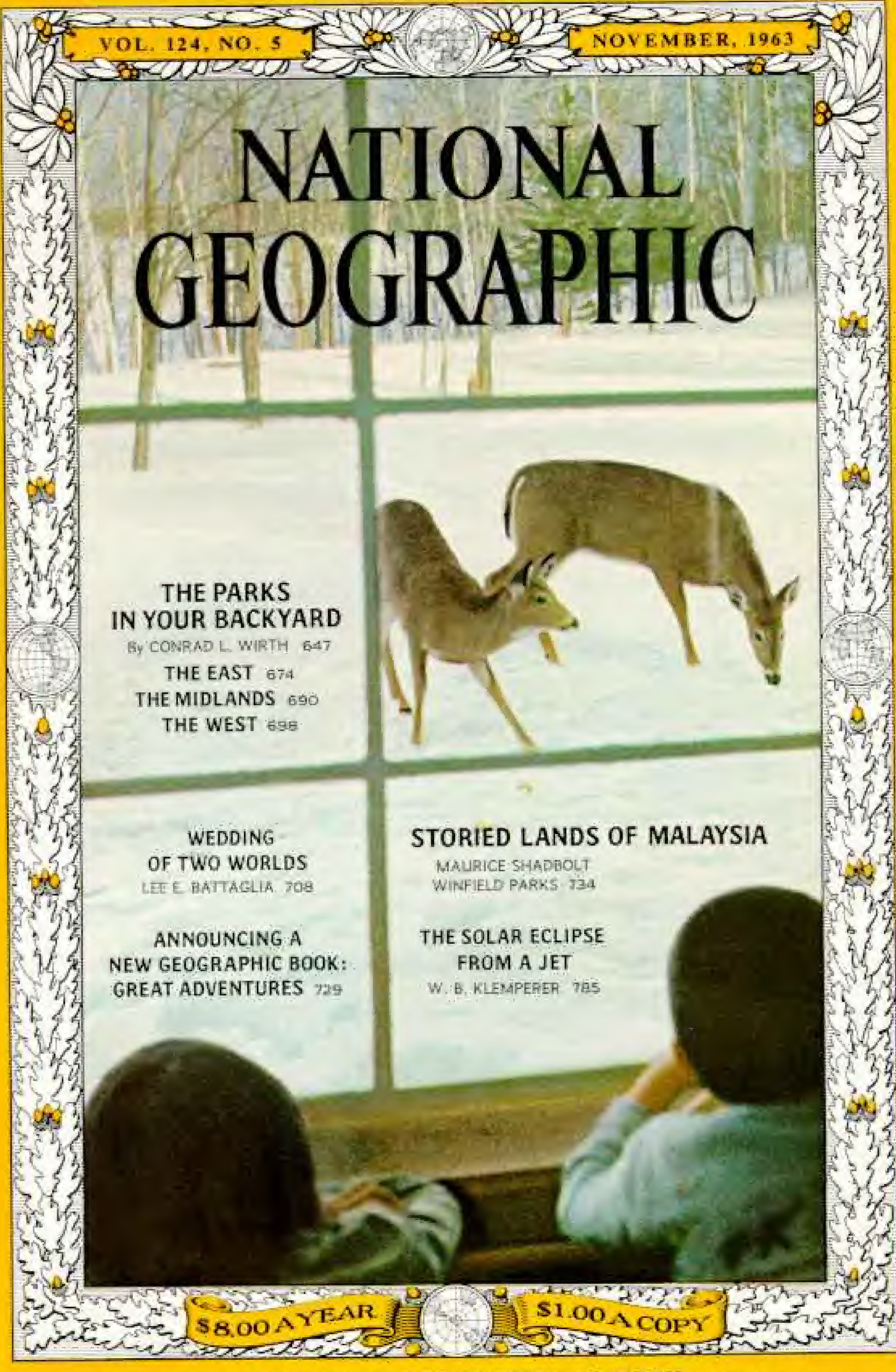

THE JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D. C.

NATIONAL GEOGRAPHIC SOCIETY

WASHINGTON, D.C.

75TH ANNIVERSARY

1888–1963

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The National Geographic Society is chartered in Washington, D. C., in accordance with the laws of the United States, as a nonprofit scientific and educational organization for increasing and diffusing geographic knowledge and promoting research and exploration.

Since 1890 the Society has supported more than 200 explorations and research projects, adding immeasurably to man's knowledge of earth, sea, and sky. It diffuses this knowledge through its journal, NATIONAL GEOGRAPHIC; more than 21 million maps distributed each year; its books, globes, and atlases; 30 School Bulletins a year in color; information services to press, radio, and television; and the publication of technical monographs.

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◀ **COVER:** Deer and children enjoy Porcupine Mountains State Park in Michigan, one of the Nation's more than 26,000 local recreation areas (page 669).

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PILGRIMAGE FOR A PAINTING

When you see staff artist Robert W. Nicholson's painting of the siege of Jerusalem in next month's NATIONAL GEOGRAPHIC, you'll find an unusual work of art. His painting started with a trip to the Holy Land. There he interviewed Moslem, Israeli, and Western archeologists. He met with historians who are authorities on the Crusades. He photographed the terrain. He studied maps. He researched architecture, the costumes and warfare of the times, and made dozens of sketches.

He even built small-scale models of a javelin-throwing *ballista* and a rock-slinging *mangonel* that really work!

It is this kind of diligent search for realism by staff members that has gained world renown for the National Geographic Society.

And it is one of the reasons members gave 725,000 memberships in the Society to friends as Christmas gifts last year—"gifts that transcend the commonplace."

Rope tension, transmitted to the mangonel's throwing arm, propelled rocks or pots of Greek fire.

Wooden spring of ballista snapped forward when released by rope trigger, launching javelin (sometimes fire-tipped).

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11/63

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'64 JET-SMOOTH LUXURY CHEVROLET

A CAR THAT'S NEVER BEEN SO LUXURIOUS BEFORE! More luxurious outside with that long clean new look. And much more luxurious inside. The new Impala Super Sport Series, for example, has a new kind of ultra-soft vinyl upholstery and door-to-door deep-twist carpeting that you would be proud to put in your home. And even the lowest priced Biscayne models are now fully carpeted and have arm rests and foam-cushioned seats both front and rear. Then these new Chevrolets have a Jet-smooth luxurious way of going. Quiet. Soft. Transmissions operate more smoothly and quietly. That sturdy Body by Fisher and generous coil spring at each wheel cushion you against every kind of road shock. Actually, the whole idea for '64 was to see how much luxury and comfort we could add to the car—but still keep it reasonably priced. And everything worked out just beautifully. Wait until you see it. SEE CHEVROLET'S GREATEST AT YOUR CHEVROLET SHOWROOM.

NEW CHEVELLE! by CHEVROLET

A KIND OF CAR YOU'VE NEVER SEEN BEFORE! Not a new model or just a new name, but a completely different kind of car from Chevrolet for 1964. Outside, it's a good foot shorter and a few inches narrower than the big cars. Parks in the tightest places. But the passenger space, leg room and trunk capacity are surprisingly generous. Eleven sedans, wagons, coupes and convertibles to choose from. Four engines: a 120-hp Six. A 195-hp V8. An extra-cost 155-hp Six. And an extra-cost 220-hp V8 with four-barrel carburetion. Body is by Fisher—and you know what that means in terms of quality and comfort. Brakes are self-adjusting. Service is seldom. Quality is by Chevrolet clear through. And so is the price, you'll be happy to know. SEE CHEVROLET'S LATEST AT YOUR CHEVROLET SHOWROOM.

THE '64 CHEVY II by CHEVROLET

NEW CHEVY II V8! An optional-at-extra-cost 195-hp V8, to be exact. Chevy II is now the only car made that gives you a choice of Four, Six or V8 power. Two Sixes, by the way. A 120-hp and a new extra-cost 155-hp. And all the new II's are trimmer outside and nicer inside. Each with Body by Fisher, of course. And rust-fighting rocker panels and long-life muffler. And self-adjusting brakes. And all those other Chevrolet engineering features that keep you from dipping into your savings to keep it going. Come dr-r-r-rive a Chevy II V8 at your Chevrolet dealer's showroom.

'64 CORVAIR and '64 CORVETTE

NEW CORVAIR POWER! Nearly 19% more horsepower in the standard engine. A full 110 horsepower in the extra-cost engine. And 150 hp in the Monza Spyder. Some nice new interior refinements, too—like softer, more deeply tufted seats in the Monza and sporty map pockets on the front doors. Outside of that, it's still very much the same easy-to-park, easy-to-handle, hard-to-keep-your-hands-off-of Corvair.

NEW CORVETTE RIDE! Smoother and quieter than it's ever been, but no less of a sports car than it's always been. New extra-cost V8 engines up to 375 hp. And note the new *one-piece* rear window in the coupe, so you can see who's behind you better. You'll be surprised at what a beautiful boulevard car Corvette is. Yet it's one of the world's few great sports cars, too. . . . Chevrolet Division of General Motors, Detroit, Michigan.

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Syncom is an entirely new kind of communications satellite. It is the first synchronous satellite — the first to "stand still" in space.

Actually it is traveling 6,875 mph. But at its altitude of 22,300 miles, Syncom's speed matches the earth's rotation. Result: It is "parked" over the earth.

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◀ *Syncom differs from other satellites in that it is precisely controlled in a high-altitude orbit. Here it can be permanently "parked," while other types of satellites are in random, low-altitude orbits.*

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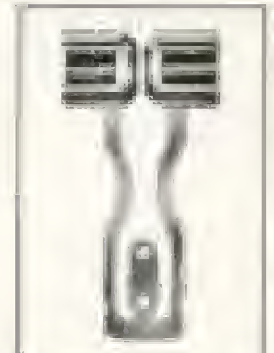

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New styling sets the Thunderbird mood. Inside it is maintained by advances that make even Thunderbird veterans sigh. An exclusive, new Silent-Flo ventilation system *pulls* floods of fresh air through the entire car, even with the windows closed. New contoured "shell" front seats cradle you in luxurious Thunderbird comfort. Instruments are positioned and lighted for flight deck clarity.

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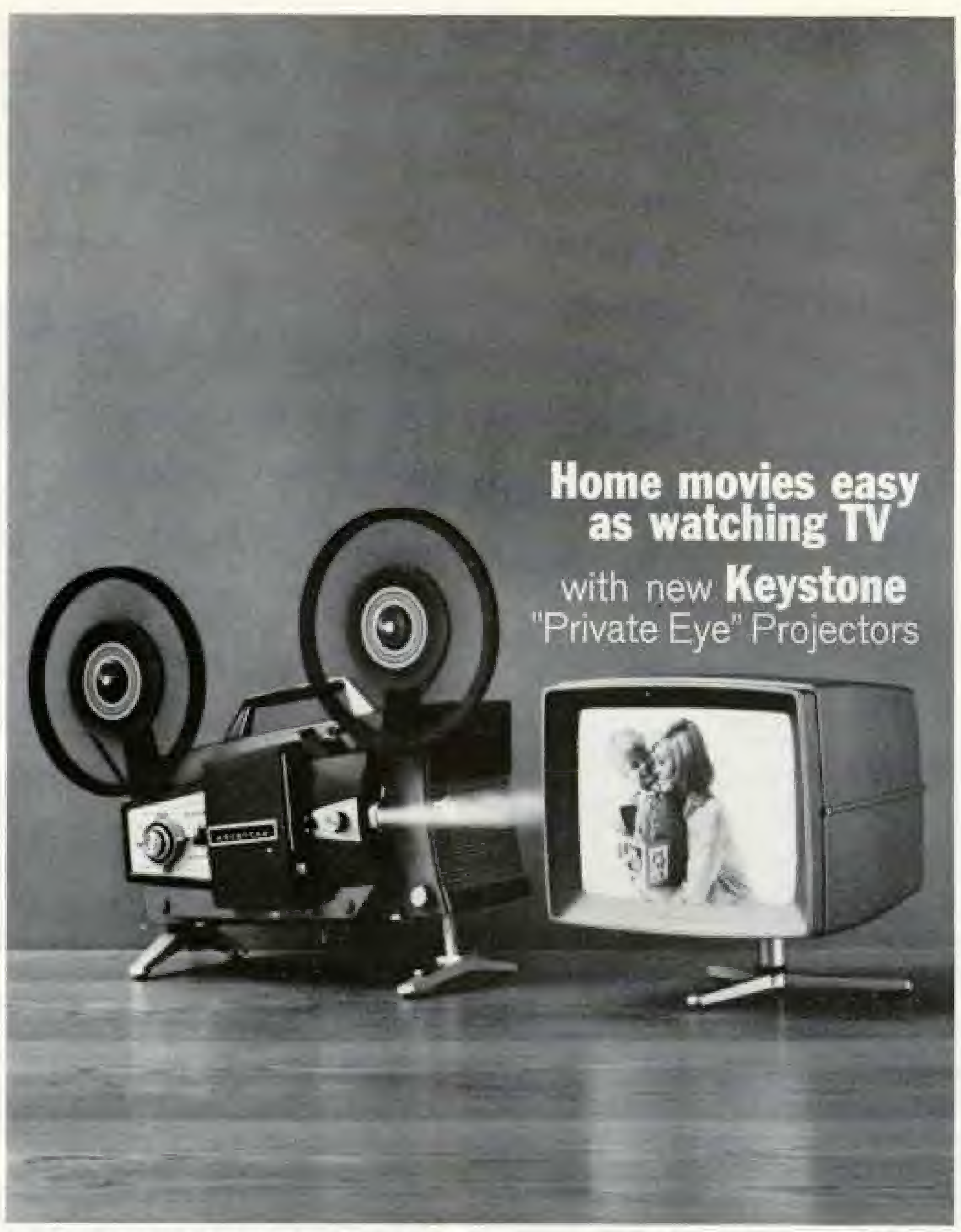

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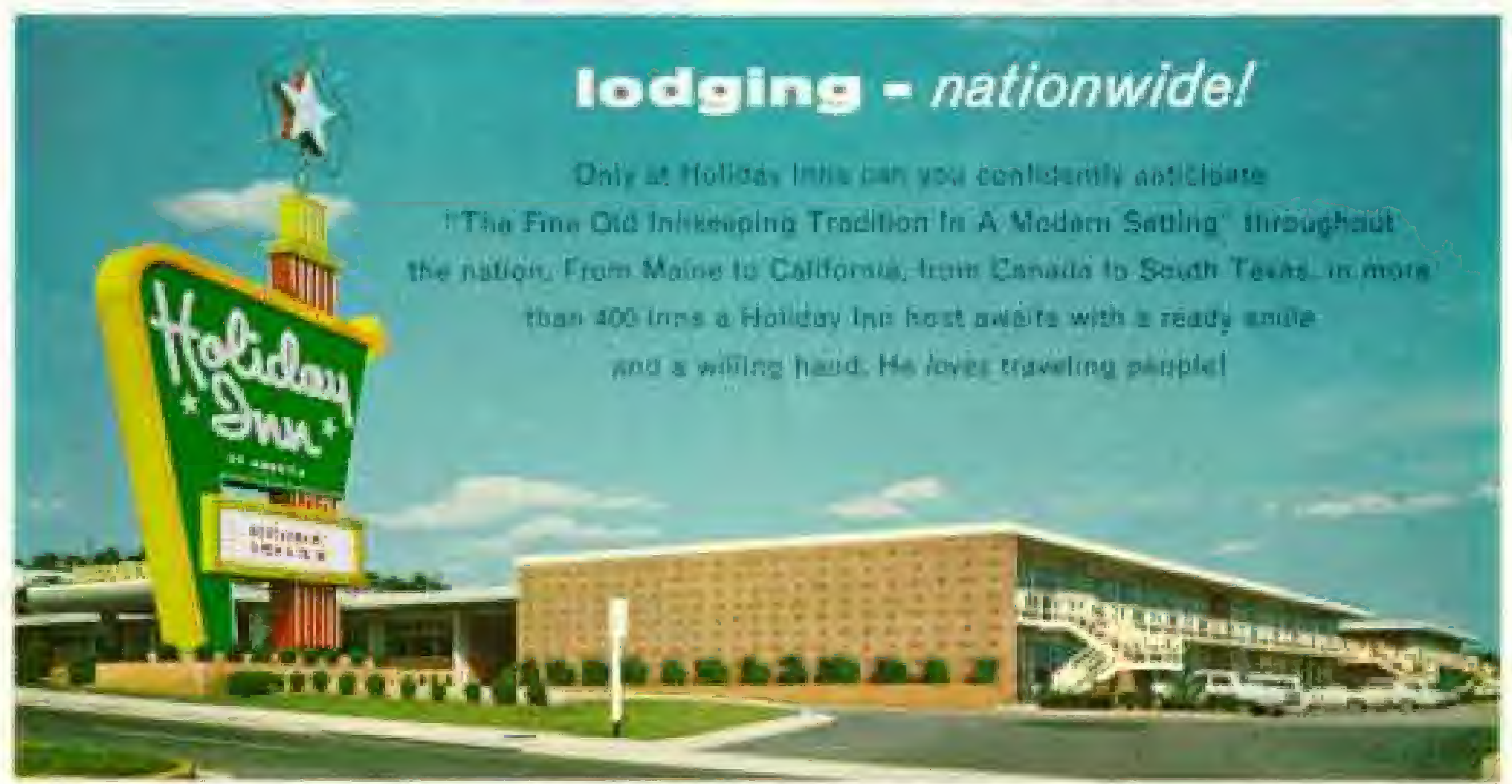

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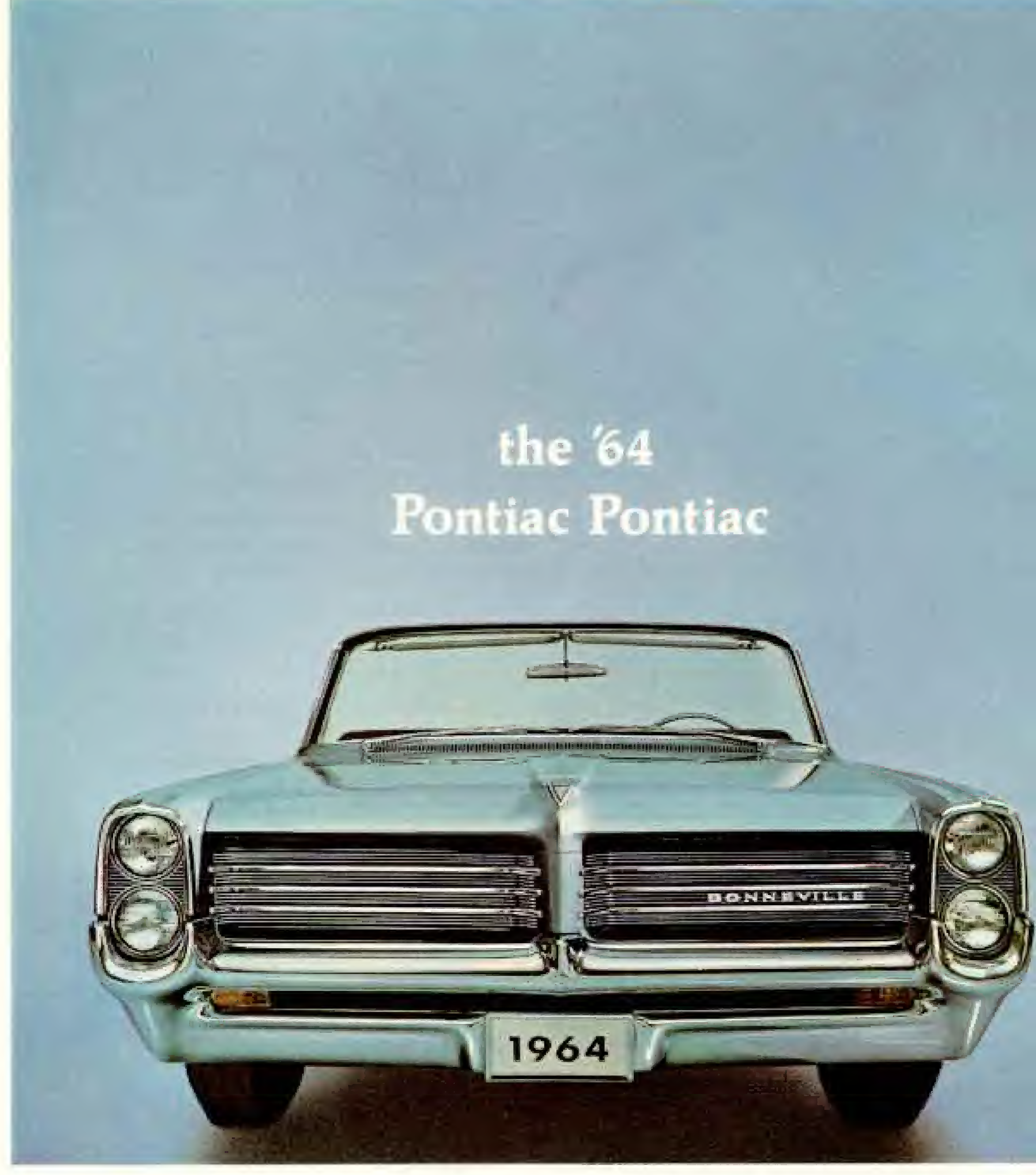

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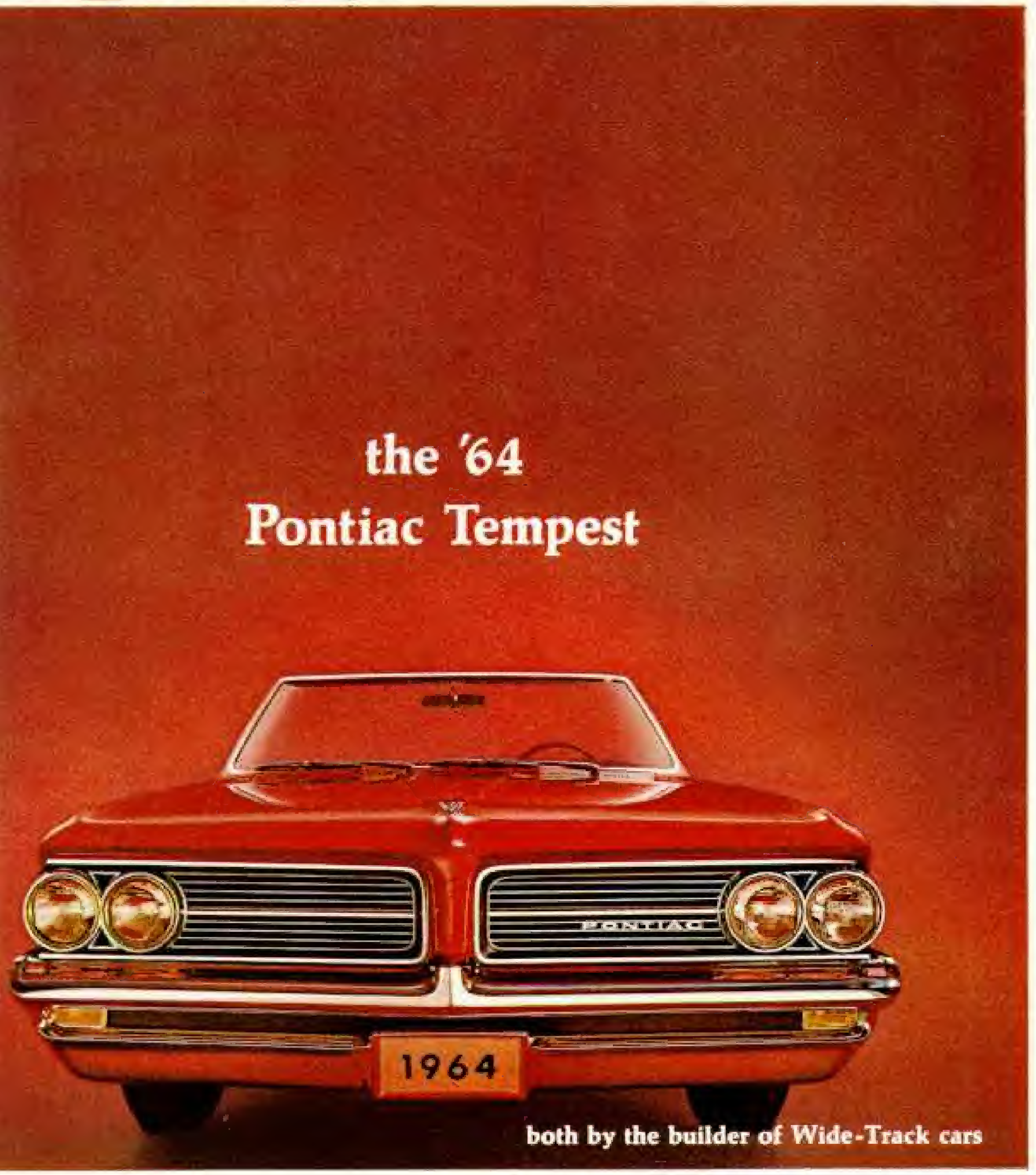

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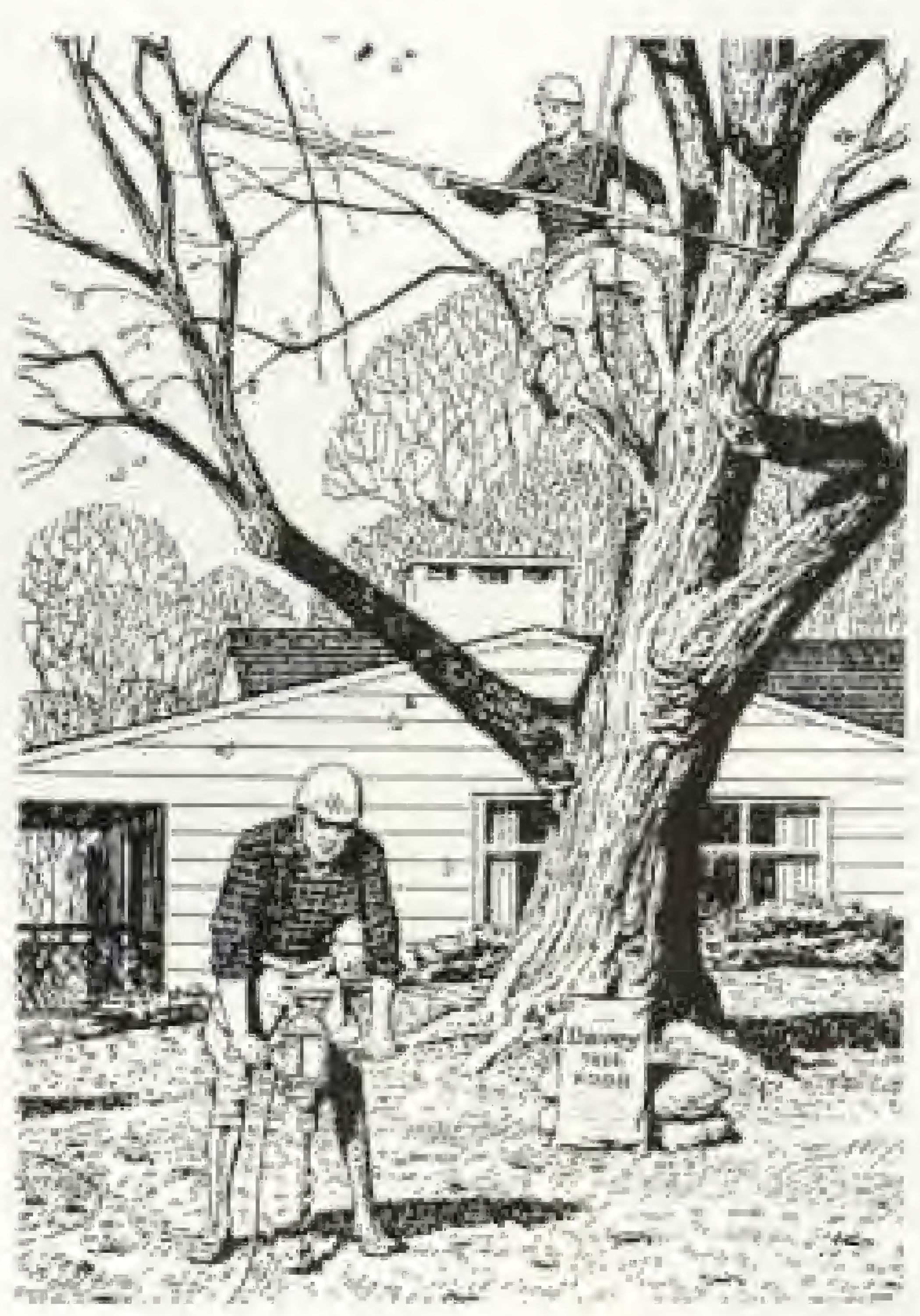

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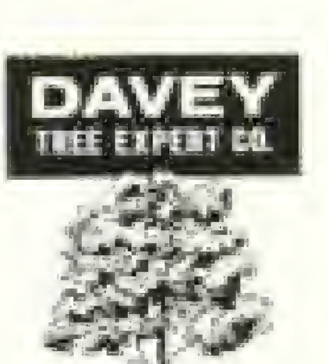

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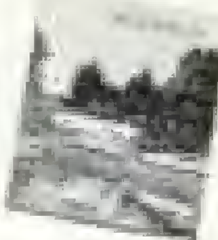

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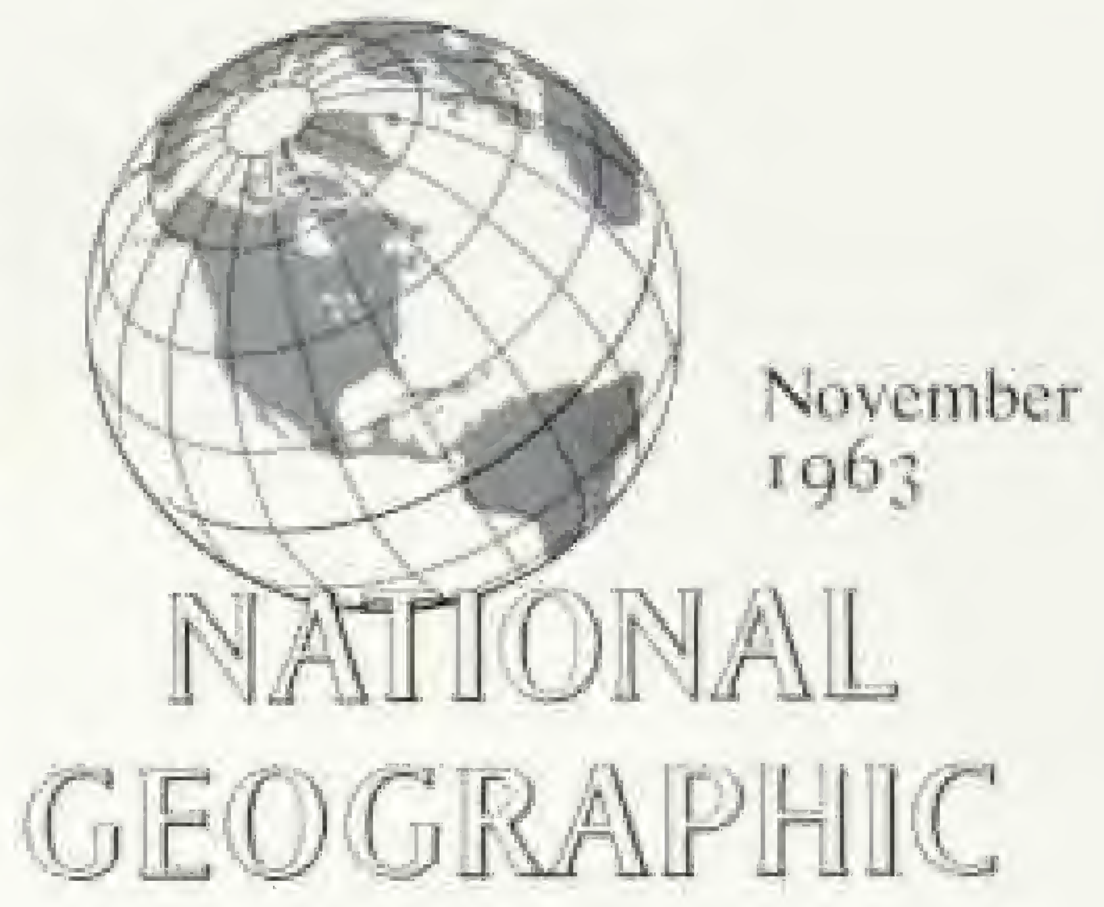

November
1963

NATIONAL
GEOGRAPHIC

The Parks in Your Backyard

By CONRAD L. WIRTH

Director, National Park Service
United States Department of the Interior

WOULD YOU LIKE to share a sack of marshmallows with wild alligators, swim with barracudas, hobnob with a gorilla? Would your children care to pet a tapir, or perhaps a guanaco?

Maybe you'd rather eat buffalo steaks on a cookout under the stars or watch Choctaw Indians play stickball. Possibly you like great symphony orchestras, Shakespearean theater, or masterpieces of painting; or maybe you go in for square dancing, lawn bowling, sailboat racing, or studying sea otters.

You can find every one of these things, plus swimming, fishing, riding, golf and baseball, skiing, picnicking, hunting, camping, nature trails—hundreds of others too, most of them free—all within easy distance of millions of Americans in this day of instant travel.

You will find them in one or another of the city, county, and state parks that dot our Nation with oases of respite from the turmoil of urban life.

Relief From Steel and Asphalt

Since I administer only the National Park System, I may appear to be stepping out of my bailiwick in writing about state and local parks. I do not see it that way.

I believe in public parks, no matter who runs them. I look upon each one as part of an all-American parks system. Each supports the other in offering every citizen his just share of those special benefits found in a public park.

Of our need for all our parks with all their varied uses, there can no longer be any doubt. Along the Atlantic and Pacific, even on the plains and prairies, cities are expanding and touching each other and merging into unbroken expanses of steel, concrete, and asphalt.

This is the age in which we live, of course, and it is a good age. Without sunshine, fresh air, and open space, however, man diminishes physically, mentally, and emotionally.

We need more parks. We need them now, before the cities and the highways and the private beach cottages take all the scenic lands or drive the price out of reach. We need more national parks—but above all, we need more local parks, close to the people.

So when I talk about local parks, I am not really leaving my own field—or my own philosophy, if you wish—but only my jurisdiction.

Instead of generalizing about local parks, maybe it would be best if we set out right now to visit some. There are thousands, ranging in size from New York's two-million-acre Adirondack Park (pages 678-9) to tiny green plots in the downtown sections of large cities. We cannot see them all, but those we do visit will be fun.

Take the one, for example, with the alligators that eat marshmallows. This is Highlands Hammock State Park near Sebring, Florida—3,800 acres of live-oak trees hung with Spanish moss and shy orchids, of cypress trees, of heron and egret, deer and scuttling armadillos (page 689).

A jeep with a trailer takes visitors into the heart of this true nature park. Naturally the sightseers want to see alligators. Well, there are plenty of 'gators, but it takes coaxing to bring them out of the deep swamp.

Natural bait—fish and meat—costs too much for a parks budget. One day a child

World's tallest trees spire skyward in California's Jedediah Smith Redwoods State Park. Fenced *Sequoia sempervirens* soars 340 feet

dropped a marshmallow into the water. The 'gators went for it like ladies for a bargain counter.

Now the naturalist who rides the jeep carries marshmallows and need only crinkle the sack to bring the 'gators out. Once I noticed one minus a front foot.

"Caught in a trap?" I asked.

"No," was the answer. "I think that when he was a little fellow, he got a marshmallow stuck in his teeth. He tried to claw it out with his foot. A larger 'gator grabbed the marshmallow and the foot too."

The Roebling family of New Jersey donated magnificent Highlands Hammock to the people of Florida. Two talented members of this family engineered the Brooklyn Bridge, and Roebling factories made the wire cables that hold it up.

Sightseeing Among the Barracudas

To go on with our trip and maybe swim with barracudas, folks do that in the only park in the United States that is entirely underwater except for its 2,200-acre headquarters area and boat docks. This jewel of Florida coastal waters is the John Pennekamp Coral Reef State Park, which is also known as Key Largo Coral Reef Preserve.*

Most people see its gorgeous coral formations and vivid tropical fishes from a glass-bottomed boat, but a surprising number go down in swimsuits and Aqua-Lungs (page 688). Barracudas are found there, from little ones to gaunt, sinister six-footers.

Experts say the 'cuda strikes only at something it believes to be a fish of moderate size, its natural prey. I keep thinking there might be a 'cuda with bad eyesight among all those hundreds of ghostly shapes, so I stick to the glass-bottomed boat.

Florida named the 21-mile-long reef for the veteran managing editor of the Miami *Herald*, who has long been active in conservation matters. Mr. Pennekamp, who with Senator Spessard L. Holland (then Governor) and the late Ernest Coe had helped acquire Everglades National Park for the people of the Nation, also sparked a citizens group in the movement to conserve the reef as a park.

Regarding that hobnobbing with gorillas, mine has been done with Yula, who lives with a baby chimpanzee and a youthful orangutan in the San Diego Zoo, an outstanding feature of the city's marvelous Balboa Park. Yula apparently enjoys sitting on my hip like the infant she is (above).

KODACHROME BY THOMAS NEBBIA © N.G.S.

Author and friend. Conrad L. Wirth, Director of the National Park Service and a Trustee of the National Geographic Society, holds Yula, a baby gorilla, at the Children's Zoo in San Diego's 1,400-acre Balboa Park. A second-generation parks man, he favors more recreation areas "close to the people." He knows local parks as intimately as those he administers.

Many city zoos these days have special sections for children. They are wonderful places; every zoo should have one.

In San Diego the child can pick up dogs, cats, rabbits, baby chickens. He can slide down a chute into a corral filled with baby hoofed animals, too young to harm him. This is where he may pet a tapir and a guanaco (page 653), also learn firsthand that a camel has chronic bad breath, and put his arms around the neck of an African sable antelope.

Young girl attendants teach the children not to squeeze the chicks or feed the tapir chewing gum, and of course they also watch for signs that the larger animals are getting big enough to kick or bite.

The main San Diego Zoo is one of the best in the world. Mostly the animals live behind hidden moats rather than bars. Visitors from every state ride the buses that wind through the zoo's steep, palm-lined roads.

*See "Florida's Coral City Beneath the Sea," by Jerry Greenberg, and "Key Largo Coral Reef," by Charles M. Brookfield, both in NATIONAL GEOGRAPHIC, January, 1962.

Wild ducks drop onto the waterfowl ponds by the thousands during migrations, thus paying Director Charles R. Schroeder the greatest compliment possible: They come to his zoo because they want to.

Balboa Park also has mirror lakes, an art museum, formal gardens, even a replica of London's Old Globe theater, where Elizabethans cheered Shakespeare's plays.

While we are still in California, we had best look at another of the great Western city parks, Golden Gate in San Francisco (pages 654-5). It was created in its entirety out of sand dunes and noisome marshland.

The city bought the desolate landscape in 1868. In 1887 Golden Gate's guiding genius, John McLaren, took over, and the wonderful park with its herds of buffalo and elk, its Steinhart Aquarium, its arboretum, its botanical gardens, and its matchless trees and grassy spaces stands today as his monument.

McLaren was one of the great parks men of all times, a member of the small but dedicated group who around the turn of the century understood what parks and open spaces meant to their fellow men and had the courage to fight for their convictions. I knew him well and learned much from him.

A city park on the other side of the country from California is regarded by parks people as the most sacred place of all, for in Boston Common, in the capital city of Massachusetts, the American concept of public parks was first put into practice.

Boston's "Village Green" Still Serves City

In Europe, originally all land was held in the name of the rulers, and about the only space that vaguely resembled a public park was the central square in a town. This was a utilitarian place, however, where people went to draw their water and sell their pigs.

The New England settlers brought the town square to the New World with them, although they put the title in the name of the people and called it a "village green." Set aside in 1634 as public property, Boston Common was simply a place where the cows grazed and the militia drilled.

There the matter stood until 1830, when the people informed their servants, the city officials, that they preferred a playground to a pasture. The officials perforce chased off the cows and planted shade trees and flowers for the people to enjoy (page 656).

Other cities initiated parks systems early. Philadelphia established its first parks in 1682, and its 4,000-acre Fairmount Park is the largest within the limits of any U. S. city. More than four and a half times the size of New York's Central Park, it would cover Manhattan from the Battery to 23d Street.

President George Washington in 1791 gave approval when Pierre Charles L'Enfant included parks in his master plan for Washington, D. C., so that today the National Capital is bejeweled with parks, forming graceful settings for public buildings and giving the city its air of spaciousness and beauty. Rock Creek Park, with its extension into Maryland, totals 3,400 acres (pages 664-5).

Coyotes Compete With Cowboy Singers

I mentioned a buffalo steak cookout under the stars. I was thinking of an enchanted evening I spent in Custer State Park, in South Dakota's Black Hills country, when the cowhands sang songs of the West around the campfire and the coyotes answered in the wild tenor voices of their kind.

The buffalo steaks sizzled. Behind me a great roar drowned coyotes and guitars.

"Is that a buffalo come to avenge his brother we are cooking?" I asked.

The young ranger at my side laughed. "No, Mr. Wirth, that's a wild burro. We have about 30 head of them. They stop cars on the roads and beg for something to eat, which in the case of a burro can be almost anything.

"But the tourists love them, and heaven help us if we ever tried to get rid of them."

Since the herd must not exceed the grazing capacity of Custer's grassy hills, the park runs a commercial buffalo ranch, turning a profit on meat and hides. If there is another buffalo-ranching public park in the world, I never heard of it. Chances are that the buffalo meat you find sometimes on menus in big restaurants came from Custer (pages 658-9).

Choctaw Indians play stickball at Chucalissa (its name means "abandoned village" in Choctaw) near Memphis, Tennessee. A wild and woolly game, related to lacrosse, it was played in the old days on the central square that most Indian villages possessed. The sport was a kind of formalized warfare, village against village, and all able-bodied men joined in. The racket was used as a weapon as much as for catching and throwing the ball, and broken bones and dislocated joints were not uncommon.

Chucalissa, inhabited for at least six centuries starting around A.D. 1000, has been lovingly restored, and the stickball games take place on the original square surrounded by mud huts with thatched roofs (pages 660-

Child Pets Guanaco in a California Zoo That Says "Touch the Animals"

San Diego has scaled its Children's Zoo to the size of a four-year-old. Youngsters may meet a West African chimpanzee and a South American tapir, or gaze into picture-window burrows of Southwestern ground squirrels. Guanaco's near relative, a llama, stands aloof; both of these New World camels dwell in the Andes.

61). But Charles H. Nash, Chucalissa museum director, has had to set up restraining rules.

"Sometimes the players are Boy Scouts," he explained. "I'm sure they'd be proud to tell their friends a real Indian cracked their skull, but parents wouldn't understand. So we forbid using the sticks as clubs, and we bench players who become angry."

Parks Owe Debt to Depression Years

The Civilian Conservation Corps of the depression years found the site of Chucalissa. Parks on all levels, especially state and national parks, owe a great deal to the CCC.

Everywhere you see the solid buildings constructed by the jobless young men of those difficult years, sometimes as the only buildings in an entire park. Lovely park forests stand now where they planted saplings. In my opinion the CCC was the best and most enduring investment in human and natural-resource conservation this country ever made, and I wish every young man today could similarly work with his own hands to preserve our natural heritage. He would be a better citizen for the experience.

One of my Park Service jobs in those days was finding worthwhile projects for the CCC. I well remember the enthusiasm of archeologists when they learned what the corps uncovered at Chucalissa.

Swiftly the University of Tennessee took over scientific direction of the dig. Today Memphis State University operates Chuc-

KODACHROME BY THOMAS NEBBIA

BOY'S WORLD *is a wind-tossed balloon as spring sun quickens San Francisco park land. "Do walk on the grass!" Golden Gate Park tells children.*

SAN FRANCISCO *looks like the great globe itself to a "fish-eye" lens borne by a helicopter 8,500 feet aloft. Oblong Golden Gate Park spreads a green thousand-acre carpet to the sun-bathed Pacific shore; Park Stadium stamps a huge oval on its lawn. Golden Gate Bridge to Marin County vaults from the Presidio district at upper left. Bay Bridge, at upper right, spans San Francisco Bay to Oakland. Alcatraz Island, the former Federal prison, looms like a white steamship in mid-bay.*

KODACHROME BY JOE MUNROE, LENSGROUP © N.G.S.

LITHOGRAPH BY [illegible], NEW YORK PUBLIC LIBRARY, PHELPS STOKES COLLECTION

alissa Park; Mr. Nash is one of the professors.

Preservation of historic sites and objects is an important responsibility of all park authorities. Understanding the past is valuable and inspiring. Patrick Henry put it this way:

"I have but one lamp by which my feet are guided, and that is the lamp of experience. I know of no way of judging of the future but by the past."

A few states established parks of their own before the turn of the century, but the big year for the state parks movement was 1921. Called together by Stephen T. Mather, then Director of National Parks, some 200 conservationists met in Des Moines, Iowa, and promulgated the idea of state participation in the all-American system of parks. "There shall be public parks, forests and preserves within easy access of all the citizens of every state and territory of the United States," the group recommended.

County parks came later. Many were established near big cities whose residential suburbs had sprawled over city boundaries. In such cases the city and county parks really form a single large metropolitan park system.

State parks in general preserve areas of interest mainly to the citizens of the state and are handier to the local people than a national park might be. Some offer less scenery and more varied recreation—things like group camps, baseball, and such organized sports—than a national park provides. This is the way it should be, but many offer, as sort of a bonus, scenery that meets national park specifications so well that it makes us envious.*

The city park moves still farther away from nature, furnishing a rich variety of worthwhile artificial recreational forms—zoos, swimming pools, playgrounds, museums, music, formal flower gardens, even Ferris wheels and carrousels.

*See "Heritage of Beauty and History," by Conrad L. Wirth, NATIONAL GEOGRAPHIC, May, 1958.

The tiniest plot of land can make a useful city park. Seattle, Washington, for instance, has Pioneer Square: hardly more than a few benches clustered under an old-fashioned glass-and-iron roof. Yet it rarely is without its group of Indian and Eskimo fishermen and cannery workers, who use it as an outdoor clubhouse. Appropriately, a totem pole rises from the square's center.

The various categories of public parks have a great deal in common, and parks people have two major professional associations through which they keep in touch with each other and swap ideas. One is the National Conference of State Parks, the other the American Institute of Park Executives; the latter began in 1898 as the New England Association of Park Superintendents. Many national park officials belong to both groups.

One of the finest nature parks I know is Point Lobos Reserve State Park, a glorious

Boston Common: the Nation's first park. Top-hatted humanity eddies around Cochituate Fountain at the dedication of a city water system in 1848. For two centuries the Common served as a cattle pasture. An 1830 ordinance banned the animals.

Towels spread on green beach, sunbathers laze in Oglebay Park, Wheeling, West Virginia. Crispin Center, which houses a recreation room, bath house, and golf clubroom, rises beyond the pool.

bit of California's rocky Pacific coast near Monterey and Carmel. Established primarily to preserve one of two original stands of the strangely beautiful Monterey cypresses, it has become of late a haven for sea otters.

First Russian fur hunters, then others of many nationalities, almost exterminated the sea otter of northern Pacific waters. Inch-deep otter fur commanded fabulous prices in Moscow, China, and Europe.

The United States Government forbade the taking of otters in 1911, but their numbers nevertheless still declined, until naturalists, in the 1920's, declared them doomed.

Then in 1938, people with field glasses spotted a few playing in the ocean off Monterey Peninsula. The graceful animals have been making a gradual recovery ever since.

Today an estimated 700 sea otters frequent the coastal waters, ranging from Carmel Bay south to Point Conception, near Santa Barbara. You can see them asleep in the kelp beds beneath the cliffs, lulled by the long Pacific swell. Sometimes, when they eat fish or clams, they lie flat on their backs and use their chests as tables (page 700).

Butterflies Cloak Entire Trees

Besides sea otters and sea lions, the Lobos forest has myriad nesting sea birds, deer, foxes, raccoons, bobcats, an occasional mountain lion, and the greatest glory of all: countless millions of monarch butterflies, resting in migration time until whole trees look like tongues of flame.*

California's famous Save-the-Redwoods League helped launch the state's outstanding parks system in 1927, although it thought initially only to protect the unique coastal redwood trees of northern California from annihilation by lumbermen.

The redwood parks the league saved from the ax and turned over to the state are unmatched anywhere. The dedicated group raised millions of dollars to buy groves, then gave them to the people.

*See "Mystery of the Monarch Butterfly," by Paul A. Zahl, NATIONAL GEOGRAPHIC, April, 1963.

Shaggy remnants of herds that numbered millions; bison lope across the foothills in 72,000-acre Custer State Park, South Dakota. Starring in Hollywood Westerns and supplying truly rare steak, the herd of about a thousand helps pay the costs of operating the park. Buffalo share their Black Hills sanctuary with deer, elk, antelope, bighorn sheep, and wild burros.

Now the primeval forest still survives along Prairie Creek, with a thriving herd of Roosevelt elk, as a crowning touch, living peacefully in the open meadows beside the main highway. There are redwood parks along the Del Norte coast, and on Smith River and Mill Creek near Crescent City.

Best of all is the Bull Creek watershed, a part of Humboldt Redwoods State Park. Humboldt's magnificent Avenue of the Giants contains the tallest trees on earth, *Sequoia sempervirens*, scores of which tower more than 360 feet high (pages 648-50).

Once in Humboldt Park's Rockefeller Forest, night overtook us—a warm summer night musical with the sound of Bull Creek running in its rocky bed. Frederick Law Olmsted, one of the great naturalists and landscape architects of his time, was with us.

"Walk away from the campfire," he suggested. "Then lie on your back on the forest floor and look up at the sky."

Through the openings in the roof of redwood foliage the stars blazed. So bright were they, and so lofty the trees, that I could have sworn they touched. Never in my life have I felt heaven and earth so near each other.

Canyon Shelters Rare Palm Groves

In Anza-Borrego Desert State Park, between San Diego and the Imperial Valley, a man also feels close to his Creator. Here are the trackless sands, the pitiless sun, and the gaunt cacti that march almost to the Mexican border. Here too are the 6,000-foot-high San Ysidro Mountains, home of bands of desert bighorn sheep, and Borrego Palm Canyon with its everlasting stream and its groves of Washingtonia palms, the only palm tree native to California.

When Juan Bautista de Anza's expedition left Sonora in 1775 bound for the founding of San Francisco and the building of its Presidio, the Spaniards rode through what is now the park. And Kit Carson led General Kearny's troops through in 1846.

A man on a horse or in a jeep sees Anza-Borrego best, for some of the roads are too rough for passenger cars. He must take water along and be careful of the sun in the summer (pages 702-3).

The only hotter place I ever ran into was Nevada's rugged Valley of Fire State Park. We went there in a car, before the days of air-conditioning, and put a box of dry ice on the back seat, thinking it might cool us.

It helped some. Our thermometer showed only 105° F. in the car, against 115 outside.

It is always cool, on the other hand, in Longhorn Cavern near Burnet, Texas. The state developed a 708-acre park, one of a string of good local parks in the rough scrub-oak woods that mark this part of Texas.

I know Longhorn from CCC days. For four years the youths scraped silt and dirt from the cavern floor until they had made a two-mile underground trail. Today 35,000 people walk along it every year without bumping their heads too many times (pages 662-3).

According to a fairly well documented story, a band of Comanche Indians raided San Antonio, captured a girl, and held her prisoner in the cave. Three Texas Rangers rescued her after a battle, and one of them later married her.

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Painted Choctaws and Collegians Clash in a Stickball Game in Tennessee

Chucalissa, an Indian village abandoned for 300 years and rediscovered in the 1930's, has been reconstructed as a museum of primitive America. Choctaw guides lend reality, though their ancestors may never have lived there. This contest finds Indians driving toward goal posts against the defense of a team from Memphis State University, which maintains the village. In stickball, a game akin to lacrosse, players with two hickory rackets pass a rawhide ball back and forth in a fast-moving scramble to score. Student on the page opposite daubs a Choctaw, whose forebears wore paint for the game.

During the Civil War, the South used the cave as a gunpowder factory; its deposits of bat guano provided a handy source of saltpeter. Excavations have yielded a rusted Colt revolver made in 1852 and a skeleton in the remains of a Confederate uniform.

I wish I had room to describe more of the state parks with unusual features. There is, for example, Dry Falls in Washington State, with a great, sheer cliff over which the entire Columbia River tumbled when an Ice Age glacier changed its course (pages 698-9).

There is Petit Jean in Arkansas, a cool, wooded plateau overlooking part of Winthrop Rockefeller's Santa Gertrudis cattle ranch, Winrock, beside the Arkansas River; and Minnesota's lovely Itasca, enshrining the birthspring of the Mississippi River. When I was 12 years old, my father took me to Itasca on my first family camping trip.

For every park of unusual grandeur, there are fifty quiet green places where people go to picnic and camp and sit in the sun. One such place is Hungry Mother State Park, in Virginia between Roanoke and Bristol.

City Family Finds Handy Retreat

I know a devoted visitor to Hungry Mother. She is a Washington secretary, a mother working to help support her family. She has neither time nor money for luxury vacations.

"So," she says, "we tried the Virginia state parks, several of them, until we found Hungry Mother, and that was for us.

"We load the old car with children and canned goods and nice old clothes. We drive down to the cabin we've reserved. We rent a boat, and my husband fishes in the lake [pages 686-7].

"Our three kids swim, hike, and play on the beach. In the evening, the whippoorwills on the hills sing us to sleep. Sometimes my husband and I go to a little lodge where there is music, and we square dance in bare feet.

"The best thing is the knowledge that here we are, city people who don't know much about forests and animals, living here, alone but together, doing all our own chores—and all the time I know that if something goes wrong, like a skunk under the back porch, I only have to scream and a ranger will come running and chase the skunk away."

What more can you ask of a park?

Forests Replace Farmed-out Fields

Another of the quiet parks, North Carolina's beloved William B. Umstead near Raleigh, stands with San Francisco's Golden Gate as an example of what persevering people can create out of practically nothing. Once it was eroded, submarginal farmland, with the sight and smell of human failure hanging heavy over treeless, gullied hills and cotton fields gone back to weeds and briars.

The CCC came in. The young men dammed Sycamore Creek to make a lake and put the trees back. Roads and nature trails were constructed. A bigger lake was built. Now the trees are forest, and under the trees are campgrounds and picnic tables (page 679).

Four city parks have had considerable influence upon my life. The first is New York's Central Park, which, more than any other place in the country, demonstrates the lengths to which Americans will go to give themselves sunshine and green grass.

Here, in the heart of the huge, congested city, lies an 840-acre park that would bring the people of New York, were they to sell it, hundreds of millions of dollars. Would they sell so much as a foot of it? Emphatically no. They have been resisting encroachments upon the park's beauty and cultural values since it was created out of a patchwork of farms in the 1860's.*

Boyhood Spent in and Around Parks

When my father, Theodore Wirth, a Swiss landscape gardener, came to this country, he took a job trimming the trees in Central Park. Right after a city election the politicians laid off their tree trimmers, common practice in the 1880's. My father went out to Long Island and worked for a horticulturist whose daughter he later married.

I was born in the second city park that influenced my life. In the park superintendent's house, that is, for my father was by then superintendent of Elizabeth Park in Hartford, Connecticut. Here he designed and built the first municipal rose garden in the United States. No one has ever changed his design so far as I can find out, and experts call it one of the finest in the country (page 667).

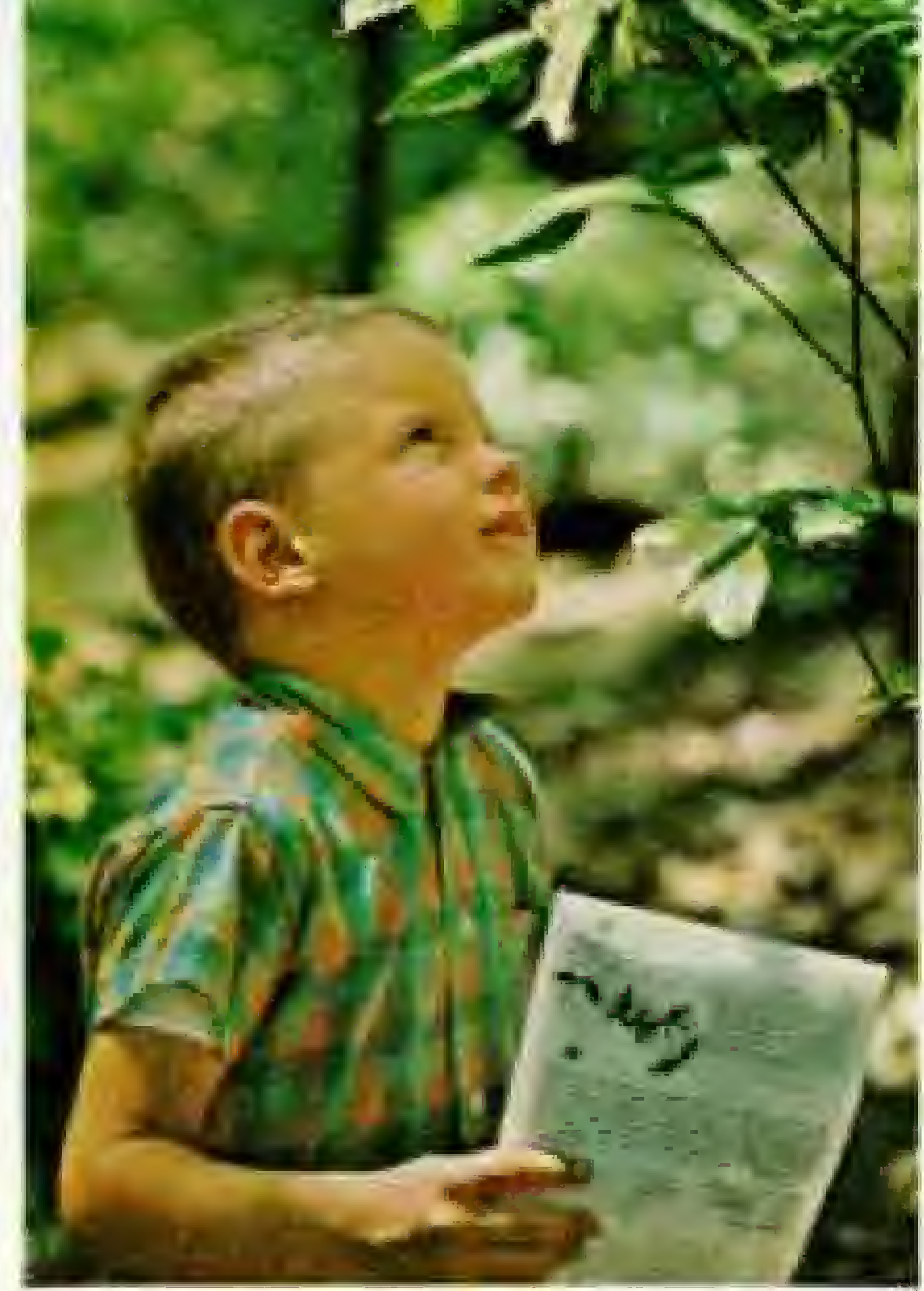
The mounted head of a ram glared from a wall of the superintendent's house, I remember. Once it had belonged to the leader of the park's lawn-mowing flock; in those days, before power mowers, city parks invariably used sheep to cut grass. The shepherd kept telling my father the ram was getting old and cantankerous, but Dad wouldn't listen.

One day my father dropped something in the grass, and when he bent over to pick it up, the ram sent him flying into the shrubbery. So then he left the ram's fate to the shepherd.

*See "Central Park: Manhattan's Big Outdoors," by Stuart E. Jones, NATIONAL GEOGRAPHIC, Dec., 1960.

Squeezed flat, speleologist Tom Phillips inches along an unexplored crawlway of Longhorn Cavern State Park in Texas.

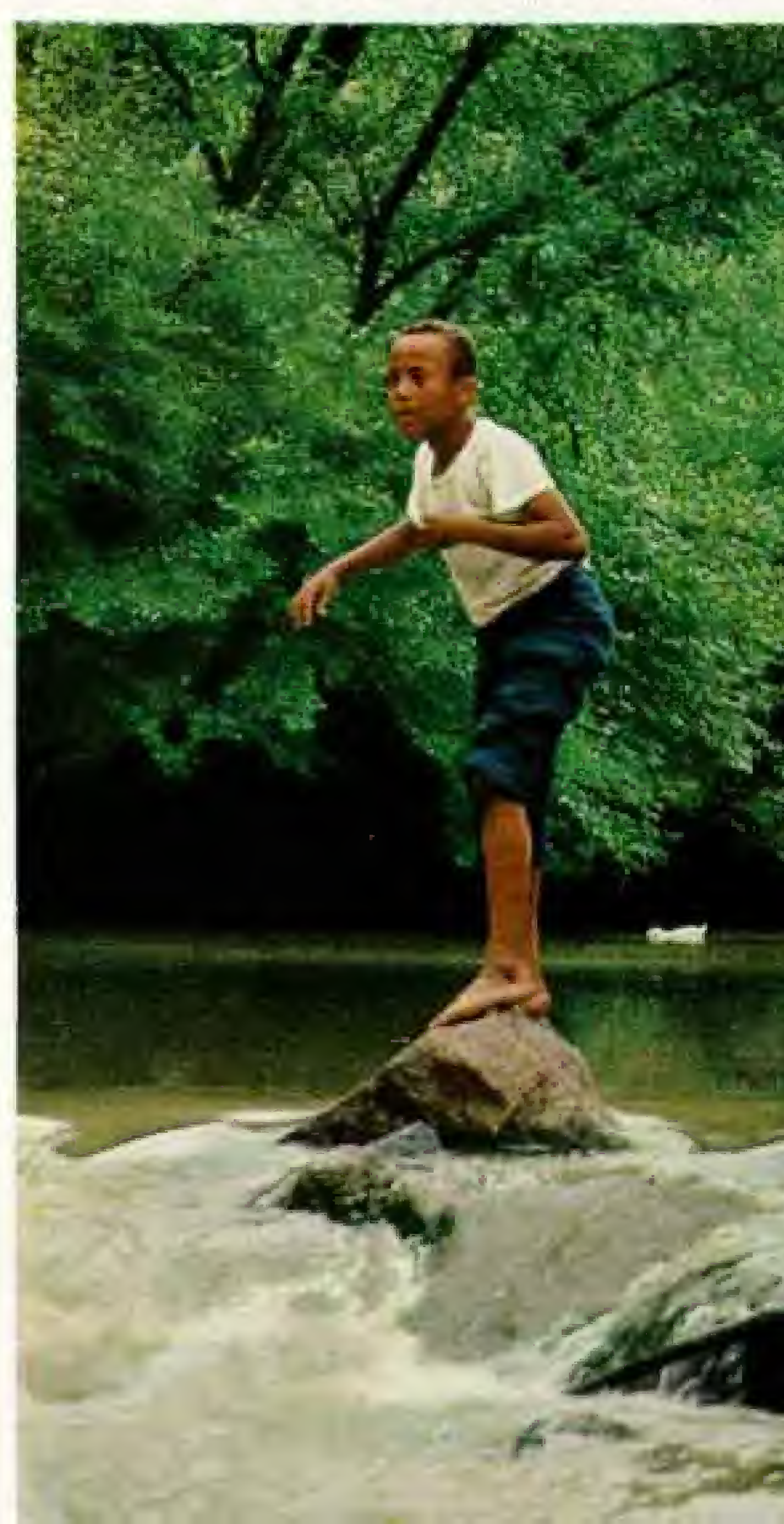
More accessible, the cave's Hall of Marble (opposite) vaults above visitors. Beyond eight miles of explored passages, the cavern winds into the dark unknown. Comanche Indian war parties and Wild West bad men took shelter in the cave. Archeologists have unearthed early man's crude tools and the ashes of his fires.



Young naturalist in the Nation's Capital learns leaves at Rock Creek Nature Center.

Glass entranceway allows honey bees to crawl outdoors from a transparent hive at Rock Creek Nature Center in Washington, D.C. Designed primarily for children, the center offers wildlife displays, motion pictures, and a planetarium.

Children teeter on steppingstones in Rock



who shortly afterward sent him the mounted head of his late adversary.

In the third park I spent much of my youth, for Dad went to Minneapolis, Minnesota, as parks superintendent, and he built much of that city's outstanding system. He badgered city officials and the taxpaying citizens until he was allowed to create a string of swimming, fishing, and boating lakes out of a chain of marshes (pages 690-91).

There was always a little trouble keeping the water level where it should be during dry years. Recently the city put in a pump with which it can keep the uppermost lake full and feed water through the chain as needed.

Loring Park, the big downtown central park, my father found forlorn and neglected. He put a fence around it, he ploughed every bit of it, he planted grass. When the grass was strong, he pulled the fence down and passed the word: "Do walk on the grass."

After the people had trampled trails, showing where it was they liked most to go, Dad paved the trails. "Let the people make their own paths," he said. "A park that is not for people is not a park."

Nation's Capital a City of Parks

The fourth city park that looms large in my life actually is in my jurisdiction. It is the District of Columbia system planned by L'Enfant. The National Park Service of the Department of the Interior runs it only because Washington is a Federal city.

Visitors oceans apart cross paths in Lafayette Park, a green rectangle of spreading trees and beckoning benches across Pennsylvania Avenue from the White House. These students come from Thailand.

Creek Park, an 1,800-acre haven of ravines, trails, and picnic grounds in the Nation's Capital

University of Virginia Folk Singers Blend Voices With the Roar of the Potomac

Great Falls Park, Virginia, lies 10 miles from the Nation's Capital. Here George Washington engineered a canal to skirt the cataract's 77-foot plunge. Its ruins still groove the riverside.

Almost every American has heard of Rock Creek Park, and of Lafayette Square across Pennsylvania Avenue from the White House (pages 664-5). I doubt, however, that most people realize there are 776 pieces of park property in Washington, some of them the merest patches of greenery with room for a few benches, a few flowers, a statue, and numerous gray squirrels. We have a mule-drawn barge that takes visitors up the Chesapeake and Ohio Canal, one of our historic areas that doubles as a place for outdoor recreation.*

Probably every school child in the Capital area has visited our Nature Center in Rock Creek Park, or been to the top of our Washington Monument, or seen Japanese cherry blossoms against the background of our Lincoln and Jefferson Memorials; thousands have walked along the Theodore Roosevelt Island nature trail in mid-Potomac.

Thanks to the best kind of intergovernmental cooperation, the National Capital Parks System sprawls far beyond District of Columbia boundaries, into those nearby Maryland and Virginia communities that are in reality the Capital's residential suburbs.

Thus Montgomery County, Maryland, cooperated to the full in extending Rock Creek Park upstream, and Virginia is as proud of George Washington Memorial Parkway, running south to Mount Vernon, as we are.

Good city-county cooperation exists elsewhere. Cook County, Illinois, acquired its big Forest Preserve almost solely for the people of Chicago, to give them woodland wilds they could not have in their modern city. The parks system ringing Cleveland, Ohio, does not hesitate to spill over the city-county frontier when this makes for a better park.

Dade County, Florida, runs a park system in the Miami area that benefits local people, tourists, everybody. It has some of the best beaches and marinas in the state, and also a rifle range in the nearby Keys.

KODACHROME BY WINFIELD PARKS © N.G.S.

Sisters admire a hybrid tea rose in Elizabeth Park Rose Gardens, Hartford, Connecticut. The author's father started this plot, first municipal rose garden in the Nation, in the late 1890's.

Today's Park Concept: a Place to Play

A moment ago I reported that my father pulled down the "Keep off the Grass" signs. He also put community recreation buildings in his parks. This represented a major change in American park philosophy, a change that is now accepted as imperative for modern local park and recreation systems.

The old-timers in the parks business were mostly landscape gardeners and horticulturists. They liked their parks beautiful, formal, and neat. You could row on a lake in Baltimore's Druid Hill Park, or admire the flowers in Chicago's Grant Park—but you'd better not play catch with your son on the grass or the police in those days would chase you off.

But plenty of today's parks have the necessary buildings and roads and athletic fields, and many a community has added to the title Department of Parks the words "... and Recreation." And why not?

After all, a park is but a piece of public land dedicated to recreation, and there are many healthy kinds of recreation. In this big country of ours we can have all sorts of parks.

Good parks can furnish an infinite variety of good things to do—gymnasium and athletic fields for the young; the checkerboard painted on the table and the bowling green for the old; the square-dancing classes, the ceramics and hobby shops for everybody.

In Houston, Texas, the park police prowl car pulled up late one night beside a floodlit basketball court. Although park rules said the court should have been closed an hour

*See "Waterway to Washington," by Jay Johnston, NATIONAL GEOGRAPHIC, March, 1960.

earlier, some youths still played, and the park recreation director said he would stay and keep lights on as long as the boys wanted.

"Bless you," said one of the policemen. "There's a dozen less kids for us to worry about tonight."

And in Florida's strange little Redland Fruit and Spice Park near Homestead, created originally to show the exotic commercial fruits the state can grow, I watched as some adults painted happily under a teacher's direction.

I looked over the shoulder of one gentleman who must have seen 80 summers. He was painting, without any guide or model, the portrait of a lovely young girl.

Well, if a park activity can restore an old man's memory, it has to be a good thing.

Parklands Not Easy to Gain and Hold

But the parks business has its problems.

Americans hold firmly to the principle of public parks. We realize we need parks, we want them, and we know we do not yet have enough of them to take care of present and future needs.

Parks management, meanwhile, becomes more and more efficient, and parks people are fast uniting into a professional fraternity that speaks with a single voice.

But no sooner does the parks man get down to the brass tacks of land acquisition and park management and park protection than he runs into obstacles, mostly bearing the label "in the name of progress."

He doesn't have as much trouble with commercial interests as he used to. The mining company that sought to invade the Porcupine Mountains wild area on Michigan's Upper Peninsula (left), for instance, has quit trying, at least for now. Enlightened timber companies in the West have sold many valuable holdings to park interests at fair prices.

The people's own public agencies, usually with the best of motives, give the parks their biggest headaches these days. The military, for example, has legitimate need for large

Like Alice's magic looking glass, a window in Michigan opens on a wonderland. Hungry deer in Porcupine Mountains State Park venture close for food placed on the snow by the children. This 58,000-acre wilderness spreads south from Lake Superior into Michigan's Upper Peninsula. Virgin hardwood forests harbor bears, snowshoe hares, and ruffed grouse.

EKTACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ALBERT MOLDVAY © N.G.S.

BREAKER-LASHED *sea stacks, islets carved from the mainland, thrust from the Pacific off Oregon's Ecola State Park. Evergreens march down to the ocean. The state holds all but 23 miles of its shore forever in trust for lovers of nature.*

EKTACHROME BY BOB AND IRA SPRING © N.G.S.

Young Texans romp on an exercise bar at Garden Villas, one of 40 year-round recreation centers for residents of Houston.

tracts of land and competes with parks systems for what is available.

Logically enough, the highway builders often decide parks offer the best routes for new roads. At this very minute, they seek to run a throughway across Prairie Creek Redwoods State Park in California. The Nation's Capital is battling this situation throughout the city, the most important test being over a proposed freeway through Glover Archbold Park, a beautiful place we promised never to let become other than a park the day we accepted it as a gracious gift.

Since good highways are eminently desirable, the parks man has trouble fighting off the throughway builder. Sometimes the roads man gives us the impression he sees a park simply as free land.

We insist, however, that the social and cultural values in a good park outweigh a road curve or detour. After all, more than 100 billion miles a year is rolled up by Americans on vacation or seeking a weekend's recreation. Why, then, destroy the very thing that people seek when they take to the road?

No doubt the highway engineer thinks us unreasonable sometimes, and maybe we are, but I do find increasing signs of better cooperation. The case of Oregon shows what can be done.

A few years back, Sam Boardman was state highway engineer. But under the Oregon system, in which parks management is vested in the highway commission, he was also chief of state parks.

Building a coastal highway, he bought for the state not only the road right-of-way, but all the land between road and sea plus strips on the other side that would screen ugly lumbering in the Douglas firs.

Now, driving this beautiful highway, you can turn off every few miles into a state park, and fish and camp and picnic and have a wonderful outdoors experience (pages 670-71).*

Taking up where Sam Boardman left off, the Parks and Recreation Division of the Oregon Highway Department last year published what I consider a model plan for the future of its parks.

Exhaustive research laid the foundation for its recommendations—in population growth, the rate at which American leisure time is increasing, trends in recreational preferences, the rise in land values, and all the other factors involved in sound planning.

Oregon in only a dozen years, the report concluded, will need at least 15 new parks.

*See "Oregon's Sidewalk on the Sea," by Paul A. Zahl, NATIONAL GEOGRAPHIC, November, 1961.

Further, park officials say, 22 of the existing 187 park units should be augmented by some 4,000 acres of adjacent lands.

You can change the figures in such recommendations, and they become valid for almost any state, county, and city park system in the Nation—and also for the national parks.

We need more parks, as I said in the beginning. In many cases, it is possible to be quite specific: Some areas seem to have been created to become public recreational grounds.

Lake Tahoe is such a place. Surely its glorious wooded shores should belong to all the people, or at least enough of these scenic shores to accommodate all who wish to visit the lake. As this is being written, California has set aside money to buy shore land, and Nevada hopes to do so. California also is acquiring land on either side of the Golden Gate.

In Louisiana, private citizens hope to persuade state officials to buy 9,000 acres at Port Hudson, 15 miles north of Baton Rouge, that are not only perfect for recreation but have archeological and historical interest as well.

About 800 acres on the Virginia side of the Potomac River at Great Falls, now under 50-year lease by the Department of Interior, should definitely be retained as parkland. Here is one of the world's finest stretches of white water, rich in scenery and history (page 666). Here Indians came to fish, hunt, and live amid beauty. Here, too, the Potowmack Company, headed by George Washington, began in 1785 to dig the first canal past the rapids; ruins of locks and buildings still remain.

The Chesapeake and Ohio Canal, on the Maryland side of the river, is in public ownership already, and I am sure Congress will authorize purchase of the Virginia side very soon. After that, we will sit down and work out a plan for using the park to benefit the citizens of metropolitan Washington and the Nation as a whole.

Precious Heritage: a Spacious Outdoors

In addition to being a bit behind on acquiring new parks, we are slow in improving those we already have—in enlarging them, in furnishing them with better equipment, in managing them better.

If we truly believe in the public parks philosophy, if we feel that parks have enriched our lives—and I am sure we do—then we must pass along to our children a full all-American park system of national, state, and local parks, their blessed heritage of open spaces. It is an obligation so long as we believe in our way of life. * * *

Portfolio displays the rich diversity of our local parks

STATE, county, and city parks in the United States number more than 26,000 and cover an area bigger than Vermont. They know every climate from subtropic to near-Arctic. They reach literally from "sea to shining sea" and beyond—from granite-sheathed New England coasts to the gentle sands of Hawaii.

Popularity of such parks shows in attendance figures: more than a quarter-billion a year for the 2,171 state park areas alone.

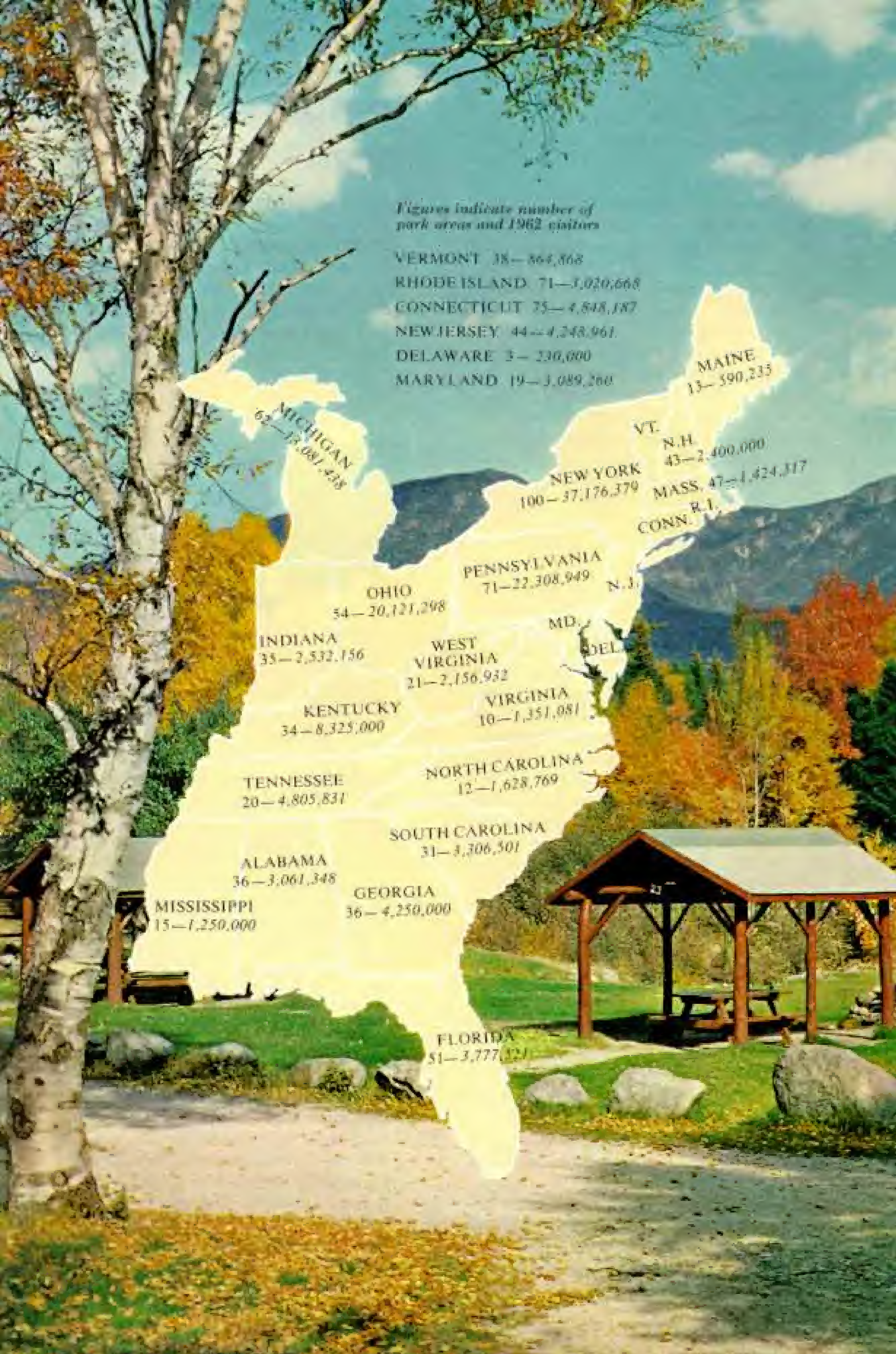
As places to enjoy, these local parks offer virtually every outdoor recreation, and many indoor activities as well. But as places to photograph, they offer an embarrassment of riches—and more are being added constantly. For example, counties and cities in a recent five-year period acquired 3,899 new sites totaling 134,166 acres.

To narrow the field, author Conrad L. Wirth suggested parks representative of each type and region. Then NATIONAL GEOGRAPHIC assigned scores of photographers to picture them at their best. Parks officials aided without stint.

Then came the difficult day when fifty-eight pictures had to be chosen from these thousands of photographs. You see the resulting selections in the preceding pages and in a special 34-page portfolio that follows.

Are those pictured the best of the home-town, home-state parks?

Says Mr. Wirth diplomatically: "The best one is always the one you're in."



Figures indicate number of park areas and 1962 visitors
VERMONT 38—864,868
RHODE ISLAND 71—3,020,668
CONNECTICUT 75—4,848,187
NEW JERSEY 44—4,248,961
DELAWARE 3—230,000
MARYLAND 19—3,089,260
MAINE 13—390,235
VT.
N.H. 43—2,400,000
MASS. 47—1,424,317
NEW YORK 100—37,176,379
CONN. R.I.
MICHIGAN 62—15,081,438
PENNSYLVANIA 71—22,308,949
N.J.
OHIO 54—20,121,298
MD.
DEL.
INDIANA 35—2,532,156
WEST VIRGINIA 21—2,156,932
VIRGINIA 10—1,351,081
KENTUCKY 34—8,325,000
NORTH CAROLINA 12—1,628,769
TENNESSEE 20—4,805,831
SOUTH CAROLINA 31—3,306,501
ALABAMA 36—3,061,348
GEORGIA 36—4,250,000
MISSISSIPPI 15—1,250,000
FLORIDA 51—3,777,521

The East

Hundreds of parks from New England's woods and mountains to Florida's coral reefs help satisfy the outdoor urge of megalopolitans starved for elbow room

FIRST SPOT *in the United States set alight by morning sun, Mount Katahdin forms a mile-high backdrop for Maine's 200,000-acre Baxter State Park. Autumn tints the birches at Katahdin Stream Campground.*

On a hot Sunday in July, 240,000 New Yorkers jam Long Island's Jones Beach

When Irish-born Maj. Thomas Jones arrived on Long Island in 1695, he could not have guessed that centuries later his name would be on the lips of almost every New Yorker. He established a whaling station on the offshore beach that now bears his name and left these prophetic lines for his tombstone: "Long May His Sons This

Peaceful Spot Enjoy And No Ill Fate His Offspring Here Annoy."

Jones Beach might still be five and a half miles of unused and empty sand but for a young park official, Robert Moses, who in 1925 proposed that the state create a recreation area out of a lonely reef off Long Island. Opponents ridiculed the project as "Moses' madness," but Gov. Franklin D. Roosevelt dedicated Jones Beach State Park in 1929. Now the park annually welcomes some 12 million visitors—one of them, the sun bather below. Each year lifeguards snatch some seven thousand persons from the ocean's grasp. Those fearful of breakers row, sail, and swim in a surfless bay nearby.

FREE

Only a few steps put visitors atop Whiteface Mountain

HIGHWAY and elevator lift travelers almost to the crest of the peak in New York's Adirondack Park, whose two million acres of state-owned land make it by far the country's largest state park. This 4,867-foot aerie surveys avalanche-scarred rocks, silvery lakes, and evergreen slopes. In the Adirondacks, city-stifled vacationists breathe air that Robert Louis Stevenson called "sweet with the purity of forests."

Beyond a leafy screen, father teaches Izaak Walton's art to his son at William B. Umstead State Park, between Raleigh and Durham, North Carolina. Its 55-acre man-made lake offers largemouthed bass and two species of sunfish, bluegills and shellcrackers. A smaller lake provides boating and swimming for Boy Scouts and other organized groups. Pine and such hardwoods as oak and dogwood cover what were once eroded hills and worn-out cotton fields.

Winter disguises trees as icicles in Franconia Notch, New Hampshire

ONE OF New Hampshire's 43 state parks, Franconia draws boating enthusiasts, picnickers, and campers in season. Known for its scenery since the early 19th century, the area attracted travelers long before state parks began.

Deep snow, which gives the White Mountains their name, often robes the peaks from December to mid-April. A skiers' training school on Cannon Mountain starts beginners down gentle slopes. Steep racing trails, slalom courses, and jumps test entrants in national championships.

Mount Lafayette, rounded by an Ice Age glacier, looms across the valley from this point high on Cannon Mountain.

Park visitor in turtleneck sweater beams a warm smile in the crisp air. Others relax in the sunshine outside a Cannon Mountain ski shop.

KODACHROMES BY NATIONAL GEOGRAPHIC CHIEF PHOTOGRAPHER B. ANTHONY STEWART © N.G.S.

Visitors to Valley Forge stroll in sun where barefoot soldiers limped in snow

HERE in the bitter December of 1777, George Washington bivouacked 11,000 soldiers exhausted and discouraged by British victories. "Their Marches," the general wrote, "might be traced by the Blood from their feet. . . ." Lashed by icy winds, the troops built log shelters and began a struggle for survival. By March, cold, hunger, disease, and desertion had left only 4,000 able troops. But in June a toughened, augmented Continental Army broke camp and took the offensive. Cannon and four-pound balls stand near a reconstructed blacksmith shop in Pennsylvania's Valley Forge State Park.

Alabamians picnic on a dune sloping to the Gulf of Mexico. Fringed by man-made lakes, Gulf State Park offers both sea and fresh-water fishing.

Raising seven flags starts the day for Tenderfoot Scouts at Fort Morgan State Park, on a point guarding Mobile Bay. Fortified by Spaniards in 1559, the point has known four centuries of changing ownership. Banners of Spain, France, Great Britain, the United States, Republic of Alabama, the Confederacy, and State of Alabama stream in the sun. Alabama was a republic for four weeks after seceding from the Union in 1861.

KODACHROMES BY BRUCE DALE © N.G.S.

Floodlights glare across land caught in a struggle between payrolls and picnics. White lights in this time exposure trail bulldozers working into the night to flatten sand hills on 3,000 privately owned acres where the Bethlehem Steel Company is building a rolling mill near Indiana Dunes State Park (left). Backers argue that the plan means jobs and prosperity for the area east of Gary. Says United States Senator Paul H. Douglas of Illinois, who leads conservationists in a fight to preserve remaining acreage around the state park: "Industry can locate elsewhere; the dunes cannot."

Desert meets woods on an Indiana dune

VEGETATION STRIVES to root in shifting sand at Lake Michigan's southern tip. The trail-laced park, a 2,182-acre world of dune, forest, marsh, and prairie, nurtures more than a thousand species of plants. Botanists prize it as an outdoor laboratory. Prickly pear, a kind of cactus, blooms within sight of the arctic bearberry. Pine, oak, and maple anchor bog-separated ridges that march inland a mile and a half. Dunes farthest from the lake, locked into hills by thick forests, stood at the shore some 17,500 years ago. Young dunes near the beach travel as much as 60 feet a year.

Here the bones of centuries-dead trees strew a blowout, so named because of winds that keep it bare of living vegetation. Swimmers head for Lake Michigan, which washes a white beach just yards away.

Sparkling lake provides a fringe benefit for Sara Dierking, Ball State Teachers College student and park waitress.

Morning mists curl about a fisherman in Virginia's Hungry Mother Park

THIS Allegheny Mountain state recreation area takes its name from a pioneers' legend. Molly Marley, kidnaped with her small son by Indians, escaped and wandered many days. When she collapsed in what is now the park, according to the story, the boy wandered downhill and came upon

some houses, but could only say, "Hungry—mother—hungry—mother." Rescuers found Molly dead. Now 25 cabins in the woods welcome refugees from city heat and stress. An artificial lake offers game fish, boats, swimming, and six miles of shoreline to roam. Trails run through thick stands of evergreen and hardwood and over a deep carpet of leaves on the forest floor. Visitors often see raccoons, and the tracks of deer run among the ferns. At sunrise, the blue-green hills seem to throw their arms around the early riser. In the lake's invigorating water, fish nibble the knees of bathers.

Savory sea urchin tempts an angelfish. Bright ocean fish by the hundreds of species dart through the waters of John Pennekamp Coral Reef State Park, 60 miles south of Miami. Corals and sponges sprout in weird guises. Such sights lure free divers to America's first all-underwater park.

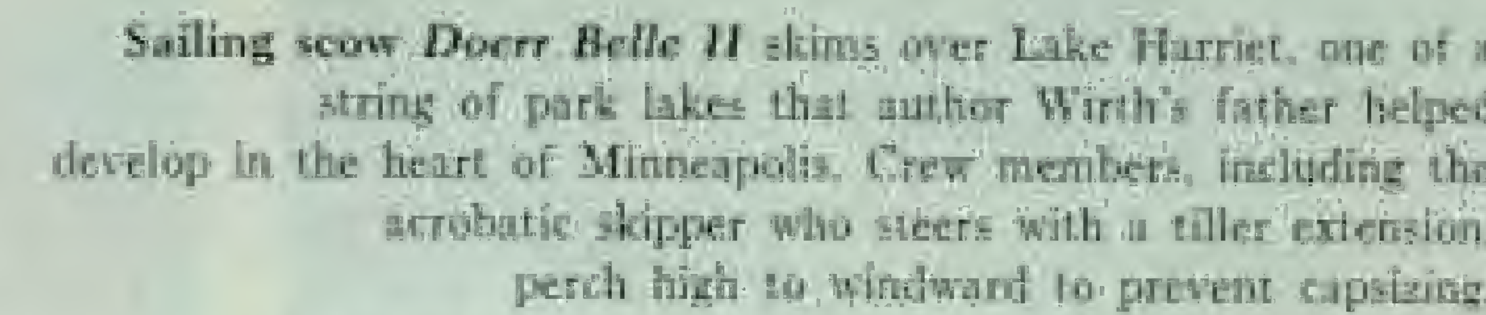
Gray festoons of Spanish moss drape shaggy bald cypresses in Highlands Hammock State Park, near Sebring, Florida. These visitors follow a catwalk across Little Charley Bowlegs Creek, a name of Seminole origin. Their reflections walk upside down in the coffee-colored water, dark with tannin and organic matter. Herons flap through the wilderness, and alligators surge up for marshmallow handouts. Strips of land protect the park against encroaching suburbs.

Watery parks draw divers and hikers

Figures indicate number of park areas and 1962 visitors
NORTH DAKOTA
7—493,100
MINNESOTA
64—3,328,650
SOUTH DAKOTA
31—4,035,409
WISCONSIN
33—4,675,051
NEBRASKA
52—4,165,707
IOWA
92—7,113,532
ILLINOIS
87—9,283,601
KANSAS
6—1,894,781
MISSOURI
38—8,097,204
OKLAHOMA
40—8,768,461
ARKANSAS
16—4,141,320
TEXAS
61—7,529,456
LOUISIANA
18—1,304,371

The Midlands

Into prairies and farmlands, expanding cities stretch tentacles of steel and concrete. Resisting the forces that would destroy their children's heritage, Midwesterners build lakes for sailboats and save bits of grassland for surviving herds of buffaloes



Sailing scow *Doerr Belle II* skims over Lake Harriet, one of a string of park lakes that author Wirth's father helped develop in the heart of Minneapolis. Crew members, including the acrobatic skipper who steers with a tiller extension, perch high to windward to prevent capsizing.

KODACHROMES BY NATIONAL GEOGRAPHIC PHOTOGRAPHER WINFIELD PARKS © N.G.S.

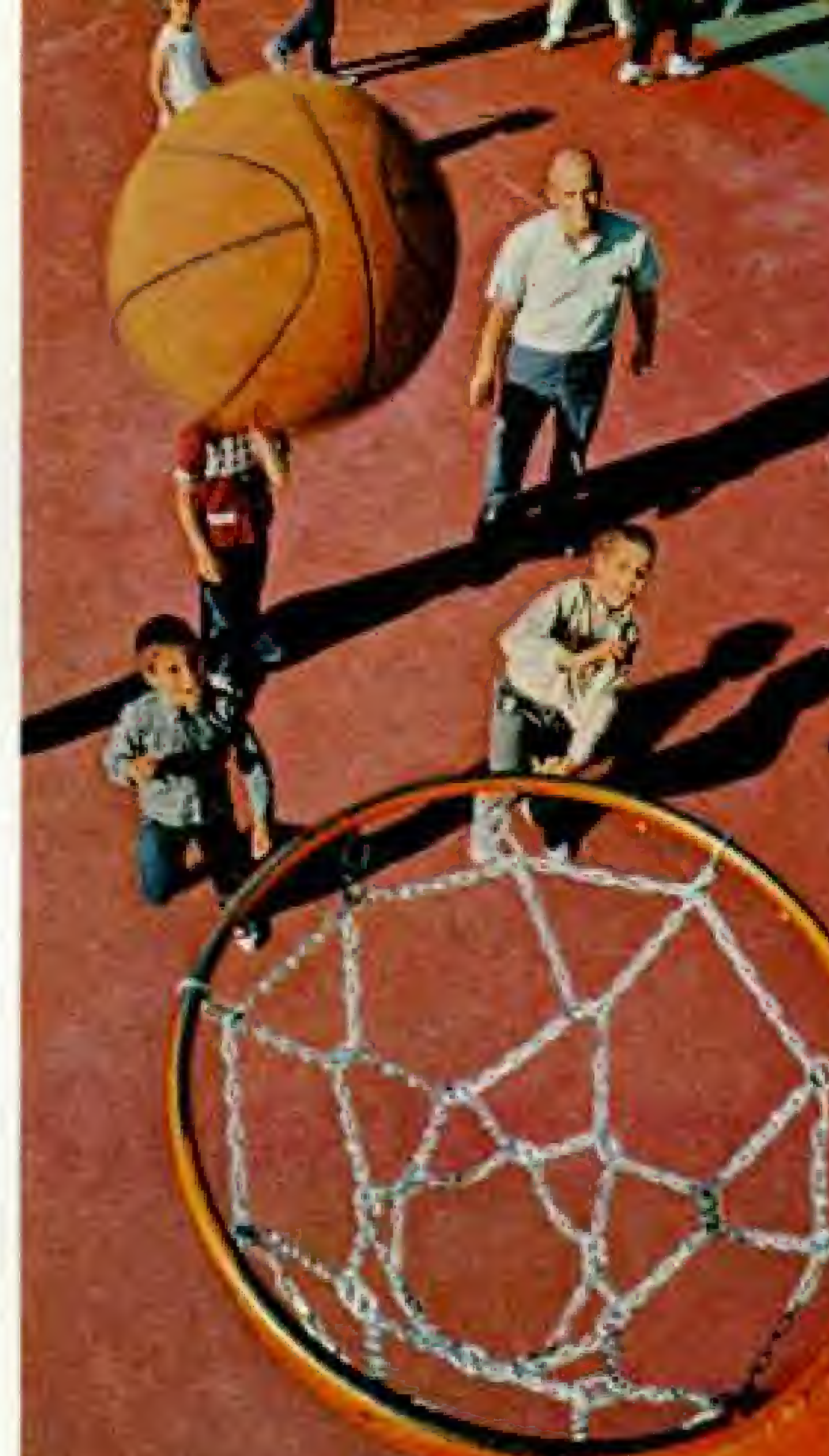
Golden-age painting class at Houston's Southmayd Recreation Center turns up unsuspected talent. Parks have been growing faster than the city itself. Since 1900, Houstonians have increased 20 times; park acreage has risen some 200-fold.

Two-nation park, International Peace Garden covers 2,300 rolling acres of North Dakota (left) and Canada's Province of Manitoba. Cairn astride the border reads: "As long as men shall live, we will not take up

Children hunt insects in Des Plaines River Preserves, part of the Cook County Forest Preserve District. Here beavers, muskrats, weasels, foxes, raccoons, great horned owls, deer, and wild turkeys roam 50,000 acres of woods and meadows within minutes of downtown Chicago.

EKTACHROME BY NORTH DAKOTA STATE SOIL CONSERVATION COMMITTEE

arms against one another." Canadian frontier has seen no war since 1814. Henry J. Moore of Islington, Ontario, offered the idea for the park in 1928. Drives at park entrance (foreground) enclose the cairn in an oblong green.



KODACHROME BY WINFIELD PARKS © N.G.S.

Basket and ball absorb Minneapolis youngsters at Lynnhurst Field Recreation Center. The city has 182 softball fields, 56 baseball diamonds, 131 horseshoe courts, 207 tennis courts, and 65 outdoor basketball courts.

KODACHROME BY JAMES L. STANFIELD

Split-rail fence, cotton field, and log cabin help to restore New Salem as a state park. Here young Abraham Lincoln chopped wood, kept a store, and studied law. New Salem died when settlers moved away. In the 1930's Illinois revived it as a Lincoln showcase.

Windows in a skyscraper form a checkerboard backdrop for a tree leafing out in Grant Park, Chicago.

Chicago commerce crowds Michigan Ave. but spares Grant Park

CHICAGO'S fabulous front yard, named for the Civil War general and 18th President, keeps gardens and playing fields at the feet of the city's changing skyline. Most of the lakefront park is reclaimed land. Debris from the fire of 1871 started the job; dredges raised sand from the lake to complete it. Today miles of park shore invite fishermen, boatmen, and swimmers.

Grant Park centers on the spectacular Buckingham Fountain, whose 133 jets (when operating) circulate 15,700 gallons a minute. A rose garden with ten thousand bushes attracts strollers. Lake Shore Drive, in foreground, is the park's main artery. Nestled within the park, Chicago Art Institute's complex (center) faces towering neighbors across Michigan Avenue. Prudential Life Insurance Building rises at right beyond sunken railroad tracks.

EKTACHROME [illegible] BY LAURENCE LOWRY (LEFT);
KODACHROME BY WINFIELD PARKS © N.G.S.

Chimpanzee acrobats delight a packed house at the St. Louis Zoo. Lion and elephant troupers perform simultaneously in two other 3,000-seat arenas. Free animal shows help attract more than two million visitors a year. Most of the zoo's residents live in fenceless, moated areas set in 83 acres of rolling hills. Children bottle-feed young mammals in a special Nursery Village.

Kids—boy and goat—rub noses in Audubon Park, once a sugar plantation, now the site of the New Orleans zoo

Palm-shaded lagoon soothes a canoeist in New Orleans' City Park, scene of many a duel in riverboat days

Arid wastes and tortuous

Hawaii approximately same scale as map above; Alaska one-third scale
Figures indicate number of park areas and 1962 visitors

mountains, barriers to Pacific-bound pioneers, today find noble use as public parks

The West

DRY FALLS, ***in Washington's Sun Lakes State Park, dropped the glacier-dammed Columbia River 400 feet during the Ice Age. When the ice melted, the river chose its present course. Today Grand Coulee, 30 miles away, dams the Columbia.***

EKTACHROME BY TED SPIEGEL, WASHINGTON STATE DEPARTMENT OF COMMERCE AND ECONOMIC DEVELOPMENT © N.G.S.

Sea otter, lolling on its back off Point Lobos, California, dines on a sea urchin that it has opened by tapping it against the stone on its chest. Among animals, the use of tools is rare but not unique. Chimpanzees crack nuts with rocks and use twigs to fish termites from their nests. Galapagos finches hold thorns in bills to pry loose insects.

Sea lions guard Point Lobos

SIX MILES of jagged coast on Carmel Bay, Point Lobos Reserve State Park takes its name from the sea lions, known to Spanish pioneers as *lobos marinos*, or sea wolves. Pacific breakers wage continuous war on the rocky shore. Setting sun wavers through distorting layers of air in this telephoto view.

Point Lobos waters hold strange life forms. Here knobbed kelp floats beside a parachutelike jellyfish.

Eroded hills march toward the sunset in Anza-Borrego Desert

MILE after mile of naked rock, tinged by nature with rust, awe a visitor to this state park in San Diego County, California. Spring rains deck the seemingly lifeless land with wildflowers—flowering cactus, blue indigo bushes, desert lavender, and delicate "belly flowers" so tiny one must get down on one's belly to see them. Anza-Borrego attracted European notice in the 18th century, when Russian power was spreading down the California coast. A disturbed Spanish government in 1775 commissioned Juan Bautista de Anza to build a presidio, or fort, on San Francisco Bay. Leading 240 colonists from Sonora, Mexico, he fought his way across hostile desert to reach the Borrego Valley, then continued on to found the settlement that eventually became San Francisco.

Geology students get a lesson from living rock. Camera's diaphragm reflects Anza's desert sun.

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

Skyscrapers of mud

CATHEDRAL GORGE State Park, about 200 miles north of Las Vegas, took shape during centuries of violent showers. Floods poured down a dry wash and dug its fantastic monuments from a formation of Bentonite clay.

Children explore the windings of sheer-walled canyons; like their parents, they see a resemblance to a city of towering buildings. As the sun swings overhead, the sand-brown earth changes from lavender to yellow. Flash floods leave the walls oozing; desert heat bakes them to dry adobe.

KODACHROMES BY TED SPIEGEL, ... AND WILLIAM BELKNAP © NATIONAL GEOGRAPHIC SOCIETY

in Nevada . . . and ramparts of stone in Utah

HERE ages ago a wide, shallow river meandered across a plain. When a subterranean upwelling created a plateau, the upper Colorado carved itself a canyon and preserved its original meanders. As the gorge deepened and narrowed, the current became swifter. Slowly, the river bit at imprisoning sandstone and carved the walls that now plunge three thousand feet from mesa tops.

Visitors view the spectacle from Dead Horse Point State Park, about 200 miles northeast of Grand Canyon National Park. Legend says the name derives from Indian ponies that failed to find their way down to water and died of thirst.

Anyone who stands at the brink looking across the canyon through binoculars and slowly lowers the glasses until his feet come into view achieves a dizzying sensation of tumbling into the canyon.

This small park overlooks an indescribably colorful maze of canyons where natural arches and weird sculptures greet the eye. If conservationists' proposals gain acceptance, more than a quarter-million acres will become Canyonlands National Park.

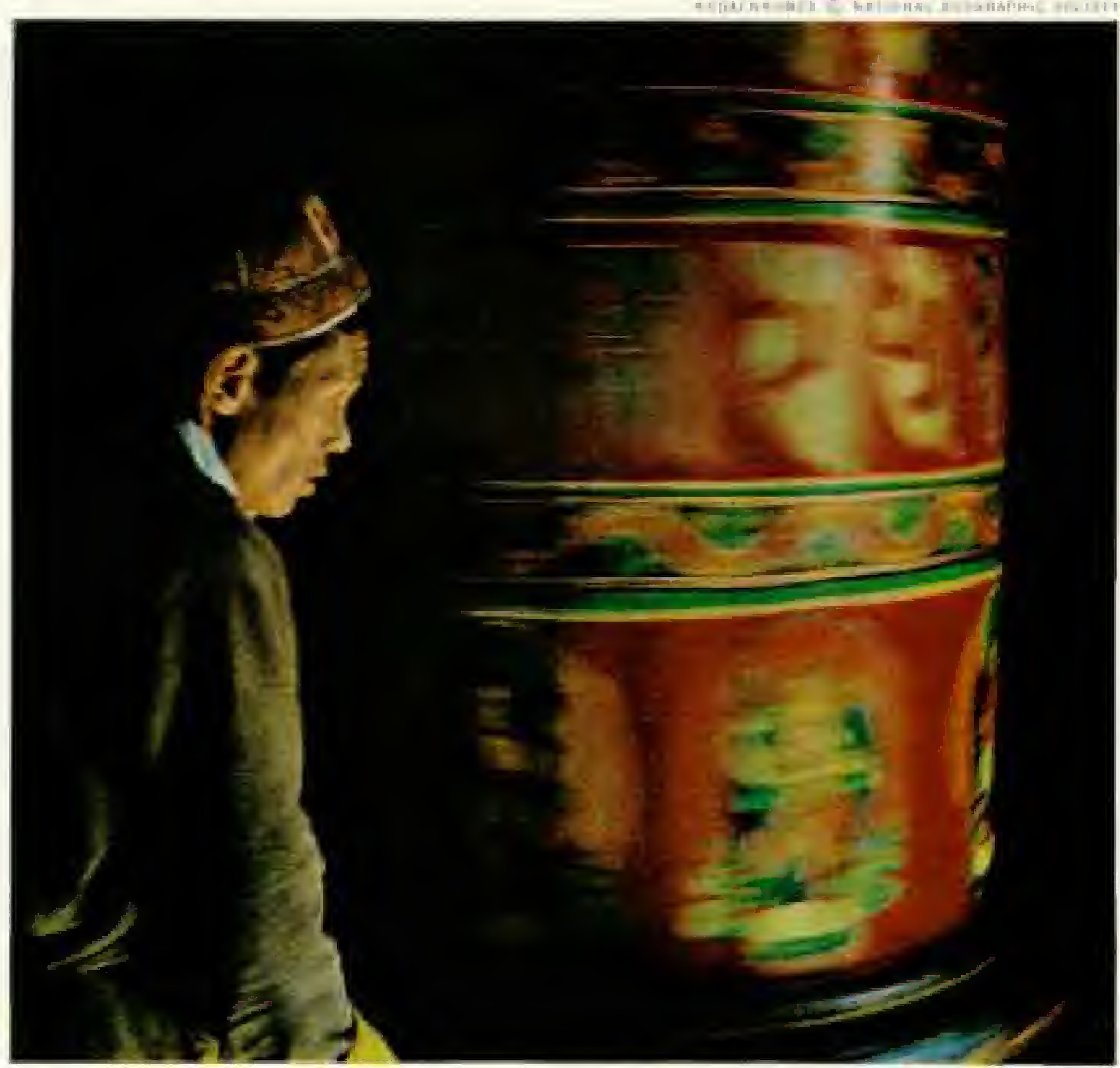
Totem poles stretch visitors' necks at Totem Bight Historical Site, near Ketchikan, Alaska. Europeans inadvertently raised totem carving to an elaborate art by giving northwest coast Indians their first steel tools. Some missionaries condemned the totems as wooden idols. Actually, poles served as coats of arms, banners, storybooks—even as notices of unpaid debts. Haida Indian pole at right has a beaked devilfish near its base. Above the devilfish a long-snouted bearlike creature squats beneath a mythical cave animal.

Easter sunrise anthems draw 10,000 Denverites to Red Rocks Park

WALLS OF ERODED ROCK whose lower slopes reach almost to the central stage create a giant sounding board, giving the theater such excellent acoustics that an actor on stage can be heard 400 feet away. "Any orchestra here sounds good," one enthusiast declared, "and a fine one sounds magnificent."

Foehn winds sweeping down from the higher slopes of the Rocky Mountains sometimes cause problems. Sudden drafts may roar into a microphone above the voices of singers or scatter sheet music not firmly secured.

THE END



Whirling prayer wheel dances with light at a lamasery, invoking benediction on the bridal pair.

Fairy-tale wedding unites Palden Thondup Namgyal, Crown Prince of Sikkim, and Hope Cooke, of *Mayflower* ancestry.

Wedding of Two Worlds

Article and photographs by LEE E. BATTAGLIA

National Geographic Staff

THE WEDDING BEGAN with a solemn flourish of 10-foot-long Himalayan trumpets.

As the echoes died away amid the jeweled valleys and dark slopes, a limousine painted the royal blue of Sikkim inched through the hushed crowd and delivered its passenger to the door of the royal temple.

She alighted, a graceful, dark-haired girl in frosty white silk brocade, the slender gown caught at the waist by a gold-and-silver belt. She appeared the image of an Asian princess, stately and shy, her head becomingly bowed. Yet as she raised her eyes to mount the temple steps, one saw the radiant smile not of an Asian, but of an American bride.

All of Sikkim now knows the bride's name: Hope Cooke, a

22-year-old graduate of Sarah Lawrence College in Bronxville, New York, and a resident of Manhattan. She had met the Crown Prince of the tiny Himalayan state of Sikkim during a vacation in Darjeeling, India, in 1959. Today, March 20, 1963, she would marry Prince Palden Thondup Namgyal and become Maharajkumarani—Crown Princess—of Sikkim.

Now, as the Crown-Princess-to-be moved toward the temple door, a 10-year-old boy, born in the year known to the Sikkimese as the "wood-horse" year, cleared her path of evil spirits by brandishing a ceremonial sword.

Months previously, I had met and worked with the 39-year-old Crown Prince in choosing illustrations for a NATIONAL GEOGRAPHIC article about Sikkim.*

Then, in February this year, the mail brought an impressive document—an engraved invitation to the wedding at Gangtok, Sikkim's capital. Now, as I waited my turn to enter the temple, some of the 5,000 other guests began to flow around me, until the temple grounds became a brilliant sea of color. There were turbaned maharajas, top-hatted ambassadors, peak-hatted Buddhist lamas, Sikkimese farmers, Tibetan refugees, Indian women in their saris, and Western women in their Paris gowns.

Above us the mighty peaks of Kanchenjunga, "Great Snow of the Five Treasures," wore a coronet of rainbow hues—whites, pinks, blues, golds—as if in honor of the royal event.

The wedding song began:

Happy day . . . we gather here
on this happy occasion,
let us rejoice . . . .

The bridal party entered the temple to the bellowing of 10-foot horns, the clanging of cymbals, and the clash of drums.

The limousine, enveloped by the crowd, was a concession to Western ways. Traditionally, the bride would have ridden to the temple on a mare that had already foaled.

Earlier that day I had visited the royal guesthouse to watch a member of the bridegroom's party exchange white ceremonial scarves with the bride and sip yak-butter tea with her and her attendants. Later a court astrologer had written with an inkless pen on the bride's fingertips, tracing symbols representing the tiger, the lion, the mythical dragon and gold-winged garuda to protect her from evil and assure a happy marriage (page 712).

*See "Sikkim, Tiny Himalayan Kingdom in the Clouds," by Desmond Doig, March, 1963.

Tiny Sikkim, a kingdom about the size of Delaware, lies squeezed between India and Communist-occupied Tibet. Gangtok, the capital, stands 100 miles from the tip of Mount Everest, in Nepal.

Splendid in silk brocades, the royal party strides across the palace lawn to the wedding ceremony in the family temple. Sir Tashi Namgyal, Sikkim's Maharaja (in dark glasses), leads the way. His son, Prince Thondup, follows to claim his bride, a shy graduate of Sarah Lawrence College, Bronxville, New York. Tenzing, the widowed prince's elder son and second in line for the throne, walks on the left. Bagpipers of the Sikkim police band call to mind the days of British dominion. Prayer flags flutter on bamboo poles.

Pure white against richly colored lacquers and brocades, a gift scarf of silk manifests a wedding guest's homage to the 70-year-old Maharaja.

Buddhist rites unite East and West

BRIDE AND BRIDEGROOM sit passively as, with chanting and the exchange of scarves, the debutante from the United States is transformed into a future maharani. A Red Hat lama passes ceremonial food to the bride, who wears a white version of the wrap-around dress of Lepcha women. Seated a bit higher, her partner watches solicitously. Astrologers, having found the planets inauspicious for 1962, delayed the wedding for a year.

[illegible] © NATIONAL GEOGRAPHIC SOCIETY

Inkless gold pen of the court astrologer traces on the bride's fingertips mystic, invisible characters designed to ward off evil spirits and ensure prosperity and children.

Now, clutching my camera, my high silk hat, and my gifts of ceremonial scarves, I followed the crowd up the steps into the lofty gold-roofed temple, Tsuk-Lak-Khang. Glancing down to make sure of my footing, I spied another concession to Western manners—a woven doormat at the temple entrance bearing the words "Good Luck."

Inside, spotlighted in the dim temple hall, the Prince's father, His Highness Sir Tashi Namgyal, Maharaja of Sikkim, sat Buddha-like on his high, golden throne (page 712). For 500 years his forebears have ruled this tiny kingdom. He gazed augustly down upon the Crown Prince and his bride.

Softly the lamas began to chant as servants passed yak-butter tea among the guests. As I found my seat, words of the song written especially for the bride ran through my head:

> *Today, in the capital of Sikkim,*
> *Land of the East, a flower of the West*
> *Blossoms amongst us.*
>
> *A daughter of Eve, the great mother,*
> *Has come to this land of Sikkim.*
>
> *All friends who have come to this*
> *Royal wedding, join us in our*
> *Rejoicing.*

In the half-light the temple seemed an enchanted forest: Brocaded pillars took on the shapes of trees, their leaves festoons of silk. The royal couple seemed figures caught up in an ancient fairy tale.

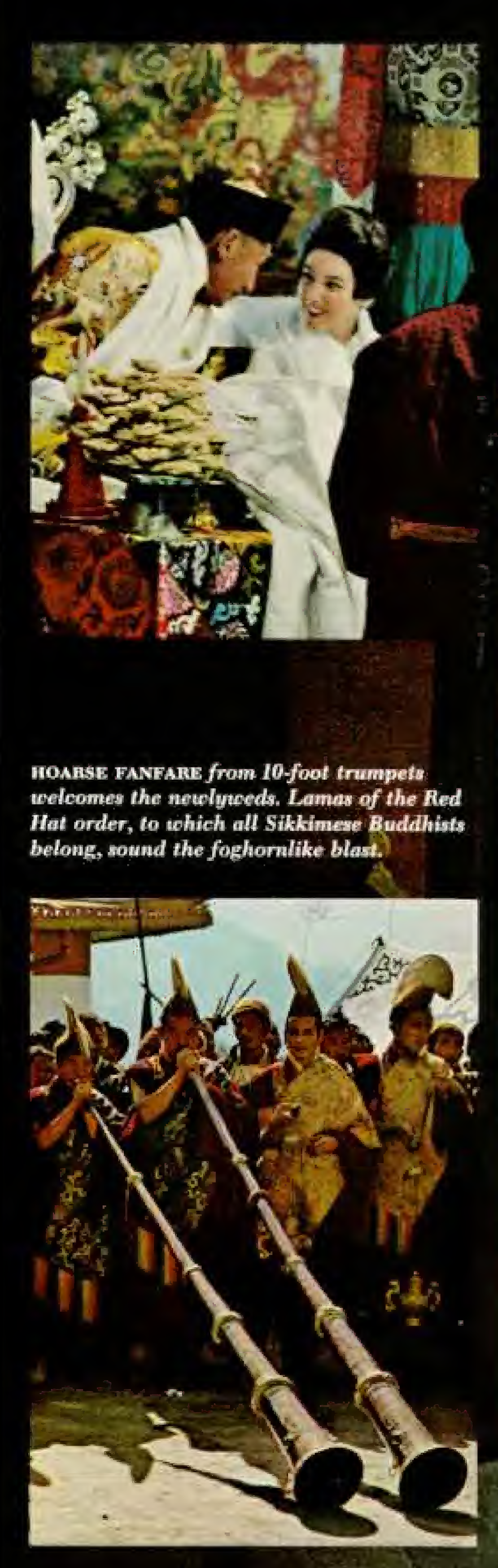
Now came the attendants, called *losangs*, whose birth dates and horoscopes coincided propitiously with those of the bride and groom, to serve them *wangzey*, or holy water.

At last the bride mounted to the altar and lighted the sacred lamps. An exchange of white ceremonial scarves between the parties of the betrothed completed the sacrament.

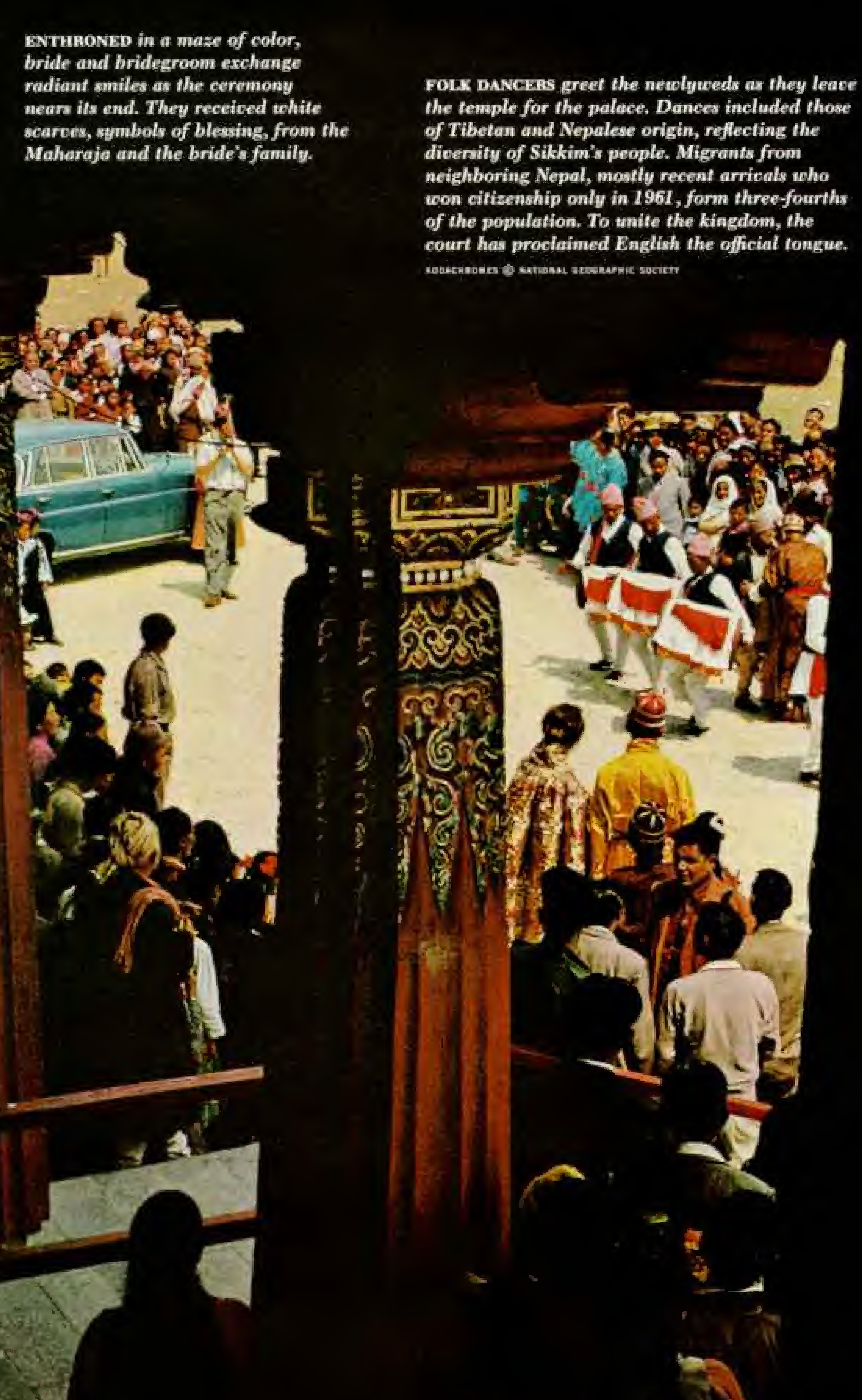
The guests crowded forward to proffer their wedding gifts and more ceremonial scarves to the Maharaja, his son, and his new daughter-in-law. Desperately I fumbled with my camera and the silk hat, trying to disentangle them from a scarf I carried. Seeing my difficulty, His Serene Highness the Crown Prince of Sikkim reached out a helping hand and drew the scarf to him.

"Thank you, Lee," the smiling bridegroom whispered.

Then suddenly the ceremony was over. The bride turned to her husband with a glowing smile. Hope Cooke of New York was gone. In her place was Hope Namgyal, "Consort of Deities," Crown Princess of Sikkim. * * *



HOARSE FANFARE ***from 10-foot trumpets welcomes the newlyweds. Lamas of the Red Hat order, to which all Sikkimese Buddhists belong, sound the foghornlike blast.***



ENTHRONED *in a maze of color, bride and bridegroom exchange radiant smiles as the ceremony nears its end. They received white scarves, symbols of blessing, from the Maharaja and the bride's family.*

FOLK DANCERS *greet the newlyweds as they leave the temple for the palace. Dances included those of Tibetan and Nepalese origin, reflecting the diversity of Sikkim's people. Migrants from neighboring Nepal, mostly recent arrivals who won citizenship only in 1961, form three-fourths of the population. To unite the kingdom, the court has proclaimed English the official tongue.*

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

"A real Beau Brummell as a wedding guest," says author Battaglia, "I was a working photographer, too. My attire drew many polite but curious glances. While changing cameras, I kept knocking my top hat off. Finally I removed the topper and collapsed it under an arm. Thinking I had crushed it, the audience gasped. When I snapped it open unharmed, popular demand forced me to repeat my magician's act."

Sikkimese and Visitors Besiege the Temple to Present Their Wedding Gifts

"To take the picture," Mr. Battaglia reports, "I climbed to the temple roof in my cutaway and striped trousers and aimed the camera straight down. There I saw hundreds waiting to deliver gold, silver, cloth, fruit, spices, and bales of yak hair—whatever they could afford. Thousands of ceremonial scarves created mounds of shimmering finery on the floor. The procession of gift bearers lasted two and a half hours in the morning and resumed after lunch."

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Potentate and his guests

"I FOUND MYSELF responding to the inner splendor and dignity that lighted noble and commoner alike," says the author. "Sikkimese and guests from neighboring lands greeted me with an openheartedness I had seldom before experienced among strangers. People were not afraid to seem too friendly."

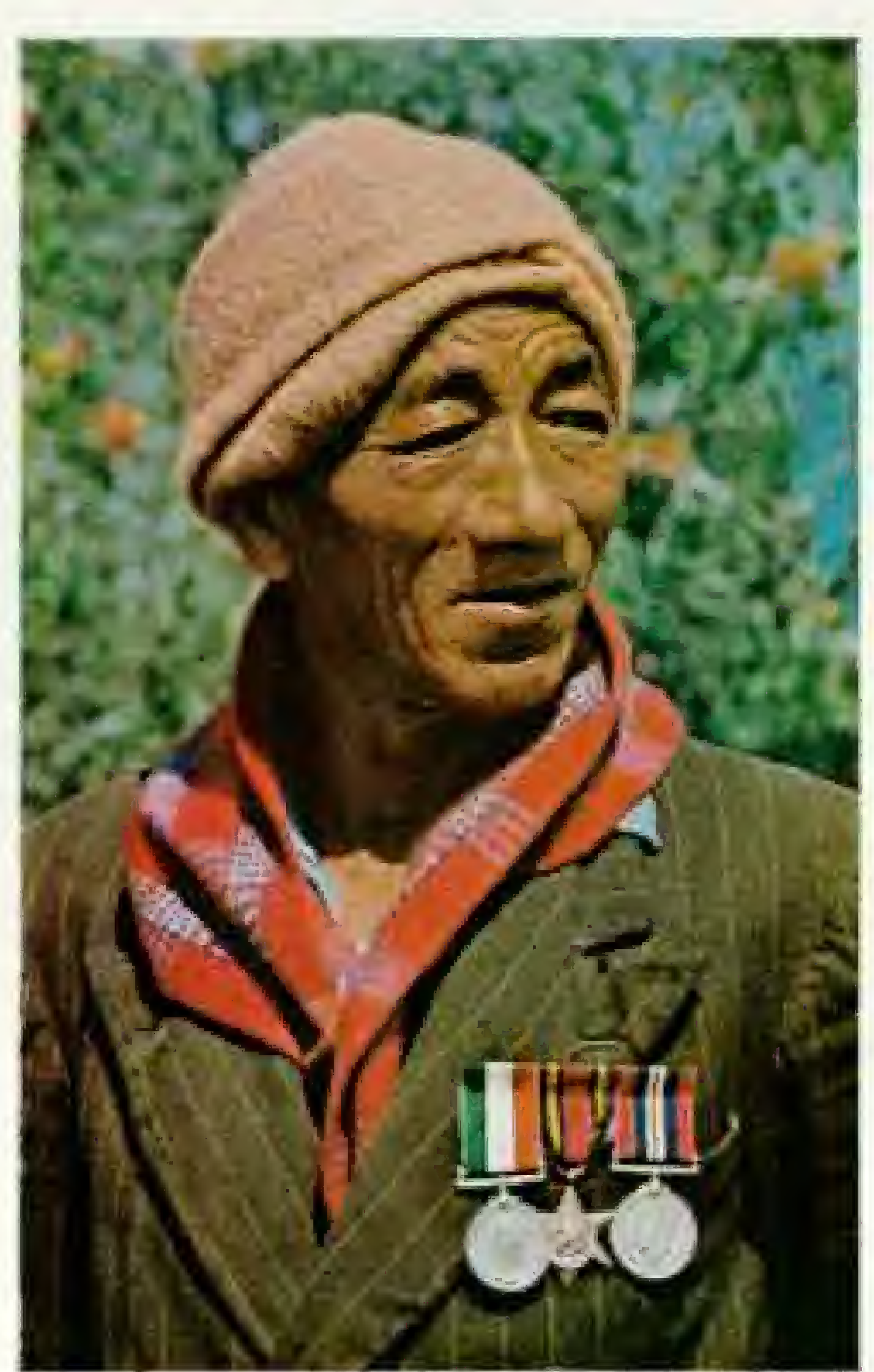
Royal face reflects the serenity of Sir Tashi Namgyal, who devotes his free time to painting and meditation. Here, seated in his studio, he explains to the author the spiritual meaning of his paintings, most of which center about 28,208-foot Mount Kanchenjunga, which Sikkimese regard as their country's divine protector.

Mandarin-capped agents of the bridegroom, in concentration so deep they did not hear the camera click, watch the court astrologer mark Miss Cooke's fingers with propitious signs (page 712). They formed her escort to the temple.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Flowing saris' lines and colors enhance the grace of young Nepalese and Sikkimese women.

Young mother lifts her apple-cheeked son for a peek at the brand-new princess from far away.



KODACHROMES BY LEE E. BATTAGLIA © N.G.S.

Weatherbeaten veteran wears his British medals.

Tibetan dances for coins. Her peacock bonnet, made of paper, suggests an American Indian's.

Out of the ***Arabian Nights*** steps the comely daughter of the Maharaja of Burdwan, India.

Plumed drum major leads drummers and pipers.

Pearls grace the brow of the sister-in-law of Bhutan's Prime Minister. She stripped a bracelet from her arm and sent it to the author's wife.

Throngs Milling About the Palace Await a Glimpse of the Bridal Pair

Nobles and farmers, diplomats and yak herdsmen, generals and traders, all guests of the Maharaja, partook of his bounty. Twenty cooks prepared a Gargantuan feast that included mountains of rice prepared in scores of ways.

Neighboring Nepal and Bhutan sent contingents of guests, as did India. Refugees from Red-held Tibet arrived in well-worn garments, and nearly 200 visitors from the West flew and jeeped in.

"Physically, the nation shows vivid contrasts," says the author. "The lower valleys lie only a thousand feet above sea level and grow rank with subtropical vegetation. A few miles away, Himalayan peaks reach for the sky with fingers eternally gloved in ice."

This photograph looks down from the temple roof. Bhutanese lent awnings; stylized bats square the corners.

Prayer wheel in one hand, rosary beads in the other, an old man pauses occasionally to drink *chang*—fermented millet steeping in a bamboo cup.

Scarlet-jacketed Sikkim Guard, the kingdom's entire independent militia, musters 60 men. Each wears the royal crest and a plume of peacock and king-crow feathers. Hats are of cane. In all Sikkim, only one old Lepcha still weaves them.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Two families join hands

Brilliant East and soberly garbed West meet at Gangtok, and both are delighted. Princess Hope smiles at her aunt, Mrs. Selden Chapin, who helped to rear her. Bridegroom and his two sisters stand in the row behind them. Partly hidden Maharaja rests a hand on grandson Tenzing's shoulder.

Young Tenzing's Brownie catches the bride (lower left). "Earlier, he got better results with my Polaroid than I did," says the author. "When he returned it, he gave me an affectionate hug."

PHOTOGRAPHS BY LEE E. BATTAGLIA, NATIONAL GEOGRAPHIC STAFF © N.G.S.

and hearts

Bridegroom's sister, Princess Pema Choki, gracefully balances a six-pound, pearl-crusted Tibetan headdress while chatting with Mrs. Ronald Metz, an American cousin of the bride.

Picture of gathered clans suffered delay when Baby La (front row) kept crawling away, to her cousin Tenzing's undisguised joy.

Sprightly twist engages Princess Pema Tsedeun, sister of Thondup, and J. Kenneth Galbraith, then U. S. Ambassador to India.

Translucent Tent Town Glows by Night; Bhutanese Brought Their Own Shelters

Lighted cars running past the encampment streak a time exposure. Many of the delegation went home when they learned the Maharaja of Bhutan had suffered a heart attack.

Gleaming in gentle night rain, tent, flowers, and pool form a glimmering never-never land for the Indian Political Officer's garden party. Time exposure blurs the figures. A glaring demon protects the pavilion.

Hands clasped, faces beaming, son and stepmother venture onto the dance floor. "They got along wonderfully," reports the author. "I never met a warmer, more charming little boy than Tenzing." Mr. Battaglia treasures a letter from Princess Hope thanking him for the "fine National Geographic globe of the world that you gave to us. The children are already fascinated with it."

The widowed prince gave his bride a ready-made family of two boys and a girl. Sons Tenzing and Wangchuk study in England.

PHOTOGRAPHS © NATIONAL GEOGRAPHIC SOCIETY

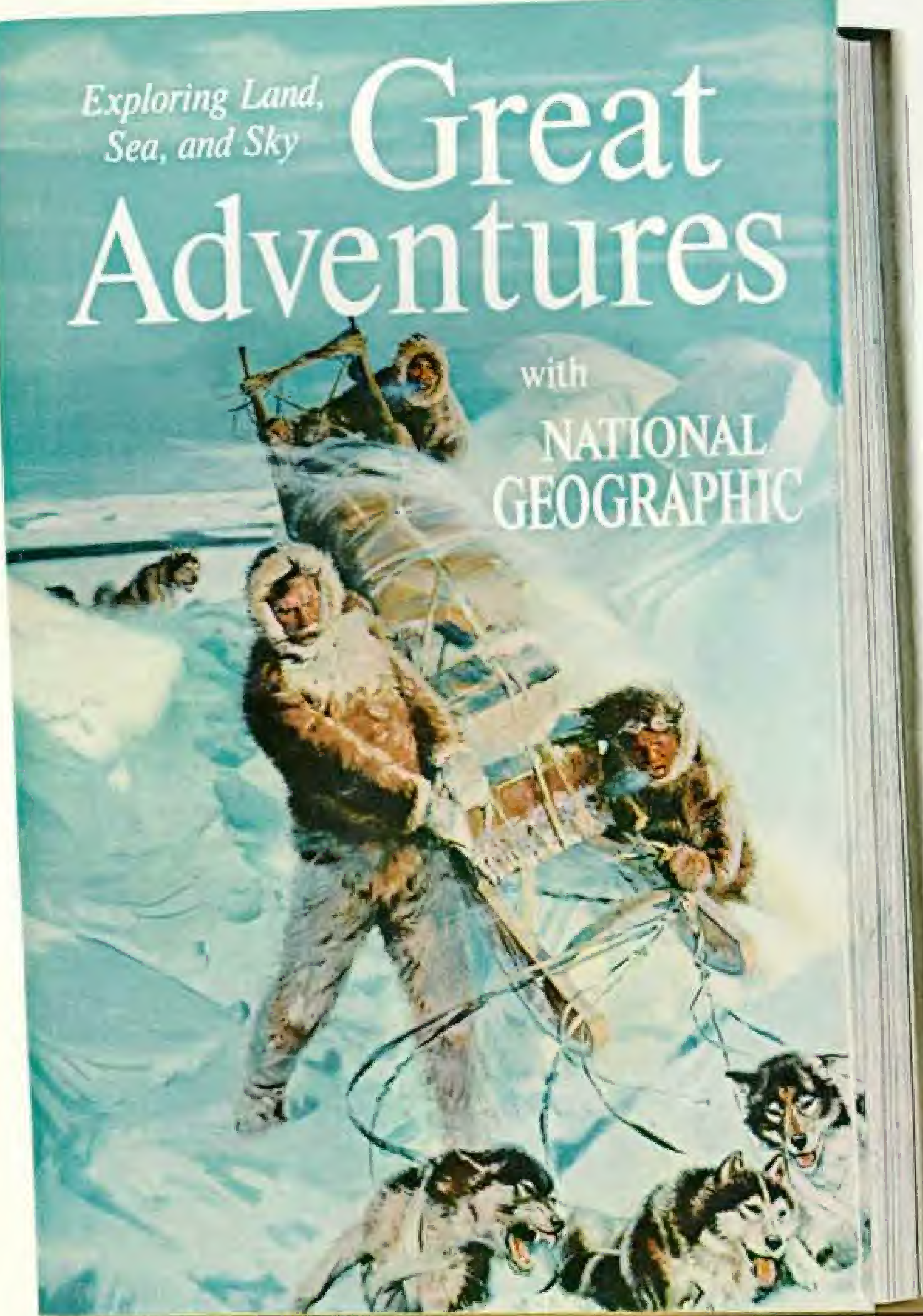
Tender honeymoon glances radiate in the palace garden. "On the last day of my stay," recalls Mr. Battaglia, "I asked the couple for one more photograph. Then we said goodbye. As they walked away, oblivious of my presence, I took the picture above and the one opposite."

Lazy breezes stir the prayer flags below towering mountains; a new life begins for the princely couple.

During her last year at Sarah Lawrence College, Hope Cooke did research in New York libraries toward a history of her future land and a textbook version for Sikkimese children. She has adopted her husband's nationality.

Prince Thondup, besides his administrative tasks, performs religious duties. Sikkimese believe he reincarnates an uncle and that the uncle was the reincarnation of a high lama of Kham, in eastern Tibet. The Prince was training to head a lamasery until the death of his elder brother in an airplane crash made him heir to the throne. THE END

White scarf of benediction decks a royal Mercedes, taking the place of old shoes and tin cans in the West. License tags of the royal family bear the legend "Sikkim" but no numbers.


Exploring Land, Sea, and Sky
Great Adventures
with
NATIONAL GEOGRAPHIC

From the Ends of the Earth to the Edge of the Future

Announcing the Society's newest book

By MELVILLE BELL GROSVENOR
LL.D., Sc.D.
President and Editor, National Geographic Society

FOR THOSE WHO THRILL to stories of adventure and exploration, for those who travel and those who cannot, I am happy to introduce the Society's newest book, *Great Adventures With National Geographic.*

Here in one volume, gloriously illustrated, the remarkable deeds of our explorers live again in their own words. *Great Adventures* is published in celebration of the 75th anniversary of the founding of our Society. Here you will read the epics of men who dared the unknown to push back the frontiers. Society members can be proud that their dues aided in making many of these feats possible.

I have indeed been fortunate in meeting and working with so many of these famous adventurers. Even as a boy I sat at the feet of such intrepid men as Peary, Shackleton, MacMillan, Amundsen, and Stefansson, and heard their tales from their own lips—yarns as stirring as Ali Baba or Sindbad the Sailor.

When I was 11, there came the day when Admiral Peary and Amundsen were luncheon guests in our home. I was allowed to peep through the curtains at the distinguished guests. Suddenly Admiral Peary noticed me and, great-hearted man that he was, called to me to share the ice cream. I shall never forget the thrill when he personally presented me to Roald Amundsen. Mr. North Pole was introducing *me* to Mr. South Pole on the occasion of their own first meeting.

Now in the new book I read again of great

Dauntless Peary sledges toward the North Pole in 1909: the jacket of *Great Adventures.*

Exploring Lands of Exotic Life

Great Adventures pictures far-away marvels, from New Guinea plumes to African platter lips.

Probing the Depths of the Sea

"Almost as unknown as Mars" 30 years ago, the ocean yields its secrets to divers and bathyscaph.

Scouting the Wild Sky

From wood-and-wire contraptions to the rocket plane X-15: aviation's swift growth in 60 years.

UNITED PRESS INTERNATIONAL

Charles A. Lindbergh sets out in 1933 to pioneer air routes around the North Atlantic. Wife Anne records their adventure.

In Africa, Theodore Roosevelt collects game specimens for the Smithsonian's National Museum. In *Great Adventures,* he tells how he put Brazil's River of Doubt—"never before . . . traversed by any civilized man"—on the map.

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© BYRD ANTARCTIC EXPEDITION

First to see both Poles from the air, Richard E. Byrd weights a flag with a stone from the Arlington National Cemetery grave of Floyd Bennett, his copilot on the Arctic flight. After a life-or-death struggle to climb above the lofty polar plateau, he dropped his tribute over the South Pole.

men closely connected with our Society. And I recall a Nation's praise of these men through its Chief Executives: Starting with Theodore Roosevelt, every President has awarded medals or attended ceremonies honoring the Society's heroes of exploration.

In your copy of *Great Adventures,* you will relive with Robert E. Peary his cruel trek in 1909 over the ice to the North Pole, a feat never accomplished before—or since. "The Pole at last!" he writes. "The prize of 3 centuries, my dream & ambition for 23 years. *Mine* at last!"

Later he messaged, "Stars and Stripes nailed to North Pole." As you read his stirring words, you can also study Peary's extraordinary photographs, some of which have never been published before.

Listen to the voices of some other heroes:

Robert F. Griggs, stumbling upon Alaska's Valley of Ten Thousand Smokes: "Sleep that night was impossible. We had discovered one of the great wonders of the world."

Jacques Piccard, making man's deepest dive, almost seven miles into the Pacific Ocean's Mariana Trench: "In the name of science and humanity, *Trieste* has taken possession of the abyss, last extreme on our earth."

And Edmund Hillary, high on Mount Everest: "Suddenly I realize that the ridge ahead doesn't slope up, but down. I look quickly to my right. There, about 40 feet above my head, is a softly rounded, snowy dome. The summit."

To me, it has been a labor of love helping editor Merle Severy and his Book Service colleagues shape this volume. To reproduce in full all the GEOGRAPHIC's tales of high adventure would require a five-foot shelf. Compressing them into 504 gripping pages required painstaking editing.

Perhaps no memory stands out so clearly as my first encounter with a young Naval officer who called one day at our headquarters

Serene city without a care, St. Pierre, Martinique, pays no heed to distant, "extinct" Mont Pelée. Later, within three minutes on May 8, 1902, the volcano snuffed out 30,000 lives. Robert T. Hill probed the city's ruins for NATIONAL GEOGRAPHIC.

PAINTING BY PAUL CALLE © NATIONAL GEOGRAPHIC SOCIETY

Standing at ship's rail, engineer Charles Evans saw the mountain explode and St. Pierre burst into flame. Bolts of lightning leaped from an immense black cloud as a wall of hot ashes and superheated steam rolled at 100 miles an hour into the city.

ADVENTURE IN THE AIR. J. A. D. McCurdy lifts *Silver Dart* from the ice February 23, 1909—the first flight in Canada.

ADVENTURE BY LAND. Afghan troops outside the walls of Farah in 1931 salute the Citroën-Haardt trans-Asia expedition.

ADVENTURE IN THE SEA. Navy bathyscaph *Trieste* emerges from man's deepest dive—35,800 feet in the Mariana Trench.

The editor and associate editor were busy; I was assigned to look after Lt. Comdr. Richard E. Byrd. He confided his plans: He wanted the Society's backing in attempts to explore the Arctic by airplane.

The Society gave him its instant support and continued to back the gallant explorer for 32 years. We honor him now as "Admiral of the Ends of the Earth," conqueror of both Poles by air, leader of expeditions north and south where no man had trod.

When Admiral Byrd died, on March 11, 1957, he had just finished his last task—correcting proofs for his eighth GEOGRAPHIC article, "To the Men at South Pole Station."

Exploits of many Americans ring through the pages of *Great Adventures*. Among them is the saga of Theodore Roosevelt, who—in his "last chance to be a boy"—canoed Brazil's uncharted River of Doubt (now Theodore Roosevelt River).

I can never forget ex-President Roosevelt, his voice weakened by fever, standing before 5,000 members of the National Geographic Society only a week after landing in this country and exclaiming, "The maps are so preposterously wrong!" He recounts his harrowing experiences anew in *Great Adventures*.

The maps of Brazil available in T. R.'s day *were* ridiculous. But recently I took from the transcript his determinations of latitude and longitude of the Roosevelt River's source and mouth and checked them out on the NATIONAL GEOGRAPHIC's latest map of Brazil. They were surprisingly close to the mark!

I remember another explorer who walked into the Society's offices looking for support. He was a little-known Frenchman named Jacques-Yves Cousteau, co-inventor of a device he called the Aqua-Lung. His descriptions of the new "silent world" beneath the sea so excited your Society's Research Committee that we immediately agreed to back him in his work and became his first United States sponsors; we continue to support his undersea scientific triumphs.

In our new book, too, E. Thomas Gilliard brings another kind of adventure to life. Perched on a shaky 40-foot tower in a New Guinea jungle, he recalls watching a bird of paradise: "Here I was, half a world away from my home in Manhattan, clinging to a flimsy rung high above a forest no white man had ever visited. Why? To see some birds. But what birds!"

We, as readers of *Great Adventures*, can exclaim with Dr. Gilliard, "What birds!" and with Sir Edmund, "What a mountain!" But in the end, I think we must admiringly declare, "What men!" THE END

Great Adventures With National Geographic, a unique chronicle of man's conquest of the unknown over the past 75 years, is available only by direct order from the Society; 504 pages, 583 illustrations, bound in buckram and chambray, $7.95 per copy. To reserve a first-edition copy, send orders promptly to the National Geographic Society, Dept. 133, Washington, D. C. 20036, requesting later billing if desired.

H. R. BENNER

MAYNARD OWEN WILLIAMS

EKTACHROME BY THOMAS J. ABERCROMBIE, NATIONAL GEOGRAPHIC STAFF © N.G.S.

In Storied Lands of Malaysia

By MAURICE SHADBOLT

Photographs by WINFIELD PARKS

National Geographic Staff

Sunset's molten gold tints the Strait of Malacca off Malaya,

FOR MONTHS I have been roaming tin-and-rubber-rich Malaya, teeming Singapore, and their wild, romantic neighbors, Sarawak and North Borneo. In a great crescent they curve across the South China Sea from the border of Thailand almost to the Philippines (map, pages 766-7).

Prime Minister Tunku Abdul Rahman Putra Al-Haj of Malaya described these far-flung lands to me as "a crescent of freedom." With British blessing he was struggling to unite

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

a rich and populous showcase of the democratic way of life in Southeast Asia

them into a new nation—Malaysia.

As another of Malaysia's builders explained the goal:

"A single rice stalk is weak and fragile, easily broken in a storm. If hundreds of such stalks are bound together, no storm can break them."

With its intricate tangle of races and religions, the proposed federation of nearly 11 million people seemed a world in miniature, for Malaysia is Moslem, Buddhist, Hindu, Christian, Taoist, and pagan. It is Malay, Chinese, Indian, European, Dyak, Murut,

Dusun, and Bajau—to name a few of its races and tribes.

In my travels of nearly 9,000 miles, I watched, fascinated, as together these people laid foundations of a new nation within the British Commonwealth, to be governed by parliamentary democracy—a nation which its builders hope will be an example to all Asia.

Six years ago the word *merdeka*—Malay for "freedom"—echoed across Asia when, on August 31, 1957, the Federation of Malaya became the 11th sovereign member of the Commonwealth after more than 100 years of British control. "Merdeka Malaya!" was the cry.

Now the cry was "Merdeka Malaysia!" It called for uniting Malaya, Singapore, Sarawak, and North Borneo.

The bold new plan stirred men's minds and imaginations. I heard it discussed everywhere on my journey. Up the Rajang River, hard by the great warm jungles of Sarawak. In the water village of old Brunei town, lately scarred by an attempted revolution. Beside the rice fields of mountainous, fertile North Borneo. On the hot asphalt streets of Singapore, bus-

The Author: As Malaysian lands moved toward federation, NATIONAL GEOGRAPHIC sent the brilliant young New Zealand writer Maurice Shadbolt and staff photographer Winfield Parks to make a comprehensive survey. Mr. Shadbolt has written two earlier GEOGRAPHIC articles, on New Zealand (April, 1962) and Western Samoa (October, 1962).

Rural planning takes on the urgency of a military campaign as Malaya's Deputy Prime Minister Tun Abdul Razak (center) and associates study the model of a village center in a new settlement. Wall map shows land surveys. Malaya has led in efforts to form Malaysia, a new nation also including Singapore, North Borneo, and Sarawak.

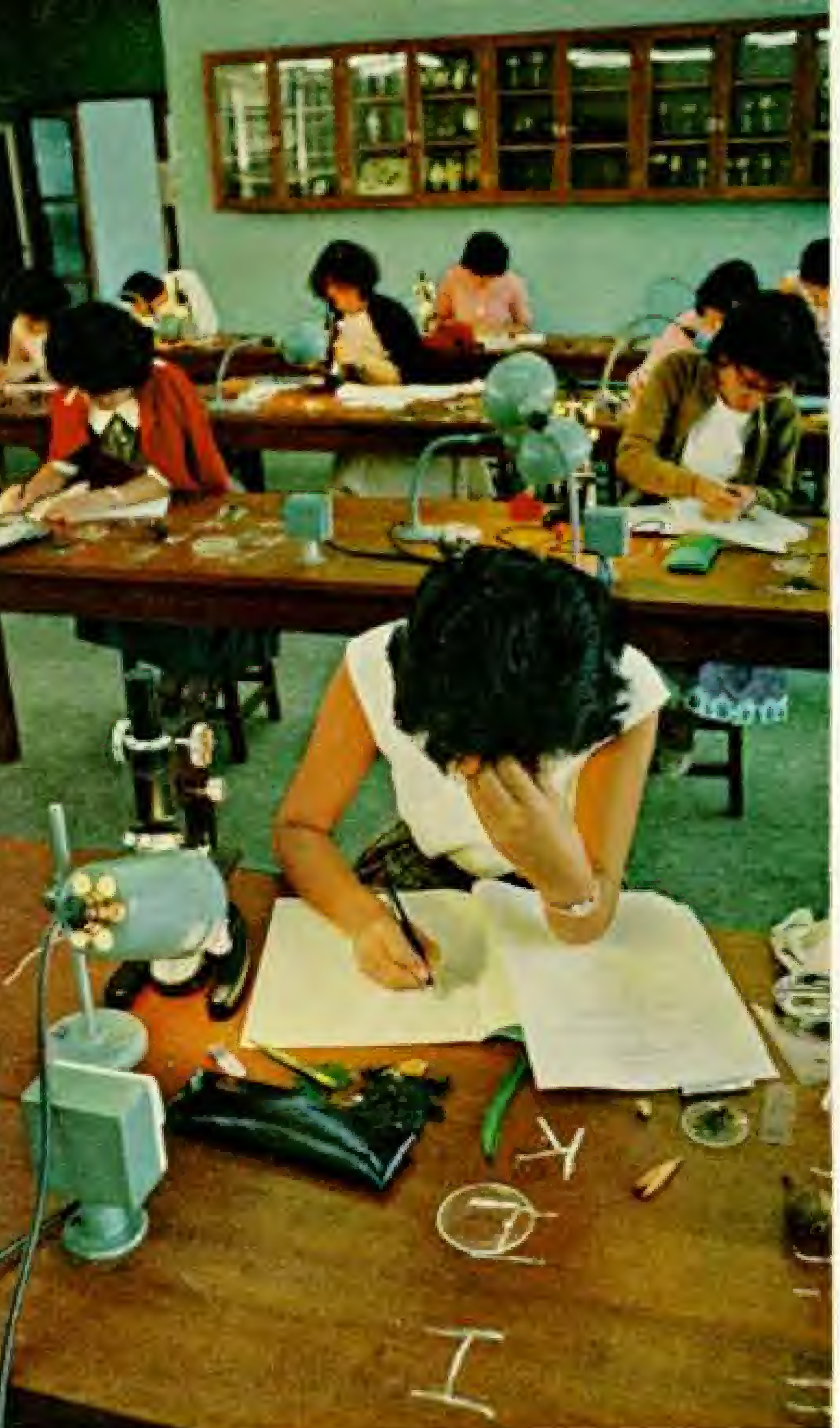
Onetime head-hunter in Sarawak puzzles over a poster picturing Malaysia leaders.

iest port in Southeast Asia. In the welcome shade of rubber plantations in Malaya, richest and most populous of Malaysia's lands.

"Whoever knows Malaya has his hand on the pulse of Asia." So runs a modern proverb.

And no wonder. For this is a land where the New Year is celebrated four times in 12 months by different faiths, where nothing is alien and no Asian a stranger. How could anything be alien to a country that boasts most of the world's creeds, much of its culture, many of its languages?

This was a keenly sought prize in the power struggle between East and West, and in Malaya genuine democracy has won a decisive victory over militant Communism.



Zoology students concentrate on a final examination in a new laboratory at the University of Singapore. Established in 1949, the school enrolls seventeen hundred students.

But that's by no means all. In the north are people of Thai ancestry. The thick central jungles of Malaya are inhabited by Negrito aborigines, and in the jungles to the northwest live the Sakais.

To the south, about historic Malacca, are dark-skinned descendants of Dutch and Portuguese settlers who came here in the 16th and 17th centuries.

"Unity in diversity" has been the vigorous young nation's slogan since it first won merdeka—independence—in 1957.

I saw diversity as I traveled Malaya's 50,700 square miles—from Penang and Kelantan in the north to Johore in the south—and I also found unity.

Take Lim, my student friend at the University of Malaya in Kuala Lumpur. His grandfather came from Canton, a starving coolie, but Lim's family now prospers in the tin business.

"Don't call me Chinese," Lim insisted as we talked one day. "Call me Malayan. This is where I belong. Indians, Chinese, Ceylonese, or Arabs—we're all Malayans now."

While many other newly independent nations have been racked by communal strife, Malaya has remained a model of peaceful coexistence. In a land roughly the size of England or Greece, Indian and Chinese live side by side in harmony, as their homelands recently have not.

The result? Today the standard of living in Malaya is among the highest in Asia.

"Don't say that the West won and the East lost," advised a Malayan journalist of Indian descent when I discussed the 12-year jungle war against Communist guerrillas with him. "Just say Malaya won." *

Malaya has a knack for coming out on top. And by Malaya I don't mean Malays alone. For Malays constitute only about half this peninsular nation's population of 7½ million. Most of the remainder are Chinese and Indians.

"And we mean to keep ahead," Prime Minister Abdul Rahman told me. "We've done all this ourselves. But we've a lot to do yet."

Like the Prime Minister, Kuala Lumpur, bustling capital of Malaya, exudes confidence—not just in itself, but in the future of the new Malaysia, whose gleaming new capital buildings jut from the city's skyline.

"Before World War II, this place was as

*See "Malaya Meets Its Emergency," by George W. Long, NATIONAL GEOGRAPHIC, February, 1953.

quiet as a village," an old resident told me. "Today we've even got traffic jams. But you won't find much of interest here. It's a very functional capital."

Functional, yes—but attractive, too. Blocked in by green hills on three sides, straddling a river, sprawling Kuala Lumpur scatters its new bungalow suburbs into tropical vegetation. And in the city's center I found new tall buildings—banks, government offices, low-cost apartments—beginning to crowd the skyline. New stadiums and modern hotels, beside the city's old Moorish-style architecture, complete the urban picture. "K. L.," as citizens of Malaya fondly call their boom child, is fast becoming a popular place for Southeast Asian conferences.

"We'll become the Washington of Malaysia," insist its forward-looking residents.

There is still a defeated but tough force of several hundred Communists sheltering in jungles of the north. But they're seldom mentioned now. Malaya is too secure in victory.

As the biggest exporter of both tin and natural rubber in the world, Malaya can afford confidence. But she can't afford to rely on the tricky demand of the world market for these products. Since independence, the country has encouraged new industry; in five years industrial production has doubled. And near Kuala Lumpur the large new satellite town of Petaling Jaya is testimony of Malaya's rising industrial status in Asia.

I climbed atop one of Petaling Jaya's tallest buildings. In the foreground was a multitude of factories. Beyond the town loomed tin dredges. Beyond those lay the vast rubber plantations which characterize Malaya's landscape. I had the story of Malayan economy at a glance.

Primitive Sakais now Go to College

The road north from Kuala Lumpur was broad and fast. I looked out on rice field and plantation, with jungle and mountain in the distance. Less than ten years before, I could not have traveled this highway without risking my life. Terrorist ambushes were frequent here. Almost every bend in the road had its own terrible tale.

A side road carried me up into the mountain spine of the Malay Peninsula, around precipitous slopes, past big new hydroelectric projects which will feed Malaya's new industry and take light to the remotest Malay *kampongs*, or villages. Finally I came to Cameron Highlands, nearly 5,000 feet up, where Malayans vacation in a temperate

Boy and girl ride to the movies through the gleaming dusk of Kuala Lumpur, where new buildings have risen to house Malaysia's government.

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Young Murut finds the world changing fast. His bamboo home in North Borneo shows a model airplane, a line of clothes—hitherto little worn by tribesmen—and pictures of Britain's Queen Elizabeth II.

climate—complete with blazing log fires in the cool evenings. Green golf links and Tudor-style buildings bring a touch of England to the jungle here.

But a short distance from the vacationers dwell the Sakais, an indigenous people of the Malay Peninsula. The plight of these long-neglected jungle folk was revealed dramatically during "the Emergency," as the bitter war against Communist terrorism is euphemistically called.

"Without the Emergency they might still have been forgotten," a welfare worker told me. "Many of them went over to work for the Communists as guides and porters."

I met some of these ex-terrorist guides and porters in the highlands. I found them living in a six-month-old settlement, still clearing the jungle for cultivation around their neat new homes. Once overworked and underpaid by landowners on highland tea plantations, today they are protected. Many have government jobs. Their children go to school, some to universities. Already the Sakais have produced some brilliant young scholars.

From the cool temperatures and rugged beauty of the highlands I went to the hot, flat Kinta Valley, greatest tin-bearing area in the world. The sun was dazzling on thousands of acres of white tin tailings where only patchy vegetation now grows. Here, 24 hours a day, seven days a week, tin ore is dragged and pumped, washed and panned from the earth.

Tin Dredges Rival Ocean-going Ships

I scrambled aboard one of the huge tin dredges which work the wealthy valley and which are often as large as ocean-going ships. From the top deck I counted 15 others within a couple of miles. The bulk of Malaya's tin production is alluvial; many deep ore deposits in the mountains have been worked out. But Malaya produces yearly some 60,000 tons of the finest tin, more than a third of the world's production (pages 744-5).

More than a third of the world's natural rubber, too, comes from this fertile, fingerlike projection of Asia, although the rubber tree is native to South America. Imported by way of London's Kew Gardens in 1877, the rubber tree soon flourished up and down Malaya. Then came the world boom in prices early in this century. Today 30 percent of the country's population is dependent upon the rubber industry.

Much of Malaya's tin and rubber finds its way to the world through the offshore island of Penang. I found its harbor at George Town jammed with small vessels from neighboring Sumatra and Thailand. Beyond rose the bulky shapes of visiting cruise ships, for Penang, a free port, is known to tourists for its charm.

Yet Penang disappointed me at first. In the blistering heat of day, I looked in vain for the island's famous appeal. Sweating tourists crowded the bustling bazaars in search of duty-free bargains (page 743). Even the white-sand beaches outside George Town seemed lackluster in the heat. Where was the dream-world Penang of which I'd heard?

I found it at last with dusk. Day only drives the real Penang into hiding. As the setting sun simmered on the sea, slim sampans and fat junks rose in silhouette off the palm-girt, surf-loud shore. Mists gathered on distant hills of the Malayan mainland.

Three races — a few of the peoples building a new nation—gather over teacups at a track meet in Jesselton, North Borneo. Referee E. O. Plunkett (left), a Briton, shares an umbrella with Sikh and Chinese sports enthusiasts. Shorts-clad Sikh at right, G. S. Kler, last year led North Borneo athletes to the Asian Games in Djakarta, Indonesia.

Father of federation, Tunku (Prince) Abdul Rahman guided planning of Malaysia while serving as Malaya's Prime Minister. At the signing of a federation agreement last July, he predicted: "There is going to be a happy Malaysia."

Age-old transport, the human back, moves vegetables to market amid motor traffic in Kuala Lumpur. United States flag flies from the embassy at right.

Blaring signs of a boom pervade George Town, a free port on Penang island, where tourists shop for duty-free bargains. Cars, bicycles, and trishaws parade beneath signs advertising English and Chinese shops.

George Town itself danced with light. Lanterns swayed on hundreds of small craft as tired seamen, their day finished, tumbled to their decks for rest. Hawkers and trishaws tinkled along narrow alleys.

Penang is one of the few places left in Asia where taking a trishaw is still safe enough to be comfortable. So take one I did, through the cool frangipani-scented streets of evening, past rows of old shuttered colonial homes that soon gave way to the flashing neon and busy traffic of 20th-century George Town.

I couldn't leave without visiting the temples for which the island is famous. Strangest of all is the snake temple. Drugged by incense, poisonous vipers drape themselves cozily on altars and rafters. These sacred reptiles have the run of the temple, descending at night to eat eggs left by worshipers.

From Penang I headed for the east coast in heed to oft-repeated advice:

"There you'll find the real Malaya. Our west coast is too European, too Chinese."

A Malayan Airways DC-3 took me across the rice-bowl state of Kedah, with its carpeting of paddy fields. Near the Thai border we flew over thick jungle that hides remnants of the once-menacing terrorist army. Hunted by troops, they are seldom seen.

"They're content to play a waiting game," a Eurasian editor explained.

Kelantan State—90 Percent Malay

Now, through thinning monsoon cloud, the DC-3 drifted down into Kelantan. This 90-percent Malay state prides itself on being the cradle of Malay culture.

Near Kota Bharu I visited coastal villages

Malayan treasure: not gems, but tin

LIKE A FORTY-NINER in the American West, a Chinese woman pans for metal in Malaya's Kinta Valley, earth's largest alluvial tin field. Though she barely ekes out a living, her nation reaps wealth as the world's biggest producer. Endless chain of buckets lifts ore-rich silt to a 5,000-ton floating dredge that washes out clay and gravel. Smelter workman on Penang (below) ladles liquid tin from a furnace. Hundred-pound ingots (opposite) bring about $100 each on the world market.

E.S.COY.LTD.
PENANG.

Spice of flirtation, sheen of brocades, and syncopation of drum and gong lend excitement to the *olek bandal*, a Malay harvest dance. Man at right improvises intricate steps that his partner must follow with variations of her own. This group performs in a paneled hall of the palace of Prince Sri Akar Raja at Kota Bharu, Malaya.

Children shriek as shadows depict the adventures of Prince Rama and his brother Laksamana (left), facing the demons of Maharaja Rawana. Leather figures, manipulated by a puppeteer behind the screen, serve as actors in this ancient drama, seen at Kota Bharu.

where fishermen in intricately painted craft ride out from palm-lined beaches with curious and beautiful names—Rhythm Beach and Beach of Passionate Love. I drove toward the sea under lowering monsoon clouds. A storm sent great waves smashing up long, empty beaches. Giant palms caught the wind's fury. Rain stung my face as I sought out the Malay fishermen of the east coast.

Landbound by the monsoon, the fishermen talked idly under their stilted beach cottages. Their painted boats rested forlorn on the sand.

"When the monsoon comes," one told me, "our livelihood goes. This sea—" he pointed to the raging water—"is no place for fish, let alone men."

At Kota Bharu I watched Kelantan's folk dancers recapture the magic of pre-Moslem Malaya with their *garong*, a classic court dance, and the *olek bandal*, a harvest dance to please the rice spirit (opposite).

Statistics told me that economically Kelantan was one of the poorest regions in Malaya. But northeast Kelantan is rich in culture, in tradition.

Rich Past Tints Malacca

Malacca, to the southwest, is rich in history. Here, in a square mile, is the story of Malaya, for Malays, Chinese, Portuguese, Dutch, and British all have left their mark on this most picturesque of Malaya's cities. Here Arab traders carried Islam into Malaya. And to Malacca in 1409 came Admiral Cheng-Ho, the Three-Jewel Eunuch, bearing gifts from the Emperor of China. Here, too, in 1511 came Affonso de Albuquerque of Portugal—bringing war. He made of Malacca a fortress which lasted more than 100 years. The Dutch followed, taking the city by storm in 1641, and then the British.

Yet, as I wandered the narrow streets of Malacca, I realized that it was the Portuguese who had won out in the end. Albuquerque's durable descendants still live in Malacca, speaking a patois no citizen of modern Portugal can understand. Many people I took to be Malay informed me they were of Portuguese ancestry.

Malacca caused me to reflect on the past. But Kuala Lumpur, whenever I returned, switched my thoughts to the future.

For 12 years Kuala Lumpur was headquarters for the fight against Communist revolution. Today it is the control center of a peaceful revolution. In a vast Operations Room, the nation's spectacular rural development and resettlement campaign is plotted

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Almond eyes, high cheek bones, and luxuriant black hair reflect the Chinese blood of a serene young dancer at Kota Bharu.

on huge flagged maps, as was the campaign against terrorism (page 736).

Throughout Malaya I found this new campaign in full swing. Landless farmers get government land and financial assistance for clearing and planting high-yield rubber. Fishermen buy new boats on government loans.

"It's all part of the same struggle," Prime Minister Abdul Rahman explained to me, taking time off from a hectic budget debate to discuss Malaya's future. I found him surprisingly large for a Malay, vigorous and plain-spoken, yet quick to laughter.

"Once the struggle was military," he said. "Now it's for the hearts and minds of the people. We are showing the people that democracy can give more than Communism could ever hope to give them.

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As morning mist fades, rubber trees near Kuala Lumpur drip latex into cups. Describing the scene, the author writes: "Sleepy-eyed plantation workers tumble out of their homes into the stillness of the night's final hour. The country rings with the clatter of collecting cans. Within minutes, the workers spread out through the forest to open the rubbery veins of the trees."

Like a rubber ball on the bounce, a blob of latex drops from a spout on a tree. Pale lifeblood of Malaya, latex provides a livelihood for 30 percent of the population and earns a third of the government's income.

Baled for shipment, slabs of rubber move to a ship in Singapore. Malaya supplies nearly 40 percent of the world's natural rubber.

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Threading knife-edged grass, aborigines train near Kuala Lumpur as members of a home-guard paramilitary force that fights remnants of the once-menacing Communist guerrillas.

Onetime haven from the Red terror, Fort Legap in northern Malaya now serves as a trading and educational center for aborigines. A small police force mans the post. The arcing flare signals the photographer's pilot to land on the short strip (left), near a helicopter parking circle and aviation gasoline shed. Isolated in a roadless jungle, Legap gets all its supplies by air.

"All the same, we can't live in splendid isolation," the Prime Minister continued. "On our doorstep we have Singapore, where Communism is strong. We also have a duty to help our brothers in the Borneo territories.

"My hope is that Malaysia, like Malaya, will remain linked to the West, while pursuing a generally independent role. We want to remain on good terms with all countries which respect democracy and the individual rights of man."

From Kuala Lumpur, it is only an hour's plane ride to Singapore, metropolis of Malaysia. There, a jet-stop tourist collapsed into a hotel chair opposite me, sighed, and mopped his sweating face. Parcels cascaded around him. I could guess the contents: silks, 24-hour tailored suits, perhaps a duty-free camera, maybe even some Chinese jade. Outside, the sun died spectacularly on hot, darkening Singapore. He leaned forward confidentially. "Boy," he breathed, "what a city. I haven't stopped spending all day."

Singapore, where all Asia meets, is a frantic world of its own. Its old name, Singapura, meant "city of the lion." Modern Singapore is the city of the fast dollar. It has always been a place to drive a good bargain. My tourist friend was the latest in a long line.

Marco Polo sailed past the 224-square-mile island in 1292, but didn't record its existence. A few years later, though, he couldn't have missed it, for it had become the site of a flourishing Malay kingdom that prospered on trade between the Middle East and Far East, and exacted tolls from traders between Malaya and Sumatra.

Singapura declined as Malacca flourished, and the swampy island languished for hundreds of years until a farsighted

young Englishman, Sir Stamford Raffles, founded a trading post on the site of the old kingdom in the early 19th century.

Singapore is still a trading post—slightly overgrown these days, with more than one and three-quarter million people on the island. Greatest in Southeast Asia, its port is among the busiest in the world.

I never tired of Singapore, its changing face, its changing color, from dawn till dawn. It's an inexhaustible treasure house of traditions, cultures, and religions—all of which blend in the character of the modern Singaporean.

This small island by the Strait of Malacca has welcomed waves of migrants from the Arabian Peninsula, Ceylon, India, Pakistan, China, and mainland Malaya. From Europe came Christian and Jew to add to the babel of languages and cultures. Within the Chinese community alone, as many as a dozen dialects are spoken. And the Indians may be Punjabi or Tamil, Bengali or Sikh.

Within the 30 square miles of Singapore city you'll find nearly any language, race, or culture you care to name. For example, one of Singapore's oldest churches is Armenian.

Frail Trishaw Dares Murderous Traffic

Teeming Singapore's traffic must be about the most terrifying in the world. I found that out on my first night when I made the near-fatal mistake of taking a trishaw through the city. After my driver, pedaling furiously, had hurled the frail trishaw across a thundering line of heavy, hooting vehicles, I called a stop and walked back to my hotel. But even as a cautious pedestrian, I had two close escapes, apart from witnessing a collision. Police make a huge harvest of smashed cars every night.

Overcrowding means frustration. And frustration, among other things, means young lovers hurling themselves hand in hand from high buildings rather than face the tyranny of unsympathetic families. Frustration, too, means gangsters—secret societies that flourish in the dim recesses of Chinatown. It means acid throwing, kidnaping, crimes of violence. It means strikes, bitter labor struggles. It also means Communism.

All this is Singapore, too—the darker side.

When the people of Singapore became internally independent of British rule in 1959, they elected brilliant lawyer Lee Kuan Yew and his left-wing People's Action Party to office. Splitting with pro-Communist allies, the new government gave itself quickly to the task of making life more tolerable in a city that always threatens to burst its seams.

Singapore Plans Its Survival

I saw vast new government-built housing estates rising on the outskirts of the city (page 762). I toured the proposed industrial center of Jurong, where government-helped industry should provide as many as 80,000 jobs for Singapore's multiplying unemployed. Elsewhere new industry is already pumping fresh life into Singapore's economy.

"We can no longer afford to rely only on trade," an official told me. "We must industrialize to survive in the modern world."

Within the city, life must be made more comfortable for hundreds of thousands of people who often live twelve to a room. To give the population more breathing space, the government has pushed ahead with a campaign to build community centers. At the end of 1962 there were 63 centers, many right in the heart of the city, serving the people for culture and recreation. At the end of this year there will be 190.

Believing the future of the island depends on union with mainland Malaya, to which Singapore is linked by a three-quarter-mile causeway, the government fought opposition from both Communists and conservative Chinese. The Ministry of Culture, with its emphasis on racial harmony, has been headquarters of the dramatic battle for Malaysia.

"We use everything in our power to create a Malaysian consciousness," the Minister of Culture, Mr. S. Rajaratnam, told me. "We've used radio, cultural evenings, community projects. We plan to use television too."

Singapore's televiewers will eventually have the choice of an identical program on four channels, each in a different language.

"Kuala Lumpur might be the Washington of Malaysia, but Singapore will be its New York—and its Paris," Mr. Rajaratnam said.

(Continued on page 758)

Man, not machine, labors in making batik at Kota Bharu. This artisan stamps designs on cotton cloth. Wax coatings protect patterns during the dyeing process. The colorful material goes into the making of sarongs.

New green and old, waving from fields of rice, reflect plants in various stages of maturity. Mother and youngsters on a dike near Kota Bharu set out to transplant seedlings.

European and Chinese partners delight in the twist, an American dance, at a private party in a Singapore home.

Singapore's Teeming Maze Lies at an Asian Crossroads

"If no untimely fate awaits it, [Singapore] promises to become the emporium and the pride of the East," wrote Sir Stamford Raffles after he leased the nearly uninhabited island in 1819.

The city's British founder proved prophetic. Situated at the tip of the Asian mainland, Singapore was hard for ships to avoid, and few did. Soon it drew a host of Malays, Chinese, Indians, Javanese, Ceylonese, Eurasians, and Europeans. City and free port grew rich on trade.

Here, like so many waterbugs, hundreds of sampans cluster in Singapore River as ocean-going freighters anchor in the harbor's inner and outer roads.

Banks, shipping firms, insurance offices, and department stores ring Raffles Place, a one-time swamp at upper center. Clock tower at left tops Victoria Memorial Hall and Theatre.

Skirts lifted, an elderly Indian dashes across a rain-slick Singapore street

Union with Malaysia is a must for Singapore, according to the city's more farsighted citizens. One of these, an outstanding Chinese lawyer, explained it to me as we sat in a food-stall, dipping our sticks of *satay*—Malaya's kebab-style national dish of skewered meat—into hot peanut sauce.

"One and three-quarter million people on one tiny island," he said, "and most of us Chinese. Malaya couldn't absorb us on her own without upsetting racial balances. Yet left to ourselves we might go Communist. So the only answer is Malaysia—a bigger framework, politically and economically."

Economically and geographically, Singapore will become the natural hub of Malaysia. Prime Minister Lee Kuan Yew expressed high hopes when he welcomed me into his office high above the crowded port.

"In the long run, all the towns and cities within Malaysia will probably lose their predominantly Chinese character," he said. "Singapore will be no exception. That's when the true Malaysian identity will arise."

I asked Prime Minister Lee if his left-wing government had difficulty in making common cause with the right-wing government of the Federation of Malaya. His reply was blunt: "In a sense Malaysia is beyond ordinary party politics. The question isn't one of socialism or capitalism. No, in Asia today the question is one of survival. Together we can survive. Divided we can only perish."

He looked out his window at the dark monsoon clouds drifting in from the South China Sea. Across that storied sea I went—to Sarawak, land of the White Rajas, for this, too, was preparing to become Malaysia.

First White Raja Comes to Sarawak

In 1839 an adventurous young Englishman came ashore from a stormy sea near Cape Datu on the west coast of Borneo (map, pages 766-7). Thirty-six-year-old James Brooke was to change the entire map of Borneo—world's third largest island, after Greenland and New Guinea—before his lifetime was over. He was also to found one of history's most remarkable personal dynasties.

In return for services rendered the once-mighty but declining Sultanate of Brunei, Brooke received an extraordinary gift—the province of Sarawak.

Yet anyone might have been pardoned for looking this gift horse in the mouth. The region then known as Sarawak was as wild and primitive as anything the world has known. Inland there were savage head-hunters. Offshore there were murderous pirates.

But for James Brooke there was no hesitation. He became the first of the three White Rajas—all Brookes—who, as enlightened despots, were to rule Sarawak for 100 years.

In the Sarawak I saw, the White Rajas have gone forever. In 1946 Raja Sir Charles Vyner Brooke ceded the territory to the British Crown and retired to England, where he died May 9, 1963. Yet I found it impossible to escape the White Rajas, and the ghost of James Brooke, in modern Sarawak.

Rivers Snake Through Borneo Jungle

I had dozed on the early-morning flight across the South China Sea from Singapore, for the plane flew most of the way in dense monsoon cloud. I waked to find the Borneo coast magically beneath me.

Rivers. And more rivers. And jungle, as far as I could see. The rivers, huge and mud-colored and sluggish, were looped like fantastic reptiles through swamp and jungle.

Rivers are vital in Sarawak. In this largely roadless territory, they are often the only highways. Towns rise at their junctions.

Now the glint of corrugated-iron rooftops drew my eye to Chinese farms and Land Dyak longhouses in jungle clearings. Buildings began to multiply. So did cultivation—stripped hillsides planted with dry rice.

We lost height. Then Kuching, capital of Sarawak, appeared below.

No one warned me I might find strange beauty in Kuching. People simply said I might find it quiet; too quiet. Yet no town or city in all Malaysia appealed to me more.

Kuching is still an old river city of the East, something out of the pages of Joseph Conrad or Somerset Maugham; the 19th century is stamped heavily upon its character. Its 60,000 residents are mainly Chinese and Malay, with a sprinkling of urbanized tribesmen.

Quiet? "People here go to bed at nine o'clock every night," growled an old-time English resident as he took his brandy nightcap in my hotel. "There aren't any nightclubs here."

Dusk brings mystery to Kuching, a swift return to the past. Ferry lights twinkle on the slow, muddy water. A cannon booms every evening at eight, a tradition dating from the time of the White Rajas, to shatter the thickening silence of the surrounding jungle. There

Plucked pigeon hangs high, last in a Singapore merchant's display. Chinese characters advertise raw fish with a flavorful paste of rice: a big portion, 17 cents (U.S.).

KODACHROME © N.G.S.

什錦魚生粥
三角

Feast in a bowl keeps chopsticks flying. Ingredients: boiled noodles flavored with prawns, vegetables, and spices. This youngster eats at Singapore's Chinese food market, where shoppers can buy anything from a flying fox to a python still writhing on a meat hook.

Mouth-watering aroma of *satay*—spicy bits of beef or lamb—rises from a charcoal cooker on Bugis Street. Each bite skewered on a stick, satay comes with rice cakes, cucumbers, and peanut curry sauce. Customers pay according to the number of sticks held at meal's end.

is the dying note of a martial bugle call. Lights flicker among the Malay kampongs near the Astana, once the palace of the Brooke rajas.

I soon stepped out of the past and into the 20th century—as Sarawak itself has done in the past 20 years. In their genuine anxiety to protect the indigenous people of Sarawak—even against education—the Brookes had held back progress.

"Sarawak's change has been abrupt," said Information Officer Alastair Morrison, a Peking-born Englishman who has always had his heart in Asia. "And we've been gathering pace year by year. Of course the first political parties have sprung up only in the past few years, and political leadership is still in the emergent stage.

"But education has been widespread since the war. Malaria has been elim-

Pungent tang of dishes in Chinese

inated throughout Sarawak. Education and health—these things have come first. Now it's politics. Naturally Malaysia is going to pull Sarawak into the modern world even faster."

But real change will come slowly across Sarawak's 48,342 square miles, about the area of Louisiana. There isn't any quick way to prosperity for the territory's 790,000 people, many of whom live barely above the subsistence level. Mineral-poor and only patchily fertile, this land of swamp and river and jungle has only its agriculture—often still primitive—as a mainstay of the economy.

Land; food; life. These words, I soon discovered, are synonymous in Sarawak. The shotgun has brought quick destruction to much of the wildlife in this thick strip of Borneo; game is no longer plentiful, and the struggle

Tempting tropical fruits brighten the dessert table in a Singapore cafe. With a center of mandarin oranges, the spread includes pineapples, muskmelons, pomegranates, glazed carambolas and plums, soursops, and papayas.

and Malay cuisines lures customers to foodstalls. Many take courses from a variety of shops

KODACHROMES AND EKTACHROME (OPPOSITE, UPPER) BY NATIONAL GEOGRAPHIC PHOTOGRAPHER WINFIELD PARKS © N.G.S.

Singapore's low-cost apartments, each with a balcony, represent a victory in the "battle against squalor," according to the city-state's Prime Minister, Lee Kuan Yew (opposite, lower). An ambitious five-year public housing program completes an apartment every 45 minutes. A new three-room flat rents for as little as $20 a month.

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

for food has become sharper in recent years. Jungle has been recklessly burned for the planting of hillsides, and the soil is quickly exhausted.

Meanwhile, with good health, the handsome, sad-eyed population increases apace.

"What's the answer?" I asked the British Director of Agriculture.

He gave me not one but a dozen answers, among them better use of existing land; better cash crops, such as rubber and pepper; the search for new land. With substantial funds from various sources, his department has embarked on a crash program.

High on the priority list is the building of fish ponds to provide a better diet for protein-hungry longhouse dwellers. Other projects include importation of hundreds of water buffaloes from North Borneo and dispatch of farmers to Malaya for agricultural training.

Gentle People Flee Violent Coast

I soon saw these tribesmen for myself as I bumped along in a Land-Rover that took me from Kuching into the heart of the Land Dyak country.*

Land Dyaks are perhaps the most peaceable and gentle of all Borneo's peoples; they took heads only in self-defense. Long ago they retreated to inland fastnesses of southern Sarawak, leaving the coast to the warlike Ibans, or Sea Dyaks, of the north.

My driver parked our vehicle outside a mission school filled with young, healthy Land Dyak children. Then we took to the jungle afoot. The track wound, dipped, and climbed. Behind my agile Land Dyak guide I swayed uneasily over narrow bamboo bridges.

At last, fresh but meager cultivation began to break in upon the steamy jungle scene: wet paddy and sago in swamps, dry paddy and tapioca on burned-off hillsides.

Beside the fields were pagan shrines, where offerings were placed to appease evil spirits at rice planting time.

"Many of us are Christian now," remarked my young guide as we rested at a point on

*See "Jungle Journeys in Sarawak," by Hedda Morrison, NATIONAL GEOGRAPHIC, May, 1956

Silken elegance of hand-loomed fabric may be purchased at a shop in the Raffles Hotel courtyard.

Barefoot artist Chen Wen-Hsi demonstrates finger-painting technique in his Singapore studio.

Festive Chinese lions cavort and firecrackers pop as Prime Minister Lee arrives at a Singapore housing development to dedicate another government clinic.

the trail specially prepared for travelers like ourselves. There was a rough-hewn wooden seat and even a traditional pipe for the pleasure of the weary walker—and also for the use of any spirits, evil or otherwise, who happen to be passing.

"But as you see," added Lawrence, "many of my people still keep to the old ways."

After more than an hour's walk, we came to our goal, a Land Dyak longhouse. Terraced, it stretched up a hill as far as I could see, then dipped and wound snakelike into jungle on the other side. It was home to more than 70 families.

Stilts kept it high off the ground. Underneath, pigs rooted and chickens clucked. Women pounded rice on the veranda above; men repaired their fish nets.

A ringing bell sent children scattering from their tiny school. They tumbled down the longhouse terraces to their family entrances.

Cities Lure Dyaks From Longhouse

I wondered about the children. What would happen to them, after education? "Do they want to leave the longhouse?" I asked Lawrence. He frowned. Plainly the subject was a painful one.

"Yes," he said at last. "I'm afraid they do. Education makes them restless. Life in the longhouse, work on the land—these things no longer seem enough for them. It's a problem. There aren't many jobs in the towns. And the country must depend on agriculture. I don't know the answer."

Shy but hospitable, the longhouse families guided me into their cool, dim dwelling places beyond individual doors, offered me food and drink, and talked of their lives.

Their poverty was plain; their staple diet rice and whatever vegetables, fish, or meat they could add. Yet they did not complain.

"We manage," said a young Dyak, summing up their attitude. "We have less sickness now, and some of our children go to school."

"Will Malaysia make any difference to you?" I asked.

"Malaysia?" He examined the word wonderingly. "Malaysia?"

He had never heard of it. For him, Sarawak was the world.

After I had explained, he asked wistfully, "Do you think it will mean a better life?"

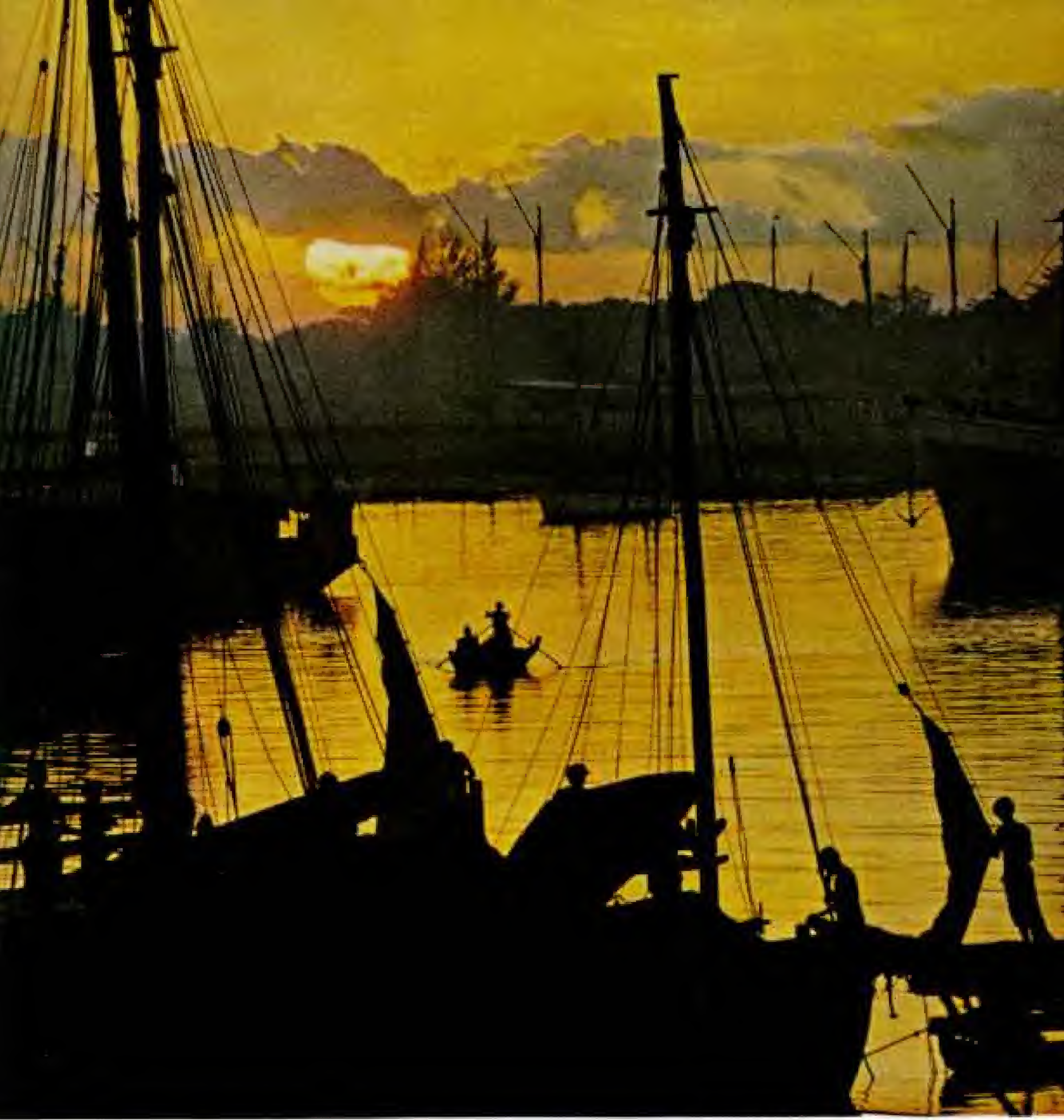
Land; food; life. I had begun to see how desperate was the struggle for mere existence among the remoter peoples of Sarawak.

Back in Kuching I was joined by NATIONAL GEOGRAPHIC staff photographer Winfield Parks, and together we flew up to Sibu, main center for nearly half of Sarawak's land area and a third of its population.

On Sibu's busy wharves, near the mouth of the great Rajang River, we saw our first Ibans —the original "wild men from Borneo." Also called Sea Dyaks, because of their pirate past, they are people of magnificent physique. Older men still boast elaborate tattoos and wear rings in distended ear lobes (page 737).

Numbering about a quarter-million, the Ibans constitute the biggest single racial group in Sarawak. Proud and self-confident, they are today the most politically advanced and knowledgeable of all Borneo's indigenous peoples.

Dawn awakens Singapore's harbor. Sails



KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

run up the masts of a Chinese coastal freighter preparing to ride the wind to Indonesia

This I discovered when we traveled almost 100 miles up the Rajang into Iban territory. We took a speedboat which dodged floating logs and debris of the turbulent river.

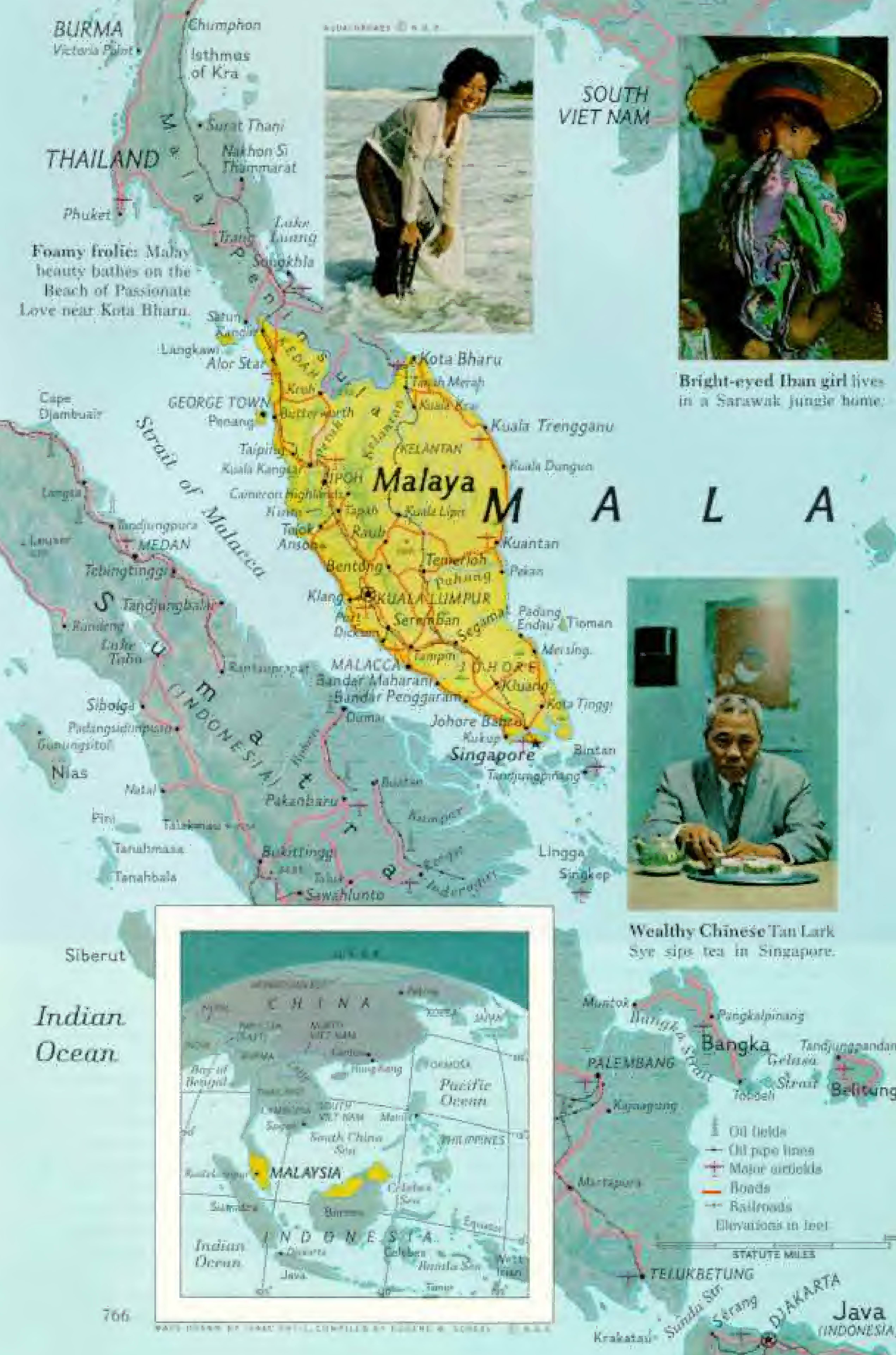
We passed Iban longhouses at riverside, where women and children washed and swam. The Ibans' love of water is legend. Skilled boatmen and powerful swimmers, they once even settled longhouse disputes by water: The man who stayed under longer had right on his side.

Few of the Iban longboats we saw were paddled. Once the standing of an Iban was measured by the number of human heads he had taken. Nowadays it can be measured by horsepower—the size of his *prau's* outboard.

Jungle tightened its grip on the banks, and we came at last to Kapit, which grew around a fort built by the second Brooke raja in 1880 to suppress Iban head-hunting. The old wooden fort now houses government offices.

With its multitude of Chinese merchants and narrow muddy streets, Kapit is shopping center for nearly 40,000 Ibans, Kayans, and Kenyahs. To drowsing Chinese coffee shops, their tattooed flesh and dangling all-purpose machetes, called *parangs*, brought a dramatic touch of old Borneo.

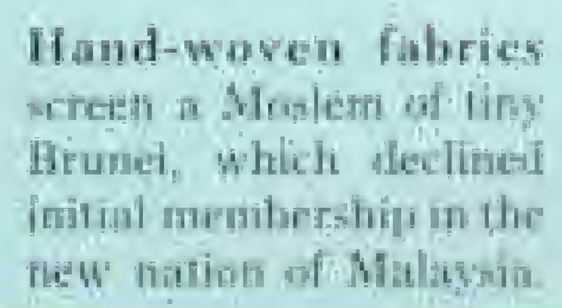
I talked with many Ibans in the coffee shops of Kapit, and Malaysia was the No. 1



Foamy frolic: Malay beauty bathes on the Beach of Passionate Love near Kota Bharu.

Bright-eyed Iban girl lives in a Sarawak jungle home.

Wealthy Chinese Tan Lark Sye sips tea in Singapore.



Hand-woven fabrics screen a Moslem of tiny Brunei, which declined initial membership in the new nation of Malaysia.

Bananas go to market in hat-like baskets in North Borneo.

Malaysia plan unites Malaya, Singapore, Sarawak, and North Borneo

All were formerly British territories. Under the leadership of Malaya—independent since 1957—they signed an agreement on July 9, 1963, to band together in a federation. They set August 31, 1963, as the birth date for the new nation, to be called Malaysia, but neighboring Indonesia and the Philippines won agreement to delay its formation pending a United Nations report on whether the union fulfilled the wishes of the people of Sarawak, a British protectorate, and North Borneo, or Sabah, a Crown colony.

AREA: 130,000 square miles. **POPULATION:** 11,000,000 Malays, Chinese, Indians, Pakistanis, Ceylonese, aborigines. **LANGUAGE:** Malay, Chinese, Tamil, Urdu, Ceylonese, many dialects. English taught in schools and widely spoken. **RELIGIONS:** Moslem, Buddhist, Hindu, Christian, animist. **ECONOMY:** Leads world in tin and natural rubber production. Also has oil, iron, timber, copra, palm oil, rice, pineapples. **MAJOR CITIES:** Singapore (pop 1,023,700), key port in Southeast Asia, has extensive trade in tin, rubber, manufactures; Kuala Lumpur (pop. 350,000), capital of Malaya and of the new Malaysia; Kuching (pop. 60,000), capital of Sarawak, and Jesselton (pop. 21,700), capital of North Borneo. **CLIMATE:** tropical; average high temperature 88° F., low 74° F., average mean 81° F.; cooler in mountains; heavy rains during April-July and September-November monsoons in Malaya; peak rains during October-January along Borneo's wet north coasts.

topic. Ibans accept the idea, with reservations.

"We hope for the best," they told me. "For faster progress, more schools, and a better life for our children. Malaysia will mean unity. And unity means strength."

But often they patted a lethal parang and added something like this: "Remember, in Malaysia or out, we Ibans never take an insult lying down." Eyes flashed. "We're always ready to fight."

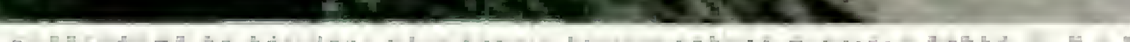
From Kapit we journeyed to Iban longhouses, and soon found that the day of hanging human skulls as trophies in the longhouse is past (page 771). Head-hunting was eventually suppressed by the White Rajas, though the Ibans gave themselves willingly to their old occupation again in guerrilla warfare waged against the Japanese invaders of World War II.

The vanished skulls, now almost all removed and buried at the urging of Christian missionaries, symbolize the passing of the old Iban. Thousands of Iban children are working their way through schools throughout Sara-

PAINTING BY SIR FRANCIS GRANT

Rich adventurer James Brooke set sail from England in 1838 with the aim of bringing civilization to the Malay Archipelago. He became the first White Raja of Sarawak after helping the Sultanate of Brunei subdue a revolt. Brooke's nephew and the latter's son succeeded him. Each worked to develop Sarawak's trade and give its people benevolent government. In 1941 the last White Raja, Sir Charles Vyner Brooke, gave his subjects a new constitution and after World War II ceded the war-impoverished land to Great Britain. He died in London in May, 1963.

Winding mirror in a green tangle, Sarawak's Kanowit River, east of Sibu, is highway and home to many. Here Chinese women draw water and clean vegetables.



KODACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER WINFIELD PARKS © N.G.S.

wak. Others study at colleges in the United States, Britain, Australia, and New Zealand.

At remote longhouse Rumah Buja, the old men with long memories insisted that we were their first Western visitors.

"Stay as long as you like," they urged. But there was much of Malaysia ahead. We waved them farewell and turned our boat downriver, riding the current to Sibu.

Sarawak itself is riding a current. The swift current of progress bears sons and daughters of head-hunters right into the 20th century.

From Sarawak I went to North Borneo, which now prefers to call itself Sabah. At Tawau, a mushrooming boomtown, I stood on the docks and looked into the hungry face of Southeast Asia. The Celebes Sea lapped below me, and across the harbor rose the jungle-clad hills of Indonesia (map, page 767).

The water seethed with small craft from Indonesia or the Philippines. The boats were alive with people, dark bodies swarming like bees in a hive—traders and immigrants.

Many of the traders were certainly smug-

Hospitable Ibans, or Sea Dyaks, in a longhouse on Sarawak's Rajang River spread rice wine and cakes for visitors, author Maurice Shadbolt (center) and NATIONAL GEOGRAPHIC photographer Winfield Parks (right). Once fierce warriors, these people now have one foot in the 20th century, as the sewing machine and radio reveal. But older women still go bare to the waist, and men wear elaborate tattoos.

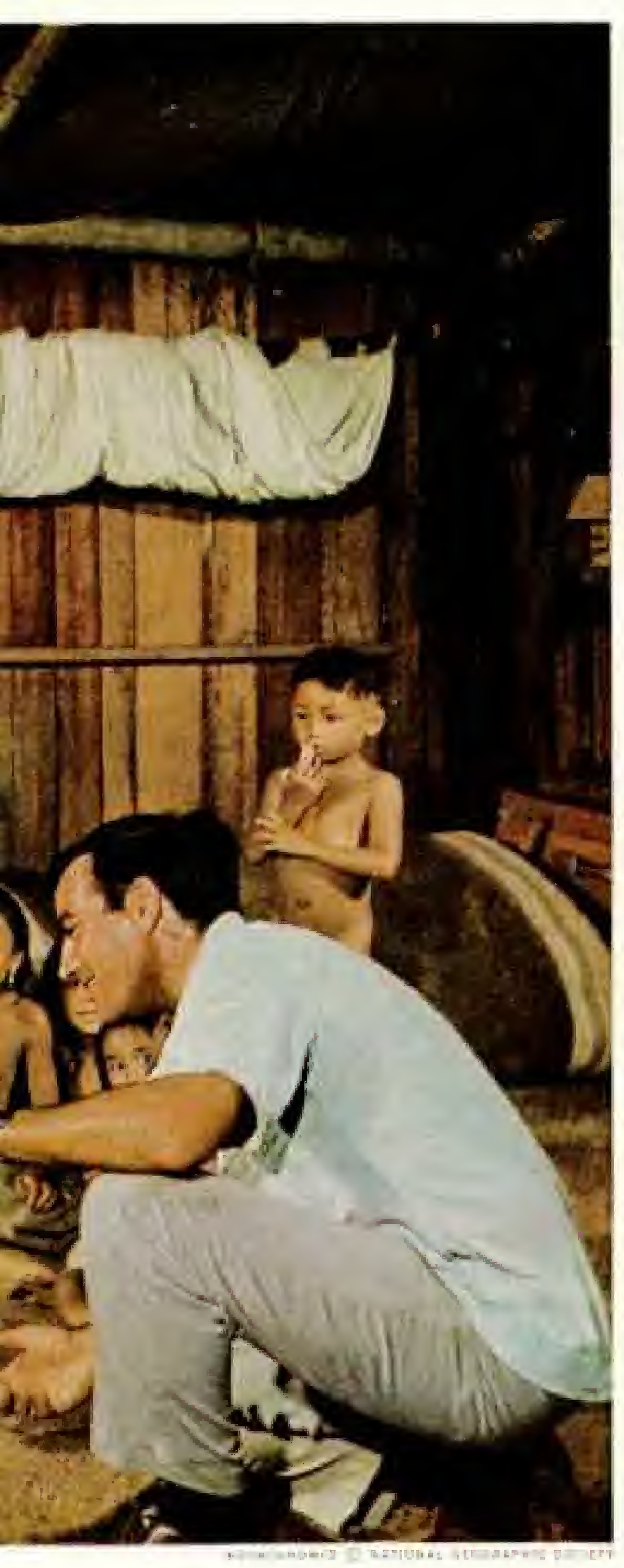
glers. And some were probably pirates. But it was the immigrants who claimed my attention—their lean bodies, thin faces, sad eyes. From as far as Timor, a month's journey, they had sailed to the promised land of Sabah.

Often they are lucky and find a job and don't have to face the long voyage home on a pirate-ridden sea. For flourishing North Borneo has room for more than its half a million population. Thousands of desperate immigrants pour each year through Sandakan and Tawau, twin boomtowns of North Borneo's expanding frontier. If they find work within two weeks, they may win permits to stay.

Why do they come? "A man can get a fair day's pay for a fair day's work," one immigrant told me.

"And there is no corruption," another said.

Tawau's bustle typifies North Borneo, one of the hardest hit regions of World War II.



KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Human skulls, treasured relics from the past, hang from a roof beam in the Rajang River longhouse. Newest one is that of a Japanese soldier who invaded Sarawak during World War II. Because of the influence of Christian missionaries, most trophies of this kind have been buried.

Pensive daughter of a former head-hunter peers from a longhouse window. Sling across the shoulder usually serves in holding a baby on her back; the cloth bunched in front keeps it from cutting.

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

After the war, North Borneo began all over again by becoming a British Crown colony. Before that it had been administered by a British-based chartered company.

The capital of this 29,388-square-mile territory, about the size of Ireland, is Jesselton, beside the South China Sea. While Japanese forces occupied the town during World War II, it was hit hard by Allied bombers, and Australian troops found it a complete ruin when they arrived in 1945. Today Jesselton, double its prewar size with more than 20,000 population, is a bright, clean, modern town.

Many reminders of war remain. At a Murut village in the Borneo interior, I was intrigued by the local school bell—the shell of a 500-pound bomb. I asked headman John Tingkalor about it.

"An American plane dropped it across the river," he said. "It didn't explode."

"But how did you get it?" I persisted. "Who defused the bomb?"

"I did," he said proudly. "I knocked the fuse off with my ax." He slapped the grotesque school bell affectionately. "I took out the explosive with my hands and used it for fishing. I caught a lot of fish."

Agriculturally prosperous, economically secure, North Borneo was ready for bigger things. The territory's new political parties unanimously backed the Malaysian ideal.

At a Jesselton sports meeting, I met the plump, vigorous leader of the pro-Malaysian Sabah Alliance Party, Donald Stephens, a Dusun despite his English name.

"There's no alternative to Malaysia for us," he said. "With understanding on all sides, among all races, we can make Malaysia work."

North Borneo is already a model of racial harmony. There has never been hostility toward the immigrant Chinese who make up a quarter of the population. Rather, Chinese immigration has been encouraged—with controls, of course—making North Borneo unusual among the world's lands.

Through fertile valleys we traveled up the west coast from Jesselton. In early morning light we glimpsed 13,455-foot Mount Kinabalu, sacred to the pagan Dusuns of North Borneo (page 783).

Until recent times no one scaled Kinabalu without the assistance of a pagan priest. I heard chilling stories about European climbers who had met disaster after failing to propitiate the spirits who dwell on the mountain by making the proper offering—seven slain chickens and seven eggs.

Following the tortuous road to Kota Belud, we passed many Dusun and Bajau women bearing baskets of produce on their heads. Children rode plodding water buffaloes. Like us, they were bound for Kota Belud's famous Sunday *tamu*, or market (pages 778-9).

Snake Charming Boosts Sales

Under shady trees by the Tempasuk River the tamu was already well under way. I was quickly lost, dazed by color. An Indian medicine man charmed cobras and hawked his products on the side. Traditionally dressed Dusun girls, with wide, melancholy eyes, watched him with awe.

The black cap of Islam spotted the crowd, for the Moslem Bajaus, onetime pirates, predominate on this part of the Borneo coast. Legend says they're originally from Malaya, descendants of sailors who were to have carried a princess to wed a Sulu sultan in the Philippines. Somehow they lost the princess en route, and wisely decided it was safer not to return home to Malaya.

Puffing a roll-your-own cigarette on the rattan mat of his Rajang River longhouse, a tattooed Iban seems lost in memories of a time when his forebears, the original "wild men of Borneo," set out in 100-man war canoes and raided for heads. Today young Ibans migrate to cities for higher education.

Supermarket in Sarawak offers the world's goods, including many American products. Only such market in Sibu, bustling Rajang River port, the store crowds its stock into a 30-by-40-foot space. This housewife inspects the candy selection near the checkout counter.

Not pain but vanity brings an Iban to the chair of a Chinese dentist in Kapit, Sarawak. Man at right proudly displays fashionable gold caps on his teeth.

But the handsome Dusun people constitute North Borneo's biggest indigenous group. Sometimes also called Kadazans—a name in favor with educated Dusuns like Donald Stephens—they're to be found on the east and west coasts and in the interior, too.

I met some in the Christian village of Penampang, south of Jesselton, and was persuaded to join them in the *samazau*, an intricate dance from their pagan past. My legs soon ached with the slow, stilted throb of the drums, and I collapsed into a chair.

"Do you know the meaning of the dance?" one of my hosts asked. He smiled. "You have danced the role of victor in battle. You've returned to the longhouse with human heads."

But I felt a victim rather than a victor. For years the hill people of the interior have posed a major problem for administrators. The jungle-dwelling Muruts—the great hunters and trackers of Borneo—took refuge in the hills long ago. Stricken with disease, they also starved in bad seasons. Their numbers were dwindling, and most of their womenfolk were becoming sterile. The Muruts seemed near total extinction as a race.

How to save them?

Land was the answer; better land. In North Borneo there's no shortage. But it needs clearing and irrigation. The administration had to act, so that the hill people could help themselves.

Ten years ago the first small group of tribesmen was encouraged to come down into the Keningau valley. They got financial help while they broke in the new land. The British,

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

"**Brunei's great mosque** dominates the town," author Shadbolt says. "Wherever I went, I was always within sight of it.

"'Ah,' Brunei friends said, 'but you should see it during festivals. We illuminate it beautifully.'

"'Any festivals coming up?' I asked hopefully.

"'No. Not just now.' Then their faces brightened. 'But we'll illuminate it specially for you tonight—for NATIONAL GEOGRAPHIC.'"

And they did (above).

Hands up, a Brunei rebel marches ahead of police during the revolt of December, 1962. Indonesian agitators encouraged the revolutionists in the hope of keeping Brunei out of the proposed federation of Malaysia.

meanwhile, sped ahead with a great irrigation scheme to water the valley. More tribesmen followed the next year. And the next. Today 600 onetime hill families prosper on 85,000 fertile acres, and Keningau's resettlement scheme is an example to all North Borneo. Others are under way.

"We no longer have malaria," one Murut leader told me. "And you can see for yourself our womenfolk are no longer sterile. Our children overcrowd the schools" (page 780).

Death Houses Gay With Flags

Of all Borneo's peoples, I found the Muruts the most intriguing. Loving life and respecting death in their own way, most Muruts are still animists, worshiping spirits of the soil, the jungle, the rivers.

Their vitality is best expressed on the *lansaran*, a kind of great trampoline found in every Murut village. Well-fueled with *tapai*, the local rice wine, Murut warriors sing, dance, and leap all evening on a lansaran in celebration of almost anything. The authorities overlook the making of tapai, for they say it's a rich source of vitamin B.

The Muruts' respect for the mystery of death shows colorfully in their strange death houses—gay with flags—which I saw everywhere in the interior. Each corpse has a separate dwelling, with implements, knives, perhaps a blowpipe, for use in afterlife.

Still tasting the dry-season dust of the interior, I boarded a railcar for Jesselton. From the time I arrived in the territory, people had urged that I ride their railway linking the interior with the coast. I put it down to local pride; after all, this is the only line in all Borneo. Now I understand their insistence. The 86-mile journey encompasses some of the most magnificent river and mountain scenery in the country, with a flavor all its own.

Speeding along at all of 25 miles an hour, we often had to slow for pedestrian traffic—children hiking from school, Muruts returning from the hunt with blowpipes and shotguns. Sometimes lazy water buffaloes had taken up occupation of the track and had to be driven off by repeated toots of the horn.

At Jesselton the pace picked up as I switched to one of the DC-3's linking the west coast with the east. A coast-to-coast road, scheduled for completion in 1965, will end this reliance on aircraft, besides giving access to thousands of miles of rich virgin land.

Basket-weaving Murut mother and child find health and hope for a better life in a new home near Keningau, North Borneo. Before resettlement, many of the mountain-dwelling Muruts were thin, sickly, and malarial.

As the DC-3 followed the east coast, I glimpsed the vast jungles which are North Borneo's greatest natural asset.

I hadn't been in Tawau an hour before I ran into a typical fast-talking timber man, the manager of a British company.

"Welcome to the Texas of Borneo," he said. "Whatever the rest of Borneo's got, we've got, too—bigger and better."

A launch took me upriver, past lumber ships loading for Japan, Hong Kong, Australia, past long log rafts on their way down.

The sky grew heavy as we traveled through a maze of swampland. Sudden sharp rain pierced the turgid skin of the river. The world grew dark, and fitful flashes of lightning lit the huge ferns of the swamp.

Who could inhabit this wilderness, this dismal landscape fit only for crocodiles?

I soon had an answer. Lights began to flicker like multiplying fireflies up ahead.

Whisper of wind in coconut palm, swish of water against pilings, shuffle of feet on a dirt road: These are sounds of Mengkabong, a village of Bajau people near Tuaran, North Borneo. Cool, mosquito-free homes ride stilts above the water, dugout canoes tie up beneath them at night. Metal-roofed mosque stands on the island at center.

KODACHROME (OPPOSITE) AND EKTACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER WINFIELD PARKS © N.G.S.

Soon I was looking in astonishment at a busy town—Kalabakan, North Borneo's biggest lumber settlement. Dai Rees, manager of the Bombay Burmah Trading Corporation's concession here, met me on the wharf.

"Welcome," he said. "We've got people of 20 different nationalities in this place. Including one Welshman. That's me."

We went deep into the jungle to see his men at work. Nimble Filipinos, who delight in their skill, scrambled aloft to top tall hardwoods—*serayas*, *kerungs*, and others marketed as "Philippine mahogany" (page 782).

Iban axmen from Sarawak moved in for the felling. As the tree began to sway, the first axman jumped clear. The second delivered a swift coup de grâce and bounded away too. The jungle giant fell with a nuclear roar, and yet another tree had begun its long journey to the plywood mills of the world.

It's hard to escape talk of piracy on this east coast. Remote Kalabakan was no exception. Five years ago the entire settlement was taken over by a well-organized team of pirates who escaped with more than $5,000.

Her wares displayed on bark and leaf, a vendor at Kota Belud, North Borneo, watches the crowd from her seat on a *bongon*, a tree-bark basket worn like a rucksack when she carries produce.

Sunday market at Kota Belud offers a harvest from home industries: woven baskets, hand-loomed cloth, dried fish, fried cakes, and vegetables.

Wonder of learning makes eager scholars of Murut boys in a village school near Tenom, North Borneo. Their rough plank bench, set on a dirt floor, doubles as a writing desk.

The docks at Tawau hum with intrigue. The town itself thrives on the barter trade, and the traders are natural targets for the pirates who fan out from the Sulu Archipelago in the Philippines.

Kumpits and *padangkangs*—small trading craft of this coast—arrive with copra and other produce from Indonesia and the Philippines; they take out cigarettes and manufactured goods in exchange. Often returning traders smuggle goods into their home countries, avoiding their own customs patrol boats.

And avoiding pirates, too. If they can.

Hijacking and murder can be an everyday affair on this coast. A kumpit and cargo will vanish overnight—with no member of the crew left alive to tell what happened. Lately the pirates have grown more daring and have made savage raids ashore. They are hard to identify; many pose as legitimate traders, who customarily carry arms for self-defense.

In Tawau police headquarters I looked over a grim collection of captured pirate weapons and an even grimmer collection of photographs which showed how pirates had slaughtered peaceable villagers near Tawau only a few months before. The victims' hands were tied behind their backs, and they were blasted down by shotgun and submachine gun at close range. Among them were two small children, murdered beside their parents.

The murderers were known, but not yet caught. The coast seethed with indignation.

"There's no room for British justice here," one wealthy Chinese businessman told me. "These vermin should be killed as soon as they're caught."

It takes resolute men to hunt down the pirates of the Celebes and Sulu Seas. I watched as a heavily armed police patrol boat, disguised as a trader's kumpit, headed out from Tawau to decoy pirates. I met Gurkhas and Queen's Own Highlanders serving on coastal patrols; their presence deters shore raids (opposite). The Royal Navy also carries the offensive to the pirates.

"But it's not something that can be eliminated in a day—or a year," Terrence Estrop, Tawau's assistant police superintendent, informed me. "Our antipiracy campaign has produced results. But it's an uphill fight. Piracy is traditional on this coast. The pirates

often know no other way of life. Their fathers and grandfathers were pirates before them."

And finally we come to Brunei, coyest of the lands tapped for membership in Malaysia. She declined to join initially, despite the fact that otherwise this Delaware-size state would be but a minute enclave in the midst of the big new nation (map, pages 766-7).

"If you want to tell the story of Brunei," said the smiling British oilman, "you'd better take a photograph of a hundred million Malayan dollars."

That was Brunei's income from oil in a single year—close to 35 million American dollars for 85,000 people.

All Brunei's recent history is summed up in the one magic word: oil. The earth's black treasure has built schools and hospitals, highways and mosques, in this venerable, British-protected sultanate. Oil has meant pensions, education, and free medical care for citizens in one of Asia's tiniest states.

"Asia's only welfare state. That's us," said a Malay resident of Brunei town.

First major oil strike on the west coast of Borneo was at Miri, in north Sarawak, early in this century. Though some of Miri's original wells are still pumping, production has declined steadily. Only the oil piped down from Brunei keeps the Miri refinery functioning. It's from Miri, with its deep and sheltered offshore anchorage for tankers, that Brunei's oil must be shipped.

Under the eerie glow of natural-gas flares at the Brunei Shell oil town of Seria, I saw more than 2,000 people of nine different nationalities working 24 hours a day to win this oil from the earth.

Here the oilman's hard hat has become a status symbol. Workers are reluctant to shed them, even when fishing on Seria's beaches.

Sultan Lives in Modest Palace

But there's nothing flashy about Brunei's wealth—no chauffeured Cadillacs, little of the opulence or poverty that marks some Persian Gulf oil kingdoms. His Highness Sir Omar Ali Saifuddin, 28th Sultan of his line, lives in a relatively modest palace above Brunei town, the capital. Only the great new mosque, opened in 1958, announces the prosperity of this predominantly Malay kingdom (page 775).

The Sultan, an absolute ruler, wanted to take his people into Malaysia. Yet despite the strong ethnic link with Malaya, many citizens of Brunei preferred to remain outside.

A month after I left Brunei, rifle fire crackled through Brunei town; shotguns exploded on the Seria oilfields. A sultan of Brunei was

All eyes search the sea as Queen's Own Highlanders and North Borneo police patrol for pirates.

Rifles in hand, grim-faced men await a practice attack. Pirates have massacred entire villages.

facing armed revolt for the first time in the 20th century. Openly encouraged by Indonesian leaders, an "army of liberation" all but took over the country. Though suppressed swiftly with British aid, the revolution made plain the 47-year-old Sultan's dilemma. Which way for Brunei? Feudalism or democracy, isolation or Malaysia? I pondered the question as I strolled the capital city.

Ordinarily there are few more tranquil places than old Brunei town, with its beautiful Kampong Ayer (water village). On its forest of stilts, Kampong Ayer has existed for perhaps a thousand years. And despite government efforts to shift its 15,000 water-loving citizens to better homes on dry land, it seems likely to persist for years to come.

I traveled by prau through this sleepy little Asian Venice. Waterborne hawkers peddled their wares to housewives. Children paddled to school in tiny craft. Dreamy old men fished from their own back doorsteps. Perhaps oddest of all, in this watery town, was the sight of regular water mains jutting up beside the houses. In the houses, I saw the traditional home industries of Kampong Ayer; the fame of its silversmiths and weavers extends afar.

When the tide receded, gay youngsters scuttled across the mud like dark-brown crabs.

Malaysia Puts Humanity on Trial

Now, in all their diversity, I had seen the faces of Malaysia, the races which planned union last summer in a new, vital nation.

In a world haunted by threat of nuclear destruction, their endeavor has special significance. Future historians might mark it down as the beginning of one of the most decisive experiments in man's history.

Can people of so many races, so many beliefs, find a true harmony?

The answer affects us all. Because Malaysia is not simply a test for Asians.

It is a test for the human race itself.

THE END

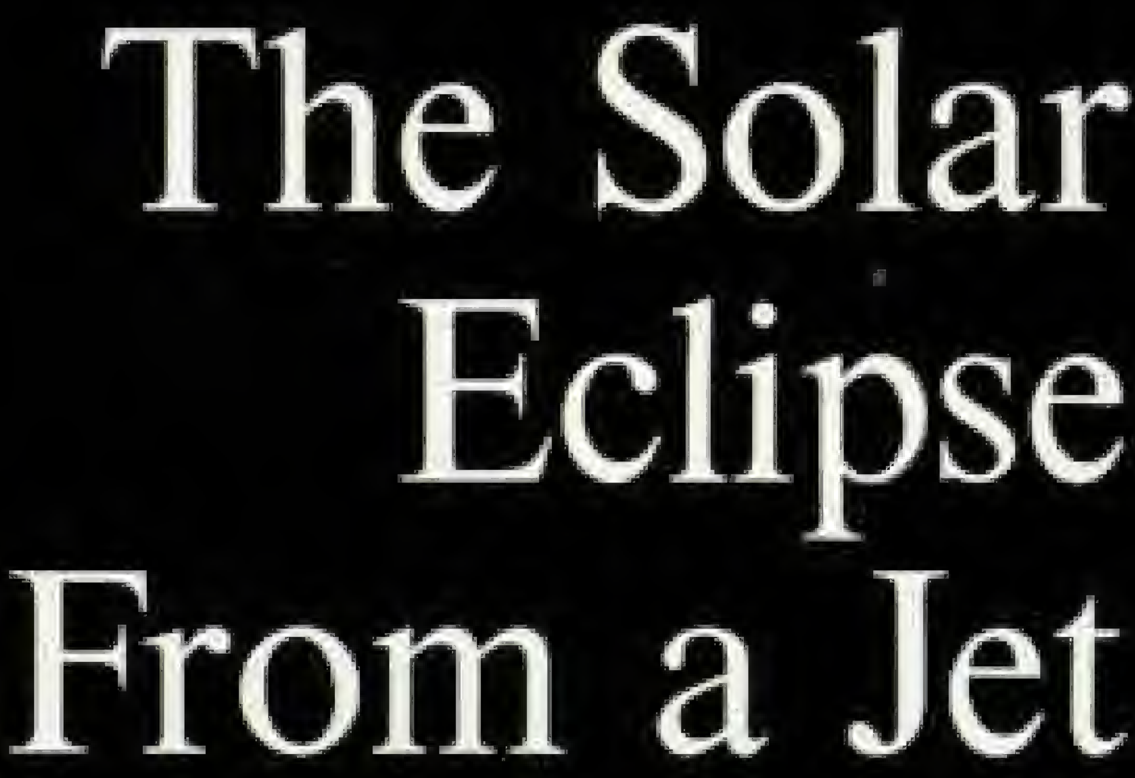
Timber toppers, whipping rope slings ever higher, climb a 150-foot hardwood near Kalabakan. Disdaining power saws, the crew will cut the base by ax. Annually North Borneo exports more than $30,000,000 worth of timber, its main crop.

Mist adds mystery to sacred Mount Kinabalu, a 13,455-foot peak in North Borneo. Residents warned the photographer: "Be careful at Kinabalu. Strange things happen when you photograph that mountain." But nothing untoward happened to him.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

CHURNING RED GASES *on the sun's vanishing rim glow at temperatures of at least 11,000° F. Solar prominence high on the opposite edge would engulf half a dozen earths. The National Geographic-Douglas Aircraft expedition observed the total eclipse of July 20, 1963, aboard a jet plane observatory that rendezvoused with the moon's swift shadow high above Canada.*

KODACHROME BY J. BAYLOR ROBERTS, NATIONAL GEOGRAPHIC STAFF © N.G.S.



The Solar Eclipse From a Jet

Racing through the stratosphere in a unique flying laboratory, scientists take a long, close look at the moon's transit of the sun

By WOLFGANG B. KLEMPERER

Scientific Director
National Geographic Society-Douglas Aircraft Company Eclipse Expedition

THE CRISP VOICE of young Robert Cameron, my assistant at the control desk in the cabin of our DC-8 airliner, rang from the plane's loudspeakers.

"Your attention please," he said. "Time to totality is now exactly one hour." The wall clock's hands pointed to 12:37 p.m.

I looked across the aisle at the array of instruments that had converted the plane into a flying astronomical observatory. Our expedition, I thought, must be the most comfortable ever to observe an eclipse of the sun.

Total eclipses seem to prefer inaccessible or inhospitable regions. Scientists often have had to undertake arduous journeys into the deserts of Africa, the icecap of Greenland, or the jungles of South America. During a National Geographic expedition of 1948 into China, soldiers had to be hired to protect the

Brilliant sun, diffused by aircraft window glass, flares above the observatory-equipped DC-8 airliner during a test run. Three days later the aircraft lifted 55 eclipse observers almost eight miles aloft.

Behind optical glass installed for the flight, scientist prepares a radiometer (left) to measure solar radiation. Multiple-lens cameras will study the corona, the sun's outer atmosphere.

Partly eclipsed sun, still far too bright to show its crescent shape without filters, blazes through a port of the flying observatory.

party from bandits and prowling wild beasts.

Despite the hardships, astronomers willingly struggle to such places in the hope of observing, even for a few moments, celestial phenomena that can be recorded only when a total eclipse blots out the sun's direct light. Most important of these is the corona, the sun's outer atmosphere. The corona, most scientists now believe, stretches all the way to earth, forming the environment through which our planet moves in its orbit.

For a glimpse into these mysteries, visible from Japan to Maine on this July 20, 1963, other scientists had climbed mountains, eaten camp rations, and endured mosquitoes. Yet we were enjoying an air-conditioned, pressurized cabin as we circled high above the Great Slave Lake area in Canada's Northwest Territories. Last night we had slept comfortably in a hotel in Edmonton, Alberta. Tonight we would be back in Long Beach, California, where the expedition had started. This was luxury indeed—much appreciated by those of our 55 scientists and observers who had studied eclipses from ground sites.

Astronomers Enjoy a Cloud-free View

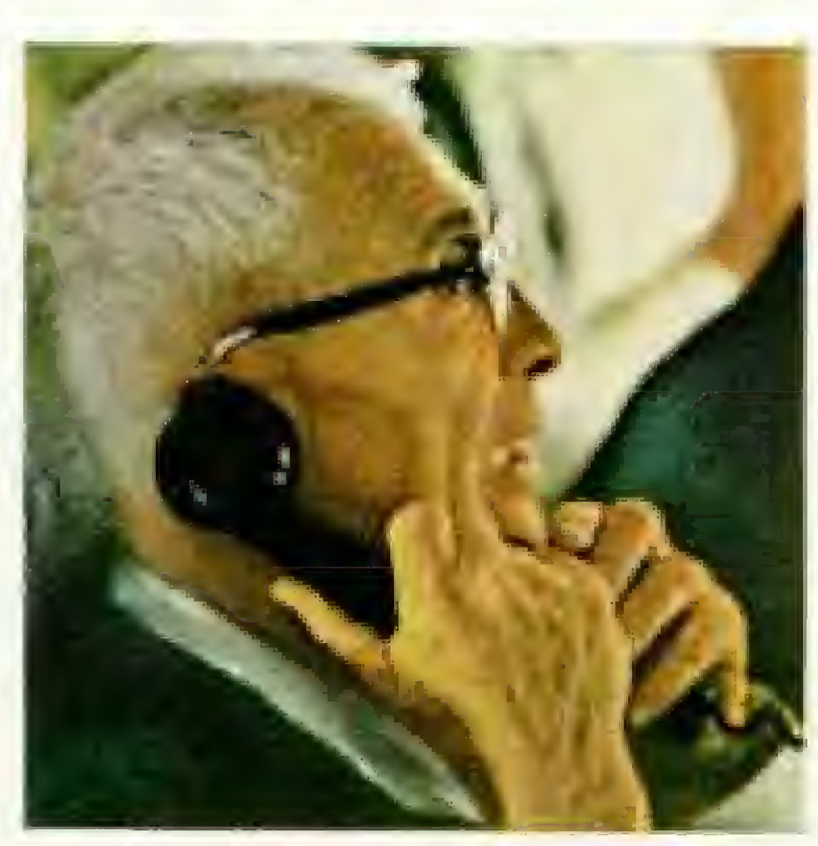
But we were not in a jet for the sake of comfort. We wanted to get a better—and longer—view than our ground-based colleagues could obtain.

"Our altitude is now 38,500 feet, air speed 510 miles per hour," Bob Cameron announced by loudspeaker. We were moving into the stratosphere, where we hoped to encounter a minimum of air turbulence and so provide a

stable aerial platform for our sensitive instruments. Below us lay 85 percent of the earth's atmosphere and nearly all of its water vapor—molecules that absorb and scatter sunlight, particularly the infrared.

We hoped thus to observe certain solar phenomena more extensively than ever before. And at the least, flying above the weather would safeguard us from the frustrations that clouds have brought to many an expedition.

This assurance of challenging and dependable viewing conditions had prompted our APEQS flight expedition. The project's name, pronounced "apex," had been coined to signify the general objective of the undertaking: Aerial Photography of the Eclipse of the Quiet Sun—"quiet" because this year the sun is nearing the minimum in its 11-year cycle



"T-minus-three!" Author Klemperer hears the countdown. An aeronautical engineer, he helped design National Geographic–U. S. Army Air Corps stratosphere balloons in 1934-35.

of sunspot activity. Eleven research organizations teamed with us.*

Initiative for the enterprises came from the Douglas Aircraft Company as part of its Advanced Research Program. Joint sponsorship by the National Geographic Society carried on a long tradition of Society participation in solar eclipse expeditions.†

Scientists Fly to Work

Our aircraft was leased from Delta Air Lines. It had been brought back to the Douglas plant in Long Beach for installation of new fan-jet engines—and for temporary conversion into a flying observatory. All seats on the right side of the cabin and four rows on the left were removed to make room for sky cameras and other recording devices.

To provide safe mountings for a 700-pound spectrograph, a complex sodium day-glow photometer, and other astronomical equipment, about a ton of steel and duralumin tie-down brackets had to be fastened to the plane's floor. Nearly a mile of electrical wiring was snaked about the cabin.

Project APEQS thus was no simple operation. It took months of planning, and a final nine days of feverish, almost around-the-clock installation of equipment. For we faced an inexorable deadline. The appointment of the sun with the moon could not be changed.

Cameron's voice came again over the loudspeakers: "We are now entering the uptrack leg. Time to totality is 40 minutes."

Our plan was to fly west-northwest along the Mackenzie River in the opposite direction to that in which the moon's shadow would travel, then turn and let it overtake us from the rear. Racing at 1,710 miles an hour, the shadow would put ground observers in darkness for 100 seconds. But the speed of our jet would make totality last longer for us—a calculated 144 seconds, provided we were precisely on target in our flight pattern.

This called for exquisite navigation. Even on the ground, astronomers cannot predict

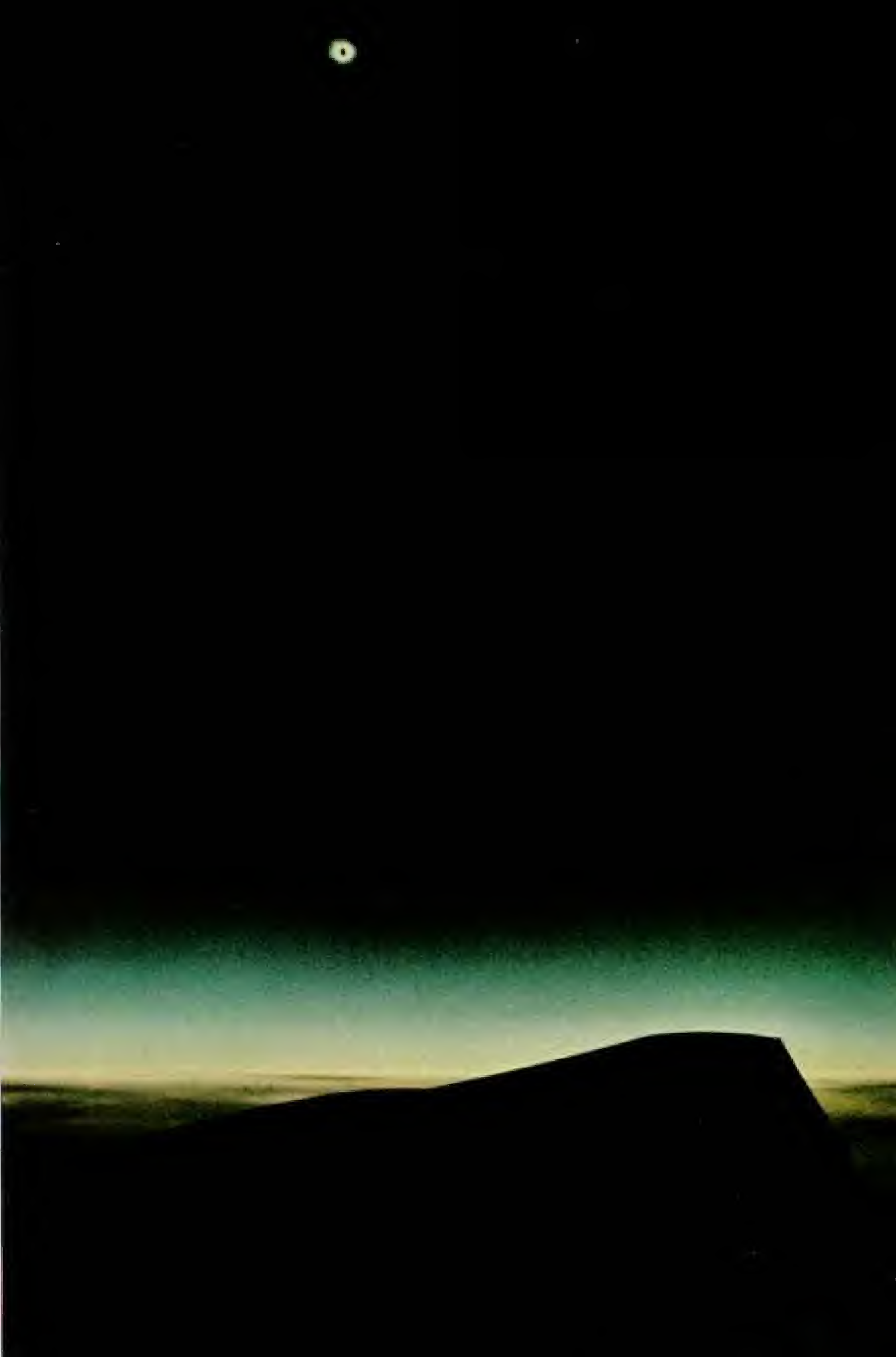
*Besides the National Geographic Society and the Douglas Aircraft Company, the following organizations participated in the 25 scientific experiments on the APEQS flight: National Aeronautics and Space Administration, Aeronautical Research Laboratory of the U. S. Air Force; Naval Ordnance Test Station, China Lake, California; Naval Missile Center; Rand Corporation; Lockheed-California Company; Service d'Aéronomie of Verrières-le-Buisson, France, in association with the University of Pittsburgh; Johns Hopkins University; Mount Wilson and Palomar Observatories; and the Astrophysical Observatory of Arcetri, near Florence, Italy.

†The NATIONAL GEOGRAPHIC has published numerous accounts of solar eclipses in the past. Among them: "Eclipse Hunting in Brazil's Ranchland," by F. Barrows Colton, September, 1947, and "Operation Eclipse: 1948," by William A. Kinney, March, 1949.

Shadow of the moon sweeps at 1,710 miles an hour through gathering gloom to overtake the airliner. Fading sunlight glints on the starboard wing. Racing the shadow at 525 miles an hour, the jet stretched totality to 142 seconds, or 42 more than ground observers had.

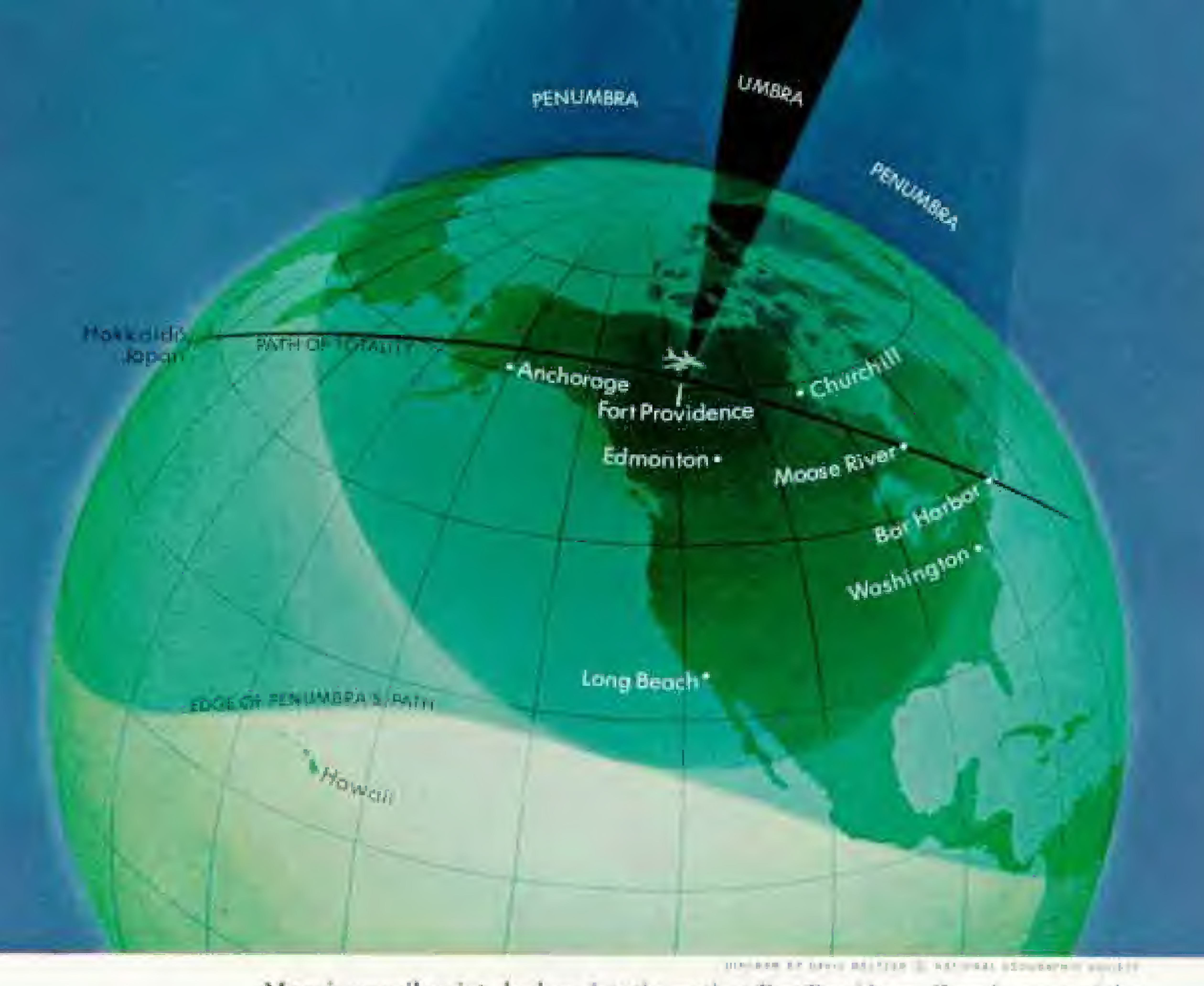
Seconds later darkness wraps the wing. Along the horizon, light bounces off clouds outside the area of totality, here an ellipse 65 miles wide. High above, the corona of the obscured sun shines with the brightness of a full moon. Venus glows faintly to the right of the eclipse.

KODACHROMES BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JAMES P. BLAIR © N.G.S.



CAUGHT AT 5-MINUTE INTERVALS, *the sun wanes from full disk to crescent. Images taken from the ground at Moose River, Ontario, show the moon grabbing ever-increasing—and diminishing—bites. To picture the sun, the photographer used a lens filter so dense it appeared almost opaque. He removed it to capture the moment of totality, when the corona burst into view as a pearly halo, and for the final exposure, which reveals a scientist and his camera.*

EKTACOLOR BY LAIRD BROWN © N.G.S.



Moon's pencil-point shadow dots the earth at Fort Providence, Canada, scene of the flying observatory's dramatic achievement. From Hokkaido, Japan, where the false night brushed the earth at sunrise, the shadow sped 8,000 miles in 2 hours, 44 minutes—its velocity ranging from as low as 1,700 miles an hour to many times that figure. Sunset found it sweeping out to sea beyond Bar Harbor, Maine. Cone of the partial eclipse, or penumbra, covers a tenth of the globe.

the start of totality to the exact second. We were adding the problems of a moving platform and of keeping the sun at a specified bearing for our instruments.

The uptrack run now gave us a last chance to allow for the wind speed and air temperature that would affect the aircraft's performance. At the controls sat Capt. A. G. Heimerdinger, chief pilot for Douglas and a veteran of more than 10,000 hours in the air. In the cockpit with him were Paul H. Patten, copilot and navigator; Warren T. Dickinson, assistant navigator; and Joe Tomich, flight engineer—all from Douglas. No more keenly understanding or cooperative flight crew could have been assembled.

We had, too, the unhesitating support of many friends in Canada. The Canadian Department of Transport sent men and equipment to Fort Providence, in the Northwest Territories, to activate a decommissioned radio beacon as an aid to eclipse expeditions in the area. Also, the airways at our altitude were held clear of other traffic. The ground crews of Trans-Canada Air Lines and Canadian Pacific Airlines serviced the aircraft at Edmonton.

Jet's Stability a Key to Success

"This is APEQS control," our loudspeakers announced. "The time is totality-minus-30-minutes. Further movement in the cabin must be held to the absolute minimum."

On the ground, astronomical instruments often are anchored in concrete. We had to rely on the inherent stability of the DC-8, on the pilot's skill, and on specially refined automatic controls. The Sperry-Phoenix Corporation had made the autopilot system so sensitive that its adjustment could be affected

by the shift in weight caused by a person walking down the aisle. Our plan was for Captain Heimerdinger to bring the aircraft into exact position on the downtrack run; then, just before totality, let the autopilot take over.

We expected a smooth ride at our altitude, 40,500 feet. Weather observations coordinated by Dr. C. E. Anderson, our meteorologist, indicated minimum turbulence there.

Airglow a Target of APEQS Study

Up forward Jean Bereyziat, Professor J. E. Blamont, and Guy Cornet, representing the Service d'Aéronomie of France and the University of Pittsburgh, checked their intricate instruments to study airglow, a very faint luminescence of the upper atmosphere very difficult to observe in the daytime. They hoped to measure the role of sodium atoms in this glow. The brightness of the sodium airglow might indicate the nature of chemical reactions in the ionosphere, a region vital to radio communication.

Amidships, opposite my control desk, Dr. Guglielmo Righini, director of the historic Astrophysical Observatory of Arcetri near Florence, made last-minute adjustments on the spectrograph. Working with scientists and engineers of the Douglas Company and in collaboration with Dr. Armin J. Deutsch of Mount Wilson and Palomar Observatories, Professor Righini planned to record the spectrum of a narrow band of the sun's corona. Measurements of the resulting photograph were expected to yield a determination of the density of free electrons near the sun in relation to the amount of interplanetary dust.

The spectrograph was coupled to a six-inch reflector telescope that was illuminated by a heliostat tracking mirror. Precision gyros, originally developed for space vehicles, stabilized the line of sight in a novel manner. Once locked onto the sun, the instrument could hold the image in place with an accuracy of one minute of arc—1/60 of a degree.

Aft of the spectrograph station, Astronaut Scott Carpenter laid down a novel with which he had been whiling away the time. He was to observe dim-sky effects such as may be seen by space travelers. He worked with Dr. Jocelyn R. Gill, a NASA astronomer. Among their interests: the zodiacal light, the extensive sky glow believed to be caused by sunlight scattered off dust particles in space.

Near Carpenter's window, Navy astronomer William C. White used the stream from the air nozzle above a passenger seat to clean a bit of dust from a delicate instrument part. He was ready to photograph the corona with two multiple-lens aerial cameras.

Along the length of the cabin, participants hunched over their instruments or squatted behind sighting devices. Tense expectancy charged the scene—from Window One, where the Air Force's Kenneth E. Kissell waited to record the sun's flash spectrum in the invisible colors of infrared radiation, to the aft galley porthole, where Harold E. Cronin of the Naval Ordnance Test Station measured airglow with a photometer, a light-measuring tool delicate enough to detect a candle burning 100 miles away.

"This is APEQS Control. The time is T-minus-10. . . . Plexiglas window covers may now be removed."

Cameron's instructions, issued after we

Mechanics of a total eclipse. Sun, moon, and earth line up in this foreshortened view. Dotted lines define the angles at which sunlight passes the moon. Two shadow cones are formed: the narrow umbra, area of total shade, and the wide penumbra, or partial shade. The moon's shadow is always present in space. Sometimes only its penumbra touches the earth, causing a partial eclipse.

Eclipse research rocket spears skyward near Churchill, Manitoba. Scientists at the Canadian-U. S. range, a point of 94 percent totality, fired rockets to study effects of the darkening sky on the ionosphere, which reflects radio waves.

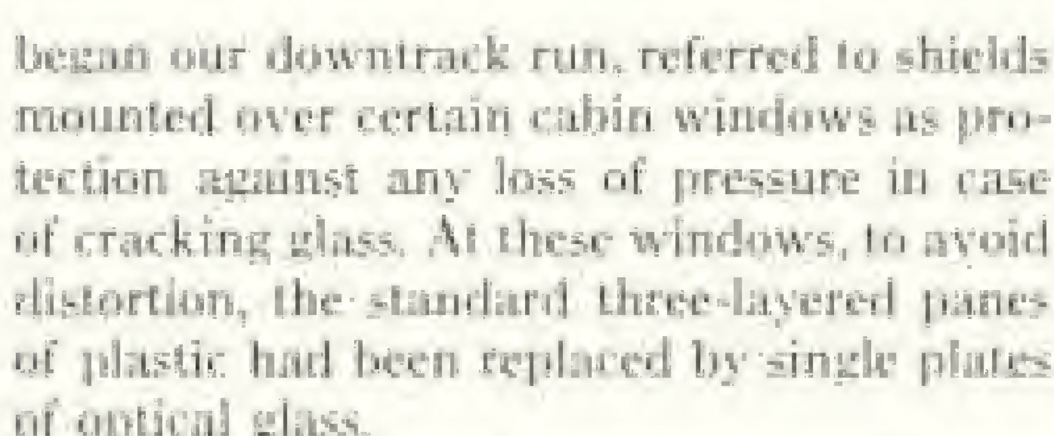
Astronaut Scott Carpenter, holding a camera, discusses viewing positions with Dr. C. S. Beals of Dominion Observatory, Ottawa, Canada. Carpenter joined the expedition to study dim-sky phenomena near the eclipsed sun.

With Questar telescope, Rand Corporation researcher George Kocher prepares to guide cameras for study of coronal light.

Sun's flash spectrum, visible only by means of a prism or other light-dispersing instrument, arises from the glow of gases seen as a thin crescent just as the sun vanishes (page 784) and as it reappears. Red and green curved lines in this spectrogram made by Lee Simon, graduate student in astronomy at Northwestern University, reveal hydrogen, the blues show calcium, and the yellow, sodium. The exposure was made from the ground as the sun reappeared above Moose River.

Another scientist, Belgian astrophysicist Francois V. Dossin, discovered a faint new comet—the first of its magnitude ever recorded near the sun—on eclipse photographs made from a hilltop at Pleasant Pond, Maine.

Diamond-ring effect, a brilliant sparkle, bursts from the rim of the receding sun over Moose River. Seconds later the flash spectrum appeared where the last ray of direct sunlight vanished; then came total eclipse.



began our downtrack run, referred to shields mounted over certain cabin windows as protection against any loss of pressure in case of cracking glass. At these windows, to avoid distortion, the standard three-layered panes of plastic had been replaced by single plates of optical glass.

These single panes, however, were of course more subject to frosting, because frigid glass quickly condenses humidity in cabin air. To solve this problem, we pumped jets of dry nitrogen across these glass disks to evaporate ice crystals as they formed. We also kept the cabin temperature low and held humidity to nine percent, changing the air continuously by means of the DC-8's ventilating system. We were careful not to exhale near the windows until after the eclipse observations.

The sun had dwindled to a thin crescent. Clouds below us paled to a leaden gray. The light seemed unreal, with hues reminiscent of a dull sunset. We were flying in the moon's penumbra, the dusky shadow realm ringing the central deepness of totality (page 792).

"T-minus-five . . . T-minus-four . . . T-minus-three. . . ." Cameron ticked off the minutes.

Darkness overtook us swiftly. We could see behind us the moon's approaching umbra, an elliptical patch of black 65 miles wide. No sharp edge marked its limits; undulating tops of clouds produced a diffuse transition from gray to ebony.

At our altitude, nearly eight miles above the earth, our eyes swept a range of 250 miles. Beyond the rim of the moon's shadow the horizon shone vividly in the comparative brightness of the penumbra. Light reflected from the far-off clouds and from dust particles in the air made the cabin's interior more luminous than we had anticipated—quite different

Inverted crescents of the eclipsed sun pattern the chest of John Oakes in Falls Church, Virginia, where the moon hid 82 percent of the solar disk. Openings among the leaves of a tree acted as lenses, producing the pinhole-camera effect.

from the enveloping night experienced by eclipse observers on the ground.

Suddenly the blast of a whistle shrilled in our ears. It was the agreed signal by which Dr. Deutsch, perched with his filter binoculars at a window amidships, announced the sighting of Baily's beads. They marked the beginning of totality, the moment when the sun's last rays, glinting through canyons on the moon's rim, appeared as beadlike spots of light. The whistle, incidentally, had been borrowed from a Canadian Mountie at the Edmonton airport.

During totality, camera shutters clicked, image converters flashed, motion-picture cameras and tape recorders purred. Many of us were too busy tending instruments to watch the sky's most awesome spectacle unfold.

The sun's corona, not visible except during eclipse, spread its pearly halo and glowed against the sky's dark steel blue. Stars appeared near the blacked-out sun. Venus gleamed in the darkened heavens (page 789). At the edge of the black disk we could see solar prominences—jets of gas that sometimes erupt from the sun at speeds of 250 miles a second and to heights of 250,000 miles or more.

A second whistle from Dr. Deutsch signaled the reappearance of Baily's beads as the sun's limb (outer edge) emerged from behind the moon's retreating rim. Our time in totality had lasted 142 seconds compared with a possible 144.

For eight minutes more we continued along our autopilot-controlled great-circle course while some experiments still went on. Then tension relaxed. Grins appeared as men broke out lunches. An hour and 20 minutes later we landed at Edmonton for refueling.

A New Approach to Astronomy

The three-and-a-half-hour return flight to Long Beach that same evening gave us an opportunity to assess preliminary results. While not all the observers achieved all their goals, Dr. W. N. Arnquist, project manager, said: "Operationally, the expedition was a gratifying success."

The successes include physicist Kissell's data on infrared radiation in ranges never before recorded, data that may open new knowledge about the sun's upper atmosphere. Our Douglas spectrograph obtained a rich record of a section of the corona extending out from the limb for a million miles; analysis could reveal valuable information about this gaseous envelope. But months of study must precede final evaluation of APEQS results.

Still, far-reaching conclusions can already be drawn, conclusions that point to a new era in astronomical observation. Our expedition demonstrated that a large jet transport can serve admirably as a stable platform high in the air—a stratospheric observatory. Our autopilot kept our wingtips level with no more deviation than one-fourth of a degree during the critical period, and our longitudinal pitching was even less.

However, as Dr. Deutsch enthusiastically remarked, much credit must be reserved for the able airmanship of the flight crew. The leading edge of the moon's shadow was intercepted practically on dead center within three seconds of the moment planned.

With an airplane navigated and stabilized to this accuracy, the National Geographic–Douglas Aircraft APEQS Expedition pioneered techniques that could become standard procedures for future experiments.

"In such an observatory," Dr. Righini predicts, "astronomers could conveniently conduct many valuable experiments from the stratosphere in addition to those concerning eclipses of the sun."

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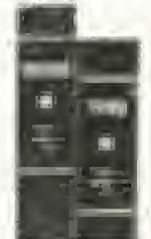

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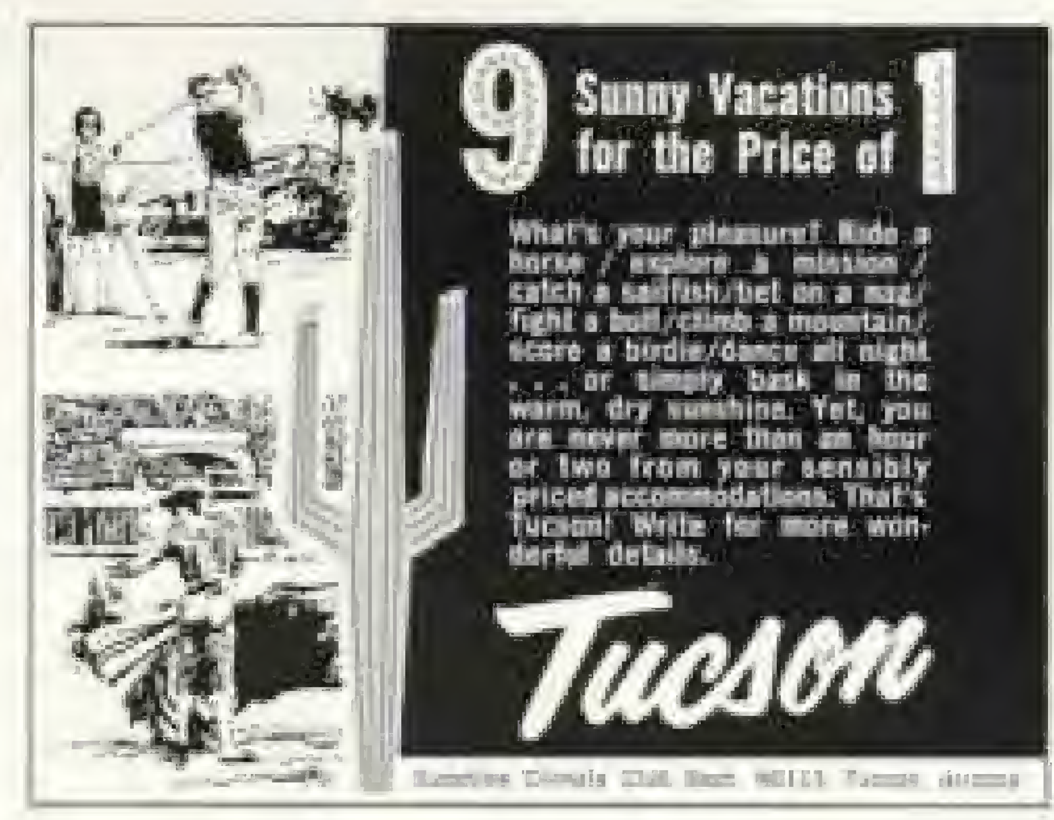

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