed, and classified to give the totals for relationships, say, among age, sex, and marital status of selected groups.

The results, recorded into still more pulse combinations on a third tape, go into the high-speed printer.

We watched with awe as the printer transformed pulses on this tape into statistical tables, including printed words as well as figures, unreeling on sheets of paper ready for publication as final census reports.

In a practical demonstration, we watched a programmer feed tapes for a western city of 90,000. From Fosdic to high-speed printer, the whole process took less than two hours.

Errors? To see how these are caught, we stood beside an electronic typewriter set up beside the computer operator's console. From time to time, the machine automatically typed out code symbols, of which we understood only one—"T failed."

"It works like this," Mr. McPherson explained. "T stands for tape, and its failure may mean any number of problems—perhaps

malfunction within the machine or an incomplete pattern of magnetic pulses presented to it. By pressing buttons to make the machine back up and try again, the operator can usually correct the trouble.

"For more specific messages, the programmer may set the computer's responses so that it types out a code warning when it receives a nonsensical pattern.

"The initials MS-20-D-age—10, for instance, would tell the operator that an illogical situation is reported under marital status—20 divorcees aged 10 or less."

Until its last tape has unwound and its last report has been printed, Census 1960 will absorb most of the Bureau's mechanical and human energies. In all, the mass of tabulated information is expected to fill more than 100,000 pages.

But decennial or no, other surveys—big and little, conducted by mail or by interview—constantly roll off the Bureau's assembly line (page 698).

The 1959 *Statistical Abstract of the United States*, which includes material from other Government and private agencies, offers more than a thousand pages of small print on subjects that range from recreation and education to politics and taxes.

In this and other census summaries you can find such widely assorted items as the number of children adopted in a given year, the amount appropriated for atomic energy research, and the total of unmarried female bus drivers between the ages of 20 and 34.

Some Towns Pay for Special Censuses

If the details you need have not been published, they may be unearthed from a storehouse of information on hand but too esoteric for general presentation. Work pressures permitting, and for a cost-covering fee, census authorities can produce such data as the number of aspirin tablets shipped in 1957 from New York to Calcutta in a certain Dutch vessel.

Fast-growing towns and cities frequently use the Bureau's facilities (also at cost) to take special censuses. Nearly 500 California communities have paid to have their residents counted in the past 10 years.

One of the Bureau's most personal services is the age search, an assignment that often calls for keen detective talents (page 708).

Before the early 1900's, birth registrations were incomplete or nonexistent in many States. Then came social security legislation and a

spurt in private pension plans. Evidence of age suddenly became a prime necessity.

"I was born in 1873 [or '97 or '92]," thousands of desperate Americans write in effect to census headquarters. "But I can't prove it. Can you?"

Sometimes it is easy. Records might disclose, for example, that the applicant lived with his family on a farm outside Philadelphia and was five years old when the census was taken 60 years ago.

Such facts come to light quickly if the inquirer remembers his exact address during a specific census, for the returns are filed not by name, but by the city block or rural section each enumerator has visited.

It's another story when the applicant not only has no idea of where he was at census time, but can give the searchers only the vaguest clues as to the time of his birth.

"They've told us they were born in the year of the Big Fire or the Great Dark," reminisced Milton D. Swenson, long-time Chief of Personal Census Service.

"Assuming that meant San Francisco or the year of an eclipse, we've sometimes gone on from there to turn up the information needed."

Soundex, an ingenious index system in the census field office at Pittsburg, Kansas, contains more than 230,000,000 names in a mile and a half of card cabinets. The cards are filed in coded groups by the way the names sound, so that misspellings and mispronunciations cannot mislead the searchers. Indexers turned up the name Albert Atwood in less than two minutes.

Nine Feet of Books: 1950's Report Takes the Country's Measure

Author Atwood holds a copy of the 56-page booklet that sufficed for the first census. The 1790 tally was simply a nose count that told how many white men and women, plus slaves, lived in each State. The 1960 census will fill about 100,000 pages in more than 100 bound volumes—a 10-foot stack.



Thanks partly to these cards, together with other census clues to the past, millions of people have been able to obtain not only pensions, but passports, citizenship, jobs, and insurance payments.

"You've restored my faith in the Government," wrote one recipient of a birth record.

"I could hardly believe my eyes," another acknowledged. "The wonder of it. . . . And thank you again for all the work it must have taken to dig me up."

Westward Expansion Continues

Thus, between the lines of stark black-and-white statistics crowd the faces of ever-multiplying masses of human beings.

This rising tide still flows westward. In 1950 the population center of the United States was eight miles northwest of Olney, Illinois. Even without the 10-year increase, the new States of Alaska and Hawaii push it 17 miles farther west.

Census forecasts indicate that 1960 returns will underline many other familiar trends and confirm some only hazily suspected.

American families steadily grow bigger. The "baby boom" that began in the forties and speeded up in the fifties has now buried concern over "national suicide." Somewhere between the jumbo-sized crop of the frontier era and the only child or none of the depression years, today's families increasingly include two, three, and often four children.

Paradoxically, composite America grows both older and younger. This is due primarily to the relatively low birth rates from 1900 to 1942, as compared with those before and after that period. Life expectancy for women jumped from 48 years in 1900 to 73 in 1950. Less spectacularly, it rose for men in the same period from 46 to 67 years.

For marriageable girls, the future looks steadily darker—except in a few States, especially Alaska, where men are not only men but there are more of them. The 1960 census is expected to find about 500 single men to every 100 single women in the 49th State.

In the United States as a whole, the male ratio has gradually declined since 1910, even though more boys than girls are born year

after year. In 1950, for the first time, women outnumbered men. Next year their lead will approach 2,000,000.

As the second half of the 20th century gets under way, the census portrait of life in America bears almost no resemblance to that of only a few generations ago (diagram, page 700). In fact, it shows changes taking place so swiftly that most people are hardly aware of them.

Big cities, for instance, seem more and more congested with traffic jams and new apartment houses. Actually, many hold no more population than they did 10 years ago—some even less. The answer lies in expanding suburbs (pages 702 and 703).

More than 60 percent of us are urbanized and suburbanized. Independent farms grow fewer. Big mechanized ones increase, and hire fewer workers. Multiple machines take over office and industrial drudgery.

Women today make up 32 percent of the total working force. More than half of them are married. Two-income families, plus larger wages, salaries, and profits in spite of inflationary squeeze, have pushed American standards of living to new heights. Census graphs reflect this as they record increases in the numbers of individual homeowners, of vacation cottages at the beach or in the mountains, of two-car families, of food freezers and air conditioners.

Census Sheds New Light on Problems

Education levels continue to mount. "Illiteracy dropped so low that we stopped covering it in the decennial censuses after 1930," said Dr. Henry S. Shryock, Jr., Assistant Chief of the Bureau's Population Division. Illiteracy is covered, however, in other reports.

Census figures reveal our problems so that something can be done about them—problems of city slums and rural stagnation; of chronic unemployment, in some places, and illnesses that still resist medicine's modern miracles.

Year in and year out, the Census Bureau draws a portrait that has its own special fascination for Americans. For like the fairy-tale "mirror, mirror on the wall," it shows us the way we are.

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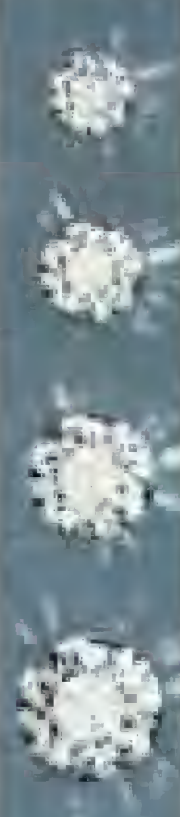
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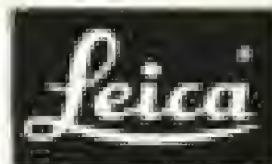


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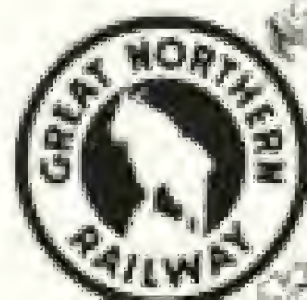
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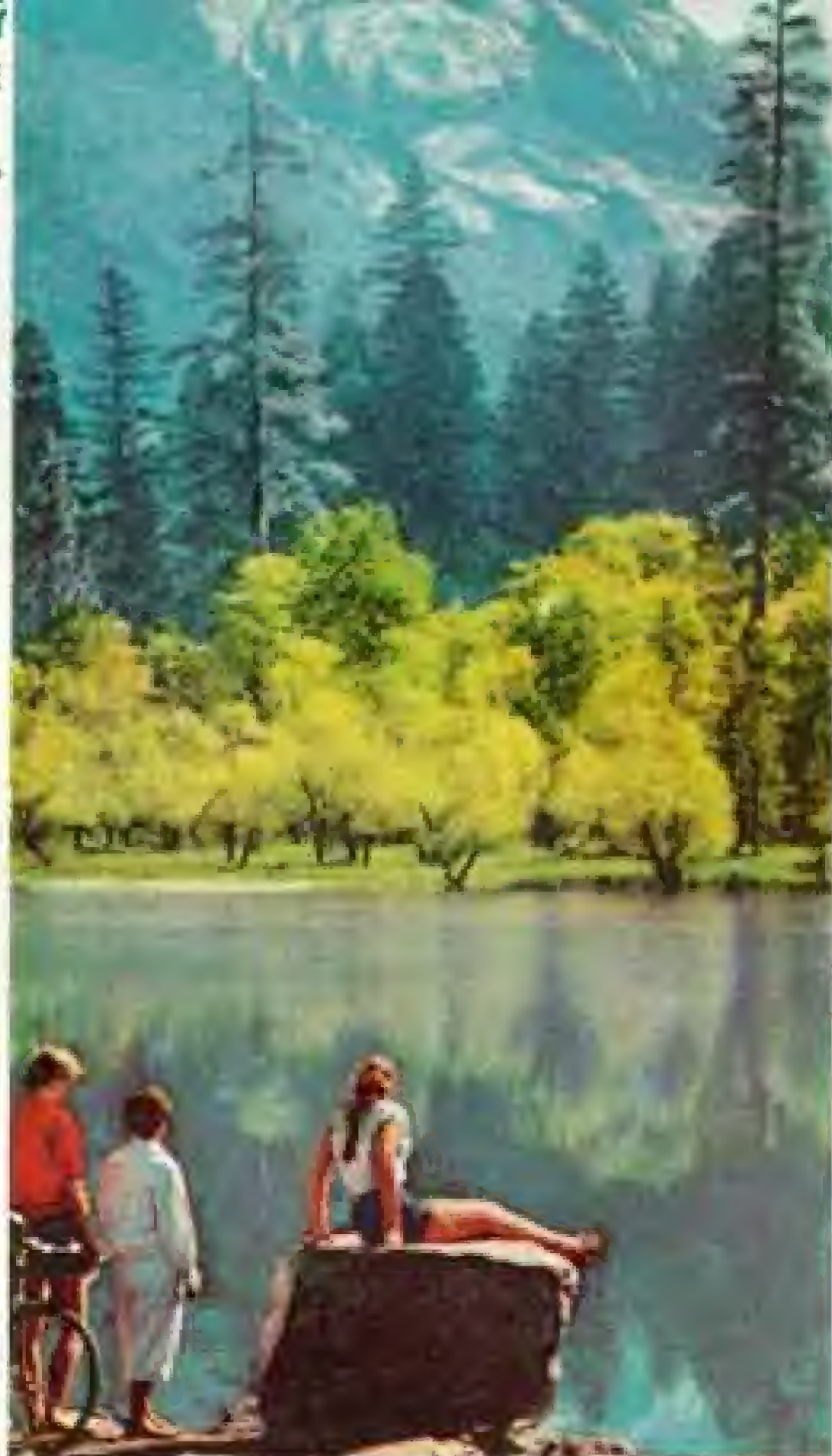
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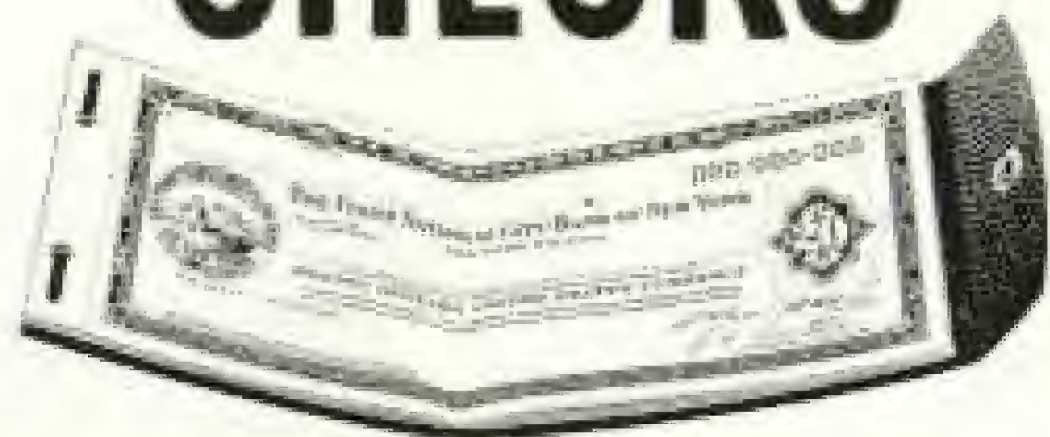
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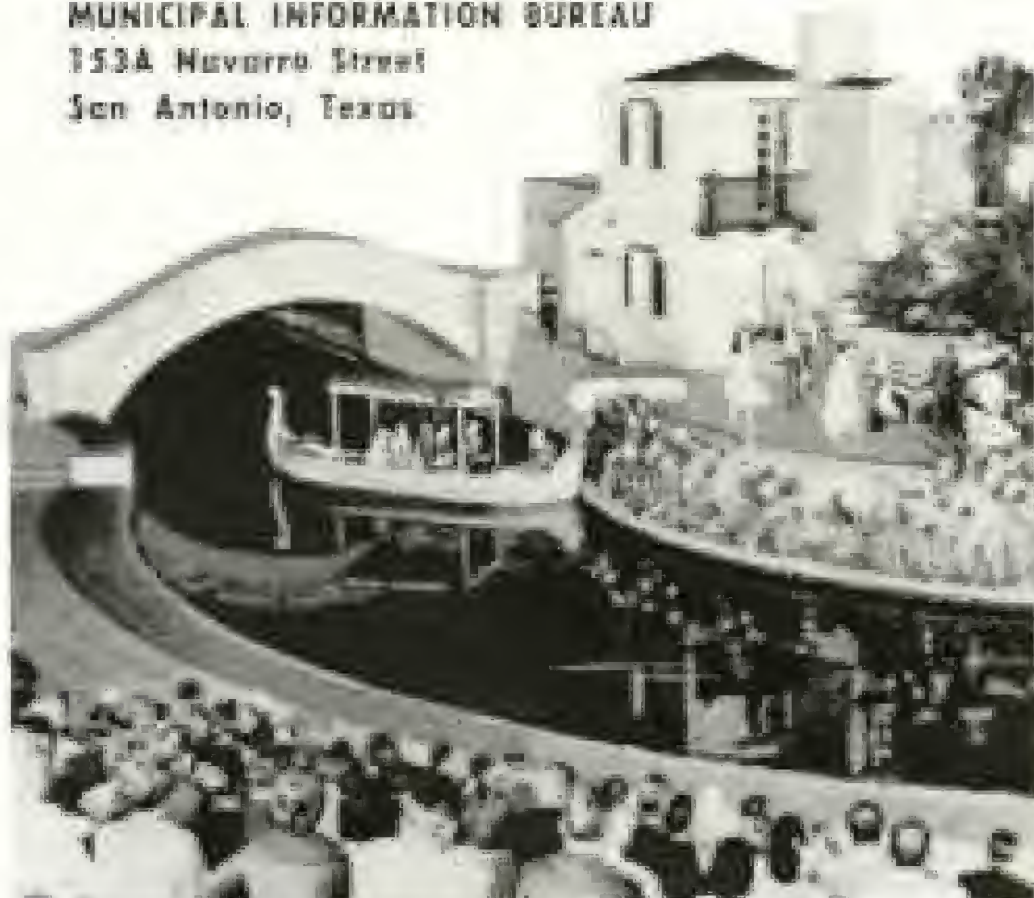


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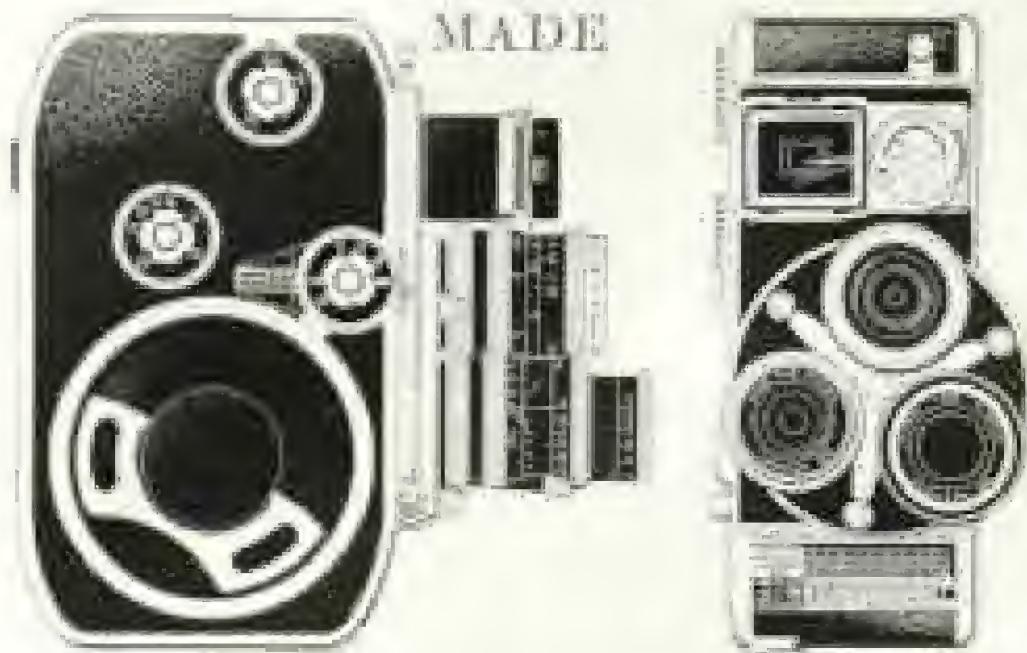


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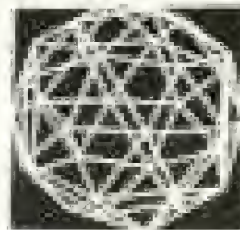


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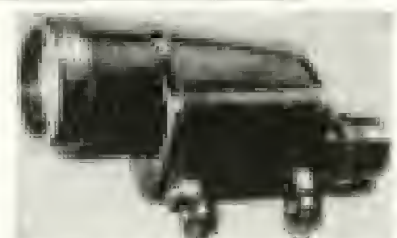


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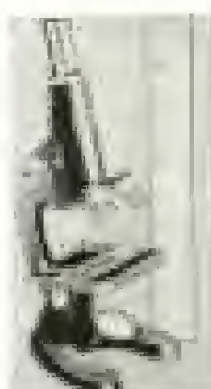


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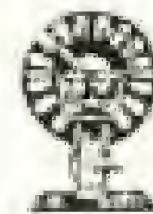
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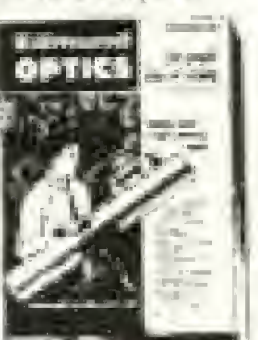
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