VOL. 136, NO. 5 NOVEMBER 1969

NATIONAL GEOGRAPHIC

SEE "SIBERIA: THE ENDLESS HORIZON," TUESDAY, DEC. 2, ON CBS TV (page 734A)

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

COVER: An epic comes to life on the Indonesian island of Bali as villagers enact the story of a monkey army that saved a princess (pages 658-9).

How INA is working to mend lives.

Jack McWilliams was a nurseryman until a fall from a tree put him in the hospital. The diagnosis: a fractured spine. He'd probably be paralyzed for life.

Jack was insured by Insurance Company of North America. And INA's innovative rehabilitation program called MEND was ready to help him.

Within days after the accident, INA had specialists start McWilliams' treatment. Including long range psychological counseling to give him the confidence in his future that we had.

We had a specially trained MEND nurse begin looking after him and his family to make sure their essential needs were filled, their immediate expenses met. She helped them shoulder the emotional strain.

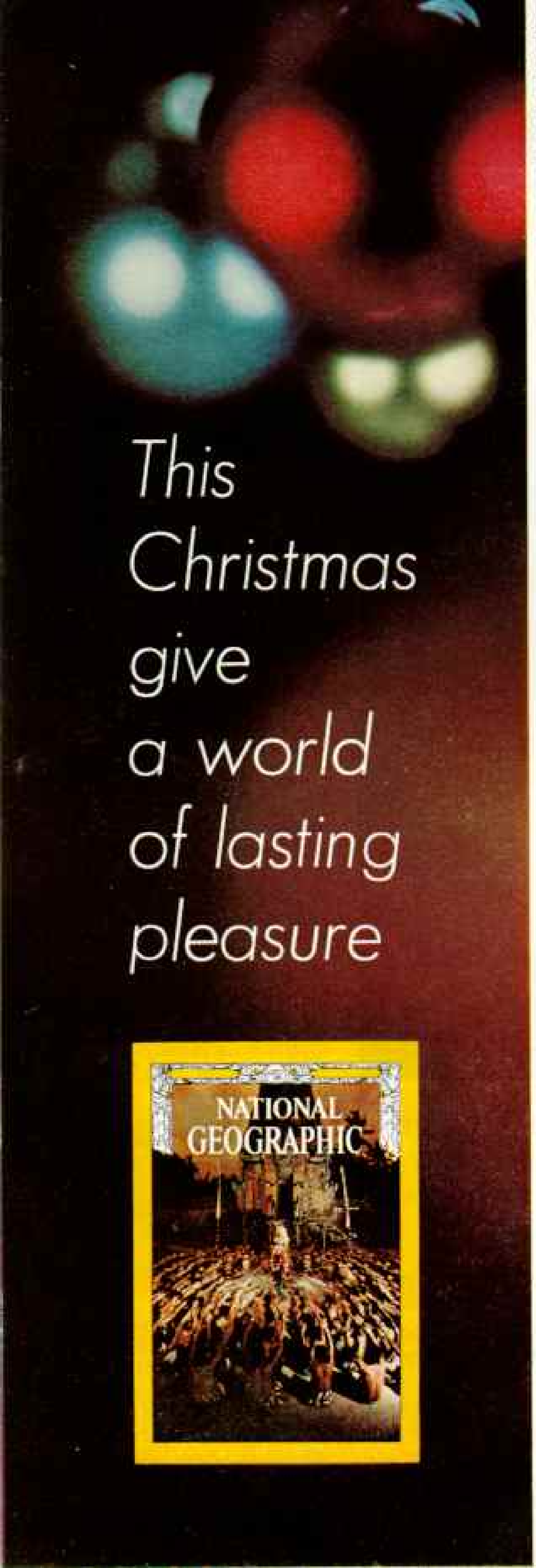
Jack's treatment isn't finished yet, and he and INA are still working on his rehabilitation. But now he has a new occupation: he's opened a kennel to breed and train Irish setters. He's on the road back to independence.

That's the heart of the MEND concept. And the way INA's already helped more than 8000 disabled people.

It's part of using our imagination to help others.

IMAGINATION

Insurance Company of North America, 16th and Parkway, Philadelphia, Pennsylvania 19101



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You are now ready to shoot up to 40 flash pictures, without stopping to put in a flashbulb.

As you focus, louvers in the flash unit automatically adjust to deliver the exact amount of light you need. You depress the shutter and zoing! the strobe releases a 1/1000th of a second burst of light, fast enough to freeze a juggling act or capture the wildest dancer at the party.

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As you focus, louvers adjust automatically to insure correct light intensity.

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The electronic timer beeeeeeeps.

hand jiggles, you don't have to worry. The pictures are always razor sharp.

You'll never have to use another flashbulb (so you'll never run out of them!). Let's say you're having a party. You take 40 pictures. One last shot? Plug in for 15 minutes and you can shoot another pack.

1/1000th of a second exposure makes possible spontaneous flash pictures.

Plug it in for an hour, it's recharged. When you're not using it, just keep the flash unit plugged in, like your electric toothbrush.

Best of all, The 360 gives you the freedom to shoot when the moment is right.

You'll get perfectly exposed shots, indoors or out. This remarkable strobe light is particularly kind to flesh tones. Outdoors, the sophisticated electric eye and electronic shutter system will read the light and set the exposure automatically.

You won't waste any more pictures because of poor timing. You set the timer correctly and let it worry.

No flashbulbs ever. Electronic flash shoots up to 40 pictures, recharges on house current.

One fascinating feature will give you an inkling of the ingenuity that went into this camera. In the timer, the shutter and the flash unit are circuits containing transistors, resistors, and other electronic components. Each would normally fill a space as large as a deck of cards. In The 360, they have been reduced to tiny chips of plastic-covered silicon less than 1/32 of an inch square, about the width of a pencil point.

This Polaroid Land camera has a Zeiss Ikon range- and viewfinder. Triplet lens. Four film-speed settings. Two exposure ranges for color, two for black-and-white. It can take Polaroid camera attachments for close-ups and portraits. It has a tripod socket. And instant pack-film loading.

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Center: Ivory rose: Earrings $16.50. Necklace $10.50. Earrings $14. Brooch $22. Twin leaf motif: Earrings $15* and $19.50. Brooch $12.
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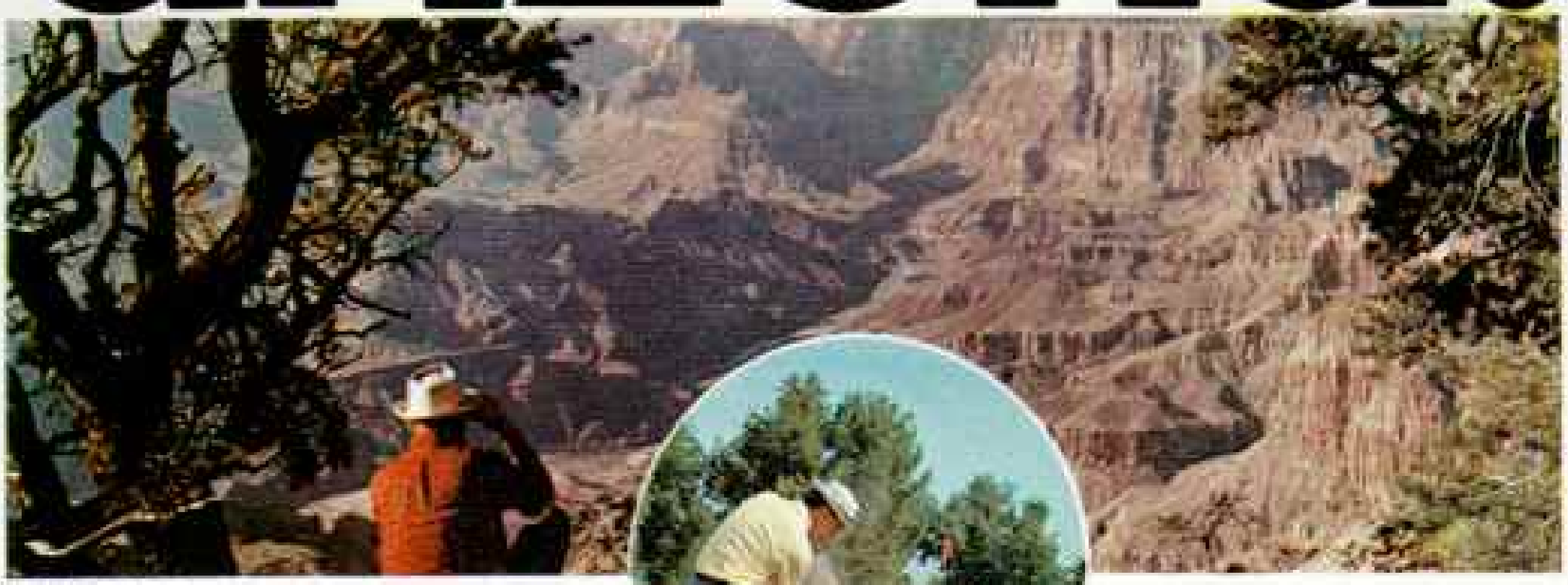

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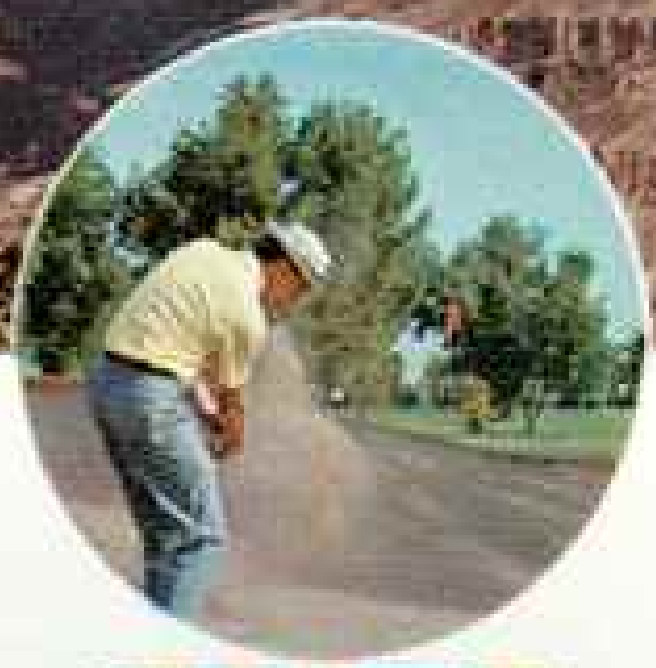

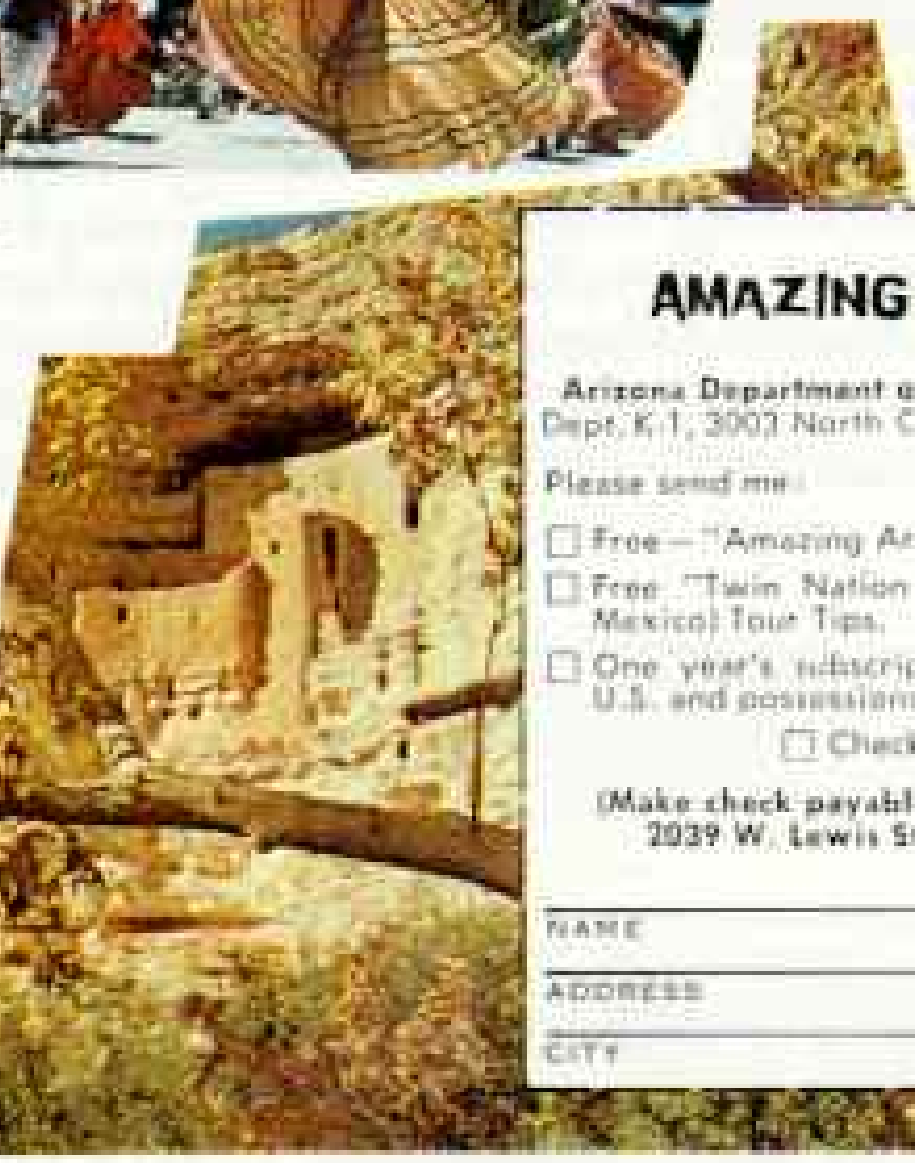

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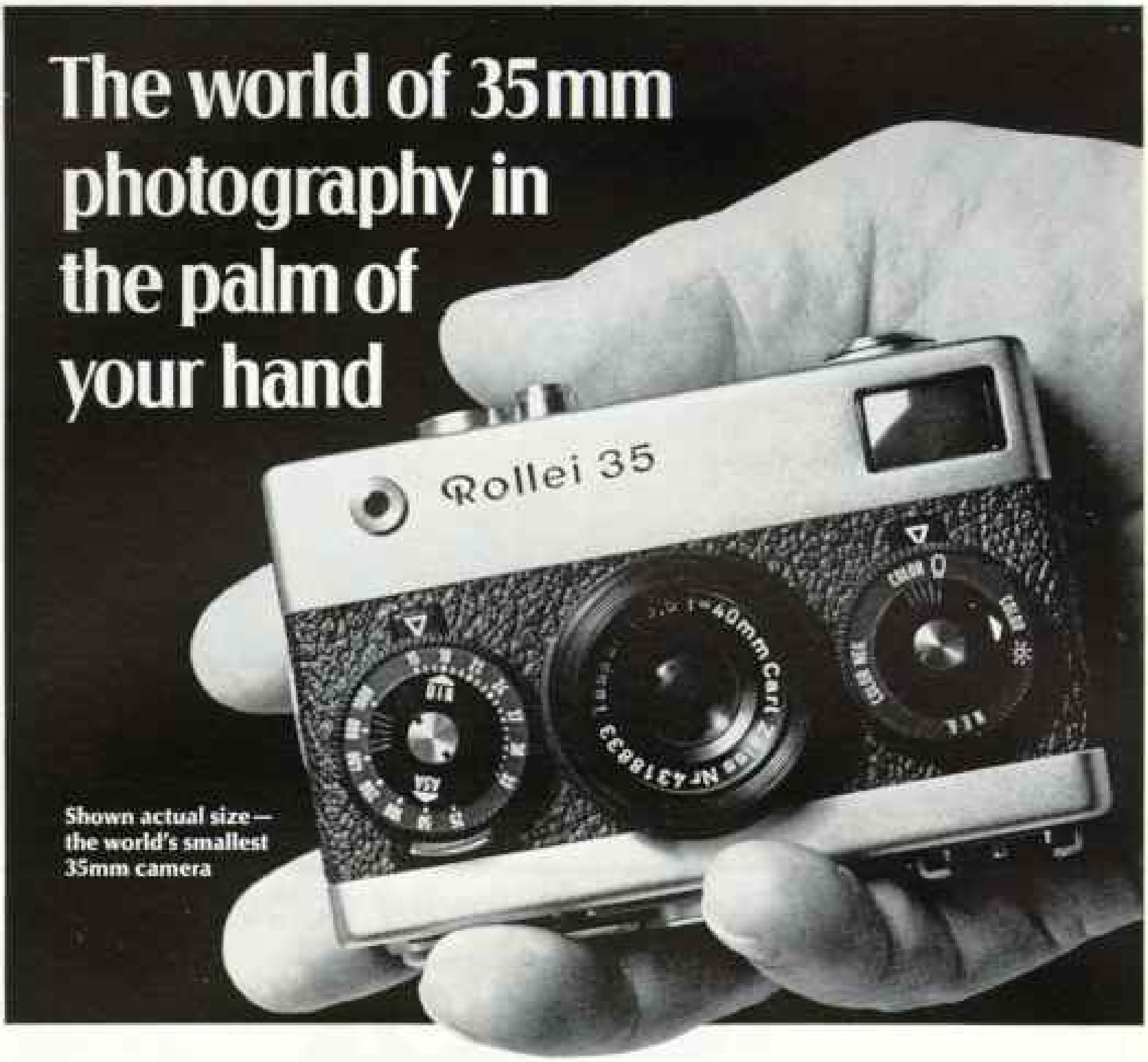

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THE ORIENT

Historic

This is the biggest ship ever to be launched sideways.

She's the Esso San Francisco, hitting the Mississippi at Avondale, Louisiana, last July. And two 76,000-ton sister ships, also ordered by Jersey's affiliate, Humble Oil & Refining Company, will follow her act in the next few months.

228,000 deadweight tons of ships. It's a big order. And it's only part of Humble's current shipbuilding program in the U.S.

Elsewhere around the world, Jersey's affiliates are making shipbuilding news.

At the beginning of this year, there were 33 tankers on order in nine different countries. Nearly five million deadweight tons. An investment of over $400 million.

This, the biggest tanker-building program in Jersey's history, is necessary to meet the world's ever-growing demand for oil.

And there are some heart-warming stories to tell. For example, at Wallsend in England.

Two years ago, Jersey's British affiliate, Esso Petroleum, decided to build two mammoth 253,000-ton tankers at Wallsend. Then the largest ships ever to be ordered in Europe.

"It's the best news this town has had in years," said Wallsend's mayor.

The Esso Petroleum order guaranteed two years' employment for 3,000 men. It put $7 million a year in wages into the town's economy. And now you can see the effect. More goods in the shops. More cars on the streets. More smiles in the pubs.

splashdown.

Behind this news is an encouraging story.

Only seven weeks before Esso Petroleum placed its order, no British shipyard was in the running either for price or delivery date. And delivery date was particularly tough. Two ships, both bigger than the Queen Mary, to be finished in two years. And ten unions were involved.

The initiative came from the unions themselves. They negotiated agreements that allowed one trade to pitch in on another's job. The more a worker produced, the more he earned. When they and the shipbuilders were sure the job could be done, the banks responded with low-cost loans.

Now Wallsend has more ships on order than anyone could have foreseen.

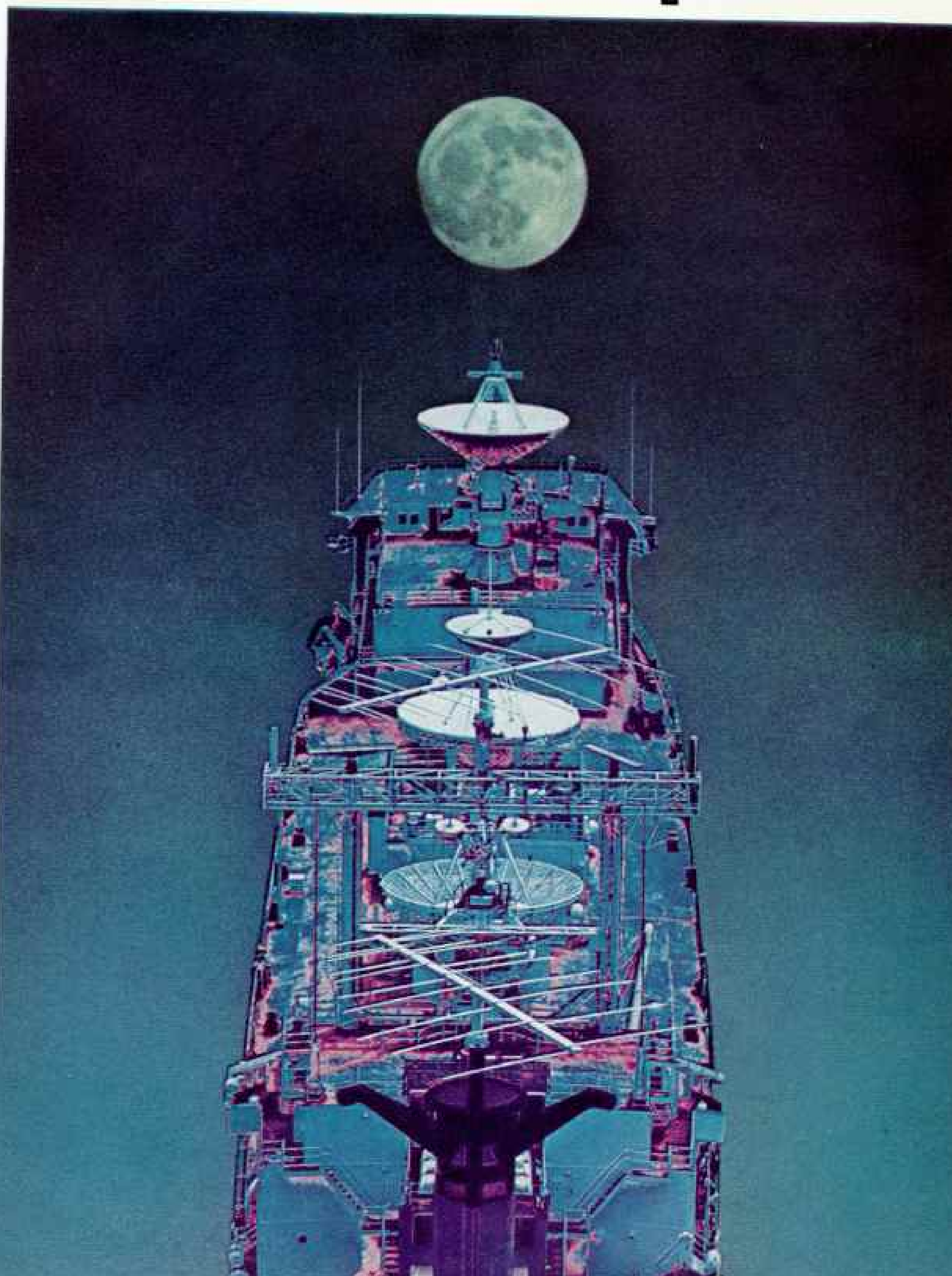
In fact, since Esso Petroleum broke the ice, there are twenty-one ships to be built there, including a third giant tanker.

We like to think that the splash we made at Wallsend was, in its own way, as historic as the one we made on the Mississippi.

Standard Oil Company
(New Jersey)

ESSO

Moonship



Neil Armstrong, Ed Aldrin and Mike Collins were on their way to the moon. Their heartbeats were firm, their breathing rates steady.

That information was relayed by a ship in the Pacific via satellite to Mission Control in Houston. Along with it, over NASA's Goddard Space Center Manned Space Flight Network, came a stream of vital statistics on cabin pressure, temperature and systems functions.

Houston came back with a terse, "Apollo 11, you are go for TLI," — (Translunar Injection).

Among the global tracking and communications links for such critical decisions during Apollo flights are three ex-World War II oil tankers. Operated by the Department of Defense for NASA, they were rebuilt for their specialized mid-ocean mission by six General Dynamics operating units.

Quincy division jumbo-ized them, Electronics division provided each with 8 major electronic systems, Electric Boat supplied attitude measuring and position systems, Convair supplied 30-foot telemetry antennas, Pomona furnished test personnel, Stromberg-Carlson the switchboards, dial phones and other components of on-board communications.

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GM

November 1969

NATIONAL GEOGRAPHIC

San Francisco Bay, the Westward Gate

By WILLIAM GRAVES

Photographs by JAMES L. STANFIELD

Both National Geographic Staff

AN 11-YEAR-OLD Midwesterner on a recent tour of northern California with his family was asked what he thought of the San Francisco Bay area. Summing up his impressions, he answered soberly, "It'll be a great place, if they ever finish with it."

The chances are they won't. San Franciscans and their neighbors are forever doing something with their bay. Almost from the moment of its discovery—November 2, 1769, just 200 years ago this month—they have been surveying, sampling, filling, dredging, diking, draining, and developing it. They have built cities around it, bridges over it, and at least one island in the middle of it.

And not once in two centuries have they stopped bragging about it.

In all fairness, San Francisco Bay is something to brag about. No bay in the world is more beautiful, or at least more beloved. Anyone who has ever seen it cherishes his own particular vision: of a great caldron seething with fog pierced by the graceful towers of bridges; of a city above the bay all prisms and crystal in the morning light; of a solitary ship steering westward through the Golden Gate, outward bound in the copper wake of the evening sun.

For myself I like San Francisco Bay best on a clear evening, when the cities and hills encircling it glitter and pulse with light, like the coals of some enormous beach fire strewn to the wind.

Scenery, however, is but one aspect of northern California's great threshold on the world. The San Francisco Bay area today is a vast human galaxy of 4½ million residents, overflowing the limits of more than fifty towns and cities in nine counties.* Population forecasts run to double that number by 1990, and to about 15 million by the year 2020.

The bay's dimensions are equally vast. The

*Associate Editor Franc Shor described San Francisco's dramatic development after World War II in "Boom on San Francisco Bay," in the August 1956 NATIONAL GEOGRAPHIC.

"**Such room of sea! Such room of sky!** Such room to draw a soul-full breath!" wrote poet Joaquin Miller about San Francisco Bay 75 years ago. There is less room today, but amazing works of man have added wonder to the scene: burgeoning downtown San Francisco, distant Golden Gate Bridge leapfrogging to Marin County across the bay's entrance, and the San Francisco-Oakland Bay Bridge,

FOUR SEASONS © NATIONAL GEOGRAPHIC SOCIETY

foreground, carrying an afternoon cargo of East Bay commuters. Just 200 years ago the Spanish first visited this sea-washed peninsula on the world's largest natural harbor; settlement became city after the gold rushers of 1849 sparked an enormous demand for goods and services. Now a new era of change sweeps the fabled hills, giving rise to office towers, hotels, a convention center, bazaars, and mini-parks.

REUACHROMES © N.G.S.

"Share our joy" read the invitations of Robert McAleese and Terry Hamlin to their wedding in Sonoma last year. Wearing "mod" styles, they married in a tree-shaded court at the Buena Vista Winery and celebrated with a champagne luncheon.

Brass bell clanging, a San Francisco cable car glides past a stand abloom with flowers during a rollicking ride to Fisherman's Wharf. The gripman controls speed by tightening or loosening a pincer that grabs an under-street electrically driven cable moving at 9½ miles an hour. Andrew S. Hallidie invented the motorless vehicles a century ago after seeing horses injured on the steep city streets.

great basin extends over an area of 422 square miles. It is nourished by many rivers and creeks, bounded by 300 miles of shoreline, and contains an estimated two trillion gallons of water at high tide. No river on earth can match the bay in motion. Tidal current through the Golden Gate can reach a peak of 10 million cubic feet a second, half again the flow of that giant among giants, the Amazon.

What San Franciscans call "The Bay" is in reality eight bays—San Pablo, Suisun, Grizzly, Honker, Richardson, San Rafael, San Leandro, and San Francisco Bay proper—joined together by a score of channels, dotted by islands, and cross-stitched by 10 bridges (map and painting, pages 600-601).

More than a dozen bay cities share an annual traffic through the Golden Gate of some 12,000 ships and 33,000,000 tons of commercial cargo. Add military cargo to that total and San Francisco Bay as a whole ranks as the Nation's third busiest port,


GARAGE
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topped only by New York and New Orleans.

At the focus of it all stands San Francisco, a queen of cities born to follow the sea. From a distance on clear mornings the city resembles some great windjammer becalmed off a coast, her skyscraper sails squared and motionless in the sun. Early Chinese immigrants, enchanted by San Francisco's evening splendor, christened the city Gum San—Cantonese for "golden hills."

Gold, in fact, runs like a bright thread through the fabric of San Francisco's past. The precious metal inspired Spanish exploration of southern California in the mid-1500's and led indirectly to the discovery of San Francisco Bay two centuries later by an overland expedition from San Diego.*

The 1848 gold strike at Sutters Mill—100 miles from the bay—set off a human avalanche that engulfed San Francisco, increasing the city's population within a year from 2,000 to 25,000. The event proved John C. Frémont, an Army officer and explorer, something of a minor prophet. Two years previously Frémont had named the entrance to San Francisco Bay Chrysopylae, a term from ancient Greek meaning "golden gate."

Kipling Found Beauty in a "Mad City"

The gold rush gave birth to an era in San Francisco as wild and extravagant as any in the history of the American West, attracting, in the words of one visitor, "the best bad things that are obtainable in America." Another visitor, the English novelist and poet Rudyard Kipling, described San Francisco in the 1880's as "a mad city—inhabited for the most part by perfectly insane people whose women are of a remarkable beauty."

Few would quarrel with Kipling on the latter point, for San Francisco's women are still remarkably beautiful. As for madness, San Franciscans themselves cheerfully acknowledge their city's split personality—a delightful blend of the antique with the new and revolutionary.

"Where else," asks a San Francisco lawyer friend, "would you find suburban commuters who travel most of the way to work by commercial helicopter, and finish the last half mile of the trip on a 19th-century cable car?"

Where indeed? And San Francisco loves it. While arguing the merits of reviving the old-fashioned cross-bay ferry system, the 750,000 San Franciscans have joined with neighboring cities to build a revolutionary $180,000,000 underwater tube beneath the bay to carry high-speed electric commuter trains.

Meanwhile, the same San Franciscans stoutly oppose plans that would disfigure their beloved Golden Gate Bridge with the addition of a second level. Instead, they continue to turn the structure at rush hour into what one newspaper columnist refers to as the "car-tangled spanner."

The Only Place to Go: Up

Nowhere is the city's dual personality more clearly revealed than in her varied architecture. In the downtown district, saloons and carriage houses jealously preserve the aura of the gaslight era as they stand wall to wall with soaring glass-and-steel columns of skyscrapers as radical and graceful in design as any in the world.

One of the men responsible for the latter type of architecture believes that San Francisco needs more of it, and in a hurry.

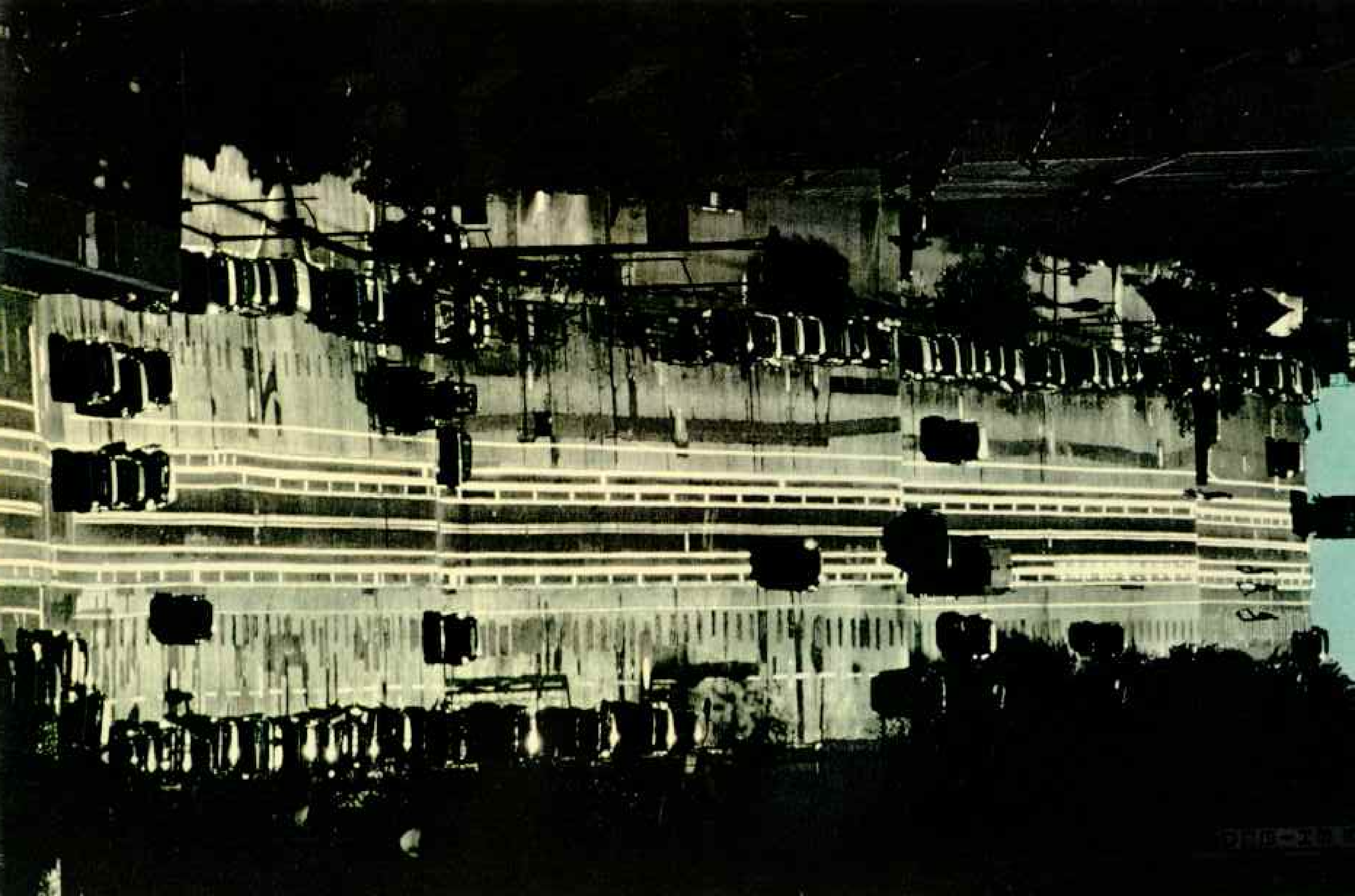
"We're like a good many other cities, with nowhere to go but straight up," Nathaniel Owings, the brilliant architect and municipal planner, told me one morning in his office overlooking the Embarcadero, the city's historic waterfront. Behind us stretched the Golden Gateway Center, San Francisco's $125,000,000 masterpiece of redevelopment.

"We're surrounded on three sides by water and on the fourth side by other cities," Mr. Owings continued. "But for a long time San Francisco wouldn't really take to the air; with a few exceptions, we stuck pretty close to the ground, to our famous hills. As a result, while the rest of the bay area was exploding with population, San Francisco was losing it.

"Now we're on the move again, because we've caught on to a simple fact: In the city of tomorrow the elevator will largely replace the

*For a vivid portrait of San Diego in its bicentennial year, see "San Diego, California's Plymouth Rock," by Allan C. Fisher, Jr., in the July 1969 GEOGRAPHIC.

Sun-paved ascent to a world of wealth, California Street climbs Nob Hill, named for the resident nabobs made rich by railroads, gold, and silver. Railroad magnate Leland Stanford founded the cable-car line for mansion dwellers, whose servants boarded the cars at Grant Avenue, Chinatown's main street (second cross street from bottom). After the earthquake and fire of 1906, Nob Hill became a realm of fashionable hotels and clubs.



Nestled between mountains, bay area communities grew from water's edge into the foothills—and out into the bay. After 1849 enterprising businessmen, catering to customers bound for the Sacramento gold fields, began filling the shoreline of San Francisco with piles, redwood rafts, and refuse to create wharfage and store sites. Silt and fill on the rim of the 60-mile-long bay have since claimed 258 square miles of marshlands and water. Aroused citizens demanded an agency that now controls future land-fill projects.

automobile." He smiled. "When it does, San Franciscans will have a better view of their bay, and they'll breathe a lot easier, too."

Certainly San Francisco could use a breath or two more of fresh air. The city increasingly faces a problem long associated with its southern rival, Los Angeles—smog. In both cases the major culprit is the automobile, whose numbers in the Golden State have resulted in such a labyrinth of freeways that more than one Californian has suggested declaring the cloverleaf the official state "flower."

San Francisco crams an average of more than 8,000 motor vehicles into each of its 45 square miles. As a result, the easiest and safest way to tour the heart of San Francisco—also the most delightful—is by cable car.

Each time I set foot on a car of the old Powell & Hyde Street Line I am reminded again of Rudyard Kipling. The much-traveled Englishman took an instant fancy to the cable cars, declaring that they had "for all practical purposes made San Francisco a dead level.

"They take no count of rise or fall," Kipling continued, "but slide equably on their appointed courses . . . turn corners almost at right angles; cross other lines, and, for aught I know, may run up the sides of houses."

Not quite. Yet the cable cars do climb hills

so steep (page 599) that San Francisco's firemen, when answering alarms, carry ladders with peg-leg extensions to attach to the downhill side.

None of San Francisco's three venerable cable-car lines takes in all the city's famous attractions, but the Powell & Hyde manages a view of a good many: Market Street and Union Square in the shopping district; Nob and Telegraph Hills, the former with its elegant hotels, the latter named for the city's old marine lookout and telegraph station. In addition, the Powell & Hyde skirts the fringes of the North Beach entertainment district, Fisherman's Wharf, and that magnet among magnets, Chinatown.

Clothes and Manner Betray New Arrivals

As every San Franciscan knows, Chinatown is the largest Chinese settlement outside Asia and the focal point for the city's estimated 60,000 Chinese Americans. Recently Chinatown has begun to spill into neighboring North Beach, formerly the province of some 60,000 San Franciscans of Italian descent. One of the latter, Joseph Lawrence Alioto, is the city's energetic mayor.

One of the reasons for Chinatown's recent growth is the relaxation of immigration restrictions for citizens of Asian countries, among them China.

"We're receiving some 1,200 Chinese newcomers a year now, mostly by way of Hong Kong," May Huie Wilson told me when I called on her at the International Institute of San Francisco, on the edge of Chinatown. May is a strikingly pretty Chinese American who was born in Hunan Province, emigrated to the United States as a girl, and married a Californian. She was helping the institute find jobs and homes in the bay area for her former countrymen.

Outsiders tend to think of Chinatown as a closely knit society, where custom demands that each member of the community look after the needs of his neighbors. I asked May if that was true, and if so, whether it helped with the problem of resettlement.

"Yes, it's true and it does help," she said, "but you have to remember that some of the Chinese families here go back four and five generations in the city, further back than most San Franciscans. They're fine people, and they're eager to help but, like other 'first families,' they have a certain attitude of superiority toward newcomers." She laughed.

"The other day I was walking through a square in Chinatown, and I passed two elderly

Chinese gentlemen on a bench, neatly dressed in their business suits, having a morning chat. At that moment another Chinese man walked by, obviously a recent arrival, judging by his clothes and manner.

"One of the elderly gentlemen nudged his friend and said quietly in Chinese, 'Just look, now—fresh off the boat!' "

Fisherman's Wharf Shows Its Age

Elsewhere in San Francisco the same remark conveys approval. Among a score of restaurants along Fisherman's Wharf, the choicest offerings come straight out of the bay or from nearby waters—shrimp, abalone, salmon, crabs, oysters, smelt, and occasionally even octopus (pages 610-11).

Like a good deal of San Francisco's waterfront, Fisherman's Wharf is long overdue for careening and repairs. Despite several elegant restaurants, much of the wharf wears the shabby atmosphere of souvenir stand and amusement parlor. Almost within heaving-line distance to the south, San Franciscans have remodeled an old chocolate factory into a graceful shopping center known as Ghirardelli Square, and a former fruit cannery into an equally handsome bazaar called, appropriately, The Cannery.

Fisherman's Wharf may soon have its turn. The city's Chamber of Commerce has proposed refurbishing a large part of the wharf. Plans include a spacious central plaza, a fish-processing plant operated as a museum, and an Italian Cultural and Trade Center, honoring a country that gave San Francisco many of her finest fishermen.

No view from land can give more than a hint of the enormous activity that churns San Francisco Bay into an endless froth, day and night. One morning before sunrise I joined Capt. Nick Ernser, a veteran bay pilot, aboard the tug *Sea King* for a run to Oakland, three and a half miles across the bay. Nick's assignment was to pick up the Pacific Far East Line freighter *Japan Bear* and deliver her to San Francisco for final loading before she sailed to the Orient.

As we plowed eastward through the darkness, the lights of the giant San Francisco-Oakland Bay Bridge above us traced looping arcs across the sky toward the far shore. I asked Nick why trucks couldn't transfer *Japan Bear*'s San Francisco cargo across the bridge to Oakland, so that the ship could load at a single pier.

"They could," Nick answered, "but because of hauling costs and bridge tolls, it's cheaper in this case to bring *Japan Bear* to her cargo, even if it means several moves. I've known many ships in the bay that changed berths half a dozen times in one week, just to fill their holds. Often they shift at night, to save daylight hours for handling cargo."

Dawn welled up over the bay as we reached Oakland, washing a high layer of small clouds into flecks of orange and gold, like a scattering of wood shavings set afire. From the bridge beside Nick I watched as *Japan Bear* dropped all lines and, with skillful nudging from *Sea King*, got under way for San Francisco.

Varied Craft Crowd the Bay

Daylight revealed considerable company on the bay. To the south of us, at the huge Alameda Naval Air Station, the gray bulk of an aircraft carrier slowly separated itself from the land and swung majestically down-channel for the Golden Gate. On the San Francisco side, an equally somber troop transport followed suit from the great building and repair yards at Hunters Point.

Incoming traffic included a Japanese ore carrier, a dazzlingly white Swedish cruise ship, and an ancient, rust-spattered tramp freighter flying the star and stripes of Liberia. Farther north, the low silhouette of a nuclear submarine from the Navy's Mare Island shipyard broke the tarnished surface of the water near Golden Gate Bridge.

Around and among the giants there was an endless scurrying of lesser craft: Coast Guard cutters; several smaller tugs hustling to their appointments; crab boats bound for offshore grounds; and even a small sloop or two heeled to a spanking bay breeze at the hands of early-morning yachtsmen.

Nick conned *Japan Bear* smoothly among them, and brought her to a standstill just off

(Continued on page 607)

Little refugee at America's doorstep: After a charter flight from Hong Kong, a Chinese girl guards hand luggage while her parents pass customs at the Oakland International Airport. An estimated 1,400 Chinese enter the bay area annually on permanent resident visas. Most seek the familiar ways of Chinatown, but add to its problems: overcrowding, substandard housing, high tuberculosis rate, and meager wages in garment factories. One result: rising militancy among the young.


CANADIAN PACIFIC
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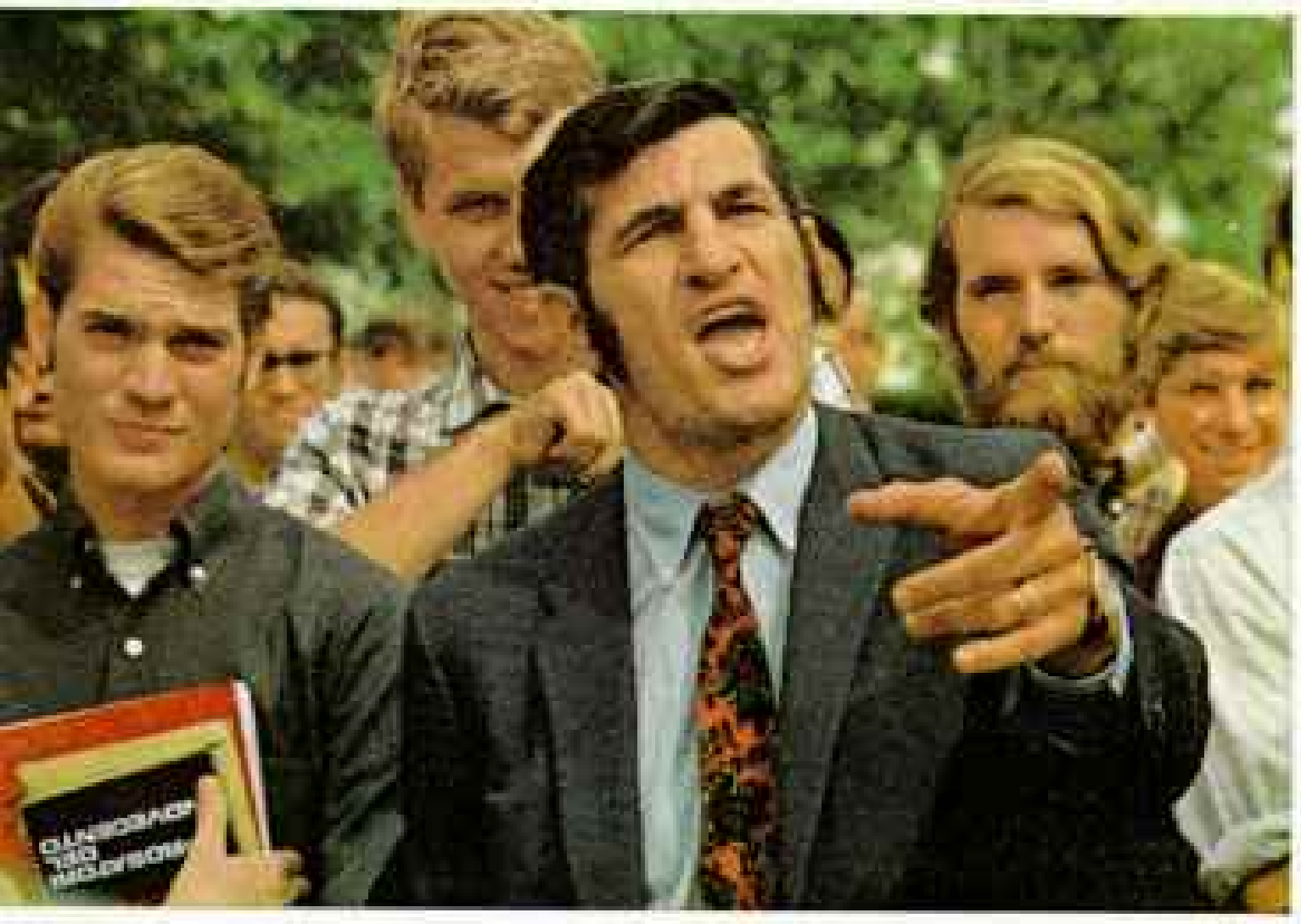
On a sail-spangled day in a year-round sport, sloops with spinnakers billowing

race in from the Golden Gate Bridge and the headlands of Marin County.

California confrontation: Bearded demonstrator and National Guardsman face off during a three-week dispute in May that shook Berkeley, home of the University of California. A small group of young people—a few students among them—planted flowers, trees, and themselves on a vacant plot owned by the university, dubbing it "People's Park." When the administration fenced them out, violence flared between those favoring the park and law enforcers. Since the Free Speech Movement of 1964, Berkeley students have become a barometer of protest against the status quo.



Vigorous sidewalk debate—a long-time tradition near Berkeley's Sather Gate—engages students in discussions of politics, religion, and social justice. Century-old Berkeley, headquarters for the nine-campus state university system, has achieved renown for the quality of its faculty—now including 11 Nobel Prize-winners—and the 4,000 courses it offers 28,000 students. The ever-expanding university and a score of state and junior colleges make the bay area a world leader in publicly supported educational facilities.

one of San Francisco's old-fashioned finger piers (pages 594-5).

For the first time Nick seemed wholly absorbed in his work, for here with a running tide the current sweeps at four and five knots in shifting patterns among the wharves. A careless pilot, with 15,000 tons at his command, could wreak almost as much havoc on bulwarks and pilings as a tidal wave.

Nick balanced *Japan Bear* delicately amidships against the head of the pier, using the structure as a pivot while *Sea King*'s 1,200 horsepower swung the vessel stern-around neatly into the narrow berth. Ashore, I thanked Nick for the cruise, but said I didn't envy him his job.

"A lot of it's just practice," he answered, with some modesty. "The old pilots have a saying that a child of 5 could do it—with 20 years' experience."

From the bay area's thundering present I turned to a brief view of the past, by way of a chartered helicopter. The flight began at San Carlos, one of the mushrooming communities that stretch south of San Francisco along the broad peninsula separating the bay from the sea (painting, pages 600-601).

To accompany me on the flight, I invited Joel Gustafson, a professor of ecology at San Francisco State College and a devoted amateur historian of the bay area.

"Gus," as friends call him, was delighted to take a day away from the college. For all its academic excellence, San Francisco State had

Splashed by the glint of sunlight, an art student sketches sandstone arches of privately endowed Stanford University, opened in 1891 on Leland Stanford's horse farm.

been virtually paralyzed for months by student riots. Violence there had reached a crescendo equal to that of the University of California at Berkeley across the bay, long known for its student demonstrations (page 606).

Taking off from San Carlos, we began a swing northward around the bay's vast perimeter. On our left rose the long shoulder of California's Coast Range, with a broad spur at one point known as Sweeney Ridge. Here on the afternoon of November 4, 1769, a band of 47 weary Spaniards under the command of Capt. Gaspar de Portolá caught their first sight of San Francisco Bay, just two days behind their advance party of hunter-scouts (painting, pages 612-13).

Error Led to Epic Discovery

"Only it was the wrong bay," Gus had explained earlier. "Portolá had been sent all the way from San Diego to explore Monterey Bay, 60 miles to the south of here, and he had overshot it—or rather, he had simply walked past it without recognizing it from an earlier description by a Spanish sea captain. No one, you see, suspected that just a few days' march to the north lay an infinitely greater bay, the kind that the early navigators dreamed all their lives of finding."

In his diary for November 4, a scholarly expedition priest, Juan Crespi, described "the great estuary or arm of the sea, which must have a width of four or five leagues, and extends to the southeast and south-southeast."

Later, back in San Diego, Crespi wrote to a fellow priest of the "fine harbor, such that not only all the navy of our Most Catholic Majesty but those of all Europe could take shelter in it."

Another member of the expedition, Miguel Costansó, first gave the bay its name on a map published in Madrid in 1771.

For a time our flight plan followed the course of bay history, running north past San Francisco, where, in 1776, the Spaniards established a mission and a presidio, or garrison. After Mexico won independence from Spain in 1821, she took over most of California—including San Francisco—only to lose the territory to the United States in 1848.

Over the Golden Gate we had a view far deeper into the past, to the birth of the bay itself. Geologists estimate that the great natural basin began to form roughly a million years ago, partly as a result of that phenomenon familiar to many Californians, especially San Franciscans—earthquake. Upheaval of the land produced immense fractures in the earth's surface, such as the famous San Andreas Fault, and created a vast trough within the Coast Range. Through this rampart the Sacramento River eventually wore deep channels—the Golden Gate and Carquinez Strait. During millenniums, the rising level of the sea inundated the trough, and one of the world's great natural harbors was born.

North and east of the Golden Gate we skimmed above towns and regions whose colorful names preserve the bay area's Spanish heritage—Sausalito (Little Willow Grove), Tiburon (Shark), Alameda (Poplar Grove), and Contra Costa (Opposite Shore).

Tucked in the bayside slope of the Coast Range, the town of Sausalito wears an air of charm and respectability that camouflages a rollicking past (pages 616-17). Famous today for its clusters of artists' studios, houseboat homes, marinas, and elegant restaurants, the town was a brawling 19th-century home port for Pacific whaling barks.

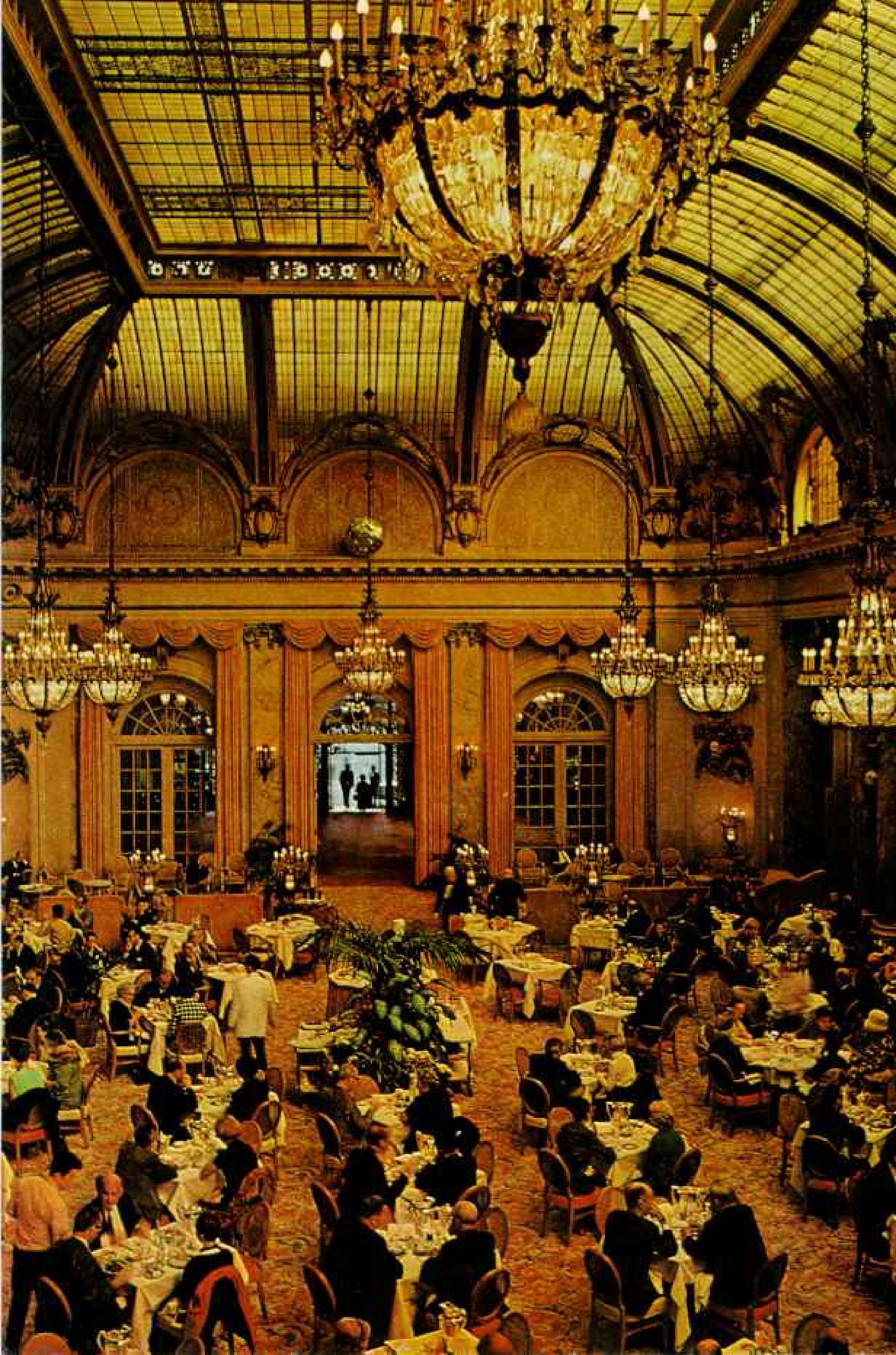
Floating Hotels Housed Forty-niners

"When the gold rush came in 1848, the crews of whalers in Sausalito and San Francisco started jumping ship and heading for the gold fields," Gus said as we swung south once more toward San Carlos.

"Before long, the bay shore was lined with derelicts, and smart operators turned them into hotels for the streams of forty-niners arriving from the East. It was only a short step to dumping dredged-up earth around the ships, and then San Francisco Bay had the beginnings of a major problem—artificial fill.

"Dredging and filling have been going on ever since," Gus added, "and the bay keeps getting smaller. North Beach in San Francisco, for example, was once a true beach. Now it's half a mile or so back from the water. We lost another 400 acres of bay in 1939, when

Elegance of yesteryear enhances luncheon in the Garden Court of the Sheraton-Palace Hotel. When the $5,000,000 hotel opened in 1875, the court served as a luxurious carriage entrance. Reconstruction following the 1906 earthquake fitted it with a roof of iridescent glass, crystal chandeliers, and marble pillars. San Francisco acquired a reputation for fine food in gold-rush days; one reporter noted, "In the matter of dining, the tastes of all nations can be gratified here."



Fleet's in, and all San Francisco can dine on delicacies from her watery front yard: salmon, shrimp, sole, sea bass, and crab. Restaurants rim Fisherman's Wharf, where 200 boats have their berths.

"**Nice big crabs,** live or cooked." Vendor John Lopiccolo hawks a 2½-pound

Treasure Island was built for an international exposition, using mud dredged up from the bay floor. Today the Navy uses the island for its Twelfth District headquarters.

"The bay is like a living body," Gus continued. "Its appendages, with their mud flats and marshes, are just as important to the bay as lungs and heart are to a human. In 1850 the bay's water and marshland area amounted to some 680 square miles. Now, thanks to millions of tons of soil carried down the rivers from massive gold-mining operations in the past and to modern fill projects for housing and industry, we're down to 422 square miles of water, and still shrinking."

As we landed at San Carlos, I could see what Gus meant; a large part of the waterfront along the peninsula had the flat, geometric look of artificial land. Few events since the gold rush have created a greater furor in

Dungeness, boiled in a sidewalk caldron at Fisherman's Wharf. He also sells "walkaway cocktails" of shrimp and crab and the city's popular sour-dough bread. Like most wharfmen, Mr. Lopiccolo is of Sicilian descent. The carnival-like wharf dreams of a face-lift with an Italian trade center and a new museum.

the bay area than the battle between conservationists and developers over fill projects in the great basin. On the developers' side, one group recently proposed leveling an entire mountain and dumping it into the bay to create additional land space.

But conservationists finally won the battle last August, when the State Legislature passed a bill to control further filling.

One of the conservationists' staunchest allies is the giant California wine industry. The multimillion-dollar industry's vineyards occupy hundreds of square miles in neighboring Sonoma, Napa, and Santa Clara Valleys—the immense green-and-gold blades that jut north and south of the bay, running parallel with the Coast Range.*

"Without the enormous bay I'd have a

*See "California, the Golden Magnet," by the author in the May 1966 NATIONAL GEOGRAPHIC.

hard time growing grapes for table wine," the owner of a vineyard in the lush Napa Valley told me. "You see, many of our valleys are actually too hot for table-wine grapes, with temperatures sizzling above 100° F. for weeks at a time. That's all right for the so-called sweet, or dessert, wines, but it's tough on the table variety. Our problem is just the opposite of the one in Europe—there the growers need all the sunshine and heat they can get.

"What saves us here is that 422-square-mile air conditioner of a bay. It funnels cool sea breezes and fog up the valleys, and lowers the mean temperature of the growing season. It sounds crazy, but for us the vintage years are the cooler and foggier ones—something no European can quite believe."

Winds Present a Traffic Hazard

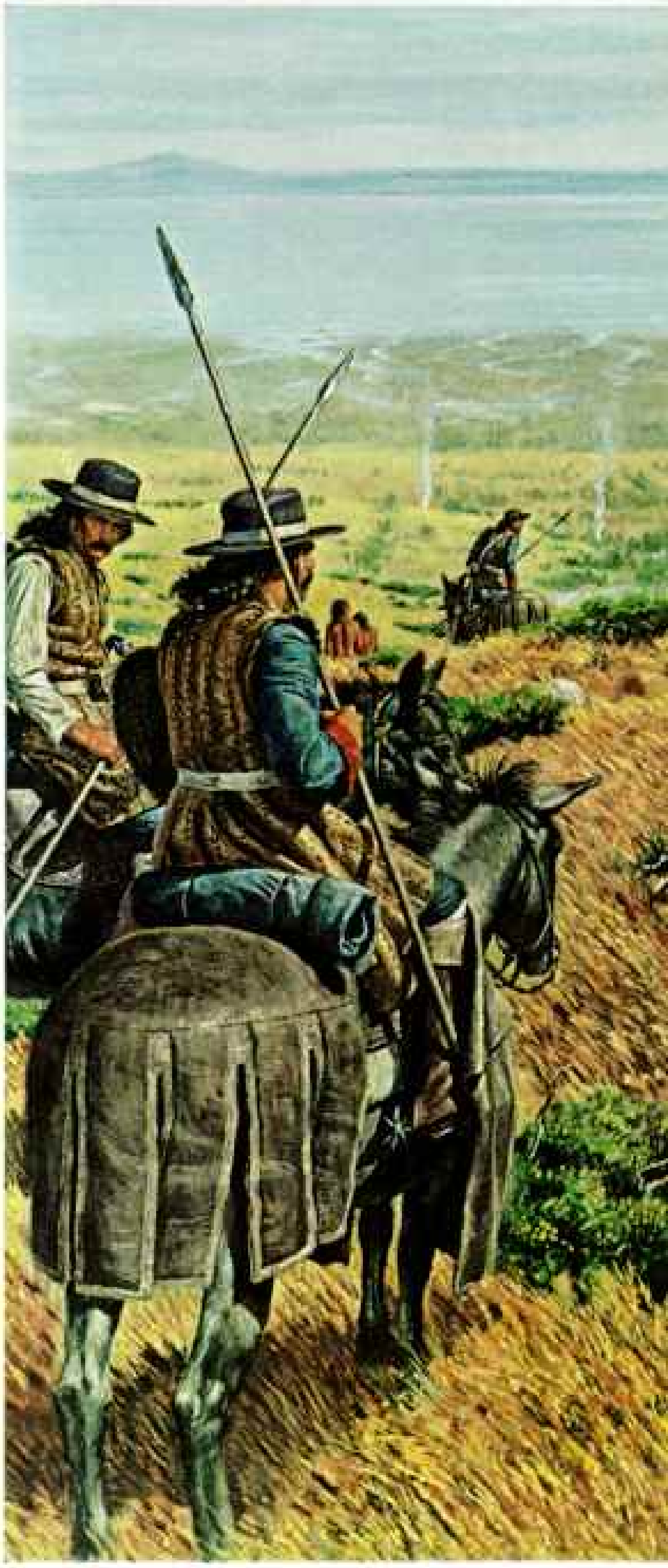
Weather fascinates residents of the bay area. At a given moment the city of San Francisco may present a patchwork pattern of bright sunshine, dense fog, and heavy overcast, all within an area of a few square miles. "Back East," says a San Franciscan, "people joke, 'If you don't like the weather, wait a minute.' Out here we say, 'If you don't like the weather, walk over a few blocks.'"

San Franciscans speak affectionately of their "banana belts," scattered areas of the city where terrain or wind patterns provide less fog and more sunshine.

Violence often accompanies variety. On summer afternoons when fierce Pacific winds funnel through the narrows of the Golden Gate at 30 to 40 miles an hour, radio announcers dutifully—and seriously—broadcast "small-car warnings on Golden Gate Bridge."

Occasionally, the weather catches long-time residents off guard. Baseball fans recall the 1961 All-Star Game at Candlestick Park, home of the San Francisco Giants, when a pitcher by the name of Stu Miller took a graceful windup—and a sudden gust of wind blew him off the mound.

By far the most dramatic feature of bay area weather is the frequent fog, produced



Discovery by mistake: Spanish explorer Gaspar de Portolá marched north from San Diego with orders to establish at Monterey Bay the northern anchor for a chain of mission-garrisons. But he overshot the mark and discovered San Francisco Bay instead.

Here on November 4, 1769, Portolá surveys the newly found bay from Sweeney Ridge (painting, page 600). In the distance lie marshlands where San Francisco's airport now stands. Clean-shaven Catalonian volunteers rest beside *soldados de cuera*—leather-jacketed soldiers—who ride mules protected against arrows by hide armor. Smoke rises from camps of friendly Indians. Franciscan Father Juan Crespí, standing in cassock, later reported that this "great estuary or arm of the sea" could hold all the navies of Europe. To ensure accuracy, artist Künstler consulted expedition diaries and modern experts on the old Southwest.

in the summer whenever warm Pacific winds meet cold water welling up along the northern California coast.

San Francisco Bay owes its record of maritime safety to the Coast Guard and to the skill of veteran ship pilots. More than 400 aids to navigation—lights, buoys, fog signals, and radio beacons—guide a steady stream of vessels, many of them bound for Sacramento, California's capital, 80 miles inland.

In the days before radar, pilots depended largely on instinct and a keen ear to thread the narrow river channels in dense fog. Here and there along the San Joaquin River, winding through rich farmland to the port of Stockton, one still sees occasional remnants of outmoded "echo boards"—huge wooden panels designed to reflect the sound of a ship's whistle, giving the pilot a "fix" on the riverbank. It was a crude system, and I once asked a retired

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riverman if pilots could tell their whereabouts with any accuracy.

"Accuracy!" he snorted. "Why, son, those old-timers could play a tune on that whistle in a blind fog and tell you whose cow give off the echo!"

Electronic echoes in the form of radar have long since replaced the boards, but bay area pilots still rely heavily on the traditional fog horn. There are 59 distinctive fog signals, ranging from the monstrous blast of the great horn at midspan on the Golden Gate Bridge to the lesser pipings of the seaward stations—Mile Rocks and Points Diablo and Bonita.

To bay area residents the mournful overture of sirens, shrieks, hoots, and groans is a necessary and even welcome sound on foggy nights. Occasionally, some visiting landsman objects to the serenade. The Coast Guard still cherishes one letter from a Midwestern tourist who spent a very foggy night with his family at a bayside motel. The foghorns, he complained, had made sleep impossible.

"Now I know you Coast Guard fellows are only trying to do your job," the letter concluded, "and you want to help the big ships get in and out of port safely. But you're wasting your time. Those horns blew all night, and the fog never budged an inch."

Offshore Light Maroons Migrant Birds

Ironically, one of the bay area's major navigation aids is an occasional deathtrap for birds. One misty autumn morning the Coast Guard flew me to the Farallones—Spanish for "small rocky islands in the sea"—30 miles west of the Golden Gate. Here the Coast Guard maintains a six-man station with a powerful lighthouse, the first landfall for many a ship inward bound from the Pacific.

I found the Coast Guardsmen on the bleak Farallones outnumbered that day by civilian visitors who were studying the islands' rich variety of bird life. With Guy McCaskie, a construction executive and amateur ornithologist from San Diego, I climbed the 200-foot cliff to the lighthouse. Among the rocks along the way, I noticed a great many dead birds—warblers, finches, wrens, orioles—all of them land species.

"They're stragglers from the Pacific flyway," Guy said. "The Farallones can support thousands of sea birds, but there's no fresh water and very little food here for mainland species. If land birds stay more than a day or two, they're doomed. Without food, they lose the strength to make it back to the mainland."

"Why do they come at all?" I asked.

"A lot of them don't mean to," Guy answered. "The flyway runs along the coast, and sometimes a strong easterly wind blows the smaller birds out to sea. If it's night, with a heavy overcast, they tend to home on the first light that's visible—and Farallon light has a range of 30 miles. Sometimes the birds dash themselves against the lighthouse."

Indians Made Beads of Precious Cargo

Flying back toward San Francisco, I caught a glimpse of Point Reyes to the north, a dark wedge of land forever thrust like a great lance point against the burnished breastplate of the Pacific. Here, according to some historians, the English navigator Francis Drake careened his flagship, *Golden Hind*, for a month in the summer of 1579—nearly two centuries before Portolá discovered San Francisco Bay, 30 miles to the southeast.

No physical evidence of Drake's visit exists at Point Reyes, and his logbooks have been lost. But a brass plate found near the point in 1933 bears his name and a crude inscription claiming the land:

IN THE NAME OF HERR MAIESTY
QVEEN ELIZABETH OF ENGLAND
AND HERR SVCESSORS FOREVER.

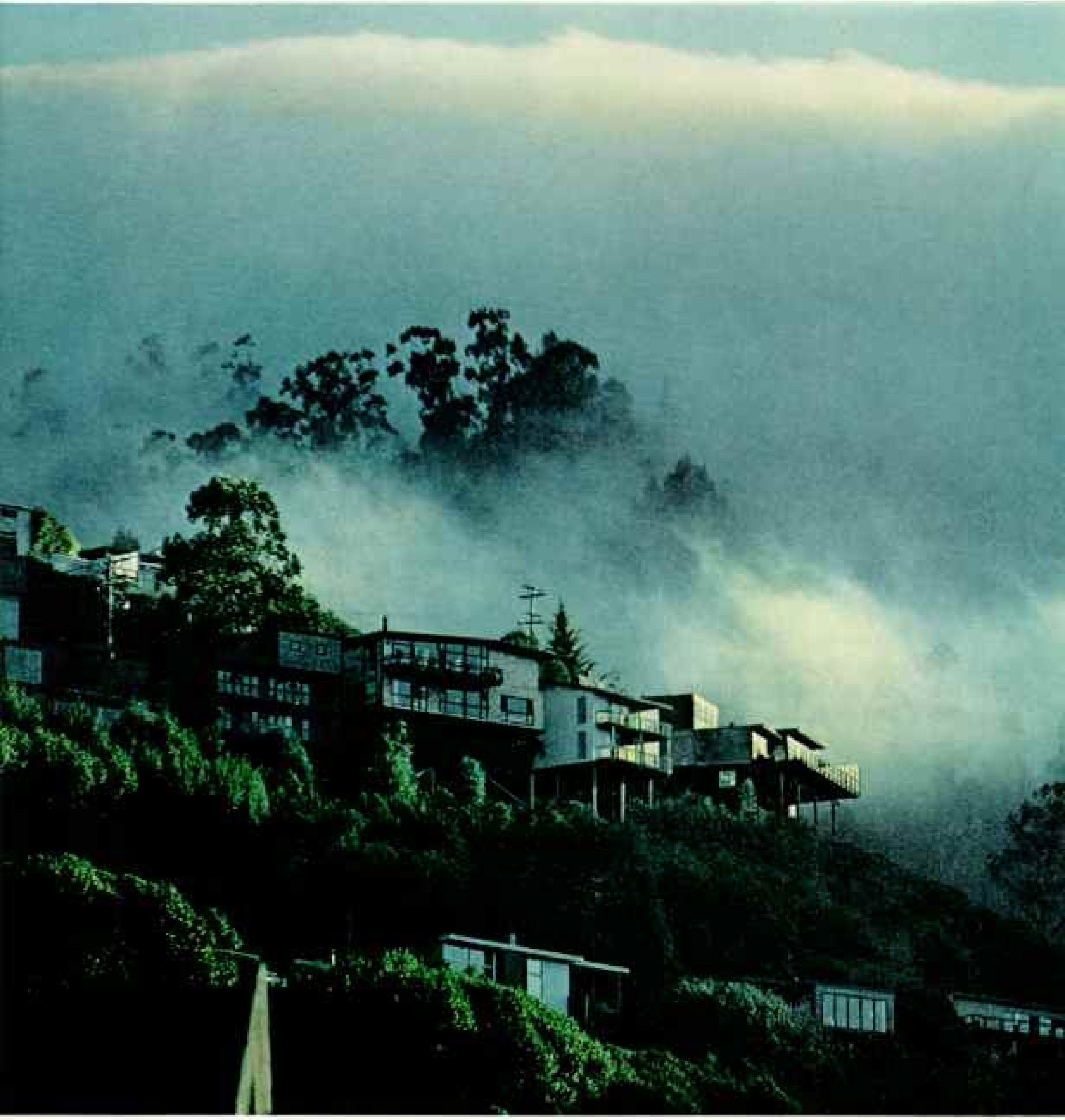
Today Point Reyes is a magnificent national seashore, and the probable spot where *Golden Hind* lay careened is known as Drakes Cove.

At least one subsequent caller left colorful proof of his visit. In 1595 a Portuguese sea captain named Sebastián Rodríguez Cermeño, sailing under Spanish colors, anchored his galleon, *San Agustin*, near Point Reyes on a return voyage from the Orient. Then a storm wrecked *San Agustin* and littered the beach with her cargo, which included some Chinese Ming porcelain taken aboard by Cermeño in Manila.

Cermeño and his crew built an open boat on shore and eventually made their way in an epic 1,500-mile voyage to Mexico. The wreck

An onion brings no tears to a farm laborer, elated about a bountiful crop on a truck farm near Milpitas. Agriculture on the wide, fertile valley of Santa Clara County today brings in $35,000,000 annually; industry, including aerospace, electronics, and auto assembly, leads with earnings of a staggering $1,166,000,000.

KODACHROME BY JAMES L. STANFIELD © N.G.S.



of the *San Agustin* proved a windfall for the Indians of Point Reyes, who found a novel use for Cermeño's dinnerware. Among bits of the Ming porcelain, archeologists recovered a fragment that had been neatly rounded and partially drilled through the center—plainly the beginning of a bead for a necklace.

Back in San Francisco I took a walk one morning beneath the bay with Donald Hughes, an engineering inspector connected with BART—the Bay Area Rapid Transit District. Don had invited me to inspect the world's longest underwater transit tube, being built across 3.6 miles of bay floor between San Francisco and the East Bay city of Oakland (pages 622-3). Don's company, the engineering consultant firm of Parsons Brinckerhoff-Tudor-Bechtel, was the project supervisor.

By 1972 bay area commuters will hurtle through the great twin-bore tube in electric trains at speeds as high as 80 miles an hour, cutting rush-hour travel time between San Francisco and Oakland from the present average of 40 minutes to 9. By that year BART also plans to link more than a score of bay area cities with 75 miles of high-speed track,

Eyries on the bay. Sausalito homes perch on stilts above an ever-changing scene: charter boats with catches of salmon, Chinese junks turned into yachts, houseboat homes at wharfside. In the late afternoon the fog tumbles over the hills, as writer Neill Wilson observed, like "an army of ghostly skyriders, a charging, trampling herd of formless wraiths." In the morning the low clouds retreat before the warming sun.

Here in Marin County, 210,000 residents strive to preserve the simplicity of rolling hill, towering eucalyptus, and scalloped shore.

Teardrops of dew sparkle on a spider's web in Muir Woods National Monument. Fog, condensing amid coastal redwoods, helps water the 240-foot giants of Marin.

in the world's most heavily automated rapid-transit system.

The core of the system is the trans-bay tube —not a tunnel, as Don pointed out, but a giant concrete-and-steel double cylinder consisting of 57 watertight sections averaging 330 feet in length and weighing 12,000 tons, laid end-to-end and joined underwater in an enormous trench dredged across the bay floor.

Don had chosen a morning when a new section was to be added to the tube, 120 feet beneath the surface and half a mile southwest of Yerba Buena Island. A long stretch of tube from the Oakland shore had already been completed, and engineers on the San Francisco side were within less than a mile of link-up.

Walking eastward from the San Francisco entrance, Don and I made our way three-quarters of a mile through the great echoing steel cylinder to the end, where a massive bulkhead sealed the tube off from bay water beyond. I had expected a sizable crew to be on hand for the event, but there were only Don, myself, and one workman.

"Practically everything's done topside, by floating cranes," Don said. "Our job comes at

Rainbows of the mind, repeated horizons, or simply basic forms? Artist David Simpson enjoys the ambiguities his paintings suggest. Influenced by the vast spaces around Sacramento in the 1950's, he turned from landscapes to abstracts, focusing on color and space. An art professor at Berkeley, Mr. Simpson works here in his Richmond studio-home under the watchful eye of his Siamese cat, Measle. Many major modern artists enjoy the climate and spaciousness of the bay area.

San Francisco has long offered a full spectrum of home-grown culture: opera, ballet, symphony, and theater. Increasingly, other area cities support their own performers, such as symphony orchestras in Oakland and San Jose.

the end, when the new section has been lowered and brought to within about an inch of the existing tube. At that point the flexible gasket on the rim of the new section presses against the rim of this one to form a watertight seal. All we have to do down here is pump the water out of that remaining space and let surrounding water pressure force the new section—all 12,000 tons of it—into final position.

"The man with the really spooky job is the hard-hat diver just outside. He can't see anything in the mud and murk of the trench, and has to feel when the guide plates and couplings at the ends of both sections are lined up. When they are, he signals to the people topside, who activate powerful hydraulic jacks attached to the couplings, and draw the two pieces within an inch of each other. Then you and I take over."

Between conversations over a small field telephone linking him with the cranes far overhead, Don explained that the new section had been towed out from shore, lined up precisely by means of surveying instruments located along the San Francisco waterfront, and then loaded down with 500 tons of rock in giant bins attached to the top of the section.

"It all has to be perfectly timed," Don added, "so that we catch the half hour or so between tides. If we tried this on an ebb tide, the current would carry the diver halfway to Treasure Island."

Presently word came over the telephone that the new section was on its way down, and after a time I heard a faint metallic clink

EXTRAVISION © NATIONAL GEOGRAPHIC SOCIETY

through the wall of the tube. "That's the diver," Don said. "He's checking the plates and couplings. In a minute he'll signal topside, and they'll draw that baby right up to our doorstep."

Sure enough, in a moment more I heard a muffled grinding sound beyond the bulkhead, and the field telephone rang.

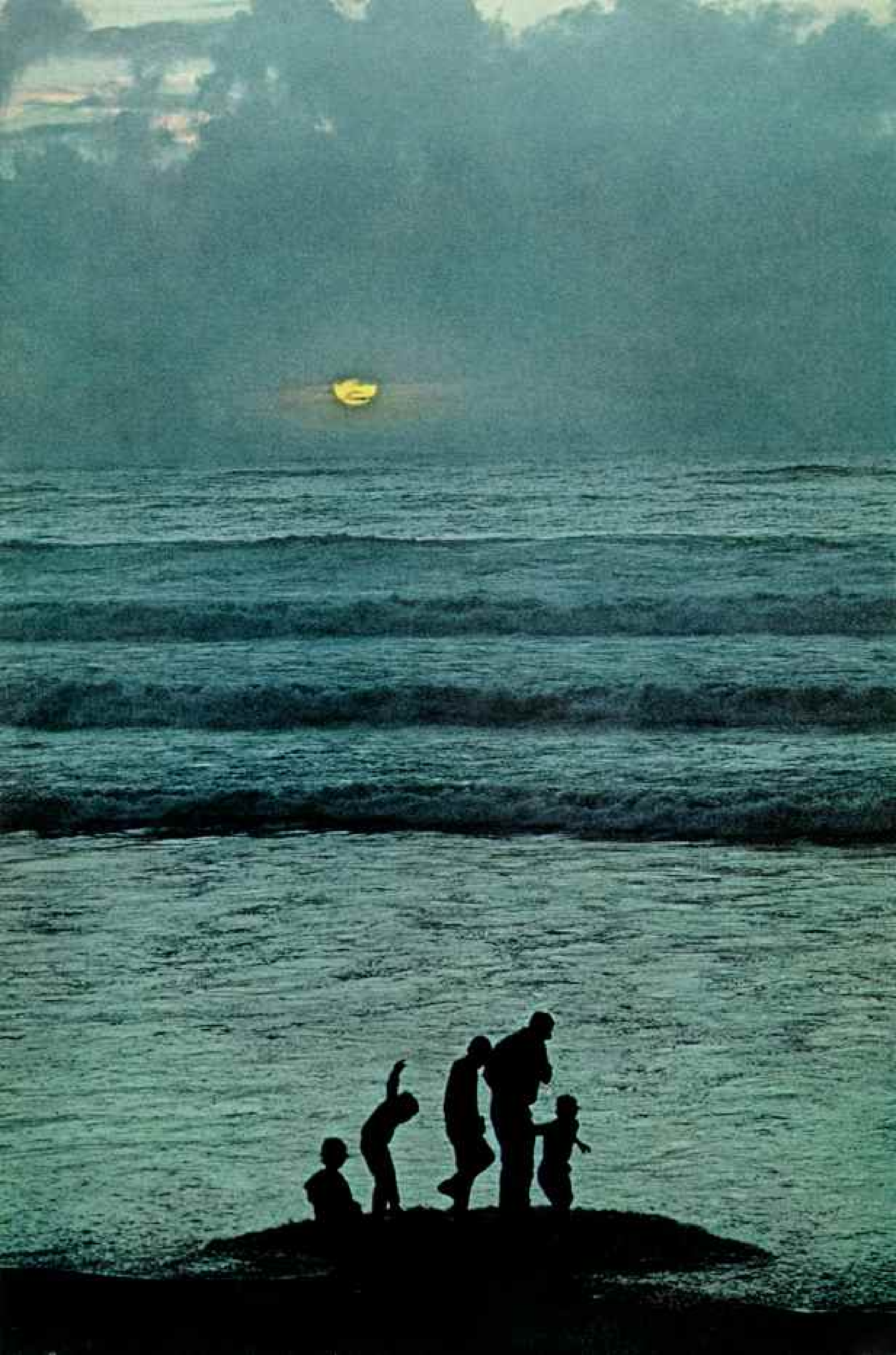
Trans-bay Tube Resists Earthquakes

"She's there, and ready to hook up," Don announced. Turning a series of valves that activated powerful pumps just inside the bulkhead, he fixed his eye on a pressure gauge on the wall above us. Slowly the needle began to drop, indicating that a vacuum was being created in the narrow space between the two sections of tube. There was a final screech of gasket against plate beyond the bulkhead, and Don nodded.

"That's it," he said. "We'll leave things for 24 hours to be sure there isn't a leak. Then we'll open the bulkheads, weld the two sections together for a permanent joint—and then on to the next one."

During the hike back to shore, I asked Don what would happen to the tube in a major earthquake, since it merely rests on a gravel foundation beneath a layer of bay mud.

"According to our tests, nothing," Don answered. "The tube has a certain flexibility to it; it's like a strand of macaroni suspended in a bowl of Jell-O. You can shake the bowl, and the macaroni will bounce around a lot, but it won't break. The critical points are the connections between the tube and the two



ventilation structures ashore, which are solidly anchored. Those connections are designed to move four or five inches vertically or horizontally without breaking."

It seemed a slender margin of safety in an earthquake, but Don only smiled.

"Anything more," he said, "and there probably wouldn't be much left of San Francisco —or maybe of Oakland, come to think of it."

Oakland Schools Face Thorny Problems

People frequently do that to Oakland—mention it as an afterthought to San Francisco. It's one of the things that vex my friend Daryl Ford, for he is enormously proud of his city.

I met Daryl, a delightful 12-year-old Negro, one morning at an elementary school in Oakland, where I had gone to learn something about bay area education problems.

Oakland's problem is twofold: The shift of population from run-down sections of West Oakland to less deteriorated East Oakland has left some schools under-enrolled, while overcrowding others. Moreover, like the city at large, the schools include a broad mixture of cultural groups, among them 54 percent Negro, 8 percent Spanish and Mexican, 5 percent Oriental, 1 percent American Indian. The mixture is often blamed for the social upheaval that has plagued Oakland in recent years and overshadowed the city's many attractions—attractions that once lured such literary figures as Jack London, Richard Henry Dana, Joaquin Miller, and Robert Louis Stevenson.

To me, Daryl Ford is one of Oakland's star attractions. His family lives in the "flatlands," the crowded, relatively low-income area east of the city's waterfront. Under special programs, Daryl and a good many of his neighbors attend school in the predominantly white and prosperous "hill area" overlooking the bay. He graciously gave up a recess hour with friends to discuss his city with me.

According to his teachers, Daryl belongs in the category of "gifted students," which means —as he explained it to me—"like they catch you reading when nobody said to." And what did he read?

"History, and the sport section," he answered, "just like everybody. You ever hear of Earl Warren and Daryle Lamonica?"

I admitted I had. In Oakland one can't escape hearing the names of two illustrious citizens—one the former Chief Justice of the United States, and the other the all-star quarterback of the championship Oakland Raiders football team. I asked Daryl what else impressed him about Oakland.

"There's the symphony and the new art museum, redevelopment, and all that stuff," he answered, obviously falling back on his reserves. Then, emphatically, "It's the best city, that's what."

I asked Daryl then about another side to Oakland, about militant groups such as the widely publicized Black Panthers, who have been involved in many a bitter struggle between white and black in the city and made Oakland virtually a symbol of racial violence.

"I don't think they have it," Daryl said thoughtfully. "People can't be all little pieces, they got to be one chunk together"—he waved toward the playground—"like me and my friends here." He paused.

"You remember all the hippies and the fuss over in San Francisco in the Haight-Ashbury district, with those drugs and stuff? I used to read about that all the time, but I don't see much any more. They fade, same as it's going to be with the fights here in Oakland." He laid a hand reassuringly on my arm. "Don't worry, now. It's all going to shape up."

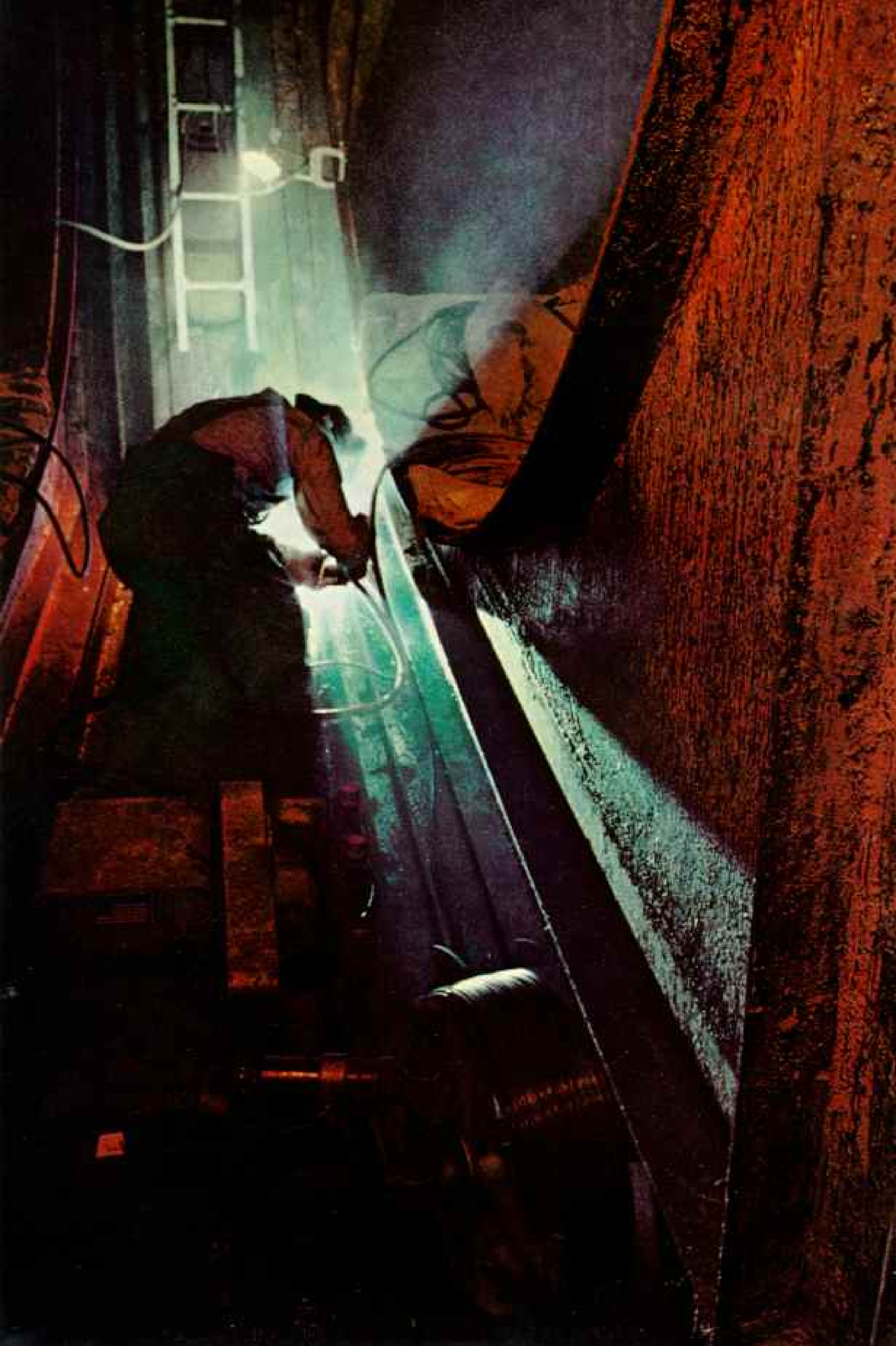
Daryl's part of the bay area, in fact, has been shaping up for years. The great fan of cities spreading into the East Bay hills bears little resemblance to the thinly populated residential area that was once known disparagingly as "San Francisco's spare bedroom."

Area Grows in Fame and Wealth

"Time was," says an Oakland research chemist, "when you were nobody around here unless you commuted to work in San Francisco. In those days, when an East Bay businessman registered at a hotel in New York or Chicago, he often listed 'San Francisco' as his place of residence—because who ever heard of Richmond or Hayward?"

Today a lot of people have—outsiders as

"**This is as far as the land goes,** after this it is sea," wrote Berkeley poet Josephine Miles of San Francisco, the city that ever gazes west. On a foggy afternoon a family lingers in the shallows near Golden Gate Park. Attractions in the park reflect the lure of the Orient: a Japanese tea garden and the Avery Brundage Collection of Asian Art—a recent gift to the city—which has encouraged expansion of Asian art studies at Berkeley, Stanford, and Oakland's Mills College.



AQUACHROMES BY JAMES L. STANFIELD © N.G.S.

Dream coming true for commuters

TO EASE TRAFFIC PROBLEMS, three counties cooperate to build the 1.3-billion-dollar Bay Area Rapid Transit system, a 75-mile underwater, underground, and elevated transport line, the first in the West (map, page 600). At the heart of the system, a double-barreled prefabricated tube—flexible to withstand earthquake—crosses the bay.

At the Bethlehem Steel Yards in San Francisco (above) a section of tube splashes from the ways. Engineers float it near the Bay Bridge and sink it to align with a section already on the bottom.

A welder seals the connection (left) and opens the two passageways. Through them, by mid-1972, electric trains will whisk commuters between Oakland and San Francisco in 9 minutes, an 8-mile trip requiring about 40 minutes during the rush hour by way of the Bay Bridge.

well as Californians. The giant oil refinery at Richmond (pages 630-31) and the increasing industrial might of Hayward are only two examples of the explosive growth and influence of San Francisco's neighbors. Other cities—such as Berkeley in the East Bay area, and Menlo Park and Palo Alto on the western shore—have earned the bay area a reputation as one of the world's leading centers of education and scientific research. Still other communities, such as San Jose and Sunnyvale in the South Bay region, contribute farming and aerospace production.

"In other words," an architect in Berkeley explains, "San Francisco is still queen of the bay, only she's become a constitutional monarch—everybody loves her, but she doesn't run the place any more."

For all its accent on progress and change, the East Bay area, like San Francisco, has a lingering attachment to the past. One of the most delightful spots in the entire bay area is Jack London Square, a remodeled portion of Oakland's busy waterfront, with elegant restaurants and the famous First and Last Chance Saloon.

The First and Last Chance was once something of a second home to novelist Jack London, whose stories of bay area life in the early 1900's include a fascinating collection entitled *Tales of the Fish Patrol*.

The First and Last Chance Saloon gives the impression of a badly built dory forever on the verge of capsizing. Almost nothing is plumb, from the heavy doorposts and worn threshold to the battered tables and chairs

Boulevard trumpeter sounds blue notes near the Hyde Street turntable where a gripman revolves his cable car. San Francisco has long treasured the unconventional; as Massachusetts author Richard Henry Dana observed in 1859, "The customs of California are free."

Swinging Sunday musicale pulls spectators to their feet at San Francisco's Aquatic Park, often the scene of free performances by a mime troupe and musicians. At nearby Ghirardelli Square, shops and cafes cater to international tastes.

Windblown cyclists climb precipitous Telegraph Hill, haunt of 19th-century writers Mark Twain, Joaquin Miller, and Frank Norris. Here Bret Harte complained about goats browsing on geraniums in his second-story windows and trampling the roof at night "like heavy hailstones."

by the bar. Somehow the proprietor, George Heinold, keeps the structure upright, as his father before him did in London's day.

I talked one morning with Mr. Heinold, who is now 75, while a procession of grimy tugs, sleek yachts, and an occasional freighter slipped quietly along the broad channel that separates Oakland and Alameda, making an island out of the latter city.

We talked for a time of the friendship between Jack London and Mr. Heinold's father, Johnny, who had encouraged the young novelist and even turned a corner of the saloon over to him as a writing studio. I asked if the name, First and Last Chance, had any connection with Jack London, and Mr. Heinold shook his head.

"That was from an earlier time," he said. "In the late 1800's, there weren't any bridges between Oakland and Alameda—only a ferry that docked about 50 yards from here.

"In those days Alameda was a mighty proper town; they didn't allow any saloons or tippling over there. But Oakland—well now, Oakland—she had a touch of the wastrel in her, and my father was an accommodating man. He built his saloon as close to the ferry dock as he could get. So if you were coming from Alameda, Heinold's place was your first chance for a little refreshment—and your last chance if you were going the other way."

Driving south from Oakland one autumn morning, I reached the foot of the bay, with its golden fringe of marshland and its great series of evaporating ponds belonging to the Leslie Salt Co. (pages 630-31). Here on a massive scale—but by a process almost as old as man himself—engineers convert bay water into pure salt crystal, pumping the brine through shallow evaporating ponds until little is left at the end but dazzling white salt pan.

"Go, Indians!" Stanford's Cheri Dyck urges her football team to victory in the hotly contested "Big Game" with Berkeley.

Sunday crunch of football fills the 53,000-seat stadium of the Oakland-Alameda County Coliseum Complex as the Oakland Raiders crush the Kansas City Chiefs 38 to 21 last November. The city's baseball team, the Athletics, plays home games on the diamond, here faintly visible through the turf. The complex, including an enclosed arena and exhibition hall, also hosts major-league ice hockey, soccer, and basketball. Alameda County's million residents and many industries spread over former ranchland.

Bay Water Yields Colorful Harvest

It takes Leslie five years—but very little effort—to extract a quarter of a pound of salt from a gallon of sea water. To air passengers over the South Bay area the process is a dazzling one. Seen from above, the salt ponds present a vivid patchwork of yellows, reds, browns, and delicate pinks—colors produced by marine organisms suspended in the brine.

Since the earliest days of exploration in the bay area, man has turned to the land's enormous natural wealth to help develop his great discovery. Among the most prized commodities were the huge redwoods, *Sequoia sempervirens*, that once darkened the hills south of San Francisco; today others are protected in Muir Woods National Monument, just north of the Golden Gate, and in Big Basin Redwoods State Park southwest of San Jose. By contrast, one bay area community—Redwood City—earned its name from the wholesale cutting and export of millions of board feet during the 19th century.*

The neighboring city of San Mateo recently memorialized Junipero Serra, the Franciscan

*The National Geographic Society has long been active in the effort to preserve these magnificent trees. In the July 1966 NATIONAL GEOGRAPHIC, Dr. Melville Bell Grosvenor, then President and Editor of the Society and now its Board Chairman and Editor-in-Chief, urged creation of "A Park to Save the Tallest Trees." Legislation authorizing the park was passed by Congress in 1968.

priest who was one of the first Europeans to see northern California's vast natural treasure. Beside historic El Camino Real, or King's Highway, San Mateans have raised an enormous carved redwood bust of the Spanish father who initiated a chain of 21 coastal missions northward from San Diego and laid the cultural foundations of Spanish California.

A Major Quake Every Century?

Not far from San Mateo, at the U. S. Geological Survey's National Center for Earthquake Research in Menlo Park, scientists continually probe the mystery of California's physical—and extraordinarily restless—foundations.

Bay area residents are forever discussing the possibility of another major earthquake such as the shock that overwhelmed and set fire to San Francisco in 1906, claiming 500 lives and half the city's buildings. The talk is more than fantasy, for experts concede the likelihood of a major earthquake in the northern California area within the next fifty years.

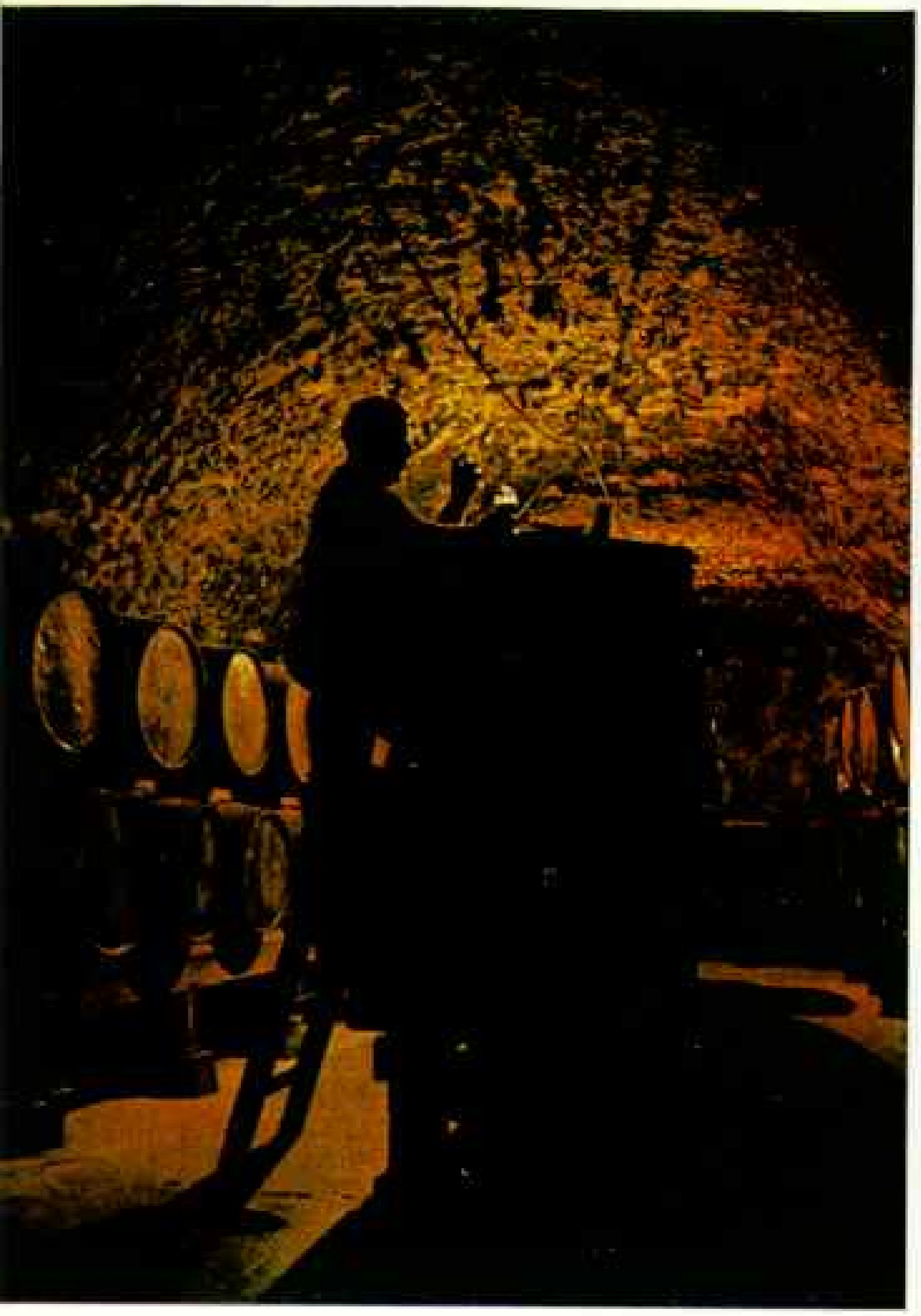
"Certainly our geological history suggests it," Dr. Robert Wallace told me one morning in Menlo Park. I had called on Dr. Wallace, a member of the research center staff, to learn how science had come by its grim prediction.

"It's a question of patterns," Dr. Wallace explained. "Our studies and records of the bay area indicate a rough cycle here of one major earthquake—that is, a shock measuring 8 or more on the Richter scale—about every hundred years. Of course, California experiences lesser shocks all the time. And three or four a year could cause minor damage if they occurred in heavily populated areas. But we're talking about a major quake, such as the one in 1906. If the pattern holds true, we might expect something on that order within the next thirty to fifty years —or perhaps tomorrow."

I asked if the research center had ever tried to estimate what a 1906-scale earthquake would do today in the bay area.

"In a rough way we have," Dr. Wallace said. "The great 1964 earthquake in Alaska was fairly

Life at their fingertips, doctors perform open-heart surgery, an operation that is scheduled twice daily at Stanford University Medical Center, a 10-year-old teaching and research hospital in Palo Alto. Dr. Norman E. Shumway, third from left, repairs the organ after connecting the patient's circulatory system to a heart-lung machine, foreground, reddened by infrared lamps used to maintain blood temperature. In 1968 Dr. Shumway performed the first adult heart transplant in the United States.

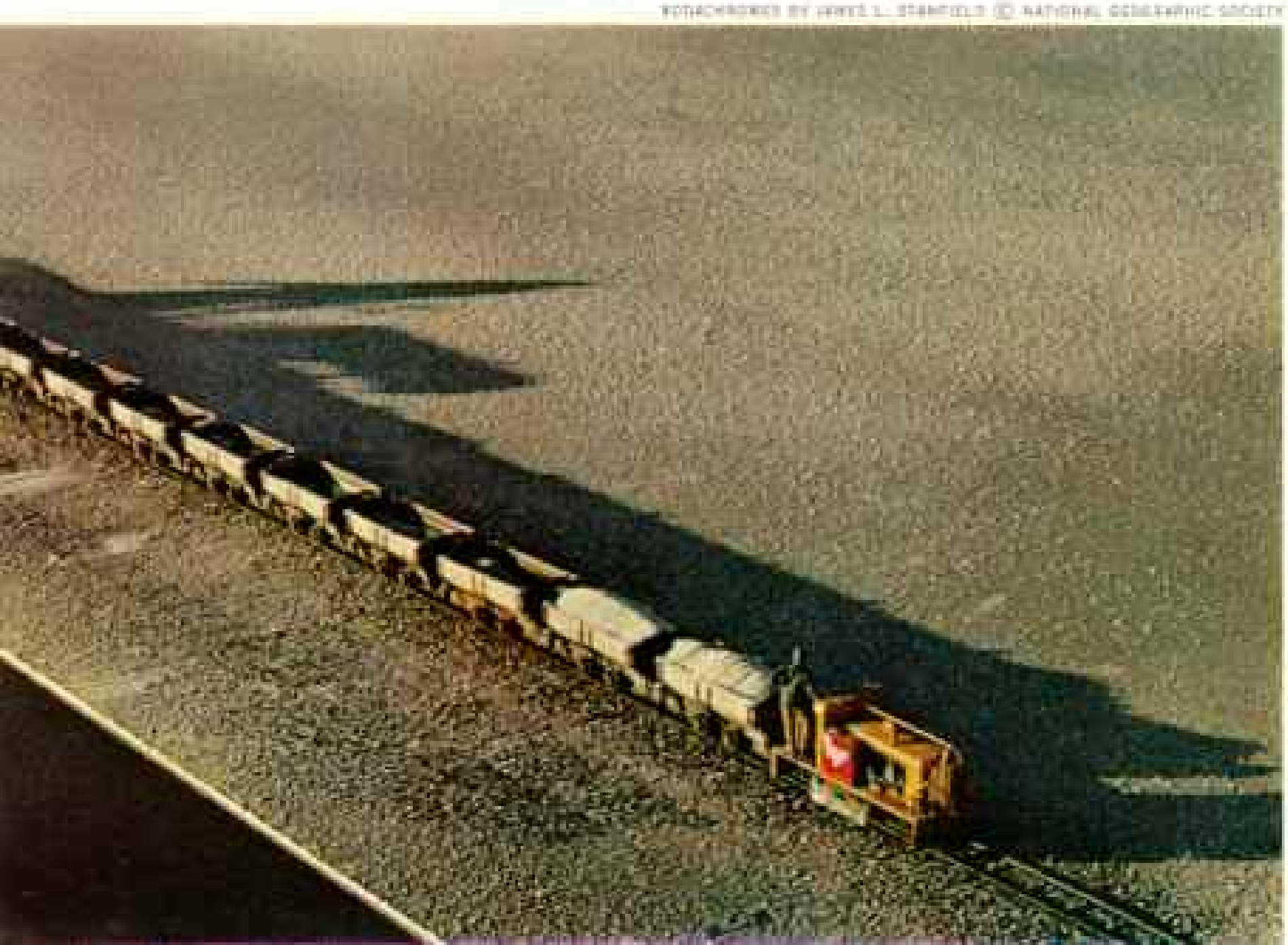


Aroma of aging red wine fills the limestone tunnels of Beringer Brothers, a St. Helena winery founded by German immigrants in 1876. Here the wine master samples a prize Pinot Noir maturing in a 50-gallon oak cask. Each year 7,000,000 gallons of wine flow from the sunny Napa Valley.

Energy factory at bayside, the Richmond plant of Standard Oil of California refines 190,000 barrels of crude oil a day. Silver-towered hydrocracking facility produces high-octane gasoline and jet fuel. To minimize pollution and protect wildlife, the 125,000,000 gallons of water used daily is purified and cooled before being pumped back into the bay. Five major refineries line 35 miles of channel from Richmond to Antioch.

Harvesting a crusty crop, a machine on portable tracks munches a layer of crude salt and deposits it in mine cars. The Leslie Salt Co. at Newark "grows" the mineral by filling 54 square miles of diked marshes with 14 billion gallons of bay water and letting evaporation do the work. The harvest: 1.3 million tons of crude salt each year. Only 4 percent goes to the table; industrial users buy the rest.

AUTOCHROMES BY JAMES L. STANFIELD © NATIONAL GEOGRAPHIC SOCIETY



Models of tomorrow's city take shape on the planning boards of the Architecture Department at Berkeley. Gary Fitschen designs totally mechanized parking buildings. Bay area architects help guide the department, whose enrollment of 1,000 makes it one of the country's largest.

Urban look of today: Over the decades tightly clustered single-family homes spread south from San Francisco's downtown core to Alemany Boulevard, below. While the population of the 45-square-mile city remains stable at about 750,000, some 6,500 people a month enter the bay area.

PHOTOGRAPHS (ABOVE) AND KODACHROME © [illegible]

comparable to the San Francisco earthquake in scale. Adjusting the Alaska damage figures to correspond with the bay area's vastly greater population and development, we estimate that a major earthquake here would now destroy several billion dollars' worth of property and could take a thousand or more lives."

If I had to be somewhere in the bay area during an earthquake, I think I would choose Alcatraz Island. The former federal prison, located three miles east of the Golden Gate in the middle of the bay, suffered scarcely a loosened brick or a cracked windowpane during the shock that razed a good part of San Francisco. Happily for the city, the inmates of Alcatraz—which was then a military prison—remained isolated by Army security and by the murderous currents that endlessly scour the island's rocky flanks.

No one, in fact, was ever known to escape permanently from the federal prison, although five out of nearly a score of fugitives who made the attempt remain unaccounted for.

Alcatraz Looks to Happier Days

Americans first used the 20-acre outpost as a defensive fort, then as a military stockade, and finally as a federal prison until 1963, when the penitentiary was abandoned as too costly to operate. The city of San Francisco is now negotiating to buy Alcatraz from the Federal Government, and plans to convert the island into a park and a convention and cultural center.

When I was there only three people were living on Alcatraz: caretaker John Hart, who had served as a guard there for 16 years, his wife Marie, and one assistant. With Government permission I spent a day on Alcatraz with the Harts, making the one-mile crossing from San Francisco in John's powerboat.

John and I spent the morning roaming the exercise yard, the workshop area, and finally the main cellblock—a single chamber housing a vast labyrinth of 336 interlocking steel cages that resembles some grim version of a child's jungle gym. In an adjoining room we came to Cellblock D, known in prison jargon as the "treatment" row and to outsiders as "solitary." Each of the 10 windowless steel chambers was heavily insulated from its neighbors and proved to be bare even of a bunk or washstand.

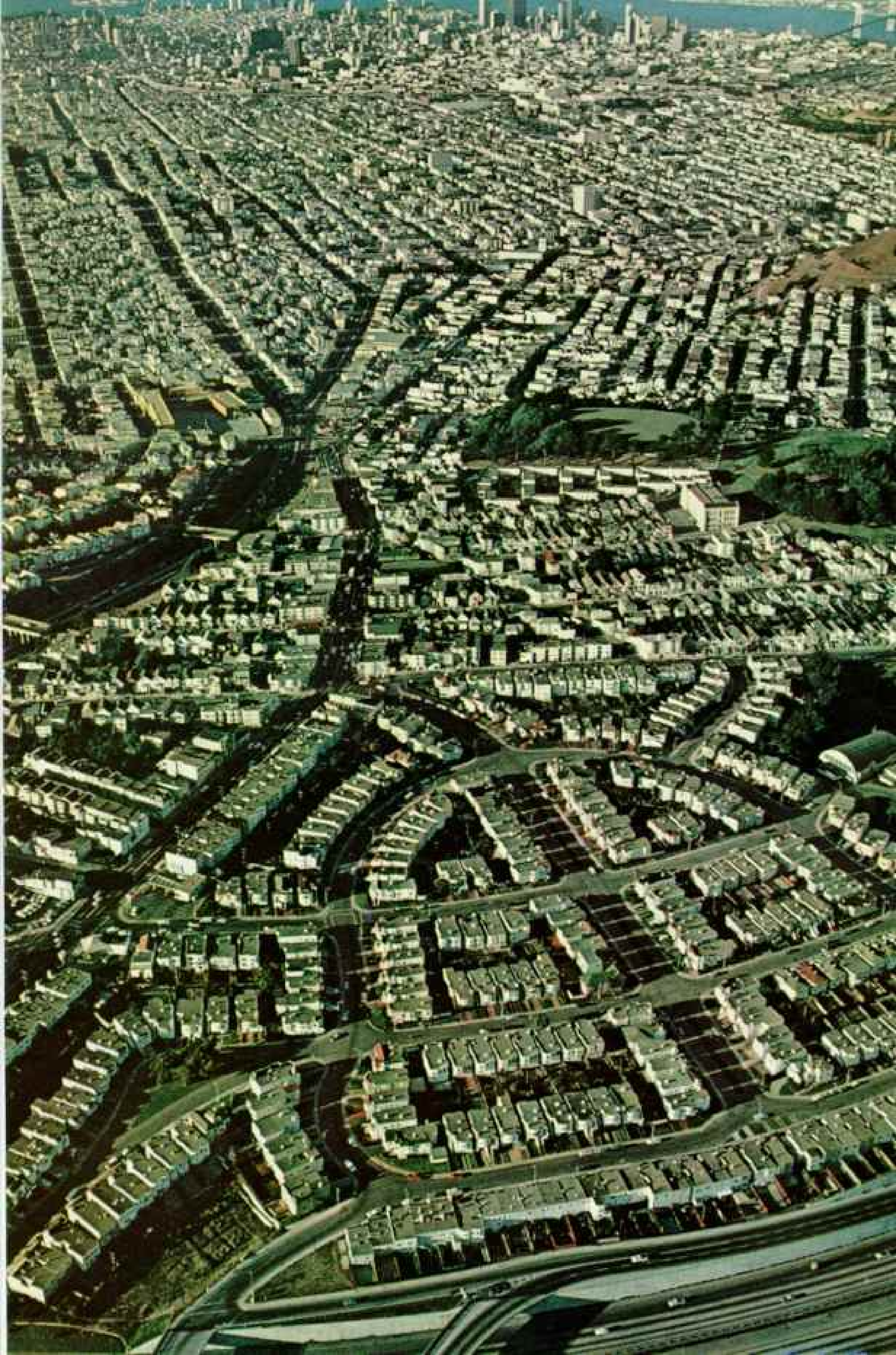
"Step in and see what solitary was like," John said, indicating one of the cells. I did, and he swung the massive steel door shut behind me, plunging me into absolute silence and darkness. I stood it for what seemed about five minutes and then had a chilling thought: If anything suddenly happened to John, I was likely to be in "treatment" for quite a while. Hastily groping for the door, I gave it a kick. It swung open easily, and there stood John, with a knowing smile.

"You aren't the first one to have that thought," he said. "We took the locks off all the doors six years ago."

Later, over lunch in the Harts' apartment, I asked John's attractive wife Marie if there was something I could do for her ashore. "We love your magazine," she answered. "Maybe you could send it to us?"

I said I would, and asked for the correct address.

"Oh, we have a post-office box ashore," Marie answered, "and John gets over once or



twice a week. But why don't you just send the magazine to our friend Lu Hurley at Commodore Helicopters over in Sausalito? Lu does the rush-hour traffic report over the bay area every day. On his afternoon run, he always swings by here and drops the evening paper in the prison yard for us. I'm sure he wouldn't mind dropping the magazine, too."

And that's why each month now a helicopter airdrops the NATIONAL GEOGRAPHIC to Alcatraz Island.

Pilots Train on Mighty *Enterprise*

On one of my last days in the bay area I sailed through the Golden Gate aboard the world's largest warship, the nuclear-powered aircraft carrier, U.S.S. *Enterprise*, with a crew of 5,500 officers and men.* The *Enterprise* was then based at the U. S. Naval Air Station in Alameda, one of a dozen installations that make the bay area one of the world's greatest concentrations of naval facilities.

Photographer Jim Stanfield and I had been invited to watch practice carrier landings off the coast by Navy jet pilots qualifying for duty with the Pacific Fleet (left).

Two things impressed me during our day at sea: incredible skill and incredible noise. More than a hundred jet pilots were involved in the exercise aboard *Enterprise*, each of them required to make 16 landings and 16 catapult-assisted take-offs in order to qualify for carrier duty.

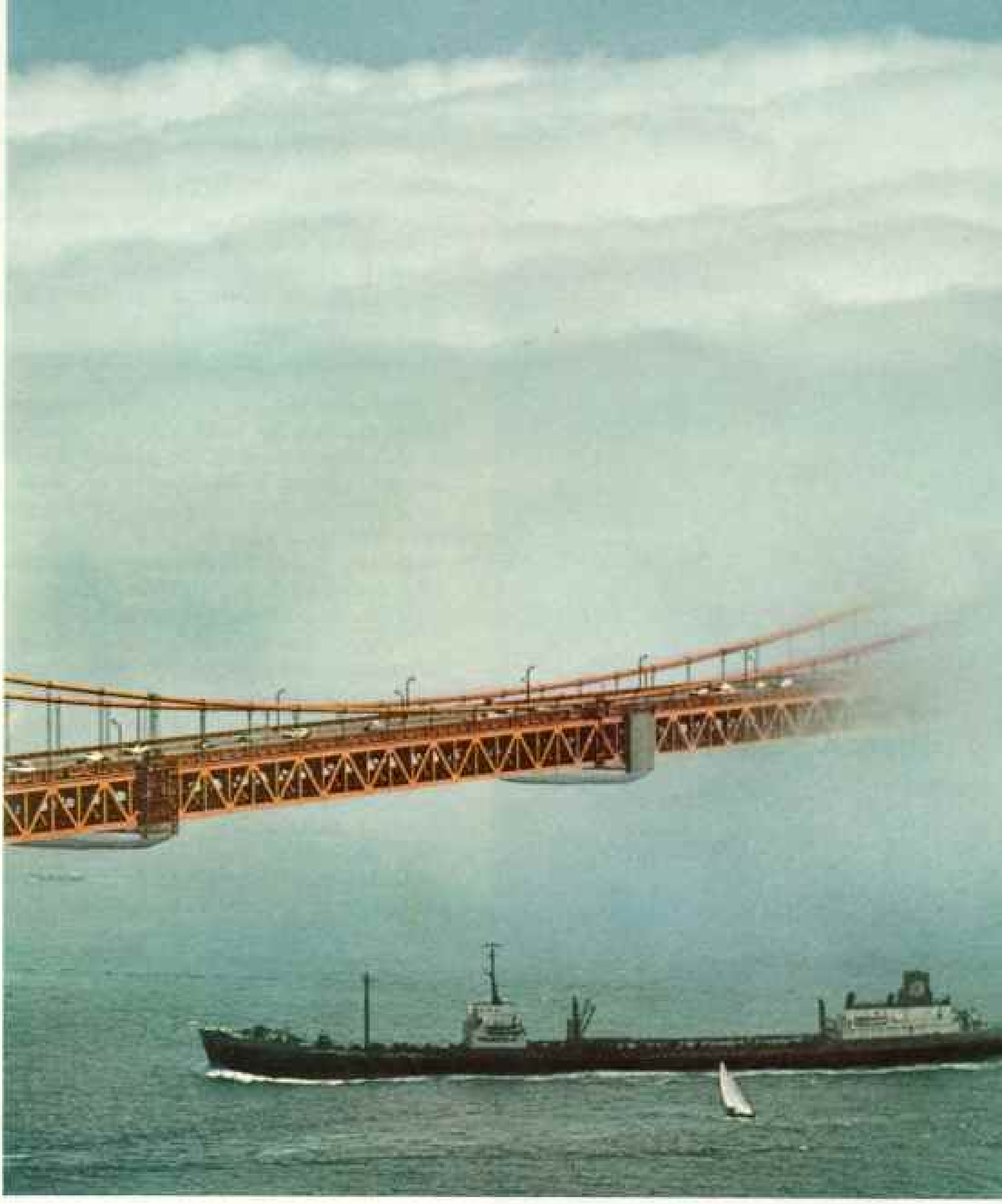
Even through the protective earmuffs that Jim and I wore on deck the sound was overwhelming. It combined the thunderous blast of jets straining against arresting cables with the pile-driver impact of steam-powered catapults, each capable of launching 34 tons of aircraft into almost instant flight.

Amid clouds of steam the flight crews went smoothly about their task of handling planes whose exhaust can sear a man to death in half a second and whose enormous air ducts can literally inhale him from a distance of 25 feet.

Just how narrow is the margin between

*See "The Mighty *Enterprise*," by Nathaniel T. Kenney, NATIONAL GEOGRAPHIC, March 1963.

Waves of deafening noise beat at crewmen scrambling to launch an A-5C Vigilante jet. The nuclear-powered carrier U.S.S. *Enterprise* catapults aircraft to 160 miles an hour in 250 feet. An airborne F-8 Crusader descends to the 4½-acre canted deck. For these training maneuvers off the California coast, the world's largest warship steamed out of the Naval Air Station in Alameda.

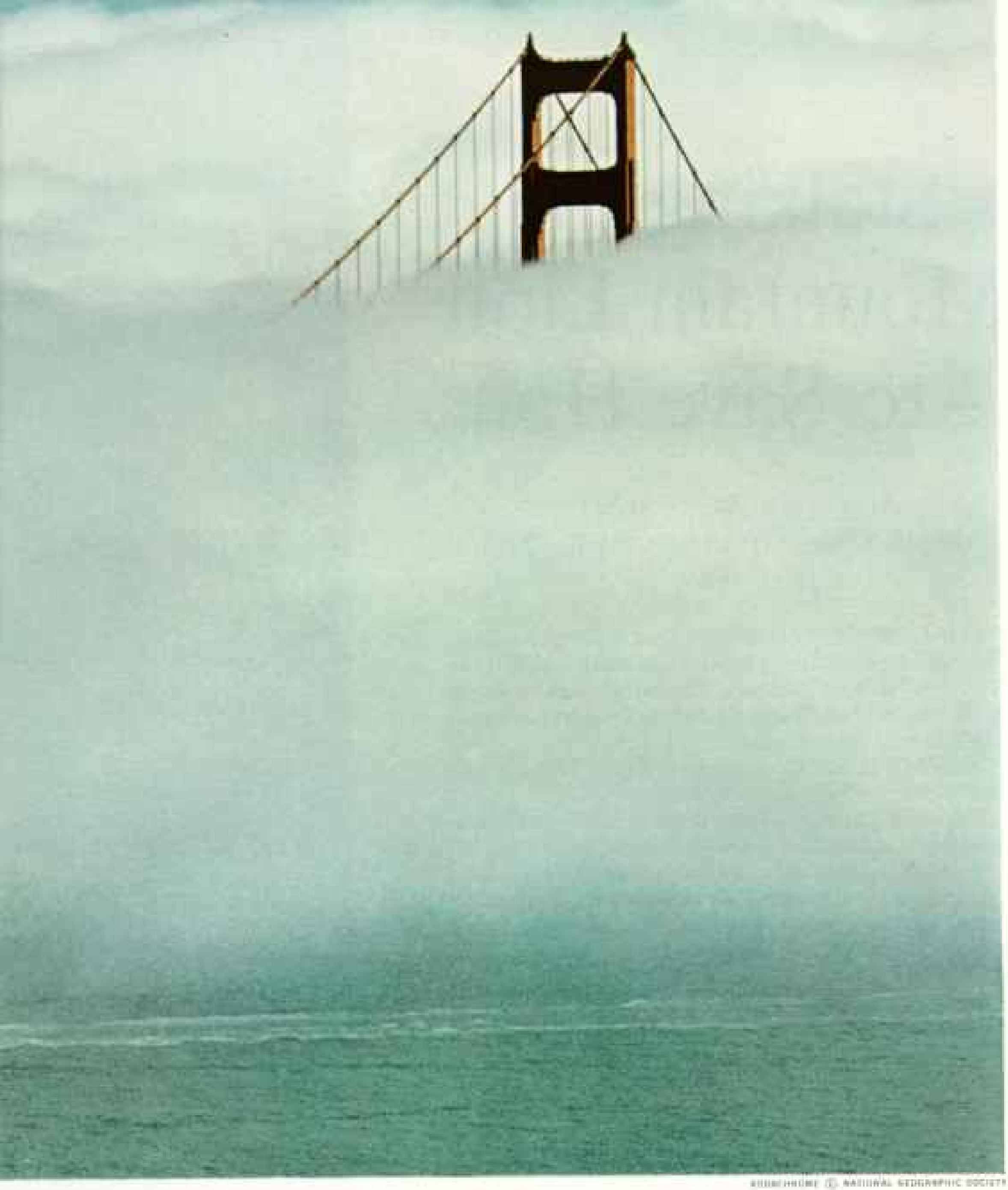


Magic curtain of fog envelops the 32-year-old Golden Gate Bridge on an autumn afternoon. The south tower was sunk 55 feet deep into bedrock, a next-to-impossible feat because of the furious currents in this strait. Cables expand and contract with changing temperature and traffic

routine and disaster aboard a carrier, we were to realize some weeks later. During subsequent combat exercises aboard *Enterprise*, a jet-engine starting mechanism apparently ignited an air-to-ground rocket under the wing of a plane being readied for launch. The explosions that followed snuffed out 27 lives.

After our visit Jim and I flew back to the mainland in a courier plane catapulted from *Enterprise*'s flight deck. Having watched dozens of similar operations I was prepared for a rough send-off, but for nothing quite like the actual experience of being jerked from a standstill to a speed of 160 miles an hour within the space of 250 feet.

An afternoon sun glazed the hills ringing San Francisco Bay as we approached from the south. There was a vivid flash of gold from the marshes bordering the head of the bay and a quick glimpse of the grassy ridge



AUTOCHROME © NATIONAL GEOGRAPHIC SOCIETY

load. Approaching ships are assured a minimum clearance of 220 feet in the main channel beneath the span. A tanker bearing crude oil—the area's largest import—slips into the bay, which is still, as Richard Henry Dana wrote in 1859, "emporium of a new world, the awakened Pacific."

where Portolá had made his great discovery two centuries before. Little else remained as the sturdy Spaniard had seen it.

On our north rose the glinting columns of San Francisco's skyline, facing across the bay toward hills richly embroidered with growing cities. Between the great steel garlands of the suspension bridges an endless flow of ocean-going traffic churned the immense stretch of water beneath us. Along the shoreline expressways, rush-hour traffic streamed out of the cities and slowly filtered into the hills and long valleys radiating from the bay.

The impression was one of a great caldron of life, constantly changing with new ingredients and new flavor. Along with changes come problems, and San Francisco Bay faces many. But as my young friend Daryl Ford in Oakland would put it: Don't worry, now. It's all going to shape up.

THE END

Stalking the Mountain Lion –to Save Him

Article and photographs by
MAURICE G. HORNOCKER, Ph.D.

STILL PANTING from the chase through the snow of Idaho's Salmon River Mountains, I pulled the gun out of my backpack. The barrel stung my hands in the cold, and my breath frosted the breech as I sighted into a fir tree 30 feet away.

"Careful!" gasped my companion, Wilbur Wiles. "Don't rush!"

Poised on a branch, staring down at her pursuers, was our target—a hundred-pound mountain lion.

We had struggled after the lion on snowshoes all morning, and now her baleful gaze was fixed upon us, anticipating our next move. Wilbur's two redbone tracking hounds bawled in a frenzy of excitement at the base of the tree (page 644).

When the big cat shifted position on the branch, I held my breath and fired. The lion jerked at the shot, bolted headfirst down the trunk, and then leaped far out over the clamoring hounds. She hit the ground, bounded down a steep brushy ravine, and was gone, the dogs in barking pursuit.

"You hit her!" Wilbur shouted. "She won't get far!"

We knew the lion couldn't escape because my gun had fired not a bullet but an aluminum dart containing a tranquilizing drug. It would, in a few minutes, render the animal completely manageable. The drugging was part of a long-term study of the mountain lion *(Felis concolor)*, one of America's most mysterious and fascinating animals.

Sharpening his skills, a cub cuffs his litter mate in mock battle. As an adult, the mountain lion—also known by such names as panther, puma, and cougar—hunts with cunning, strength, and agility. Yet man's encroachment on his wild domain takes alarming toll. To help save the species, the author—leader of the Idaho Cooperative Wildlife Research Unit—set out to bare the secrets of the big predator's solitary way of life.

Benevolent hunter, the author loads a tranquilizer dart (below) after spotting the mountain lion cornered in a rocky niche (right). Each wool-tufted dart slips into a shell for firing from a specially designed gun.

When the drug takes effect, the still-conscious but indifferent lion will allow himself to be examined, weighed, and tagged (page 649)—another step in a five-year-old study of North America's great cat. In the rugged mountainland of Idaho (map, page 642), Dr. Hornocker and his assistant Wilbur Wiles have recorded the hunting, traveling, and social habits of 46 individual mountain lions.

WILBUR WILES (LEFT) AND MAURICE G. HORNOCKER © N.G.S.

For five years, starting in 1964, Wilbur and I have tranquilized, examined, weighed, marked, and released 46 different lions, many of them again and again, to learn about their lives, their movements, and their habits. We have trekked more than 5,000 miles, much of the time on snowshoes, to follow the big cats deep into the Idaho Primitive Area, a 1.2-million-acre federal preserve of wilderness just south of the Salmon River in the central part of the state (map, page 642).

Flashing Claws Wound a Pursuer

"I hear the dogs!" Wilbur yelled. That meant they had caught up with the lion and were holding her at bay.

I half-climbed, half-leaped off the rocky outcrop where I had fired the shot, and we plunged into the ravine after the dogs. Fighting our way through hip-deep snow, we finally reached the two hounds, Red and Ranger. One was baying at the base of a cliff; the other was about 15 feet above him on a ledge, barking at the mouth of a small cave.

"The lion must be up there in the cave," I said to Wilbur. "I don't think she'll come out, but she may."

I slipped off my pack, caught Red, and tied him to a tree. Afraid that the more aggressive Ranger would enter the cave and be killed, I climbed to the ledge and crawled out on it to snap a chain on the still-baying hound.

A low growl came from the darkness of the cave. Backing slowly away, I led Ranger along the ledge and down to the ravine's brushy floor. As I tied him, I noticed that the side of his head and one of his ears were covered with blood. He had barely escaped death from a swipe of slashing claws.

All our experience with mountain lions, before this incident and since, has indicated that they rarely attack men, but almost invariably try to escape instead.

Not sure my shot had taken effect, I loaded my dart gun before climbing to the cave again. I also took a flashlight with me.

Cautiously I lifted myself over a rim and peered inside—to see the lion crouched a few feet away. The amber eyes glared out at me. When I turned on my flashlight, however, I

could see that her gaze was unsteady, that saliva was dripping from her lips. Both were signs that my shot had gone true and the befuddled female was under the delayed effects of the tranquilizer.

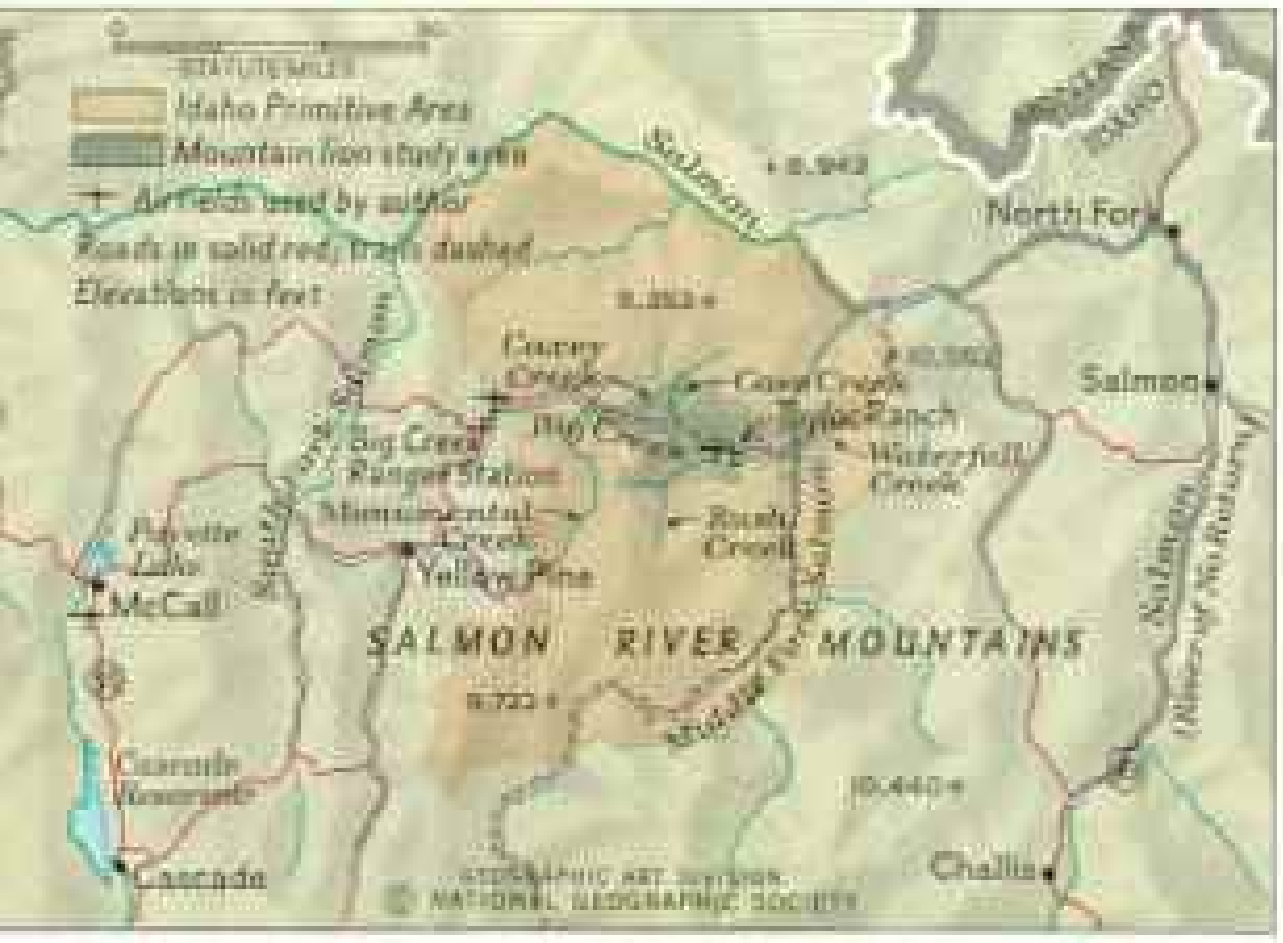
Lioness Awake During Tagging

"She's ready to handle," I called down to Wilbur. "Come on up."

While Wilbur struggled up to the ledge with the marking kit, tape measure, and weighing scales, I crawled into the cave and, gripping the big animal by the scruff of the neck and a foreleg, laboriously dragged her to the cave's entrance.

We weighed her (104 pounds) and took a series of measurements: her length, nose to tip of tail (6 feet 3 inches); her standing height at the shoulders (2 feet 6 inches). We marked her with numbered metal ear tags and with brightly colored plastic ear streamers. In addition, we slipped a collar bearing a colored, numbered pendant around her neck. Finally, we tattooed both ears, using a clamp that left numbers permanently etched on her skin—just in case the other markers were lost.

Throughout the process, the female remained awake; she managed to stand, peered about, and even tried to walk away. All the tranquilizer did was make her groggy, so we could work on her without fear that she would attack. When we finished, we half-pushed,



Once at home across the continent, the mountain lion now hangs on in areas where man rarely ventures. Zoologists estimate 4,000 to 6,500 roam fastnesses of the western United States; 100 to 300 prowl Florida's Everglades. For his study, the author chose a 200-square-mile region in the Idaho Primitive Area. The team trekked more than 5,000 miles, searching for the lion in winter months. Snowshoes ready and tracking dogs at his heels, Mr. Wiles slogs across a snowy slope (right).

half-led her back into the warmth and dryness of the cave and left her there. The drug would wear off in another 20 minutes or so with no ill effects.

The primitive area was ideal for our study. Remote and roadless, it sustains a healthy lion population relatively undisturbed by human intrusion, partly because its granite crags and deep-slashed valleys represent the greatest topographical relief in all of Idaho. Place names reflect the plight of early settlers in this harsh country: Disappointment Creek . . . Starvation Creek . . . Hungry Creek.

To get the most seclusion, I had chosen the Big Creek drainage—a territory of about 200 square miles in the middle of the primitive area. This wilderness became our laboratory for concentrated research.

We worked during the winter, from late November to early May. The tracks were easier to follow in the snow, and deep snow at higher elevations confined the lions and their prey—mainly deer and elk—to a smaller sector of their total range.

Project Sparked by Grizzly Study

Shadows were deepening by the time we had finished examining the mountain lion and returned her to the cave. At least five miles lay between us and our camp at Waterfall Creek, at the eastern edge of our study area. It was long after dark when we arrived at

Frenzied baying of Ranger, one of two redbone tracking hounds on the research team, trees a big cat for the tranquilizing gun of Mr. Wiles (above). Barking dogs so terrify mountain lions that they have been known to leap to limbs 18 feet from the ground. In their eagerness to get to the cats, the hounds sometimes suffer cuts from slashing claws.

Mother and cub take to a tree

FRIGHTENED BY PURSUING HOUNDS, a lioness scrambled 60 feet up this pine, leading her cub who climbed to a branch even higher (right).

Mountain lions may breed at any time of year. After mating, the male goes his way, and some 90 days later the female gives birth; she may produce as many as six kittens in a single litter. To the mother alone goes the responsibility of protecting, feeding, and training the young.

Snug in a den, the mother suckles her cubs and affectionately eyes their early antics—spitting, growling, hissing, scratching, and tumbling about. When the rambunctious youngsters grow older, the mother takes them, one at a time, on training hunts.

Both male and female mountain lions stake out their own hunting territories, marking boundaries with mounds of pine needles or brush scented with urine. Offspring strike out on their own at about two years of age, seeking a private range for forays as lone hunters.

camp. Men and dogs had to be fed and equipment cleaned for the next day. At midnight, when we crawled into our down-filled sleeping bags, I wondered which lion or family of lions we might capture tomorrow—and thus fit another piece of information into the puzzle of their life history.

My interest in the mountain lion began during my long association with Drs. John and Frank Craighead. John was my adviser when I attended the University of Montana, and I worked with them both on a study of grizzly bears in Yellowstone National Park.*

Experience gained on that difficult and demanding research project seemed to make a thorough study of the mountain lion a fitting sequel. I was enthusiastic, therefore, when officials of the Idaho Fish and Game Department and the University of Idaho asked me if I would conduct such a project in their state.

Dr. Ian MacTaggart Cowan of the University of British Columbia was interested in the research, and with his enthusiastic support a United States-Canadian cooperative project was arranged. Other organizations, notably the American Museum of Natural History, the Boone and Crockett Club, and the New York Zoological Society, helped from the beginning. The research is currently being carried out at the University of Idaho under the auspices of the Idaho Cooperative Wildlife Research Unit, which I have served as leader since January 1968.

Range Once Spanned Two Continents

The need for a scientific study of this animal and its relationship to its environment was obvious. The "American lion" once ranged over much of North and South America. In this country, records show that it lived in nearly every state and the District of Columbia.

Indeed, the lion formerly had the widest distribution of any single species of mammal in the Western Hemisphere. And it was, and is, the most adaptable. Lions were found in mountains, deserts, coastal forests, subalpine forests, swamps, and in prairie environments, from British Columbia in Canada to Patagonia near the tip of South America.

From all those wanderings came the mountain lion's many names: cougar, a French corruption of a Tupi Indian word; puma, from the Incas of Peru; catamount (from cat-a-mountain), a twangy New England expression; panther, the Greek word for leopard; painter, a U. S. colloquialism for panther; and *león*, used through much of Spanish America.

Big Cats Flee From Barking Dogs

Because it sometimes killed livestock, early settlers regarded the big cat as an enemy to be destroyed at every opportunity. Even Theodore Roosevelt, an avid conservationist, wrote of the "big horse-killing cat, the destroyer of the deer, the lord of stealthy murder, facing his doom with a heart both craven and cruel." In fact, individual animals sometimes learn to kill domestic stock and must be destroyed. But as a species, the lion poses little threat to the livestock industry.

Indiscriminate killing, aggravated by a now-disfavored bounty system, has taken a fearful toll. Today, lions in the United States are confined largely to rugged mountainous areas in our Western and Southwestern States. The New York Zoological Society, in a recent report, placed the total in the West at between 4,000 and 6,500—and there is evidence that the number may be dwindling even further. Since 1965, however, five Western States—Colorado, Washington, Utah, Nevada, and Oregon—have classified the mountain lion as a game animal and offered it some protection. The same is true in British Columbia.

Mountain lions are extremely secretive; they have aptly been termed the "ghosts of North America." Now they inhabit rugged, inaccessible wilderness country. They cannot be observed from a distance or from a blind, as can many other wild species, and certainly they cannot be approached readily, as can some of the big cats in Africa and Asia.† Only by tracking the lions long distances on foot, much of it on snowshoes, and by capturing

*See the Craigheads' "Trailing Yellowstone's Grizzlies by Radio," NATIONAL GEOGRAPHIC, August 1966.

†See "Life With the King of Beasts," by George B. Schaller, NATIONAL GEOGRAPHIC, April 1969.

Docile as a lamb, a drooling 151-pound cat swings down from a tree after receiving a tranquilizing drug some ten minutes earlier. Mr. Wiles, wearing tree-climbing spurs, attached the rope, looping it over a limb, and literally pushed the animal off its perch. Now he moves at top speed to prevent injury to the lion, controlling the rope with one hand and lowering the big male to the ground in a matter of seconds.

and recapturing them, could we learn the facts of mountain lion life.

In preliminary investigations in Montana, I satisfied myself that the big cats could be followed and captured alive with the aid of trained hounds. Lions have an inherent fear of dogs—barking dogs—and while adults are capable of killing a single dog quite easily, they will climb a tree to escape this noisy tormentor. Though they can outrun the average dog for short distances, they are no match for his staying power in a long chase.

Search for a Skilled Woodsman

With the means of capturing and handling the lions worked out, I turned my attention to finding an assistant. I realized that this choice could make or break the project. He had to be a man accomplished in woodcraft and willing to share weeks and months of loneliness and hardship.

Early in my search I heard of Wilbur Wiles, whose skill as a woodsman and lion hunter was common knowledge in central Idaho. I decided to seek him out.

In July 1964, I headed my pickup truck east from the mountain resort of McCall, which was to become my home, into the jumble of rugged ranges. My destination was Wilbur Wiles's home near Big Creek Ranger Station, where he had a small opal mine.

It was late in the day when I reached Wilbur's cabin. A tall, slender man in his late forties opened the door at my knock. Almost before I could introduce myself, he said, "C'mon in. The coffee's about ready." Over steaming mugs of it I outlined my ideas for the study. He enthusiastically agreed to assist

PHOTOGRAPHS BY WILBUR WILES (LEFT) AND MAURICE G. HORNOCKER © N.G.S.

Formidable weapons in the lion's arsenal, the powerful jaws of this adult male can snap the neck of a deer with a single bite. The canines of an enormous 227-pounder killed by Theodore Roosevelt in 1901 measured 1½ inches long.

Armful of defused dynamite, a 52-pound lion kitten rests placidly in the author's grip. He lugs it to a nylon net for weighing on spring scales hung from a tree.

me, and we talked far into the night, making plans for the first winter.

Five long winters of study have gone by since that initial meeting with Wilbur Wiles. Our preparations for each season have been arduous. Because we had to work on foot, we set up several camps along Big Creek and its tributaries. Wall tents sheltered us at Rush Creek, Cave Creek, and Waterfall Creek. Beside Coxey Creek we renovated a dilapidated cabin once used by prospectors. Wilbur's own cabin on Monumental Creek was our other camp in the upper Big Creek watershed.

We made our headquarters at the Taylor Ranch, a 65-acre private property on lower Big Creek. That way we could cover the entire study area, and never be more than a few miles from a camp when darkness fell.

I flew winter supplies and research equipment in ahead of the snow each year, landing at Big Creek Ranger Station and the Taylor Ranch. Wilbur used three packhorses to carry the tents, stoves, pots and pans, tools, and sleeping bags to the campsites.

Frozen Meat Supply Prepared

Every year we laid in more than a ton of dog food, caching it carefully against weather, rodents, and marauding bears. We put dried foods in waterproof bags and hung them from poles tied between trees, buried canned goods to prevent them from freezing, and stored cords of firewood.

In late autumn of each year, we shot two deer and an elk and distributed the meat among the camps; wrapped securely in canvas, it would hang frozen through the winter, ready to be thawed whenever we needed it.

Drowsy under examination, a mature female has her feet measured by Mr. Wiles. The team kept careful records of size and weight as they captured and recaptured the same cats.

The feet of mountain lions, like those of their domestic cousins, are well padded for silence when stalking their prey. Often they place their hind feet in the imprints of their forefeet, thus lessening the possibility of snapping a twig or dislodging a stone.

Earmarked for study, a lion wears a tattooed number. Metal ear tags, colored ear streamers, and numbered collars may fail to provide permanent identification; some lions marked one winter lost all tags by the next.

Crouched at cliff edge, a tagged lion appears resigned after his ninth capture. Winterized with the warmth of his luxuriant fur, he will brave the iciest streams in pursuit of prey. In summer the cougar sheds this thick pelage in favor of a sleeker, cooler coat.

Power in motion, a mountain lion lopes through the snow. One of the fastest animals for a short stretch, the cougar reaches blurring speed almost the second he springs. His stealth and powerful leap enable him to bring down animals the size of elk. Deer and elk provide the bulk of his winter food in the Idaho Primitive Area, but he also dines on snowshoe hares, wood rats, mice, squirrels, and porcupines—quills and all.

By the end of our fifth season, the story of the mountain lion was taking form. We found that the population was stable and that no more than 10 adults were full-time winter residents in the 200-square-mile study area. Of the 36 other lions we studied, 27 were kittens and 9 were transients. Every year two or three new litters, numbering two or three kittens each, were born.

The resident adults were firmly established on territories, and each had a home range to which it confined itself. The data suggest that this winter home-range size varies from 5 to 25 square miles for females; males utilize an area of 15 to 30 square miles.

Each winter half a dozen additional lions might enter the study area, but not to stay. Wandering lions of both sexes appear to know when they are in another lion's home ground. The resident scrapes together leaves, twigs, or pine needles into mounds four to six inches high, then urinates on them, to make sight and scent markers delineating its territory.

We found such "scrapes" under trees, on ridges, and at lion crossings, where the markers act as traffic lights on regularly traveled paths. Whenever we tracked a newcomer to one of the scrapes, the trail showed that the lion had abruptly

changed its course, knowing that another lion or family was in the vicinity, and retraced its route for two or three miles before trying a different area.

I call this cooperative behavior "mutual avoidance," and believe its purpose is to protect the mountain lion as a species. Because they are solitary predators, lions have to depend on their physical well-being, their agility, to survive; consequently, fighting in defense of their territory, as do some gregarious species such as wolves, is a luxury lions cannot afford. An injured wolf may survive because he is a member of the pack; an injured solitary lion most likely would starve.

Our technique of capturing and recapturing individual lions, combined with tracking them for hundreds of miles, told us many things about the habits of these great predators. We found that mature females averaged about 100 pounds and males in the neighborhood of 150. The males varied more in weight; the lightest male we weighed was 130 pounds; the heaviest, 181.

Adults Scorn the Social Life

We learned that mountain lions are strictly solitary creatures, with social tolerance being exhibited by males and females only during the brief breeding periods, and by females and young during the longer period of juvenile dependency.

The big cats, like their small domestic cousins, are capable of breeding at any season of the year. In central Idaho, however, breeding is limited largely to winter and early spring. A male and female will pair and remain together for two weeks or perhaps longer. They

KODACHROME © N.G.S.

Polka-dotted kittens, 1½ months old, romp with the author's daughter Karen. The Division of Wildlife Services office in Boise, Idaho, presented the two males to the Hornocker family to aid in the lion research. Named Tommy and Flopsy, the orphans flourished on a diet of baby formula and, later, horse meat. Distinct spots and tail rings last about four months.

Rumbling purrs greet Karen as she pets Tommy and Flopsy. At 15 months of age their spots barely show. The "talk" of the kittens helped the author discover how mountain lions communicate in the wild. Various whistle-like sounds, resembling bird calls, indicated alarm or pleasure.

then part, and the male plays no further role in the family life.

After a gestation period of about 90 days the spotted young, numbering one to a maximum of six (the largest litter we observed was three) are born in a cave or in a den under a windfall. They are helpless at birth, but grow quite rapidly. The mother brings food to them in addition to providing milk.

I am not certain when they leave the den in which they were born, but it is probably at about two months of age. After this they may utilize different temporary dens and caves while the mother forages for food, but they never again depend upon a home den.

Drugging Can Be Deceptive

Our work was not accomplished without incident. Once we had completed the arduous physical task of tracking down, treeing, and drugging an animal, we usually had to climb to it, tie a rope around a back leg, and lower it to the ground (page 646). At first I had experimented with immobilizing drugs, but these presented too much danger to the mountain lions—immobilized cats fell from the trees and were subject to injury. The tranquilizing drug I settled on merely calmed the animals, instead of immobilizing them, and they remained in the trees.

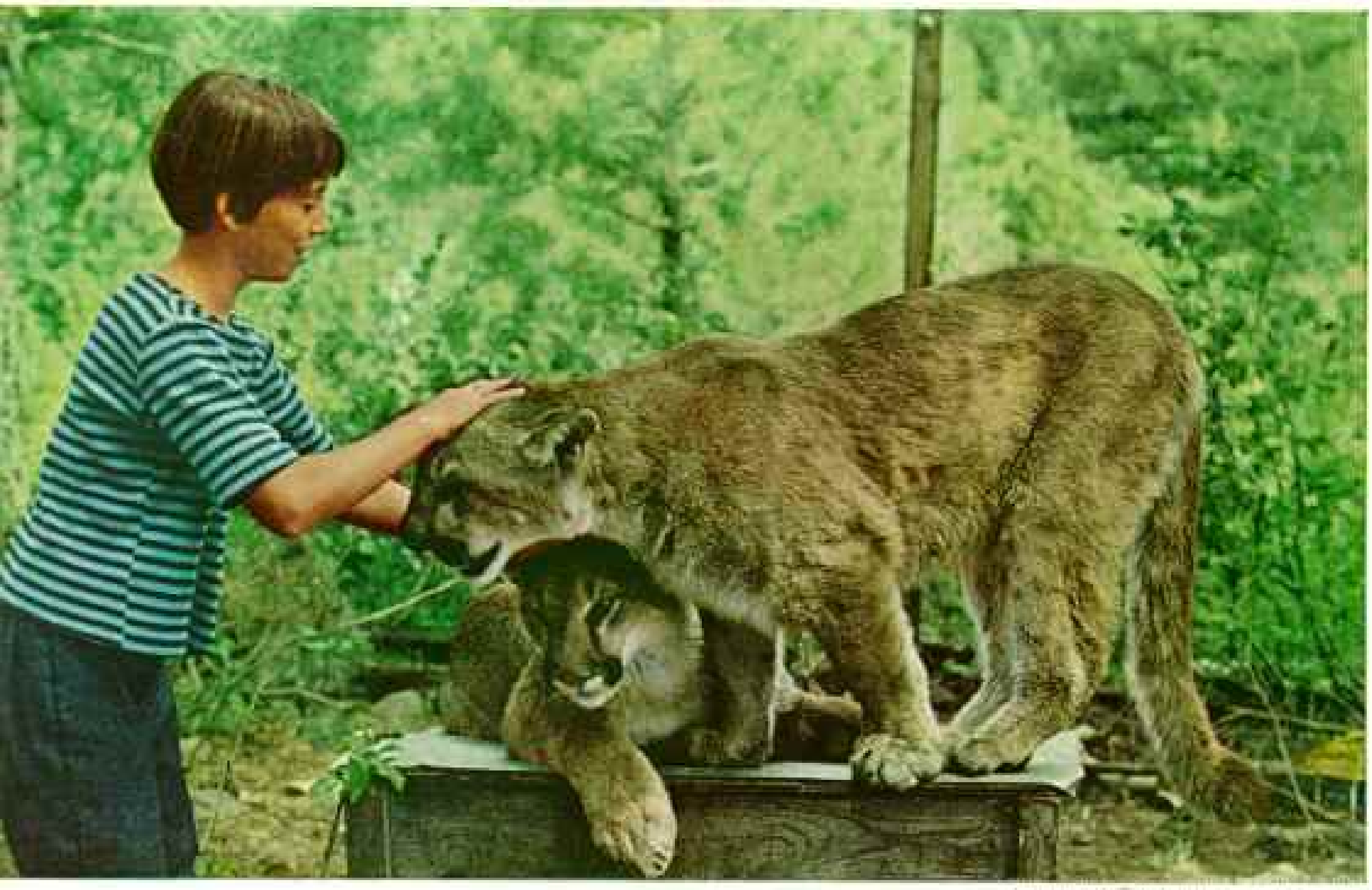
Sometimes it was difficult to tell if a cat actually was drugged and safe to approach. Usually they gave some telltale indication—drooling, jerky head movements, unsteady eyes—but sometimes we were fooled. Early in the study, in an unnamed valley adjacent to Cave Creek on the northern side of the study area, we treed a large tawny male in a half-rotten fir that leaned far out over a cliff. I fired a drug-laden dart into his hip and after ten minutes or so was sure he was ready to lower to the ground.

Strapping on the tree-climbing spurs, I began to approach him. Fully occupied with climbing, I could not keep watch on the big cat 30 feet above me. And I tried not to notice the cliff face that fell away below.

I could hear the lion breathing as I got near. Just as I started to glance up, Wilbur shouted, "Watch out, he's coming down!"

By hugging the trunk, I managed to move to my left at his warning—only to find myself staring into the face of the lion no more than three feet away. He had half-slipped, half-leaped to a lower limb while I was climbing. I stared into his chilling, amber eyes, then realized that his gaze was unsteady. The animal was partially drugged.

I dug a spur into the tree and pushed myself up. At that, the big cat literally dived down the trunk, tearing off chunks of bark with his gripping claws. He sprang from the tree and sailed like a huge flying squirrel seven feet long onto the snow at the cliff's edge. With



PHOTOCHROME © NATIONAL GEOGRAPHIC SOCIETY

another bound, the lion swung into a labyrinth of rocks behind us.

"Turn the dogs loose," I yelled to Wilbur. Red and Ranger lined out on his trail, and soon their baying told us they had treed him again. Later, as we worked over the cat now fully drugged by the dart, Wilbur chuckled, "Looked as though you two were trying to stare each other down."

Herds Benefit From Predation

One of the important objectives of our work has been to determine the effects of lion predation on their main sources of winter food—in this area, elk and mule deer. By examining carcasses and bones, we have found that the lions kill a greater proportion of the young and the very old—the easiest prey. Seventy-five percent of the elk killed were under 1½ years of age or over 9½. Sixty-two percent of the deer were in these age classes.

This information indicates that lions cull the poorest specimens from herds—the infirm and the aged—with the result that the strongest, the best examples survive. Further, the very young and the very old are the first to show the effects of malnutrition, and our studies revealed that half of the animals killed by lions were suffering nutritional deficiencies, and thus were more vulnerable.

Our painstakingly established facts—a stable lion population, increasing elk and deer populations, overused winter food supply for elk and deer, particularly the most important plants (bitter brush and mountain mahogany)—allow us to reach but one conclusion: Lion predation is beneficial to the herds in such an environment. Grazing animals tend to increase in numbers to the point of eating themselves out of food; when this occurs, catastrophic winter die-offs result. Many years are required to restore the vegetation and, in turn, the animal populations.

Predation by mountain lions may not be able to control or hold down these populations, but it is an age-old force which tends to lessen the frequency of violent fluctuations in the number of animals the lions prey upon.

The lions' predation has one other effect; it keeps the deer and elk herds on the move, a desirable result when food is scarce on the limited winter ranges. When a kill is made, the reaction of a herd is striking, as we have often seen. The deer and elk immediately abandon that area and move to new feeding grounds, reducing the chances of their eating themselves out of available food.

Not all lions are winners in their encounters with deer and elk. When you consider the relative sizes of an elk, which may weigh as much as 1,000 pounds, and a lion, it is not surprising that some attacking lions are injured, even killed.

In December 1967 near Rush Creek, Wilbur

came upon a female which had been injured by an elk. Tracks showed that she had stalked a herd of four or five elk before attacking what was probably a young bull. The two had skidded down a steep slope and crashed into a tree. The elk escaped. When Wilbur treed the female, she had blood on her mouth and head from the collision, but appeared to be all right otherwise.

Three weeks later he captured her again, about four miles away beside Big Creek. It was obvious something was wrong with her. She was terribly thin and could hardly climb. Wilbur drugged her and took her from the tree. To his horror he found that she had a broken jaw and that her lower canines had been torn out. In addition she had severe puncture wounds in a shoulder and hind leg from the elk's antlers. For three weeks the animal had suffered and starved. He had to shoot her to end the suffering.

The lions hunted as much in daylight as they did at night, if not more, and their diet was not limited to big-game animals. From their droppings, we discovered that they killed and ate snowshoe hares, wood rats, mice, squirrels, raccoons, coyotes, and, in one case, an entire meal of nothing but grasshoppers! So it became increasingly apparent that the lions, like most predators, were eating what was most easily obtainable.

Twin Cubs Join Family Circle

While in the field, I ordinarily called my wife Shirley in McCall about every two weeks by radiotelephone. She surprised me on one call with the announcement, "We have two baby lions!" The state office of the Division of Wildlife Services, United States Bureau of Sport Fisheries and Wildlife, had presented them to us for study.

The kittens, both males, grew and flourished as Shirley fed them baby formula, oatmeal, and vitamins. Our three daughters promptly named the orphans Tommy and Flopsy (preceding pages). After they reached 2½ months, we moved both of them into an outdoor enclosure and changed their diet to raw horse meat, hide, and bone.

Tommy and Flopsy taught me how mountain lions communicate. They started using different whistle-like sounds to greet me or call each other. A warbling note was a greeting; a piercing one, an alarm; and short, intense tones meant "Come here!"

I am certain lions "talk" in the wild by means of these whistle-like sounds produced with their vocal cords. It had been a mystery to us how pairs or families, hunting together, could separate—one dropping into a basin, the other circling a ridge—and then join each other at some seemingly predetermined spot to continue the hunt. Since Wilbur and I first recognized this sound, we have heard it in the wild a number of times. The captive lions did not "scream," and we have never heard anything like a scream in the wild. Lions make many sounds similar to those of house cats but, of course, much louder.

Next Goal: To Wire Lions for Sound

One day last April we climbed out of a canyon and, unshouldering our packs, leaned back in the soft sunshine. Spring had come early this year to the primitive area, and our season's work was coming to an end.

The south-facing slopes were green with new grass, and far up the ridge we heard the hooting of a male blue grouse. High above a cliff across the canyon, a pair of ravens courted, diving and rolling over and over against the azure sky. The golden eagles that had soared in courtship on bright February afternoons were now nesting, and soon steelhead trout would enter the stream to spawn, ending their long journey up the Columbia, Snake, and Salmon Rivers from the sea.

As we dropped off the ridge into our lower Rush Creek camp, I found myself looking forward to next season's work. I hope to attach tiny radio transmitters to our established residents and follow them throughout the year. For while we have learned much about these great animals in winter, we need to learn more about them and their year-round relationships with other species. As Wilbur put it, "The more a man learns, the more he learns he doesn't know." And we need to know in order to preserve and manage this splendid animal—an integral and important part of the wilderness environment and a true vestige of primitive America. THE END

"Lithe and splendid beasthood," wrote naturalist Ernest Thompson Seton of the mountain lion's physique. "His daily routine is a march of stirring athletic events that not another creature—in America, at least—can hope to equal."

Bali by the Back Roads

Article and photographs
by DONNA K. and
GILBERT M. GROSVENOR
Associate Editor

DAWN'S FIRST FINGERS touch the lofty peak of Bali's great mountain, the holy Agung. There, at the top of the world, Balinese gods awaken and watch from their balcony seats as the sun creeps down the wrinkled slopes to illuminate the perpetual pageant of mortals unfolding below.

At land's edge palm trees lean seaward as though listening for the muted crash of breakers spilling over the lip of a distant reef. In a quiet lagoon outrigger canoes glide like giant water bugs. On the beach brigades of tiny crabs etch delicate mosaics in the wet sand abandoned by the outgoing tide.

Shafts of sunshine sift down narrow shaded paths that lace together sculptured canyons of lime-colored paddy and knots of scattered villages.

The graceful silhouettes of barefoot women on their way to market glide in and out of the shadows. They wear such inspired millinery as a basket of squealing piglets, a pyramid of pottery, or a bouquet of salad greens draped with a speckled hen.

An old woman pauses at a small shrine to tuck a fresh hibiscus behind the ear of its carved-stone deity. A bronzed, half-naked farmer shouldering

With grace and devotion, queenly women of Sanur parade to a temple with offerings of fruit and pressed rice. Their towering burdens, anchored to banana stems, may weigh as much as 150 pounds. The festival adds its pulse beat to a pageant-rich culture that enchanted the authors as they roamed the byways of Indonesia's garden isle.

a heavy wooden plow steps from his mud-brick family compound. Not far behind, his elderly father quick-marches a waddling battalion of ducks.

The contrapuntal crowing of cocks triggers the half-hearted yipping of Bali's omnipresent dogs. By now the caged song doves, swaying atop tall bamboo poles, begin their serenade.

Soon distant sounds like the tinkling of filigree silver punctuate the morning chorus as the gongs and cymbals of a gamelan orchestra herald a village celebration.

This is the daily pageant that parades along the back roads of the Indonesian island called Bali—a pageant virtually unchanged for centuries. Paradise, like the visions or dreams which inspired men to create such a word, lies in the eye and mind of the beholder. More than just a place, it is a feeling, an impression, an experience. It is Bali.

Balinese Life a Continuing Celebration

"You must seek out Bali's special moments, knowing how and where to find them," our friend Njoman Oka counseled us. "The Balinese will welcome you, but whatever they are doing, they do for themselves and not for your entertainment."

For six weeks my wife Donna and I roamed Bali's rice-rich heartland, breadbasket for the island's 2,300,000 population. We trekked to the wild scrub jungle in the west, to the limestone cliffs at the southern tip, and to northern plantations of coffee and coconut. Along the way we shared our days with countless farmers, artists, priests, and village chiefs.

No one knew Bali's back roads better than Njoman, a soft-spoken father of 10, who learned his fluent English from reading books. With him, as with many other Balinese, we simply let our days unfold. Unexpected, spontaneous happenings awaited us along every path we explored.

It was just such a happening that greeted us in a small village near Tabanan (map, pages 666-7). "Look—*pendjors!*" Njoman exulted, pointing to 30-foot decorated bamboo poles lining both sides of the road. "There must be a celebration nearby."

An old man sat cross-legged under a sprawling banyan tree, preening the russet plumage of a fighting cock. Njoman spoke to him and he replied, gesturing toward a rutted, grassy path.

"The gods must be smiling on you," Njoman told us. "He says there will be a tooth-filing ceremony at the family compound of the village chief. The head of that family is an old friend, and I will introduce you."

Njoman handed us batik scarfs which he always carried in the car, instructing us to tie them about our waists. They show proper respect to a host or a temple god, and hence are a social and religious essential to travel.

Tooth filing symbolizes the coming of age, a milestone in

Monkey army saves a princess. Beneath scudding clouds and wind-rippled palms, an elaborate gateway in Pliatan completes a scene of fantasy. As 150 voices bark in staccato chorus, arms wave and bodies writhe in symbolic attack on the evil king of Lanka (Ceylon) who has captured the wife of an Indian prince—an episode from the Ramayana. The epic reached the island in the 11th century with Hinduism, which the Balinese blend with animism and ancestor worship to create a religion that rules their lives.

PAINTING BY GILBERT M. GROSVENOR © NATIONAL GEOGRAPHIC SOCIETY

A girl comes of age: As onlookers chant in rhythm to the gongs and bells of a gamelan orchestra, a frangipani-crowned celebrant from a village near Tabanan formally attains puberty at a tooth-filing ceremony. The joyous ritual, performed for both sexes, protects against *sadripu*, the evil in human nature. A priest rubs a gold ring on the girl's lips (above); then he wields his tapered file (right). Metal screeches against enamel; white dust flecks the priest's dexterous hands. At last he grinds down the six upper front teeth until all are even. When the nerve-tingling—but almost painless—ritual ends, the girl admires the added beautification. Every Balinese must undergo tooth filing to qualify for eventual cremation, lest the gods mistake him for a fanged demon and deny him entrance to the spirit world.

the life of a Balinese. Centuries ago, teeth were filed mainly to enhance the appearance of boys and girls at puberty. But after Hinduism came to Bali some nine centuries ago, the ritual acquired more religious significance.

"We think of it as laying the cornerstone of a building," Njoman said. "To ensure a strong foundation, we must ward off *sadripu*, or the evil qualities of the human nature, like greed and conceit. No Balinese should be cremated until his teeth are filed; otherwise the gods might mistake him for a fanged demon."

A typical thatch-topped, mud-brick wall surrounded the compound. Inside we detoured an inner wall designed to divert evil spirits, who can't climb or turn sharp corners.

Moss-covered stone ramps led us to an inner courtyard, where we dodged pigs and chicks scurrying from the path of children playing hide-and-seek.

Several generations share a compound, since sons traditionally return home with their brides. As the patriarch, our host ruled the household, even though his son was now the village chief, or *perbekel*.

The old man ushered us to a cool porch; there we sipped thick black coffee and ate cakes of sticky white rice that tasted like honey-coated popcorn.

Village women busily decorated the adjacent ceremonial pavilion with intricate palm-frond ornaments and straw baskets overflowing with fruit. They giggled shyly when

Dawn duck patrol waddles down a village lane near Mas, guided by the flag on a farmer's staff. Once at the paddy fields, he will thrust the stick into the ground and leave the fowl to forage, confident they will not stray out of sight of the marker.

Tuning their lives to the tropical sun, the Balinese bustle at dawn, caring for animals and crops and going to market. As the day's heat increases, they retreat into family compounds, to emerge again in the cool of evening for more work and the inevitable festivals.

Donna fumbled with strips of fronds, trying to duplicate an exquisite bird figure. Spangled umbrellas, symbols of dignity and high station, fluttered from poles. Nearby, two young boys stoked a small coconut-husk fire, appealing to the gods for clear skies. I doubt that the lightly falling rain would have dampened the excitement, but soon the sun burst through.

Family and guests began to gather. From beyond the courtyard floated the excited young voices of boys and girls preparing for the ceremony. Screened partitions had isolated them for the past 24 hours.

The girls, clutching small mirrors, scrutinized every detail as they were dressed by older women. Leathered hands wrapped budding young bodies in layers of yellow cloth and sashes of silver and gold. Fragile gold leaves crowned black hair glistening with beeswax lacquer and ornamented with frangipani blossoms.

The ceremony began. Gamelan rhythm blended with chanting voices. The air grew sweet with burning incense. Each participant was carried to the pavilion, then placed on a couch before a lay priest.

First the priest traced magic symbols with a gold ring upon the forehead, lips, and upper six front teeth of a girl. Assistants steadied her hands and feet when the priest raised his long slender file. Back and forth, back and forth he scraped, filing the front teeth flat and even (page 661). The file screeched like a hundred fingernails scratching on a blackboard. Pearly enamel yielded to grinding metal as the priest filed, smoothed, and polished. Intermittently the girl spat tooth dust into a coconut shell. Later the filings would be buried in the compound; to Balinese, a portion of the soul dwells even in the teeth.

Although Donna winced at the sight and sound, the faces of the youngsters reflected no expression of discomfort. Afterward, one girl confessed, "I had the shivers, but it didn't really hurt." A broad grin hinted her relief, and pride in the added beautification.

Events March to Spiritual Tempo

The drama and dignity, the intuitive precision with which old and young played their traditional roles, supported our conviction that Bali is no remnant of a dying culture.

Spiritual values are the strongest motivating force of life and prompt the exuberant festivity which the Balinese love. Their religion is a complex and imaginative blend of Hinduism, animism, and ancestor worship.

Hinduism's deepest inroads into Bali's animism came in the 16th century after the armies of Islam, slashing through Indonesia, had cut down the powerful Madjapahit Hindu dynasty. In east Java the weak Hindu princes capitulated, but the undaunted fled across the mile-wide strait to Bali, accompanied by musicians and dancers, poets and artists.

Reefs Deter Dutch Adventurers

Within a century, Dutch explorers, lured to the East Indies by spices, built a commercial empire in Indonesia. Bali's treacherous reefs and capricious currents caused these voyagers to sail on to safer shores.

Thus insulated, the seeds of Java's transplanted Hindu culture took root and flourished for almost 400 years in Bali under the refugee princes, or radjas, who carved up the island into tiny kingdoms. Not until 1882 did the Dutch occupy northern Bali and precipitate the downfall of the Madjapahit realms.

What seems so extraordinary is that Bali could endure a history so fraught with tumult and violence. The Balinese-Hindu culture has weathered Dutch domination, Japanese occupation during World War II, the war of Indonesian independence, and the bloody foiling of a Communist coup attempt.

Today Bali faces perhaps its greatest threat: an invasion of tourists.

"Will the old ways prevail?" we asked Tjokorda Gde Agung Sukawati, descendant of the old Madjapahit aristocracy, at his palace in Ubud. This gregarious, deeply religious prince still enjoys the love and homage of the villagers his family once ruled.

"Ah, the jet invasion," he mused. "As long as God blesses Bali, it will stay the same. It's all in His hands. If we worry we will only get high blood pressure.

"Today the world has great struggles with the devil. According to the teachings of Hindus, it is a time of trouble.

"God is the shadow player and we are the puppets, but at night when the scene is finished He puts us all in the same box. The good puppets and the bad ones."

Enjoying himself, Prince Agung added, "Only God knew that Americans would be friends with the Japanese someday in this play." Then, pausing, he chuckled, "The puppets do make mistakes—and one of them was adding Holland to the story of Bali."

Perhaps he was thinking back to a tragic

PHOTOCHROMES BY DONNA K. GRIGGSMOR (BELOW) AND GILBERT M. GROSVENOR © N.G.S.

Layers of new thatch roof a house in a family compound near Berdahulu. As a team on the ground lifts a fresh section, a second crew lashes down the roofing with magenta fibers. Such tasks fall to the *bandjar*, a communal organization of all married males, whose many duties range from temple repairs to operating a credit union.

For the Balinese, the walled family compound forms the basic living unit. Just within the gateway, an inner wall confuses evil spirits because they cannot climb or turn sharp corners. Compounds are shared by several generations with their livestock. Each married couple has its own sleeping pavilion, but all cook in a common kitchen equipped with a separate fireplace for each housewife. Near a common dining room stands a pavilion for entertaining guests. And facing the holy Mount Agung rises a family temple for worship of the ancestors and the gods.

Sticky twig (upper right) tipped with sweet sap helps a girl capture dragonflies. Her mother will serve the catch with the family rice.

Looking as if caught by a giant bird, a boy positions his father's huge kite for launching. "Bali's breezes were made for kites," observed the authors. The islanders build kites of many fanciful designs, sometimes with tails half a mile long. In popular aerial duels, men glue pieces of glass to their kite strings to cut the lines of opponents' kites.

Pot-bellied porker, contentedly chewing a leaf, parades her piglets. A comic feature of every family compound, Bali's amiable, sway-backed pigs belong to village women, who raise so many that they constitute a major island export.

Volcano-studded isle, Bali hangs like a glowing emerald in the necklace of the Indonesian archipelago (inset). Lava-flanked peaks, two of them active, roof the island's 90-mile length; streams tilt down slopes shingled with fertile paddies. Though Java lies only a mile away, fierce currents and reefs long isolated Bali, favoring development of its distinctive culture. Balinese account for 2,300,000 of the 115,000,000 people of Indonesia, sixth most populous nation in the world after China, India, the Soviet Union, the United States, and Pakistan.

episode that occurred shortly after the turn of this century. It seems the Balinese looted a Chinese ship wrecked off Bali, and China asked reparations of the Dutch colonial government. The Dutch in turn asked the Balinese to pay, and laid siege to Denpasar after the islanders refused. Warships raked the town with cannon, while ashore Dutch troops demanded surrender.

Ill-equipped to fight, the reigning prince marched his wives and children, his generals, and all his followers in resplendent procession out of the palace gates. Borne upon his men's shoulders and shaded by the gold umbrella of state, he led his barefoot band majestically, yet suicidally, into a hail of Dutch bullets. To the last warrior, woman, and infant, they were cut down alongside their fallen prince. In final defiance, the wounded impaled themselves upon the blades of their krises.

A shrine at a major crossroads in Denpasar marks the *puputan*—fight to the end. Even today Balinese tenderly shower it with offerings of flowers.

Prince Agung gave me a bear hug. "Enough talk of the past. Let's eat."

I protested that it was only midmorning. "Nonsense, we Balinese eat by the stomach, not the clock," he countered.

When rice and chicken arrived, I looked in vain for utensils. "Why use spoons or forks when God has given us fingers?" he inquired.

The chicken I could manage, but eating rice with fingers was more difficult than I would have imagined. The household dog must have sensed my clumsiness, for he stationed himself at my feet. He was not disappointed.

While towns like Ubud, Denpasar, and Klungkung were citadels of the radjas, the true spirit of Bali springs from its hundreds of hamlets. When the Madjapahit aristocracy withered, the innovative Balinese revitalized their unique system of village self-government, called *bandjar*, which still flourishes.

Every married male must join a bandjar, thereby participating in all community activities. When a house needs rethatching, everyone shares the task (page 664). The bandjar arranges such important events as marriages, cremations, temple repairs, and cockfights; it even sustains a communal treasury for loans to members. So powerful is this village spirit that the bandjars have withstood Indonesia's war of independence and later Communist attempts to destroy them.

In 1949, after four years of violent guerrilla warfare, the Netherlands surrendered its sovereignty over Indonesia. Bali eventually became a province in the new republic.* Sukarno (many Indonesians use only one name) was proclaimed president, drafted the country's constitution, then set about forging one

*See "Indonesia, the Young and Troubled Island Nation," by Helen and Frank Schreider, NATIONAL GEOGRAPHIC, May 1961.

Bali

nation from Indonesia's diverse population.

Among the 3,000 inhabited islands in the Indonesian archipelago, Sukarno favored Bali. Often he vacationed there, giving its governor opportunity to seek favors for Bali. So successful was this governor that he became known as Sukarno's *"anak mas,"* or "child of gold." Unfortunately, the Communists wielded great influence with the anak mas. Through him they tried to undermine the bandjars, arousing resentment in the villages.

Sukarno, while unquestionably the father of Indonesia, pushed too rapidly. He overextended his treasury into bankruptcy. In his quest for nonalignment with world powers, he encouraged a powerful Communist Party. Consumed by egomania, he contrived to have himself declared president for life.

In 1965 the Communists, overestimating their strength, attempted a coup. More than 300,000 Indonesians died in a 100-day blood bath that followed the abortive takeover. In Bali alone, 40,000 Communists intent on destroying the bandjars were killed and their homes burned by Nationalist Party members. Often neighbors, even brothers, vented their wrath upon one another. In the violent aftermath, students supported a military revolt that ousted Sukarno. Ultimately he was placed under house arrest near Djakarta, and his successor, General Suharto, began the task of healing the nation's wounds.

Where Man Blends Into Nature's Design

Hiking through peaceful villages in central Bali, we found it difficult to envision the fires of retribution that lit the island's skyline just four years ago. Nowhere does the Balinese instinct for beauty and creativity find more fluent expression than in the clusters of palm-shaded islands that float unobtrusively amidst a convoluted sea of thirsty paddy. Here man

An earth reshaped by patient hands lifts rice terraces in stairways toward a ridgetop town. Shelters housing human scarecrows dot the green slopes; when marauding birds zoom in, the occupants dash out, brandishing rattles and wooden clackers. Farmlands are divided into a system of

AERIAL PHOTOGRAPH ON KODACHROME BY GILBERT M. GROSVENOR © N.G.S.

subaks, or water districts, in which landowners share a common water source and maintain a complex network of irrigation canals, dams, and bamboo pipes. Planting wherever a puddle will hold a few stalks, Balinese rice farmers harvest enough to feed the island's 2.3 million people.

Instantaneous by Gilbert M. Grosvenor © N.G.S.

Instant umbrella, a banana leaf shields schoolgirls from a downpour near Denpasar, Bali's capital. Exploding population and low per capita income pose a challenge to education throughout sprawling Indonesia.

has not intruded upon nature but has enhanced the original design, blending his own patterns and hues into the harmony of greens, grays, and ochers. Even the bronze bodies match the tone of the rich soil. But flaming hibiscus interrupts the awning of green foliage that shades the villages, and flashes of brightly colored sarongs accent the landscape.

Balinese race the climbing sun to complete their daily chores in early morning. Soon they flee its stifling heat and brazen glare until the great yellow ball hangs cool in the late afternoon sky. Then they stir again, to work and to play until dawn starts the cycle anew.

Balinese Pigs Fill Piggy Banks

A feast of sights and sounds always moves along the back roads. We hear the rhythmic thud of wooden pestles behind compound doors as women pound the day's rice. Inside, we sniff kettles brimming with leaves and weeds that simmer on wood-stoked hearths —food for the preposterous pigs that sashay about the courtyard (pages 664-5). Their backs are hopelessly swayed under the weight of great pink bellies that drag in the dust.

"Pigs belong to the woman of the house," one villager told us. "When she sells them in the market, the money goes into her own pot."

"Just like our piggy bank," Donna mused.

"Better," the man retorted. "Our pig banks multiply several times a year."

So many women raise piglets that they have become an important export. The pigs are trucked and ferried to Surabaja in Java, then shipped live to Singapore and Hong Kong. Bali also exports 1,000 cattle a month to Asian cities. Formerly, the beef was canned in Denpasar. We found the plant closed for lack of tin plate. Ironically, Indonesia exports tin.

In the spacious, tidy courtyard we carefully stepped over bundles of rice drying in the sun like rows of discarded hula skirts.

"Rice is the farmer's savings account," our villager friend said. "During Dutch days, we had to sell our crops for cash to the rice mills in Denpasar. Frequently men squandered their money long before the next harvest. Today we store rice in our own granaries and sell it only when we need money."

Every compound honors a house temple that always faces holy Mount Agung. Daily the family adorns it with flowers and rice-cake offerings. One shrine pays homage to the sacred mountains, another to the souls of the ancestors. A young man told us that when he

is troubled he talks with his deceased father there. These conversations bring peace of mind and often solutions to his problems: "It is only our belief in someone that gives the person immortality," he said.

Feathered Gladiator Wins Freedom

Earlier we had seen men gathering in a village for a cockfight. Now we joined them.

Prized fighting cocks in dome-shaped bamboo baskets often bask in the sunshine along the roads. The traffic keeps them from being lonely and prepares them for noisy arenas.

"If you have insomnia you read a book, but in Bali if a man cannot sleep he grooms his rooster," said Njoman with a twinkle.

Betting Balinese attach great significance to the color of cock feathers, the day of the week, and other equally scientific factors. For example, they favor the first fight of a white cock from the town of Sanur. Once an entire village wagered, and won two million rupiahs ($5,000) applying such logic. "Never bet on a red cock against a white one on Wednesdays," one owner expounded authoritatively.

The all-male audience roared with laughter when Donna yelped in surprise after a cock pecked her leg, drawing blood. But she was soon forgotten as the first-round gong sounded.

In center stage a flutter of plumage, the swift flash of spurs marked the brief but deadly combat of two feathered gladiators (page 687). The winning owner gently smoothed the blood-matted plumage of his bird.

"This brave cock has won four victories," he said proudly. "He has earned retirement and freedom to chase the hens all day."

While Balinese men devote ample leisure time to cockfighting and village celebrations, their primary responsibility is tending the fields. So skilled are the paddy farmers that their harvests feed all Bali's people.

Like the village bandjars, this agrarian society owes its efficiency and success to a *golong-rojong*, or a spirit of mutual help. Within each rice-growing complex, fields irrigated by the same water source constitute a *subak*, or water district, to which the landowners belong. Collectively the subak dams rivers, digs canals, constructs miles of pipes and bamboo spouts, and regulates planting and water distribution.

Near Soka, one of Bali's loveliest terraced gardens, we marveled as dawn light sparkled from the rivulets of a thousand tiny waterfalls, each spilling a precious measure of water down to the next tier of paddy (pages 668-9).

"No construction diagrams are written down for government officials to ponder," we were told. "Our water engineers instinctively create and maintain a proper water flow to every inch of land."

Cleverly, the subak usually elects as water controller that farmer owning the lowest land. Members know ample water will soak his fields and thus irrigate all others along the way.

Gingerly tightroping across the narrow dikes, we passed young girls catching dragonflies on the ends of sticky twigs (page 665) and boys trapping frogs and wormlike eels. These delicacies add protein to the family rice diet. We edged past a priest sprinkling holy water on a shrine dedicated to Dewi Sri, the rice goddess, to protect newly transplanted seedlings.

Biased Bullocks Miss Their Target

I undertook to photograph a farmer urging his straining bullocks from behind a wooden plow. Eying me uneasily, he shouted and gestured vehemently to Njoman.

"Your red shirt upsets the bullocks," Njoman mumbled, without much conviction.

I had slopped through mud too far to be discouraged, so I stripped off my shirt. Njoman hesitantly coaxed the farmer to resume furrowing. Crouching precariously on the dikes, I leveled my camera at the oncoming oxen. Suddenly they bolted. I jumped clear as their lumbering hulks wheeled by me, tore through the dike, and galloped across the muddy field.

"He was right," Njoman confessed in astonishment, finally disclosing the farmer's true concern. "Bullocks really don't like the smell of Europeans."

The Land Reform Bill of 1960 split up large holdings, limiting owners to 7½ hectares (about 19 acres). Most farmers bought the small parcels they had tilled as tenants. "Give a Balinese his own land to work, and he is happy," we were told, and conversations with scores of farmers confirmed the statement.

While most Balinese benefited, the fortunes of men like Prince Agung disintegrated, since they received only partial compensation for the confiscation of vast properties.

In northern Bali, the division of large coffee plantations and orange groves stunted production. One day we jeeped over tortuous roads into northwest Bali's high elevations, stopping at Bengkel, a whitewashed brick-and-concrete

(Continued on page 679)

EXTRAVAGANZA FOR THE GODS: *Threading a palm-arched pathway, women of Tulikup bear offerings of food on a three-mile march to the sea. Behind them, in a snakelike column that stretches across a mile of paddies, men bring images of deities from the village temple for an annual cleansing in the Indian Ocean. This done, the islanders will jubilantly feast on the offerings of duck, rice, and fruit.*

Trance dancers visit a mystic realm

LIKE LIVING PHANTOMS, girls of Kintamani perform the *sanghyang deling*, a trance dance, one of the rituals that dramatize the villagers' constant awareness of the supernatural world.

As a chorus chants to flute and drum, women robe a 10-year-old girl (left), then another, 8, chosen because they are believed to be receptive to influences of the gods. A priest spreads a woven mat and sets up a brazier of smoking incense, lacquered tables holding offerings, and two sacred puppets threaded on a string between two sticks.

When the priest begins to pray, two assistants jiggle the sticks, making the puppets dance. The girls, transfixed, grow drowsy. Their eyelids droop. Soon they slide forward and grasp the sticks (below). At last in deep trance, they slump limply.

The girls rise, and with eyes half-closed begin a dreamlike dance, gliding, twirling their fans, oblivious of strain (far right).

The music quickens. Now two men stride forward and help the dancers onto their shoulders. Gracefully balancing, the girls sway in classical Balinese dance (right).

Alighting, they shuffle barefoot through a bed of smoldering coconut shells. Then the priest frees them—unhurt—from the spell.

Fearsome but friendly, a brace of *barongs* plods in procession during Tulikup's cleansing of deities (pages 672-4). Parasols, marks of dignity, attest to the importance of these animal spirits, which represent the forces of goodness in the constant war against evil spirits. Powered by a man in the forequarters and another astern, the figures represent a lion, left, and a tiger.

Cure for all ailments, a poultice called *boreh* paints a woman's brow. Balinese say the mixture of rice paste and *tjengkeh* root eases fatigue and sprains, and even causes the skin to feel hot or cold, as desired.

ENGRAVINGS BY DONNA A. GROSVENOR © NATIONAL GEOGRAPHIC SOCIETY

village built by the coffee bean. The fragrance of coffee blossoms drifted with the morning mist. Men cultivating plants had pulled sarongs over their shoulders like capes against the chill. Plantations, once tidy and manicured, had been chopped into tiny, haphazard plots. Yields had dwindled; quality had waned.

Only a few Balinese still grow coffee profitably. We visited one such man, Sebetan, who retained 20 hectares (50 acres) by transferring allotments to relatives. Between sips of hot orange juice and mouthfuls of banana fritters, he explained that Bengkel's fortunes are shaky because coffee trees are perishable and export prices for the bean fluctuate. Further, payments come in rupiahs, until recently the most perishable commodity of all.

"Rice farmers survive inflation because crops stored in their granaries increase in value," Sebetan told us. "Before the land reform I countered inflation by purchasing land. Today I can invest only in radios, sewing machines, or vehicles. A Japanese Toyota truck costs about 150 quintals," he mused.

These men traditionally quote prices in quintals of coffee (about 220 pounds). In recent years the unpredictable rupiah made pricing in currency meaningless. During our stay in Bali, an Indonesian-Singapore dispute caused the rupiah to fluctuate from 430 to the dollar up to 480; when the squabbling stopped, the rate dropped to 400. Economic reforms have since restored a measure of stability.

In the backyard workers laid concrete for an addition to Sebetan's home. "This year's investment," he shrugged.

Surging Birth Rate Strains Economy

Apologizing for the profusion of children crowding the courtyard, one man wryly commented, "If children could be harvested, all Balinese would be wealthy."

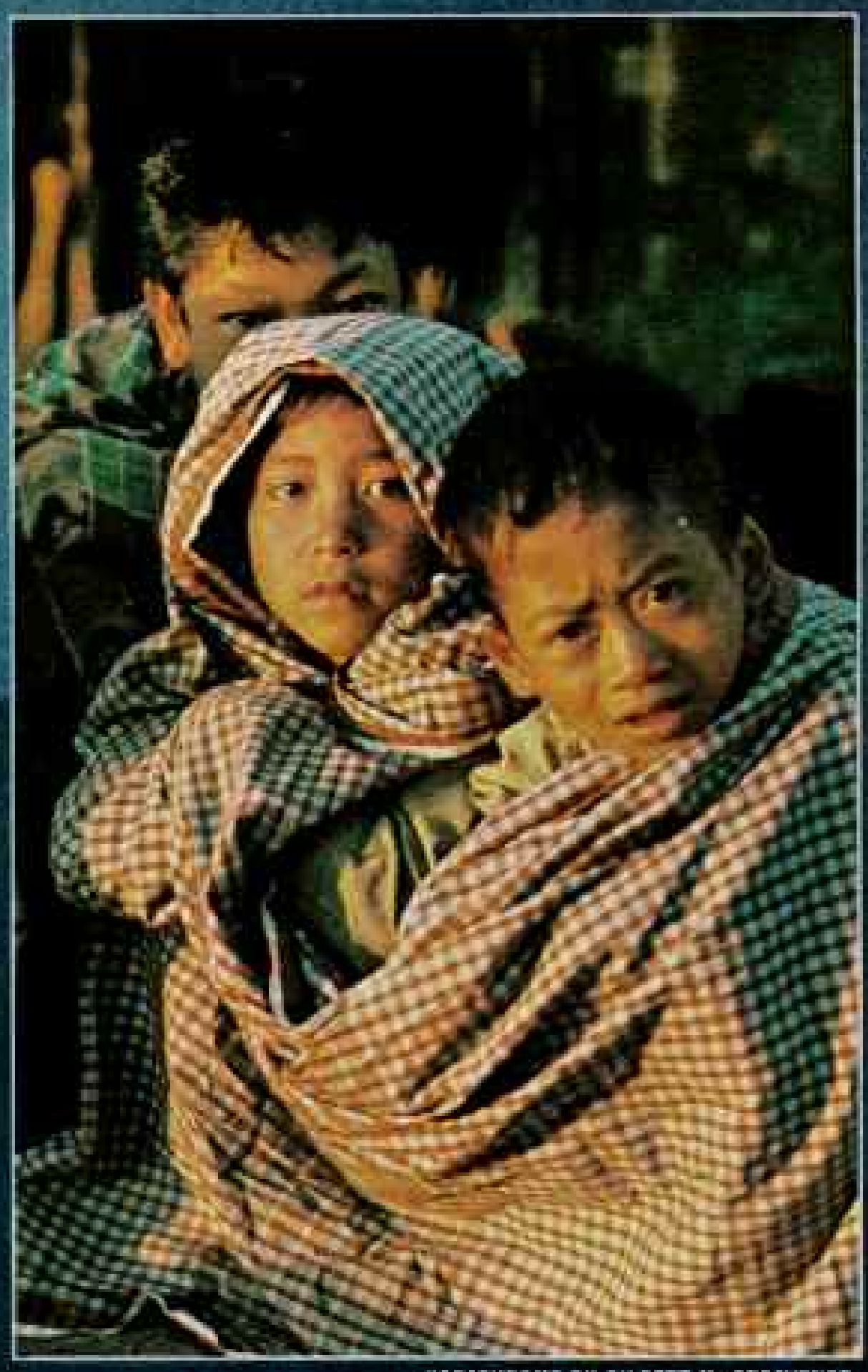
The average family has five children. Besides overcrowding, this population explosion makes it difficult for farmers to meet the demand for rice. Bengkel, a village of 334 families, claims about 1,900 people, mostly children. The school has six new classrooms this year just for 7-year-olds.

Unfortunately, Bali's educational standards have deteriorated since independence. "We built a fine schoolhouse," a coffee grower told us, "but our teachers, like other civil servants, receive meager pay. Since the defeat of the Communists, money for salaries has been diverted to support strong police and military forces. Soon we hope this will change."

Bali's present governor is well aware of the shortcomings of the schools. Although he is a Javanese army colonel, the Balinese seem satisfied with him. They reason that such a man can penetrate the bureaucracy in Djakarta much more effectively than could the most aggressive Balinese civilian governor.

In the northeast below Kintamani, the rich soil that nurtures coffee gives way to rivers of lava spreading black fingers across a barren landscape—a constant reminder that the mountains which gave life to Bali still possess the power to extinguish it (following pages).

The resettled people in Kintamani look across to the slopes of the still-smoldering Batur volcano, and the now-quiet Agung,



KODACHROME BY GILBERT M. GROSVENOR;
EKTACHROME (INSET) BY DONNA K. GROSVENOR © N.G.S.

HULKING "NAVEL OF THE WORLD,"

10,308-foot Gunung Agung looms above tree-fringed Abang and volcanic Batur, wreathed in the steam of its own breath. Sacred as the abode of the gods, mighty Agung erupted in 1963 after more than a century of sleep, snuffing out 1,600 lives and driving 87,000 villagers from their homes.

In the upland village of Kintamani three boys (inset), whose families stubbornly eke out a living from the ash-covered land, wrap up to ward off morning's chill.

where other villages once stood before the 1926 and 1963 eruptions.* The earth not scorched by fiery lava was layered with a foot of gravelly volcanic ash strewn across an expanse of 125,000 acres.

In the once-verdant valley of Klungkung District, monsoon rains plunged down stripped hillsides, pushing rock and mud before them, devastating 20 percent of the arable land. Wealthy farmers became poor overnight. Now, those remaining scratch from the sterile soil a meager subsistence of chilies, onions, and scrawny corn. Bali could not absorb the 87,000 homeless, so many were resettled in Sumatra, Sulawesi (Celebes), and the Moluccas. But thousands remain to be moved.

Children of Batur cough from the fine gray dust that seeps into the very fabric of life. Yet they smile; even where the land is lean, the vibrant spirit of the people prevails.

Poignantly Njoman surmised, "Those who stay would rather starve on the soil of their ancestors, where the mountains speak with the voices of their gods, than thrive in Java, a world away."

*See "Disaster in Paradise," by Windsor P. Booth, and "Devastated Land and Homeless People," by Samuel W. Matthews, GEOGRAPHIC, September 1963.

Backstage in a one-man drama: His projector a flickering oil lamp, a *dalang* manipulates buffalo-skin puppets in a *wayang kulit*, or shadow play, performed for an audience watching the other side of his white-cloth screen. As he guides his silhouettes, the versatile puppeteer also speaks the parts and provides sound effects. The ancient theater form plays a vital role in education, helping to pass along

Our understanding of the powerful spirit which binds the Balinese to their homeland was reinforced as we drove a few hours south to join in the temple festival of Tulikup village for the cleansing of the deities.

Barongs March to the Sea

For days we had watched the women in the Tulikup temple working magic with fronds, vegetable dyes, and rice paste, as they prepared elaborate offerings of food and fruit.

Now the altars were laden with their handiwork. Masses of sculptured bright confection surrounded the *djempana*, or sedan chairs, which carry the temple deities to the sea. The gamelan musicians, in fire-engine-red jackets, stood proudly by their instruments.

The accompanying great *barong* figures danced and pranced outside the temple gate, animated by trained men, one maneuvering the hindquarters and one the head of each figure. These animated spirits represent goodness. Their oversize wooden jaws snapped from side to side, flapping red wooden tongues and long black beards of human hair as if seeking something to chase (pages 678-9).

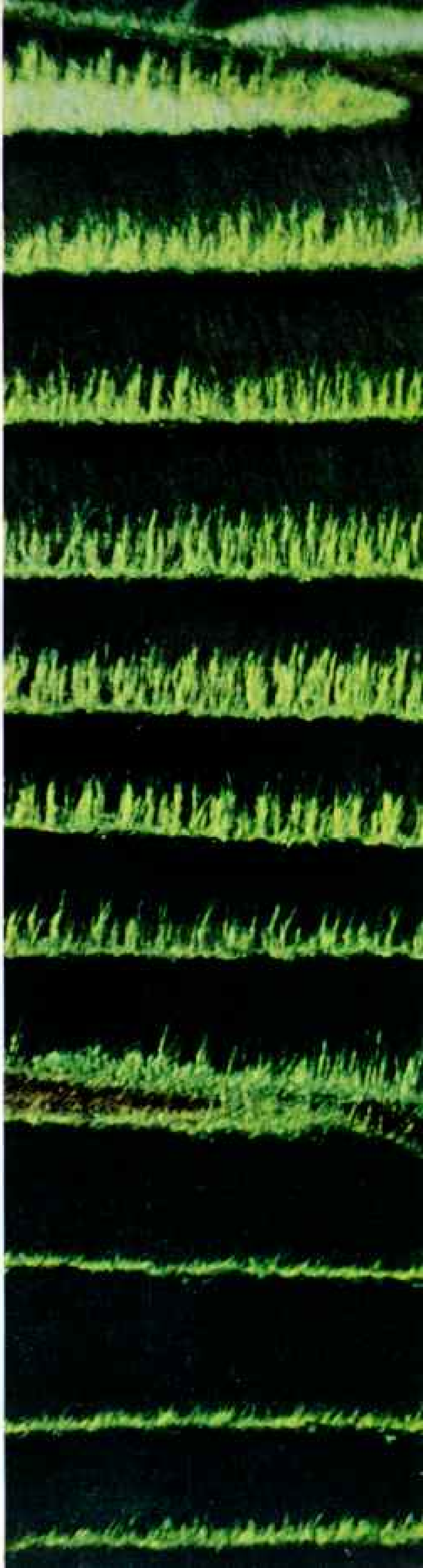
Annually each village makes a pilgrimage with its barongs to the trees from which the

from one generation to the next the epic tales from the history and religion of Bali

With eloquence in her fingers, a dancer plays the coquette in the *legong*, Bali's classical ballet, where every movement has meaning. Ribbons of gold leaf bind her torso; frangipani adorns a crown of feathery golden strands. Learning at the age of 5 or 6, the most gifted have the poise of professionals at 8 or 9.

EXPOSURES (ABOVE) AND ASSIGNMENT BY GILBERT M. GROSVENOR © N.G.S.

Asking the blessing of a bounteous crop, farmers of Soka set out young plants before an offering to the rice goddess Dewi Sri. Four more times before harvest they will renew the tribute of eggs, flowers, rice grains, and palm fronds. Solitary wader in a verdant sea, an egret hunts insects in the paddy (right). In an equatorial land that knows no winter, the maturing of rice—from green sprouts to the gold of ripened grain—gives an index to the season.



masks were cut, thus renewing their powers. Each year they undergo a spiritual cleansing in the sea. Barongs often pay courtesy calls on the barongs of neighboring villages. These creatures embody all the comical and mysterious qualities of that unknown, invisible world with which Balinese carry on a constant dialogue through ceremonies and offerings.

At the appointed time, young boys scrambled up the tower house to sound the wooden *kulkul* drum summoning all villagers.

An incredible scene unfolded: Almost effortlessly, the women of Tulikup balanced offerings three to four feet high atop their heads. Gracefully they bent low to pass beneath the temple arch, never faltering under their unwieldy headdresses of rice, fruits, and dried ducks.

Spread out in a mile-long montage of color (pages 672-4), the procession wove a ribboned pattern through the shimmering brightness of waist-high, golden-ripe paddy. They trekked three miles to the black-sand beach and roaring blue-gray Indian Ocean at Kesiut.

Steel-spurred gladiators, cocks fight before avid bettors (above). One owner gives his bird mouth-to-mouth resuscitation (left) before returning him to the fray. Balinese find justification for the sport in a requirement that a blood sacrifice must follow most temple ceremonies. The cocks have a fighting chance to reach old age through a custom of retiring veteran winners for life.

Ocean Feared as Abode of Demons

It takes only a brief encounter with the menacing surf gnawing at Bali's coastline to understand why the Balinese regard the sea as the domain of their demons, and why their gods choose to dwell in the mountains.

"We find no pleasure splashing in the sea," Balinese repeatedly told us.

But for tourists, demons pose little threat. Thus, along the glistening sand fronting the Hotel Bali Beach, bikini-clad sun worshipers brave the tranquil waters of the reef-protected lagoon. The Bali Beach, well managed by Inter-Continental Hotels, has provided spirited conversation since its completion in 1966. Sukarno, who sparked Bali's tourism, staked out the hotel's exact site, dabbled in the architecture of the 10-story, 300-room structure, and arranged the financing.

Siegfried Beil, its young, dynamic manager, provides a Balinese welcome for every planeload of guests as they enter the palatial lobby, where a gamelan orchestra conjures up the proper island atmosphere. He told us, "While I encourage guests to explore Bali, our cars travel only the paved roads in small groups to avoid overwhelming the villages.

"We work closely with village chiefs, coordinating performances of the *ketjak*, or monkey dance [pages 658-9], and *barong* and *kris* dances in nearby villages. At night Bali's best music and dance groups perform here, which stimulates competition among villages."

The staff includes 1,000 young, enthusiastic Balinese. One day, while introducing Njoman to American hamburgers in the snack bar, we asked him if these young people were drifting away from their traditional ways. He nodded toward a lovely employee wearing Western-style skirt and blouse and high-heeled shoes. Although in a hurry, she paused to place small offerings of bread and jam at the feet of the two stone deities guarding the electric-eye doors at the hotel entrance.

"I believe our culture is stronger than the tourist," Njoman said with a smile.

But General Subroto Kusmardjo, director of tourism for Indonesia, had informed us,

(Continued on page 692)

KODACHROME (ABOVE) AND EKTACHROME (CENTER) BY GILBERT M. GROSVENOR, EKTACHROME BY DONNA K. GROSVE

Strange ornaments swing from a frangipani tree, out of reach of dust and dogs. The succulent roast pigs and hampers of fruits and rice await dedication to the gods at the mountaintop temple of Gumung.

In this festive day-long outing, townsfolk celebrate the anniversary of their temple's consecration. While a boy blows on a noisemaker, women set up tables beneath the tree to sell rice cakes and coconut milk.

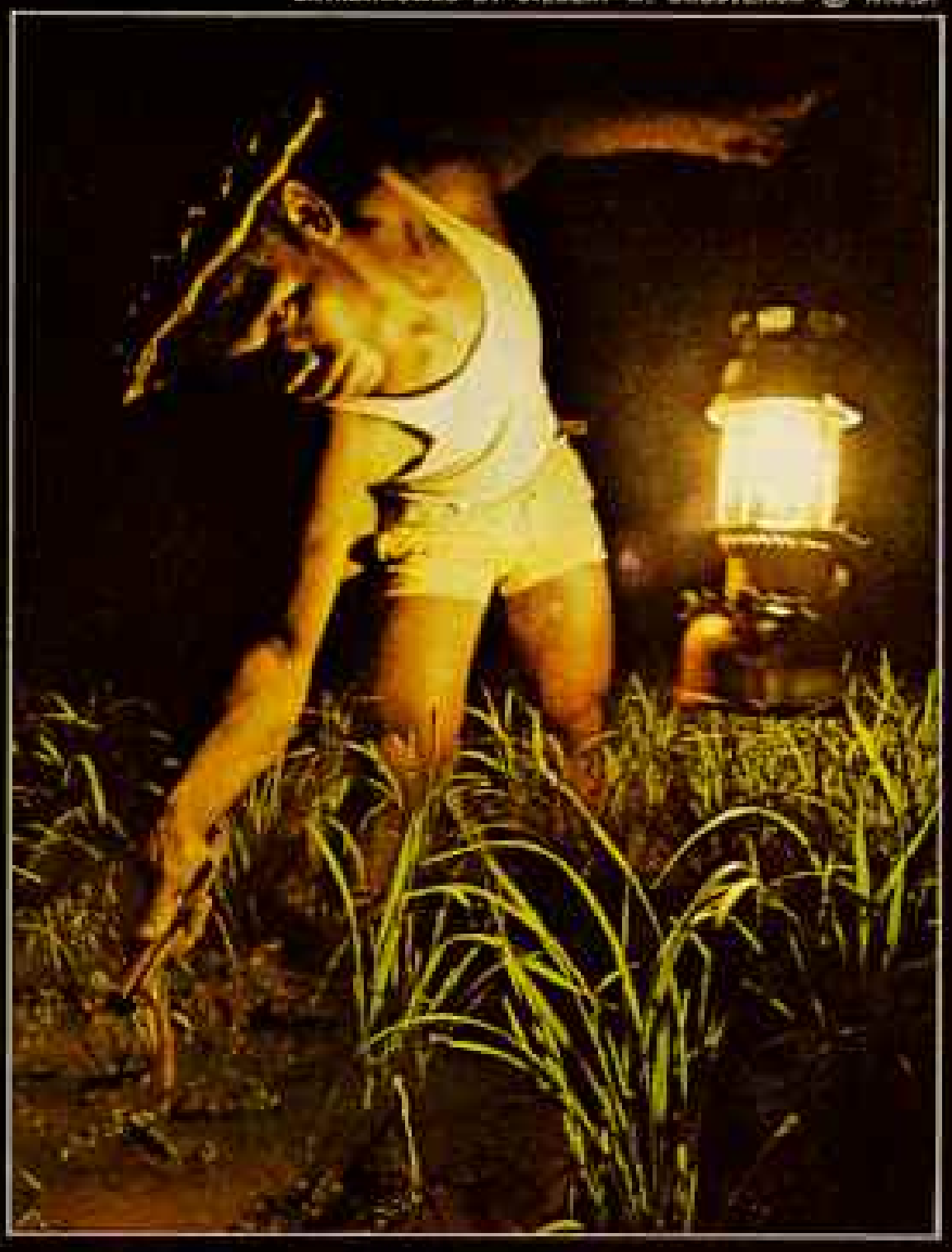
As evening approaches, the townsfolk will cut down their tributes and present them at the shrine. Then, in practical Balinese fashion, the hungry folk of Gumung will serve the offerings in a mighty picnic.

Dressed for a party, a deity wears hibiscus flowers and sarong during a temple anniversary. Incense billows over tributes of fruit and rice. A watch adorns the deity's wrist—typical touch of Balinese whimsy.

Contentment forsakes a young reveler at the Gumung festival. But only momentarily: Balinese babies are generally happy at any affair, peacefully riding on the hips of the parents or older brothers and sisters. Baby-sitters are unknown. Whether the occasion be a temple celebration or an all-night shadow play, family members of all ages attend as a group.

LIKE A FIERY SERPENT, *lantern light traces the sinuous path of a farmer stalking eels in a paddy—a striking four-minute sequence captured on a single frame of film. Starting his nocturnal hunt at upper right, the farmer periodically dips down, snaps up his wormlike prey in wooden pincers (inset), then slogs on. Eels and dragonflies add protein to the Balinese diet.*

EXTACHROMES BY GILBERT M. GROSVENOR © N.G.S.



"Now Bali averages 40 tourists a day, but soon we must accommodate 400. A new jet strip has just opened, and a 200-room wing on the Bali Beach is planned."

The general admitted that Indonesia's communications must be radically updated before this new influx of tourists comes. During our stay, cables rarely reached their destination, mail sat in Djakarta for weeks, and we were cautioned not to ship packages by sea.

"We must provide facilities to make Bali a resting station for world travelers without changing the life here," the general said. "Visitors should fly out into the countryside like birds in the day, then return home to roost in Sanur and Denpasar at night."

The thought of roosting in Bali's capital holds little charm. Denpasar's streets trap a noisy tangle of honking cars, trucks, and bicycles, all vying with undaunted little pony-drawn taxi carts. Shops already are crammed with hastily produced wood carvings.

"Tourism inevitably brings changes," admitted Jimmy Pandy, the island's foremost connoisseur of Balinese art, whose Sanur home is a living museum. "But when you live here for 20 years, you feel them so gradually.

"I'm hopeful that Balinese creativity will continue to thrive," he remarked. "Since wood and stone may crumble within a few decades in our humid climate, there is constant demand for new art."

When we expressed fears of assembly-line techniques, Jimmy reassured us: "The Balinese seize upon new ideas, but I encourage artists to prize individuality and quality in their work.

"Beyond the paved roads, the artist will be protected for years. Every time a bridge goes out and isn't replaced, Bali grows more inaccessible," he added jovially.

The next day, en route to Mas, I recalled Jimmy's levity as we approached the vintage bridge of Tjampuan. The government, duly concerned about its durability, had lowered a cross bar by several feet to limit the height, and thus the weight, of vehicles. The truck ahead could barely squeeze under the bar. The driver increased our apprehension by darting from his cab to place an offering of flowers in a roadside shrine before venturing across.

"He pays homage to the deity of iron who protects all vehicles," our driver said. As antique timbers creaked under our car we too wished for a little bridge insurance.

PHOTOGRAPH BY DONNA A. ARGUEDAS © N.G.S.

Dark-eyed charmer from Denpasar carries a freshly caught jack toward the Hotel Bali Beach, the island's only luxury resort. A new airstrip opens Bali to the age of the big jets.

Wood "Talks" to Carver

Mas claims Bali's master carver, Ida Bagus Njana, and his son Ida Bagus Tilem—at 30 already the inheritor of his father's genius with a chisel.

Tilem welcomed us, his curly black hair framing sparkling onyx eyes and an infectious smile. In the courtyard, cages of gurgling doves hung in trees, and brilliant

red-and-green parrots chattered on wooden perches. Almost unnoticed, a fragile man sat under a small pavilion. His silver hair was tied in a knot atop his head; his fingers busily translated a chunk of wood into form and line. "My father, Ida Bagus Njana," Tilem whispered.

"He works so little now that we do not sell his pieces any more," Tilem told us. "Some must remain in Bali." We admired the master's articulation of a rotund flute player.

In Tilem's own carvings the figures emerge from the natural grain and texture of wood. "A piece of wood tells me what it wants to be," he said. "Sometimes I study it for months before cutting. I often assume positions with my body to feel if they are right."

The tapping of hammers drew us to a group of 20 men sitting cross-legged on straw mats, wood chips splaying from their chisels.

"They are farmers, but they carve here during the hot hours of the day. I display and sell their finished pieces," Tilem explained. "Encouraging the arts is important for our village, so I organized a gamelan orchestra and a dance group in Mas."

Pointing to one carver, Tilem added, "He plays every instrument, yet he is illiterate."

"He plays by ear?" Donna asked.

"All Balinese play by ear, since there are no written scores," Tilem replied.

Night Brings Fun and Pageantry

We found no proof that the Balinese ever sleep. When dusk nudges daylight westward, renewed activity surges along village lanes in preparation for the nightly pageant. In the flickering glow of coconut-oil lamps, vendors tend portable stalls offering tempting delicacies for the theater-loving Balinese.

Any open space becomes a stage for *topeng* (mask dance), *wayang kulit* (shadow play, pages 682-3), or local operas. The scenarios are drawn from familiar folk legends. Everyone knows the plot, but this only enhances the audience's delight. No children are left home with baby-sitters; toddlers, teen-agers, and adults revel in the same jokes and ribald situations. Young men and girls exchange flirtatious glances or whisper softly, unnoticed along the dark fringes of the crowd.

One evening we wandered into a village mask dance. Njoman soon became so absorbed in the antics of the drama's two Falstaffian characters that he momentarily forgot to translate the dialogue for us. Donna's only notes read: "Needs subtitles." I saw one vendor so intent on the show that his fried soybean cakes burned to charcoal before the dense smoke forced him back to the brazier.

Each night, driving home to our bungalow, Donna was hopeful that along some lonely road a *leyak* might appear. We were filled with lurid tales of these bewitched spirits who are believed to haunt the back roads.

Watch Out for Roving Witches

Most Balinese credit these witches with the misfortunes that befall them, everything from sickness to dented fenders. A trucker's accident report might read: "As I drove past the cemetery near Sanur, a huge black cat jumped on the hood of my truck. His furry paws reached toward me through the window. I lost control and ran into a ditch."

We had seen masks of the wicked Rangda, queen of the witches: a monstrous woman with sagging bosom and shaggy white hair through which protrude large bulging eyes, gruesomely twisted fangs, a long red leather tongue, and fearsome claws. Many dramatizations depict evil Rangda's struggles with her counterparts, the benevolent barongs. None of these conflicts are ever resolved onstage, any more than they are offstage.

We asked Njoman whether he believed in leyaks and he answered, "I am educated in the Western way, but I am also Balinese so I cannot say that I don't believe in them, although I don't think I have ever seen one."

"How would I recognize a leyak?" Donna persisted.

"That might be difficult for you because the leyaks are shy with strangers, but if I saw a hen and chicks in a deserted place after dark or a beautiful girl alone on a remote road at night, I would be careful."

"So would I," I agreed.

Njoman added that if we were really intent upon seeing a leyak, one way is to stand unclothed near a cemetery at night, and peer backward between our legs. I assured him we were not that anxious.

Still contemplating visions of leyaks, we bade Njoman good night and started down the dark gravel walk toward our bungalow. A shadowy form darted across our path; a horrifying honk sent cameras flying in all directions. Then we recognized the Tandjung Sari hotel's faithful sentry, the old gray gander, making his nightly rounds.

Our Tandjung Sari bungalow by the sea in Sanur was set amidst the fragrance of frangipani trees. We shared our thatched dwelling with wooden deities, eloquently carved and painted, and tiny lizards that lulled us to sleep with chirping serenades. One beat of the

DEATH MAKES A HOLIDAY *for the Balinese, who believe that cremation liberates the soul for reincarnation. Borne aloft on a funeral tower, the draped body of a Brahman priest moves through the village of Mengwi. A carved-bull sarcophagus (opposite) receives the body, and flames sweep up in a rite of joy.*

KODACHROMES BY SONNA R. GROSVENOR AND GILBERT M. GROSVENOR (RIGHT) © N.G.S.

wooden kulkul drum on our veranda brought to our door a delicate creature brimming with smiles, named Putu. Whenever we looked tired she added our favorite dishes, pork *sate* with peanut sauce and black sticky rice with fresh coconut milk, to the usual dinner of fish, chicken, vegetables, and fruits.

Cremation—a Joyous Time

The same exuberance with which the Balinese greet life accompanies their joyous celebration of death. The cremation ceremony prompts no tears or black shrouds of mourning but rather rejoicing. As one Balinese expressed it, "We consider the body merely the basket of the soul, and once released, that soul is free to ascend into the higher worlds, awaiting reincarnation."

Balinese regard cremation as their most sacred duty and faithfully set aside funds to ensure a lavish launching for the souls of their departed. Such celebrations require expensive offerings, costly towers and coffins, plus the feeding and entertainment of many guests. Those who cannot afford their own cremations may bury their dead for years while waiting to join as "followers" in the ceremony of a wealthy relative or high-caste villager.

Our own solemn conditioning for funerals caused us uneasiness when we first melted into the excited crowd gathered in Menguwi village for the cremation of a Brahman priest.

The villagers surged forward when a dozen bearers emerged from a courtyard carrying the priest's body wrapped in yellow cloth. Unexpectedly, we were swept into a raucous tug of war as groups of men, struggling for possession of the corpse, jostled and pulled at the yellow bundle amid the frenzied crush.

"Don't be alarmed," a villager shouted to us over the din. "This is part of the ritual."

Balinese believe they must confuse the corpse so it cannot find its way back into the house. If it should, the deceased would haunt the relatives for having failed to perform the proper rites to liberate the soul.

Finally satisfied that the deceased was disoriented, the men lashed the body atop its 40-foot wooden tower tinseled with gold and white paper ornaments and crowned with tasseled umbrellas (preceding pages). With a shout, fifty men hoisted the formidable structure to their shoulders.

"Who determines the height of the tower?" Donna asked.

"It depends upon the family's caste and

In a last bold journey for the dead, outrigger crews challenge crashing Indian Ocean surf. They will scatter cremation ashes on the sea, one of the four elements, as the final rite to free the soul before reincarnation. The villagers go forth with dread, for—rare

bank account," our new friend said. "Once a wealthy high-caste family built a tower so tall that relatives feared offending the gods with too pretentious a display, so they chopped ten feet off the top just before the ceremony."

As 200 followers moved along village lanes, the tower bearers still whirled their teetering burden, further misleading the dead. Ahead marched the gamelans, dancers, and the followers bearing sarcophagi in which their dead would be cremated. For the deceased priest, a high-caste Brahman, village craftsmen had built a richly decorated wooden coffin in the form of a bull. For the others, smaller coffins were carved to represent lesser animals.

At the cemetery, chanting women spread a long white shroud to receive the body from its lofty perch. Holding the fabric over their heads, they moved like an undulating white caterpillar, bearing the body to its coffin. A priest anointed the remains with holy water, and personal belongings for the journey to the hereafter were placed with the body, as was a ransom of coins for Yama, the lord of hell. To ennoble the senses in another life, bits of mirrored glass were laid on the eyelids to give them the brightness of mirrors, slivers of steel on the teeth to strengthen them, jasmine blossoms in the nostrils to make breath as sweet as flowers, and iron nails on the limbs to endow the bones with added power.

Offerings of precious cloth, colored rice, and the head of a freshly killed buffalo were piled around the kindling beneath the priest's wooden bull. Followers performed similar rituals over the rows of nearby coffins. The last holy water was sprinkled, final prayers were chanted, and the fires ignited. Orange flames quickly devoured the pyres in a crackling, popping incendiary, spewing ash and smoke skyward (page 695).

Heaven Is Bali Free of Woe

Dawn signals the final episode of this remarkable spectacle. Then the ashes are carried to the sea to be scattered upon the waves.

Cremation is not only an inseparable part of Bali's living theater, but also the ultimate tribute to a way of life. The Balinese envision heaven as a Bali free of trouble and illness, and they can imagine no happier reincarnation than to return to earth as Balinese.

For ourselves, we could hardly wish for a better earthly reward than someday to rejoin the perpetual pageant that unfolds along the enchanting back roads of Bali. THE END

among island peoples—the Balinese fear the encircling sea as the home of demons, and thus orient their lives to land. Their hope in reincarnation is to return to the favored place on earth that they believe to be most like heaven—their beloved isle of Bali.

The Investiture of Great Britain's Prince of Wales

By ALLAN C. FISHER, JR.
Senior Assistant Editor

Illustrations by
National Geographic photographer
JAMES L. STANFIELD
and ADAM WOOLFITT

SLOWLY and with evident care, Queen Elizabeth II placed the gold coronet upon the head of Charles Philip Arthur George, Prince of the United Kingdom of Great Britain and Northern Ireland, Duke of Cornwall and Rothesay, Earl of Carrick, Baron of Renfrew, Lord of the Isles and Great Steward of Scotland, Prince of Wales and Earl of Chester. Then, with equal care, the young man bearing the weight of all those titles took the coronet in his own hands and adjusted it to a steadier and safer position on his head.

That action by the Prince of Wales was, of course, completely natural and unplanned. Yet to me, and very likely to others among the 4,000 guests watching

"Our most dear Son Charles . . ." The Queen's proclamation echoes within Caernarvon Castle as Elizabeth II crowns her eldest son as the 21st English Prince of Wales. Charles received the specially designed coronet on July 1, 1969, in a ceremony rich with medieval splendor.

EXTACHROME BY ANTHONY HOWARTH, DAILY TELEGRAPH © N.G.S.

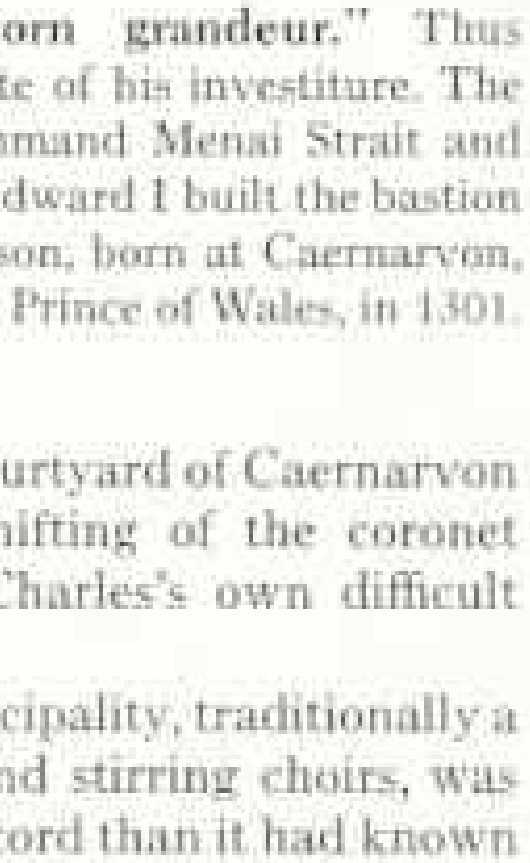
ROYAL PROGRESS OF CHARLES, PRINCE OF WALES

by auto

by helicopter

by yacht

castles of Edward I



Royal progress followed the investiture. In the tradition of Elizabeth I, the new Prince of Wales spent four days traveling through his principality.

"**Fortress . . . of time-worn grandeur.**" Thus Charles described the site of his investiture. The floodlit battlements command Menai Strait and the island of Anglesey. Edward I built the bastion nearly 700 years ago; a son, born at Caernarvon, became the first English Prince of Wales, in 1301.

his investiture in the courtyard of Caernarvon Castle, the uneasy shifting of the coronet seemed symbolic of Charles's own difficult situation.

His lovely little principality, traditionally a land of bardic song and stirring choirs, was experiencing more discord than it had known in generations. Nationalist groups, small but growing and highly vocal, sought independence for Wales from England. A nationalist party, Plaid Cymru, or Party of Wales, had recently elected its first member of the British Parliament—and that gentleman, quite pointedly, had declined to attend the investiture.

At almost the very moment when Charles knelt in homage before his mother the Queen, a group of 20 people laid a wreath in Cardiff at the statue of Llywelyn the Last, who died in 1282. Some separatists believe that he, a native-born Welshman, was the last true Prince of Wales. Indeed, in the opinion of these separatists, Charles is merely the 21st, and latest, in a line of English usurpers; their title, Prince of Wales, dates back to 1301 and

DIAGRAMS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JAMES L. STANFIELD © N.G.S.

the iron-fisted reign of Edward I, conqueror of Wales.

Unfortunately, the nationalist cause had attracted a group of extremists, disavowed by all rational Welshmen. In the days prior to and following the investiture last July 1, this shadowy fringe group planted a number of bombs around Wales, some in or near government offices. Two men were killed; a child was injured. Elaborate precautions surrounded Prince Charles at his every move. Plainclothesmen seemed as numerous as guests inside the castle. I saw briefcases searched and pockets patted. I myself was stopped and required to reveal the cause of a suspicious bulge (it was paper) in a pocket of my raincoat.

One might well assume that uneasy lies the head wearing the coronet of Wales. But, as Prince Charles knelt before the Queen, I was seated where I could look full into his face, and not the slightest trace of concern or nervousness marred his composure as he received coronet, sword, gold rod, gold ring, and ermine-trimmed mantle. Then, with great

dignity, he placed his hands in those of his mother and uttered, firmly and clearly, the ancient oath of fealty (pages 706-7):

"I Charles, Prince of Wales, do become your liege man of life and limb and of earthly worship, and faith and truth I will bear unto you to live and die against all manner of folks."

Mother and son exchanged the kiss of fealty, and Charles rose. A few minutes later he addressed the throng in impeccable Welsh. The Welsh people hold an enduring pride in their language, and Charles had taken a nine-week cram course in it at University College of Wales, Aberystwyth, where Welsh nationalist sentiment is strong. There his evident courage, dedication, and simplicity of manner won him solid popularity.

So would it soon be throughout Wales. For after his investiture, or formal installation, an event watched on television by a world-wide audience of 500 million, Charles traveled through Wales on a four-day progress, a journey to show himself to the people in the traditional manner of royalty (map, page 700). In small villages and in cities, at roadsides and town halls, at receptions and sports events, the Prince met his future subjects. Hundreds of thousands turned out for him. Time after time he stopped to chat with individuals, to shake hands, to ask questions, to laugh and joke, to compliment.

I WITNESSED part of that progress, and seldom in more than thirty years of reporting and writing have I been so impressed by an individual performance. This is still a world that admires courage, whether it be in astronauts or, as of old, in princes, and Charles showed he had it in full measure. No prospect of bomb or bullet, of stone or curse, brought the slightest hint of apprehension to his pink-cheeked face. Though he was not yet 21, he went about his job with poise and assurance. Here was a personable and superbly self-disciplined young man, and he won dramatic acceptance everywhere he went.

To understand and appreciate the solemn high pageant at Caernarvon, one must know something of the history of Wales.*

Primitive tribes inhabited the mountainous little land in Roman times; a divided and quarrelsome lot, they were no match for the disciplined imperial legions that invaded the British Isles. Romans conquered much of Wales and built a fort near what is now the Royal Borough of Caernarvon. Centuries later, when the Normans attempted a similar invasion, the Welsh—unlike the English—managed a prolonged and stubborn resistance.

Their luck was mostly bad, however, in the battles against Edward I. Known in history as the Hammer of the Scots, he might also have been dubbed the Scourge of the Welsh. Prince Llywelyn fell resisting Edward, who, once he had defeated the Welsh, set about consolidating his hold with a chain of eight castles, among them Caernarvon (pages 700-701). Its construction began in 1283 and continued for nearly fifty years.

*See "Wales, Land of Bards," by Alan Villiers, GEOGRAPHIC, June 1965.

Proud mother, smiling monarch: The Queen, accompanied by Prince Philip and Princess Anne, rides in an open carriage past cheering throngs on the way to the castle. Despite bomb threats by Welsh extremists, the day of investiture proved the good will of the Welsh toward the royal family. Old and young alike waved flags and handkerchiefs as the procession rolled by, escorted by the Household Cavalry.

PHOTOGRAPH BY ADAM WOOLFITT © N.G.S.

Brightening up a cloudy day, Princess Anne in blue, Queen Mother Elizabeth in pale green, and Princess Margaret in peach follow Gentlemen at Arms through the castle ward to their places of honor near the royal dais. Mistress of Robes for the Queen Mother, the Duchess of Abercorn, follows.

The Welsh took no joy in this public works program; indeed, they remained so rebellious that—so legend says—Edward called together their chiefs and promised them a Welsh-born prince who spoke no word of English. He left the hall and returned bearing on a shield his infant son, born at Caernarvon. Edward II was, indeed, born in or near the castle, but the truth is that his father didn't get around to making him the first English Prince of Wales until the lad was 16. In infancy he had had an older brother, but the brother died.

EDWARD was given the title at a meeting of Parliament and probably was invested at the same time, although there is no record of the ceremony. Contrary to popular belief, the title is not automatically acquired at birth by the monarch's first-born son. It must be specifically conferred, and only the monarch can do it. Queen Elizabeth II, for example, named Charles the Prince of Wales in 1958 when he was nearly 10, and at that time she announced he would be invested at Caernarvon when he was grown.

Only once before had the castle been the site of this ceremony, and that was in modern times. The handsome youngster who became Edward VIII was invested in 1911. In his memoirs the former king, now Duke of Windsor, recalls with some bitterness the satin breeches he was required to wear.

It is easier to know Welsh history than to know the Welsh. I speak with some license and authority on the subject, since my grandfather was Welsh and I have traveled extensively in Wales.

The conquest of that mini-state—in area only a little bigger than New Jersey—occurred more than six and a half centuries ago, and the Welsh and English have had the same rights and citizenship since the incorporation of the principality with England in 1536. That union was ordered by Henry VIII, who had an admixture of blood from Welsh royalty, as does today's Prince Charles.

Yet many Welsh still mourn their "true princes," notably the 13th-century Llywelyn. They also mourn Owen Glendower, who led a revolt in the early 15th century. In today's Wales these men are often written about and spoken of as if they had lived only yesterday.

I met one of these firebrand nationalists and confessed to him that this harkening back to a long-dead past was difficult for me to understand.

"The Welsh are a moody and introspective people," he said. "Inwardly we are often as lonely and barren as our ancient hills. We are not like you Americans; this is not our day and our world.

"We have a word, *hiraeth*, longing for the homeland, and we express it best in song. Ah, when we sing! That is the squeezing of our hearts."

He paused a moment, then added softly:

"This is a land where men cry. Understand that, and you are near to understanding the Welsh."

LIKE MOST GENERALIZATIONS about a people, his words are only partly true. Wales is a country of sharp contrasts. Most of it remains pastoral and timeless, but the southern part is heavily industrialized, with steel, shipbuilding, and oil refining replacing coal mining and slate quarrying as pillars of the economy. On balance I would say modern Wales is progressive and forward-looking, a land where men laugh.

But it is also a land where one's mood all too often can be akin to the predominant somberness of the skies, a land where the past is always nearby, ready to be entered like a sanctuary. I have felt that most strongly in the graveyard of the Church of the Holy Cross in the little village of Robeston Wathen. There my ancestors lie, and I have made several pilgrimages to the place.

I did so once again a few days before the investiture, hoping that somehow it would make me feel closer to the ancient ceremony as well as to my own Welsh heritage.

David Rees . . . Thomas Rees . . . William Rees . . . relatives all, and all dead a century and more. I walked through the knee-high grass, scanning each scarred and flaking headstone. The inscribed words were hauntingly familiar and even a bit jarring. These names were the same as the names of my uncles, men born in America, and now, except for frail, silver-haired Tom, asleep in graves far distant from Wales.

This blurring of the threshhold between past and present returned in Caernarvon Castle as I listened to two magnificent choirs. The Welsh bore to America like a torch their tradition of singing, and it was particularly strong in my own family. It seemed that once again, true and vital, I heard the voices of my uncles: Tom's high tenor, Dave's bass, Bill's lead tenor, the strong baritone of young and handsome Tony. All had been taught by my grandfather, Anthony deWitt Rees, a singer and choirmaster. He emigrated to America as a young man, settling in Maryland, and died before I was born.

Very likely others at Caernarvon were recalling old songs sung around New World hearths. The Wales Tourist Board estimated that 1,000 Americans of Welsh descent had come over for the ceremony. Special trains and buses had brought many of them that morning from Cardiff, where there had been a series of welcoming ceremonies. Most of the Americans sat in bleachers outside the castle, content to applaud and cheer members of the

Colonel-in-Chief of the Royal Regiment of Wales, Charles waves to the throngs on his ride to the investiture. The regiment was formed on June 11, 1969.

ATTACHMENTS BY ADAM WOOLLITT © N.G.S.

Queen's promise comes true: On July 26, 1958, Elizabeth announced to the Welsh that she was naming Charles Prince of Wales, saying, "when he is grown up I will present him to you at Caernarvon."

Ramrod straight, the Prince kneels in front of his sovereign during the ceremony, virtually identical with that of the last investiture, in 1911, of the present Duke of Windsor. Red-robed lords bear the regalia. Dais, thrones, and stool, shielded by a transparent plastic canopy, were fashioned of Welsh slate; cushions, both for royalty and for invited guests, were covered with vermilion-dyed Welsh wool.

"We do ennoble

PRINCE of the United Kingdom of Great Britain and Northern Ireland, Duke of Cornwall and Rothesay, Earl of Carrick, Baron of Renfrew, Lord of the Isles and Great Steward of Scotland—to these hereditary titles the Queen added Prince of Wales and Earl of Chester, whose symbols of office she bestows at the investiture.

Wearing the sword of the new earldom and the coronet of the principality, 20-year-old Charles then receives a gold ring (left) symbolizing his unity and marriage

"**Once-in-a-lifetime** occasion," said Tricia Nixon, daughter of the President of the United States and one of the honored guests, second from right. To her left sits Princess Astrid of Luxembourg. To her right: Lady Rachel Pepys and Lady Anne Fitzalan-Howard, sister and daughter of the Duke of Norfolk, who directed the ceremony, and the Honorable William V. S. Tubman, President of Liberia.

and invest!"

with Wales, and a gold rod (above, left) signifying temporal rule. After donning his mantle of velvet and ermine (above), he places his hands between those of the Queen (right) and swears fealty: "I Charles, Prince of Wales, do become your liege man of life and limb and of earthly worship, and faith and truth I will bear unto you to live and die against all manner of folks." The sword, ring, and rod, fashioned of Welsh gold—mined since Roman times—were the same ones used in 1911.

Thunderous applause greets the Prince in the lower ward of the castle, where guests without a direct view of the investiture watched by way of large mirrors. After a religious service, the Queen, Prince Charles, and Prince Philip proceeded to Queen Eleanor's Gate for the first of three presentations to the people. They then appeared at King's Gate, and finally on the steps facing the lower ward. From there they paraded out. The Crown invited 4,000 to attend the ceremony; all but 500 were Welsh.

Final fanfare of the State Trumpeters of the Household Cavalry resounds from the battlements as the royal family leaves.

royal family as they arrived in carriages or to snap innumerable photographs of the colorful processions entering the castle (pages 702-3).

And the castle itself—a more spectacular stage setting for the ceremony would be hard to imagine. Edward I intended Caernarvon to be the most elaborate of his Welsh fortifications. And so it is, a huge and rugged old pile, with many polygonal towers and crenellated battlements. It stands strategically at the mouth of the River Seiont, and its walls are remarkably well preserved. The interior court is now an open greensward.

For the investiture, row upon row of seats had been banked up against the stern old stones, and huge banners cascaded down the walls. At one end of the court workmen had erected a low, round dais of Welsh slate, and on it stood three thrones and a stool, also fashioned of slate. A plastic canopy shielded them somewhat from threatening skies, but not from 4,000 pairs of eyes (page 706).

Now the 200-voice Investiture Choir sang "Rhapsody for a Prince," music of great verve that seemed to have in it something of mountain torrents and emerald hills, of a soulful people and the splendor of state. A 22-man penillion choir, a group that sings to the background tones of a harp, took up the musical challenge with a lilting song in Welsh, and as they did so the first of a long series of processions emerged from Eagle Tower and marched slowly the length of the courtyard to seats behind the dais.

Appropriately, the lead group proved to be members of the Council of the Royal Borough of Caernarvon. They wore robes of blue and splendid cocked hats, and while I was still adjusting to this antique attire I became bemused by the men who followed: officers and members of the Gorsedd of Bards and the National Eisteddfod Court. These are honorary orders, the Gorsedd composed of the leading poets, musicians, and men of learning of Wales, the Eisteddfod Court governing the annual festival of Welshmen at which competitors vie for honors in singing, literature, and other arts. All these dignitaries were swathed from head to toe in nylon hoods and robes of green, blue, and white, rather like desert chieftains.

BEHIND THEM color fairly clamored and rioted at the entry of mayors and their suites from more than a score of cities and boroughs—gold maces, fur-trimmed red robes, wigs, more cocked hats . . . the air seemed electric with color. County chairmen, county clerks, and Members of Parliament were a soberly garbed, if elegant, lot, but the spectrum revived with the advent of gorgeously robed Welsh peers and churchmen and Her Majesty's bodyguard of the Honourable Corps of Gentlemen at Arms.

In my time I've seen quite a few British processions, and, as always, I was struck by the complete lack of self-consciousness on the faces of the participants. Put Americans in such dress and situation and many would smirk or scowl; the British never do.

With seeming incongruity (though I enjoyed it), a beautiful young woman in a gold dress walked with the clergy. She carried the treasured Morgan Bible, named for Bishop William Morgan who translated the Old Testament into Welsh in the 16th century and did it so well he is said to have saved the language in pure form. The young woman placed the Bible beneath a plastic shield on a lectern near the dais.

While all these people were filing in, cannon outside the castle boomed a 21-gun salute to

the Queen, signaling that she was en route to the scene in her carriage from the royal train. When the last gun had fired, trumpeters high on the battlements raised their instruments like so many arquebuses and sent volley after volley of notes crashing about the castle and out into the fields and hills.

Frankly I was ready for the respite that followed. A long hush enveloped the throng; then we heard applause and cheering. The Prince of Wales had arrived. While trumpets blared anew, the Prince entered, wearing the dark-blue uniform of Colonel-in-Chief of the Royal Regiment of Wales.

At first sight of Charles the big choir burst forth, first in Welsh and then in English, with:

Ar d'wysog gwlad y bryniau
O boed i'r nefoedd wen,
Roi iddo gyda chovon,
Ei bendith ar ei ben!

Among our ancient mountains
And from our lovely vales,
Oh! let the pray'r re-echo,
"God Bless the Prince of Wales!"

There were more words, words known to almost every citizen of the United Kingdom, and thousands of voices joined with the choir in a resounding tribute.

There is an old Welsh legend that the birds of Llangorse Lake, Brecknockshire, know who is the prince of the district and will sing for him at his bidding. I recalled that legend when, as the song ended, I looked up and saw a flock of gulls wheeling about the towers and crying. Unmelodic, to be sure, and probably not a one from Llangorse, but Welsh and a spirited chorus.

Prince Charles walked halfway down the greensward and then turned off into a side tower, where, with his accompanying peers,

KODACHROME (ABOVE) BY JAMES L. STANFIELD; EKTACHROME (BELOW LEFT) AND KODACHROME BY ADAM WOOLFITT © N.G.S.

"And what a principality"

. . . exclaimed Prince Charles in his investiture address. His statement finds echo in the welcome of Welshmen as he travels about the country: What a Prince!

In a Rolls-Royce limousine (left), Charles rides through the streets of the industrial town of Merthyr Tydfil. As the motorcade threads through Llanhilleth, the entire population of the coal-mining village seems to have turned out. Women of Cardiff, capital of Wales, press against policemen as the Prince passes by.

he would wait until summoned by the Queen. Most of his entourage, however, continued on to seats near the dais, among them 17 young men and a like number of young women, representatives of Welsh youth. Healthy and handsome, they added a pleasant contemporary touch—particularly the girls, whose skirts were reasonably demure but definitely mini.

Without pause or further fanfare, the procession continued with the entry of Princess Anne, the Queen Mother, and Princess Margaret (page 704), who sat on chairs placed near the dais. Then the trumpeters fired another salvo, everyone stood, and in walked the Queen and Prince Philip.

PROMINENT in the Queen's party strode the elderly Earl Marshal of England, the Duke of Norfolk, hereditary manager of royal events and undisputed arbiter of all questions relating to the investiture. When the press had asked what would happen to the open-air ceremony if it rained, he had replied sternly, "Then we shall all get wet."

And we did—a bit. The clouds darkened as the crowd sang *"Hen Wlad Fy Nhadau*—Land of My Fathers," the Welsh national anthem, followed by "God Save The Queen," and a downpour seemed imminent as the Prince of Wales entered and knelt on the stool in front of the Queen. However, not until the mantle was placed about the Prince's shoulders did the rain come, and then it was only a drizzle, soon over.

Charles, replying to a loyal address by Sir Ben Bowen Thomas, president of the university where the Prince had so recently studied the Welsh language, spoke first in Welsh and then in English. He seemed a young man thoroughly at home in both past and present.

"I know that social conditions have changed since 50 years ago and, of course, are still changing," he said. "The demands on a Prince of Wales have altered, but I am determined to serve and to try as best I can to live up to those

Emotion-struck Welsh girl, one of thousands lining the streets of Cardiff, breaks into tears after shaking hands and talking with Prince Charles.

At hallowed St. David's, cathedral of the Welsh patron saint, Prince Charles meets the bishop, left, and other church dignitaries. During the ecumenical service he joined in singing a hymn in Welsh. Charles's proficiency in the language delighted the Welsh, who proclaim: English is the language of men, French is the language of the birds, but Welsh is the language of heaven.

Pride in their Prince shines in the faces of Welsh women at Bala, a market town.

demands, whatever they might be in the rather uncertain future.

"One thing I am clear about, and it is that Wales needs to look forward without forsaking the traditions and essential aspects of her past. The past can be just as much a stimulus to the future as anything else. . . ."

The crowd received this firmly voiced speech with generous applause. A brief religious service followed, led by Welsh clerics, and the 200-voice choir sang mighty hymns of praise and thanksgiving in Welsh. All that remained was for the Queen to escort the Prince to Queen Eleanor's Gate and King's Gate, there to present him to the crowds outside, followed by a third presentation to people in the castle's lower ward. Then began the long recession from the castle (page 708).

NEXT DAY, on the mark at 9:30 a.m., the Prince began his progress at Llandudno, a seaside town in northern Wales, and ended it four days later in the capital city of Cardiff. His path took him from such lovely towns as Betws-y-Coed in the Vale of Conway to the begrimed cottages of Ebbw Vale and Merthyr Tydfil in the industrial south, from the mists and fern of Bala Lake to the sprawling docks of Swansea. Every village, no matter how small, flew flags and bunting, and many of the poorest and most isolated stone cottages displayed the Red Dragon banner of Wales. I saw a number of homemade banners, perhaps the most touching tribute of all.

Much of the progress was repetitious, with speeches, luncheons, and honor guard inspections. To my mind the most solemn and moving moments occurred on the second day, when Charles attended an ecumenical service in his honor at St. David's Cathedral (page 712).

No cathedral in Great Britain, not even Canterbury, has a history that goes back farther than St. David's. Christians have lived and worshiped at that pastoral site on the westernmost tip of the Welsh mainland for more than 14 centuries, which is three-quarters of the entire history of the Christian faith. Not much is known of St. David, or Dewi Sant as the Welsh call him, but he is said to have picked the site for a monastery in the sixth century. The oldest part of the present magnificent cathedral dates from the 12th century.

Because my grandfather had been born at Narberth in Pembrokeshire, I was seated with the people of that shire on the right-hand side of the cathedral. Charles and his party filed in as all sang "God Save The Queen." I noted with parochial satisfaction that he sat on the Pembrokeshire side. The service was short, and it included the accustomed prayers for the Queen and the royal family, which the Prince had heard from childhood. But there was also a new prayer in his behalf, and I thought he seemed moved by it.

A young woman recited the prayer in Welsh and a young man in English. In part it said: "O God our Father, look in Thy love on this our land of Wales, and on Charles our Prince. Bless both him and us in our dedication of ourselves to Thy service, and to the service of our nation, for the good of all nations. . . ."

The choir, though not large, was excellent, but the congregation, singing in Welsh, often overwhelmed it. All around me I heard part harmony, sung as if these people had been rehearsing together for weeks. Charles has said that he is not yet fluent in Welsh, but he sang with all the rest.

After the blessing, or benediction, the Prince walked past me to the door, his young face bearing a slight, almost wistful smile. It was then, from my very small command of Welsh, I recalled the closing lines of "*Alun Mabon*," a famous lyric poem in the old tongue. Written by John Ceiriog Hughes (1832-87), it tells the life story of a hill shepherd and ends with lines known wherever Welsh is spoken:

Ond mae'r heniaith yn y tir
A'r alawon hen yn fyw.
But the old language still remains
And the old songs still live on.

Charles, I felt, probably knew the lines of that poem far better than I. Many prayed that his evident dedication to the Welsh language, and to Welsh custom and tradition, would unite and heal his troubled principality.

THE END

"**Speaking for myself** . . . I have come to see far more in the title I hold than hitherto," said the new Prince of Wales at his investiture. "I am more than grateful to the people of this principality. . . ." The young man who won the hearts of his people will someday be monarch of the United Kingdom and head of the Commonwealth. Until then the numberless Welshmen who were captured by the promise and personality of Charles will sing: "Oh! let the pray'r re-echo, 'God Bless the Prince of Wales!' "

Florida's Emerging

THE PICTURESQUE SEMINOLE Indians of Florida are caught up in a whirlwind of change. A young, educated group has taken over and is hurrying the tribe—which has maintained its leisurely old-time ways for the past two centuries—into the complicated world of today.

The roughly 150 Indians left in Florida at the end of the Seminole wars in 1858 avoided whites, kept their identity and way of life, and increased nearly tenfold.

Now more than 1,400 strong, the descendants of the intrepid few are emerging into a new and friendlier world—but the process has most of them bewildered. It is a

Seminoles

By LOUIS CAPRON

Illustrations by National Geographic Photographer OTIS IMBODEN

At the door of change, a Seminole grandmother and two youngsters in tribal dress attend Bass Day, a white man's fishing festival at Moore Haven, Florida. Descendants of tribes of the Creek Confederacy, the Seminoles—whose name means "wild, untamed"—moved from Georgia to Florida in the mid-1700's to escape encroachment by white settlers. Long aloof from the rest of society, they now enter a new era.

formidable job the young members face, to modernize a tribe that was long the least modified of any in the United States, and at the same time to build up pride in being Seminoles. As Joe Dan Osceola, one of the young leaders of the tribe, put it, "There are good white things and good Indian things. We want the best of both."

The scene is changing rapidly. Open-sided, thatch-roofed chickees are being replaced by modern concrete and frame houses or house trailers (following pages). Heavy machinery rumbles in Seminole country. New cars speed along reservation roads. Fine buildings house classrooms for the young, gathering places for adults, a gymnasium and medical clinics for all.

But there is still much left of the old life, and strange combinations result—such as primitive chickees sprouting television antennas, or the sight of a large maxi-skirted Seminole matron, followed by a train of youngsters and carrying a huge bundle, on her way to the coin laundry in Okeechobee with the week's wash.

I've known the Seminole for forty years. I knew him when he was unchanged, withdrawn, and self-contained, and it was a great privilege to be close to a culture so admirable and so utterly different.* And I have watched him embark on a new course with little experience—only a new motivation. It is a colossal transformation, but he is succeeding because he has intelligence, courage, and pride.

"Wild" Ones Stood Off U. S. Army

These are traits his people have always displayed, since the bitter times two centuries ago when the tribe came into being in Florida. Following Indian troubles in the southeastern British colonies in the mid-1700's, groups of Indians—Creeks and Creek relations—began drifting down into Spanish Florida to escape white domination. They came to be called *Se-mi-no-lee,* or "wild," in the sense that a deer is wild. Other groups kept coming as Indian troubles increased in the north, and runaway slaves swelled their numbers.

During the first Seminole war, Maj. Gen. Andrew Jackson in 1818 invaded Spanish Florida, a thorn in the side of the new Nation to the north. A year later overextended Spain ceded Florida to the United States.

The Seminoles occupied good farmlands coveted by the settlers, so they were maneuvered into one treaty after another to restrict them to unwanted land, and to force them ultimately out of the state. There were fewer than 4,000 of them, including no more than 1,400 warriors, but they refused to move. The seven-year conflict that resulted was the most costly Indian war ever fought by the United States. Such chiefs as Osceola, Coacoochee, and Billy Bowlegs won the admiration, if not the mercy, of their foes.

After the Army withdrew in 1842, the Government, still trying to get the Indians out, harried them into the third Seminole war, in 1855. This ended in 1858, leaving only about 150 Indians in Florida, stripped of everything except their independence. They hid in inaccessible, unpopulated areas.

Star Fire Saved Chopping Wood

As late as 20 years ago the ways of the Seminoles were little changed. They spoke two languages: Miccosukee to the south of Lake Okeechobee, Creek to the north. They lived in chickees in family groups, around a cooking shelter with the star fire. Three or more long pine logs butted together made a fire with a minimum of wood chopping (page 726).

There were three Seminole groups, each governed by a council of elders that met officially once a year, at the new moon of late June or early July, for the traditional Green Corn Dance. This was conducted by a medicine man who looked after the spiritual life of the band and preserved its lore and rituals.

Except for a few school children, only a handful could read and write; most spoke little English. They sold deerskins and alligator hides and handicrafts; they guided hunters, hired out as cowhands or vegetable pickers. Their income was small, but so were their needs—salt, ammunition, pots and pans, cloth, perhaps a sewing machine and a jalopy.

*Long recognized as an authority on these remarkable people, Mr. Capron wrote "Florida's 'Wild' Indians, the Seminole," for NATIONAL GEOGRAPHIC, December 1956.

Cowboy and Indian are one on the Brighton Reservation, as a Seminole helps treat a cow for internal parasites. Rugged and independent, he reflects a proud warrior tradition. Attempts by the United States to force the Seminoles west brought on the Nation's most costly Indian war. Some 3,000 federal soldiers lost their lives from 1835 to 1842, and only about 300 tribesmen escaped death or deportation. By 1858 only 150 remained, deep in Florida's wilds.

PHOTOGRAPHS BY JOSE AMEDEN © N.G.S.

Enclaves in a varied land of pine, palmetto, and saw grass shelter the Seminole Tribe, with 803 members on federal reservations at Brighton, Big Cypress, and Hollywood, and 179 in individual settlements. A separate tribe, the Miccosukees, number about 225 on their own reservation, with 223 more in scattered camps along the Tamiami Trail and elsewhere. The two tribes share income from land rights on a Florida state reservation, though no Indians live there permanently.

Best of old and new combine in Miccosukee tribesman Henry Osceola's house on the Tamiami Trail. It boasts modern conveniences beneath the cool thatch roof of Indian tradition.

Island of unity in the Florida Everglades: A Miccosukee compound of chickees—thatched, open-sided huts—near the Tamiami Trail groups sleeping quarters around a cookhouse. Father, mother, youngsters, and married daughters and their families live together.

College-trained leader Joe Dan Osceola, holding his son Brian, serves as president of the Seminole Tribe of Florida, Inc., a business organization that promotes such enterprises as handicrafts, tourism, and modern ranching. Many Seminoles bear the name of their most famous warrior, Osceola, who in 1837 was seized under an Army flag of truce and died in prison.

House of contrasts: Television, electric fan and iron, and factory-made mattress show contemporary influence in this Everglades chickee. Owners hang belongings from cypress rafters and sleep on the platform. Seminole children, who once learned tribal lore through folk tales told by their mothers, now find another world on TV.

The Seminoles were content with an easy life.

What stirred everything up was a proposal in Congress in 1953 to get rid of the responsibility for all Indians, hand the reservations—which the Government held in trust and administered—over to them entirely and turn them loose. The Florida Seminoles were to be put on their own three years after enactment.

For a people who knew nothing about business and most of whom couldn't speak English, this was absurd. The bill for their "emancipation" died in committee.

But the pot was aboil. Restlessness replaced somnolence. In 1957 most of the state's Indians adopted a constitution as the Seminole Tribe of Florida and incorporated. They have a membership today of more than 1,000. Another group on the Tamiami Trail organized in 1961 as the Miccosukee Tribe of Indians of Florida.* They number about 225. Both are recognized by the Government, and each has its own Indian Agency.

Woman Rises to Warrior's Role

The new Seminole Tribe naturally elected the older leaders to office, but they were more or less baffled by the new conditions. In recent elections the younger, educated Indians have taken over. The government has two divisions—a business organization with a president and board of directors, and a tribal organization with a chairman, known as "chief."

Strangely enough, the chief of this once-warlike tribe is a woman, Betty Mae Jumper, bright, jolly, and vivacious. Joe Dan Osceola, college-trained in business administration, is president (preceding page). They work together, both dedicated to the good of the tribe.

"The Seminole has changed a lot," Joe Dan commented not long ago. "Where the Indian of the past was happy with an easygoing life and few possessions, the younger ones who have been away to school want to live like their white neighbors. Even the older Indians want better houses and new conveniences."

*See "Threatened Glories of Everglades National Park," by Frederick Kent Truslow and Frederick G. Vosburgh, NATIONAL GEOGRAPHIC, October 1967.

(Continued on page 727)

Garbed for friendly battle, a young Seminole goes on the softball warpath at Brighton. Athletic prowess gives Indians status outside the reservation; they excel at basketball, perhaps because of its similarity to their own time-honored stickball (page 734).

Elders of the tribe have largely lost their authority over the juveniles, and many of the old virtues fade. Even so, when visiting Seminole camps, author Capron still leaves his car unlocked—and has no fear of theft.

In the past, conviction as a lawbreaker meant banishment from dances and ceremonies until the guilty cleansed himself, perhaps by being "steamed" in a small tent where water was heated by hot rocks, and then lying for days without moving.

Young woman of the world beams during dress-up time at Operation Head Start, a preschool program at Hollywood Reservation. For some, it means the first exposure to the English language before entering elementary school. In tribal life Seminoles speak either Creek or Miccosukee. Until Head Start, language and social differences made it hard for children to compete with non-Indian classmates.

Stethoscope tickles as Dr. J. D. Workman examines a tot at Brighton's health clinic. Before modern medicine, Seminoles called on tribal practitioners to keep body and soul together. The herb doctor treated minor ailments; the medicine man attended to matters of serious illness, death, and immortality. Both skills go unlearned now among the Indians, and the remaining healers keep their secrets from the whites. When a drug company a few years ago showed interest in a Seminole potion as a tranquilizer, the herb doctor refused to break tribal law by revealing the formula.

Although the Everglades are not the disease-ridden swamps many people envision, hookworm is common among the otherwise healthy Indians. Obesity also poses a problem among Seminole matrons, who tackle it with weight-watching clubs.

"The trouble is," Betty Mae broke in, "that most can't pay for them. You can't get a decent job if you can't read and write. We've got to keep the children in school and do as much as we can to educate the grownups. Our biggest problem is education."

Today most Seminole children of school age are in county public schools, and every effort is made to have them continue to high-school graduation. Several have gone on to college, aided by Government scholarships and a state grant of $600 a year each.

Preschool Children Get Head Start

"Just about the most important thing for the children's education is Head Start," Betty Mae said. "Many of the kids went into the first grade without knowing English. So they couldn't learn much and they never did catch up. With Head Start they start out even."

Head Start is administered by the tribe but financed by the U. S. Department of Health, Education, and Welfare. It not only prepares the child for school; it prepares him for a new life. He learns to speak English and to conduct himself in the fashion of his white schoolmates. He learns the fundamentals of a new social system. And the training all seems like play (page 725); it is vastly more fun to do things in a group.

About eighty boys and girls are enrolled, and the mothers love it. It takes the children off their hands for the day.

Adults are not neglected. There are classes in English and plans for such other subjects as home improvement, family financing, health, clothing, and food preparation.

The most evident change among the Seminoles is in their housing. On the sophisticated Hollywood Reservation, by tribal law, the chickee is forbidden. But you can see one there in Okalee Indian Village, where the old life has been reconstructed for visitors.

The city of Hollywood has grown up around this reservation. Not everyone is comfortable there. Charlie Billie-Boy shook his head. "I like it all right, but things cost too much here, and I want to keep hogs and chickens. I think I move to Brighton, where I get more room and not so many rules."

The Seminole Tribe has adopted a single-story prefabricated house of aluminum and Masonite, and one of concrete block. Each has three or four bedrooms and can be built for about $11,000. Self-help reduces costs, and payment is spread over a long period.

The Government provides Home Improvement Project money for modernizing existing houses, at no cost to the owner when it can be done for less than $4,500.

But how do you modernize a chickee, which is nothing but a platform with a thatched roof? You simply ignore it, and use inexpensive materials to build supplemental living quarters—a sleeping cabin, a smaller structure for cooking and eating, and an even smaller one with shower and toilet facilities. They add up to a home. With care, the complex can be built for under $4,500.

Recently, at Big Cypress Reservation, I stopped to watch three young Indians working on one of the sleeping cabins. Peering through the doorway, I could see a quiet figure lying on a mattress on the floor.

One of the workers gestured toward him. "That sick man in there," he told me. "Old, old man called Boy Jim." Literally, they were building the structure around him.

Trailer homes are popular, too. Financed by the company selling them, they have furniture and appliances compactly arranged. My friend Ingraham Billie, a medicine man, owns one. Still, he prefers his chickee and retreats to the trailer only in cold weather.

Land—the Seminoles' Wealth

On the Tamiami Trail, the Miccosukee Tribe has adopted a "modern chickee"—a frame building with palmetto thatching over a conventional roof to keep it cool (page 720). The house has electricity, hot and cold water, a range, and complete sanitary facilities.

Along the trail are several Seminole villages not directly connected with either organized group. They have old-fashioned chickees, and most have a craft shop where handiwork and simple sundries are sold.

Greatest asset of the Indians in this state of booming property values is their land. The Hollywood Reservation is extremely valuable

Keeping to ways of old, Buffalo Jim and his wife Suzie fry fish in a chickee on Big Cypress Reservation. The elderly find change difficult to accept. One woman whose husband had his heart set on a modern house refused to move. "I'm too old to learn how to housekeep," she said. Old-timers treasure memories of the past and hold to faith in such tribal rituals as early summer's Green Corn Dance, a ceremony of purification and renewal.

property on both sides of a main north-south highway. But few commercial enterprises are owned by Seminoles; most of the revenue comes from land leased to developers.

"We've tried it the other way," Eugene W. Barrett, the Government's Seminole Superintendent, told me, "but this works better. Outside developers have the capital needed to build the businesses, and the experience to run them. Their lease payments bring a steady, assured income to the tribe—a larger income than the Seminoles would get if they had to build and run the businesses themselves."

Joe Dan Osceola nodded in agreement, then spread out a map showing planned developments—shopping center, supermarkets, restaurants, motels, shops, and factories.

"And each one calls for hiring and training Indians," Joe Dan said. "That will mean jobs and experience for us."

"How about the $50,000,000 claim against the Government?" I asked, referring to the 1967 federal court ruling that the Seminoles and their Oklahoma brothers are the legal owners of a huge part of Florida.

Joe Dan smiled. "We aren't counting on it too much. We don't know how much it will really be, how it would be divided, or when it will be paid. We hope there will be plenty—there are lots of ways we can use it."

Alligator Alley Opens Hinterland

Elsewhere than at Hollywood the Seminoles are on the move. At Brighton Reservation the Economic Development Agency will help build a house-trailer factory to employ 75 to 100 people. The tribe plans a marina and recreational area near Lake Okeechobee.

On Big Cypress a large company is negotiating for sand and gravel found there. This could bring in as much as $60,000 a year. With a road south to connect with Alligator Alley, the new cross-state turnpike, Big Cypress will be much more accessible, and the tribe is planning an area for hunters, with a trailer camp, restaurant, and other facilities.

Proud moment arrives for Jenny Osceola (far left) and Jenny Micco, who join graduation ranks at Moore Haven High School—an infrequent occurrence among Seminoles until recent years.

Attendance at higher levels of school has grown steadily in the past decade; previously less than three years of formal education was the average. Eleven Seminoles in six different high schools received diplomas in 1969, and nine enrolled in college.

Welder's torch lights the face of Rufus Tiger, who used a Government grant to learn his skill at a Texas trade school. Here he repairs equipment for the Brighton cattle project.

Even older Seminoles realize the importance of education today. Some adults are only now learning to read and write.

Alligator Alley goes through the Miccosukee section of the state reservation (map, page 720), opening up hitherto inaccessible areas and giving the Miccosukees an opportunity to get into the cattle business, so important to the Seminoles farther north.

The Seminole cattle operation is one of the most successful experiments in large-scale irrigated pasturage ever attempted by the Bureau of Indian Affairs. In the 1930's the Brighton Reservation was established in the cattle country northwest of Lake Okeechobee, and 500 cattle were turned over to the Seminoles. The enterprise was such a success that four years later $80,000 worth of cattle, including high-grade Herefords, were added to the herd. By good management, the Seminoles finished paying for them a year and a half early.

Since 1954 the tribe has been selling the cattle to individual owners. The aim is for 80 units of 200 breeding cows apiece, and eventually individual ranches instead of common pasturage. Cattle at Brighton are crossbred, Hereford and Brahman; at Big Cypress, Angus and Brahman. They now graze more than 16,000 acres, and more is being developed, fenced, and put into pasture.

The cattle enterprise affords well-paid jobs. This is important when even the traveled Indians, equipped to live anywhere, want to return. "All our people want to live on the reservation," Joe Dan had said.

I asked Betty Mae Jumper about this.

"Of course it's true," she said. "We don't want to be

white people; we want to be Seminoles. We want the modern things and we want to live nicely, but we want to do it among friends."

Betty Mae graduated from a reservation high school in Cherokee, North Carolina, in 1945, studied nursing in Oklahoma, and went on to field work with the United States Public Health Service. She then returned to Florida, and has been active in the affairs of the tribe ever since.

She pointed out that the greatest trial of the boys who go away to college or to military service is loneliness, and that even those who have lived in white surroundings have come back to the reservation.

Fred Smith, tribal secretary-treasurer, first went to school from a chickee. He graduated from high school and went on to junior college, joined the Army and served two years in Germany. He married a well-educated Choctaw girl who works with the Broward County school system. With all these qualifications for success anywhere, the Smiths live on the reservation, working for the good of their people.

Fred is a prize example of the energetic young Seminole. I asked him what his Army service meant to him.

"The most important thing I learned," he said, "was the ability to get along with everybody." Like other young Indians, he was shy, but the Army cured him of that. It taught him self-confidence and the way to handle people.

From Carving Canoes to Teaching School

Billy Cypress is another Seminole who has adjusted. His grandfather, Charlie Cypress, was a carver of canoes. In fact, 13 years ago, while I was writing a previous NATIONAL GEOGRAPHIC article about the Seminoles, Charlie Cypress carved a canoe for the Society. It's in the Smithsonian Institution now.

Billy is the new Seminole, a graduate of Stetson University, an ex-Army officer, and now a teacher at Driftwood Junior High School near the Hollywood Reservation.

Because Billy Cypress knows both worlds, I asked him which one the Seminoles would eventually choose.

"Some will leave the reservations," he said. "The ones who can feel comfortable outside. But the reservations aren't concentration camps any more. They fit the tribal unit. They help the Seminoles stick together."

He spoke quietly, almost to himself. "When you leave the reservation and live among whites, you lose a little bit of the Indian in you. But it comes back when you return."

The limited number of jobs on the reservations has resulted in a surprising rule. An Indian woman and a white husband cannot live on the reservation, but a white woman and an Indian husband can. In a society where the clans are perpetuated through the woman, this struck me as a strange idea.

Betty Mae explained, "It would be hard for an Indian man to support a family off the reservation, but a white man can."

Women Adopt Birth and Girth Control

The reservations protect the Indian and give him a confidence he does not feel in the outside world. He is safe there. If anything happens to him, he'll be among friends. Not only are welfare benefits available, but his own people by nature help each other.

But a basic problem is that the reservations simply do not have the capacity to support the fast-growing Indian population—certainly not in the style to which the Seminoles are becoming accustomed.

Better sanitary conditions and medical care are cutting the mortality rate of both infants and adults. Many women are taking measures to bring things under control. They have found "the pill" and call it the "gold nugget." That's modern enough!

Health and much welfare work are today financed by federal funds. Brighton and Big Cypress Reservations have two clinics a week, well staffed with a doctor and registered nurse, and Indian aids to take care of records and routine affairs. These clinics have become almost social events. Lucy Tiger, now more than 100 years old, never fails to come for her vitamin pills.

Obesity is a big problem among the older women, and a "weight-watchers club" was organized at Brighton with regular meetings

Fiberboard and concrete block replace thatch and cypress as Seminole women at Brighton install a ceiling in a modern bungalow, available for $11,000 with long-term financing. The woman takes the initiative in family activities. When a couple marries, the husband often goes to live with his wife's people, their children belonging to the mother and her family. Today's acceptance of marriages between Indian and white is a far cry from times when birth of a half-breed child meant death for the Indian mother.

Flying on water, an airboat skims over saw grass with Rocky Jim at the controls. Such propeller-driven craft, capable of speeds as high as 70 miles an hour, find use chiefly as thrill rides to win tourist dollars. Watery passages once served as main transportation arteries for the Indians, who poled along silently in dugout canoes. Now most live near hard-surfaced roadways and travel in automobiles.

Indian use of the Everglades has changed from days when its wildlife furnished food, fur, and alligator hides for a modest subsistence. Tourists now provide the bulk of Indian income. A prime attraction: specially staged wrestling bouts between braves and alligators.

and exercise classes. As an incentive, a prize was offered for the greatest loss in six months. Minnie Johns shed 40 pounds and won a sterling-silver pickle fork.

The Seminoles' greatest curse, though, is hookworm, since many go barefoot and sanitary conditions are still bad in many places. It's a continual struggle to keep shoes on children and older adults and to keep their chickees and grounds clean.

The Indian herb doctor still functions. A county nurse called on one of her patients and found Josie Billie "making medicine" in the old way.

"Indian God and white God same God," he said. "Both medicine good."

Today the Indian baby is likely to be born in a hospital, but the herb doctor still does business with ancient formulas.

These doctors are not necessarily "medicine men." The medicine man has charge of the sacred medicine on which the non-Christian Seminoles believe their well-being—even their existence—depends. He presides at the

KODACHROME BY OTIS IMBODEN © NATIONAL GEOGRAPHIC SOCIETY

Green Corn Dance, the purpose of which is to keep the medicine alive and the Indian healthy and fortunate.

"If no Green Corn Dance for three or four years," the late Sam Jones, Cow Creek medicine man, once told me, "the medicine die—and then no more Indians."

This festival is changing in subtle ways. It lasts five days, and for the Seminole it is New Year's, Christmas, and Easter all rolled into one. There are three annually—two on the Tamiami Trail and one on the pine prairies northeast of Okeechobee. The younger Indians regard them more lightly than their elders, and pay less attention to their rigid rules. The dance grounds are intentionally hidden and almost inaccessible, but more visitors come each year.

Seven-year Course in Tribal Medicine

The Green Corn Dance will change still more when the present medicine men die. A medicine man must know the meaning and the purpose of every one of the hundreds of

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Circling for a clear shot, Fred Smith, secretary-treasurer of the Seminole Tribe, aims at a high mark on a pole during a game of stickball at Okalee Indian Village on the Hollywood Reservation. He holds the ball with two cypress sticks, or rackets, webbed with leather thongs; women players may use their hands. A close-knit people, the Indians try to maintain tribal unity while striving for advancement. "We want to be Seminoles, not whites," says tribal leader Betty Mae Jumper.

objects in the medicine bundle and the song for it. It takes a seven-year apprenticeship to qualify; there are now only four men with the proper training. I asked Frank Shore, now medicine man of the Cow Creek Seminoles, what will happen when they die. "I don't know," he said sadly. "I try to teach some people, but everybody too busy."

Crossing the Bridge of Stars

How many times, I wonder, have I journeyed from my West Palm Beach home into Seminole country? How many times have I been welcomed into one of their villages? I've lost count long ago. But all those trips have given me a deep respect for the old Seminole and his ways.

He lived by a code far stricter than the one we follow. Lawbreakers were few. I never have locked my automobile while in a Seminole camp; my possessions are safer there than they would be out in the white man's world.

Only once was a weapon brandished in my direction. I was leaving a Seminole camp that day when old Willie Jim came running after me, waving a tomahawk. For an instant I was startled—till I realized that Willie Jim was racing to give me a present, the tomahawk. I still treasure it.

Forty long years I've known the Seminole, and admired him greatly. His friendship was hard to come by, but it was deep and lasting. He had a nobility and self-possession all too rare in any culture. There are some of my old friends left, but so many have crossed the bridge of stars.

It was a contented life they lived, and easy on the heart, and in many ways I regret its passing. But this is the world of a new and younger Seminole who must build it to his own vision, and I admire his determination and ambition. I wish him well. THE END

WATCH "SIBERIA" ON MOST OF THESE CBS TELEVISION STATIONS

(Canadian and some U. S. stations may schedule the program on another date. Check your newspaper.)

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Fairbanks KTVF (11)
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Phoenix KOOL-TV (10)
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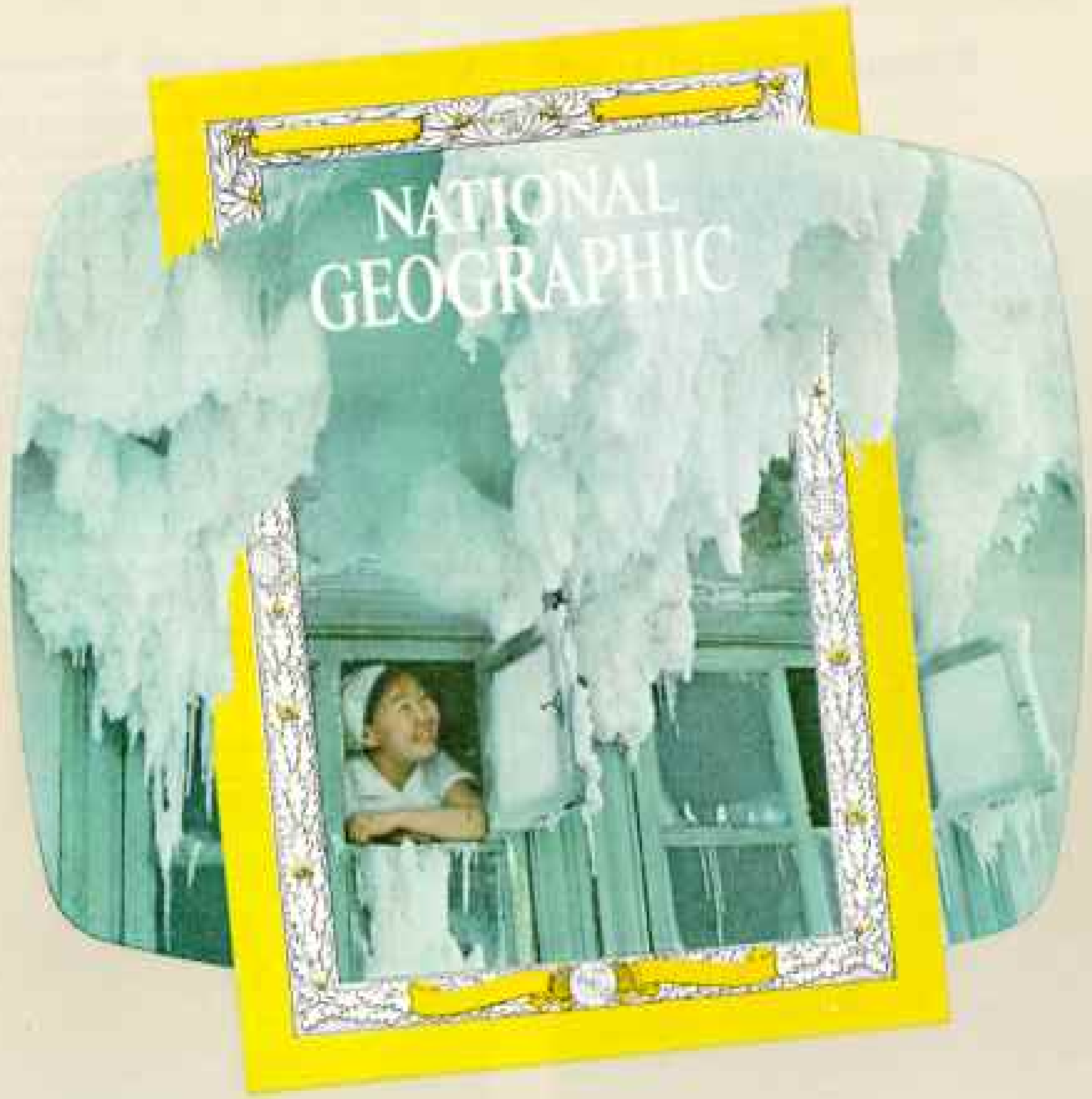

Siberia: The Endless Horizon

SEE IT IN COLOR, TUESDAY, DEC. 2

Russia's "Wild East"

SIBERIA! The word chills Westerners with thoughts of grim climate and faceless exiles. But an exciting new image of this frontier land comes into view on Tuesday, December 2, when National Geographic presents "Siberia: The Endless Horizon," second of four documentaries in its 1969-70 TV series.

The Trans-Siberian Express, running over the world's longest continuous railway, thunders through modern cities and remote highlands. Truck convoys roll night and day the year round to supply isolated villages. Sparsely settled over this vast area—more than seven times the size of Alaska—pioneers wrest a wealth of minerals, including oil and diamonds, from an incredible storehouse.

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Trans-Siberian train halts at Slyudyanka, midway in its 5,780-mile sweep from Moscow to Vladivostok.

Calming his reindeer, a herder greets a copter-borne Geographic film crew.

EKTACHROME (ABOVE) BY DEAN CONGER, EKTACHROME (LEFT) AND KODACHROMES BY PAUL VERHOCHEN © N.G.S.

Electrically heated equipment enables a Geographic team to record sights and sounds in a nomads' encampment. Sign identifies a men's club.

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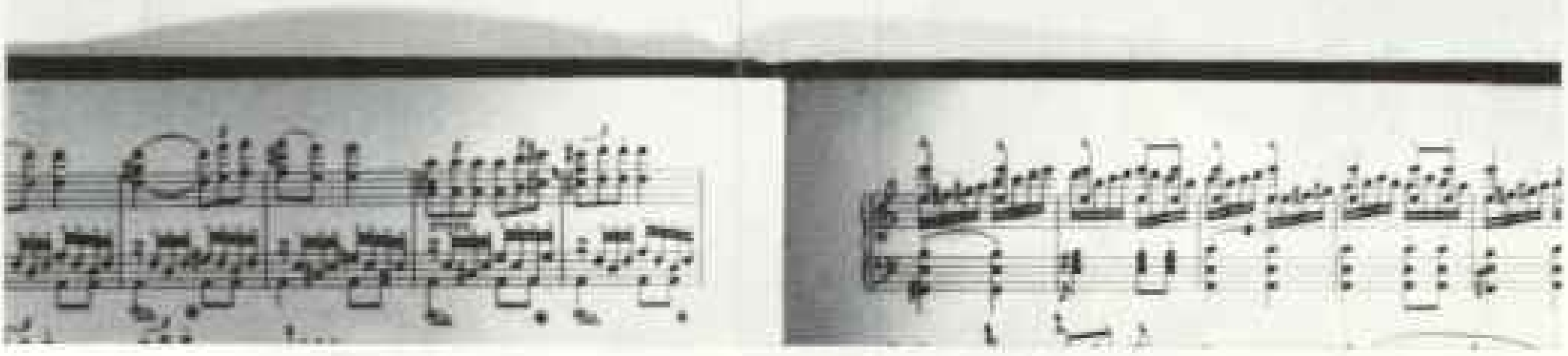

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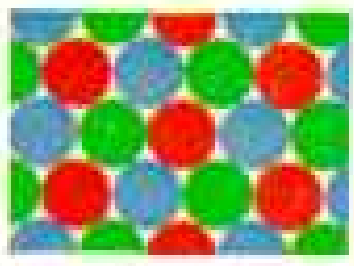
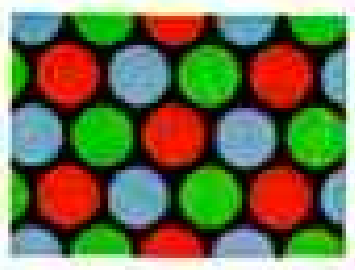
The heart of the system is the revolutionary new Chromacolor picture tube, incorporating Zenith's patented black-surround principle. Where previous giant-screen color pictures have been made up of thousands of tiny red, green, and blue dots on a gray background, Zenith found a way to reduce the dots in size, surround them with jet black, and for the first time, fully illuminate every dot.

You'll see the difference immediately —not only greater brilliance, but dramatically new contrast, new definition, and new sharpness of detail.



Magnified drawing of ordinary color picture screen



Magnified drawing of new Zenith Chromacolor picture screen

The new Chromacolor system also features Zenith's exciting Color Commander Control

Now one control simultaneously adjusts contrast, color level and brightness in proper balance to provide the most pleasing picture for any light conditions in the room.

Plus:

New Titan Handcrafted Color Chassis with exclusive solid-state Dura-Module for greater dependability.

New RGB Color Circuitry is more sophisticated for higher color fidelity.

Exclusive Chromatic Brain with the first integrated circuit ever used to produce a color TV picture.

Exclusive Gold Video Guard Tuner with 16-carat gold contacts for longer TV life.

Exclusive Zenith AFC Control electronically fine-tunes the color picture at the flick of a finger.

See new Zenith Handcrafted Color TV with the exclusive Chromacolor system at your Zenith dealer's. Chromacolor—the dramatic difference you can see in color TV!

ZENITH®

The quality goes in before the name goes on