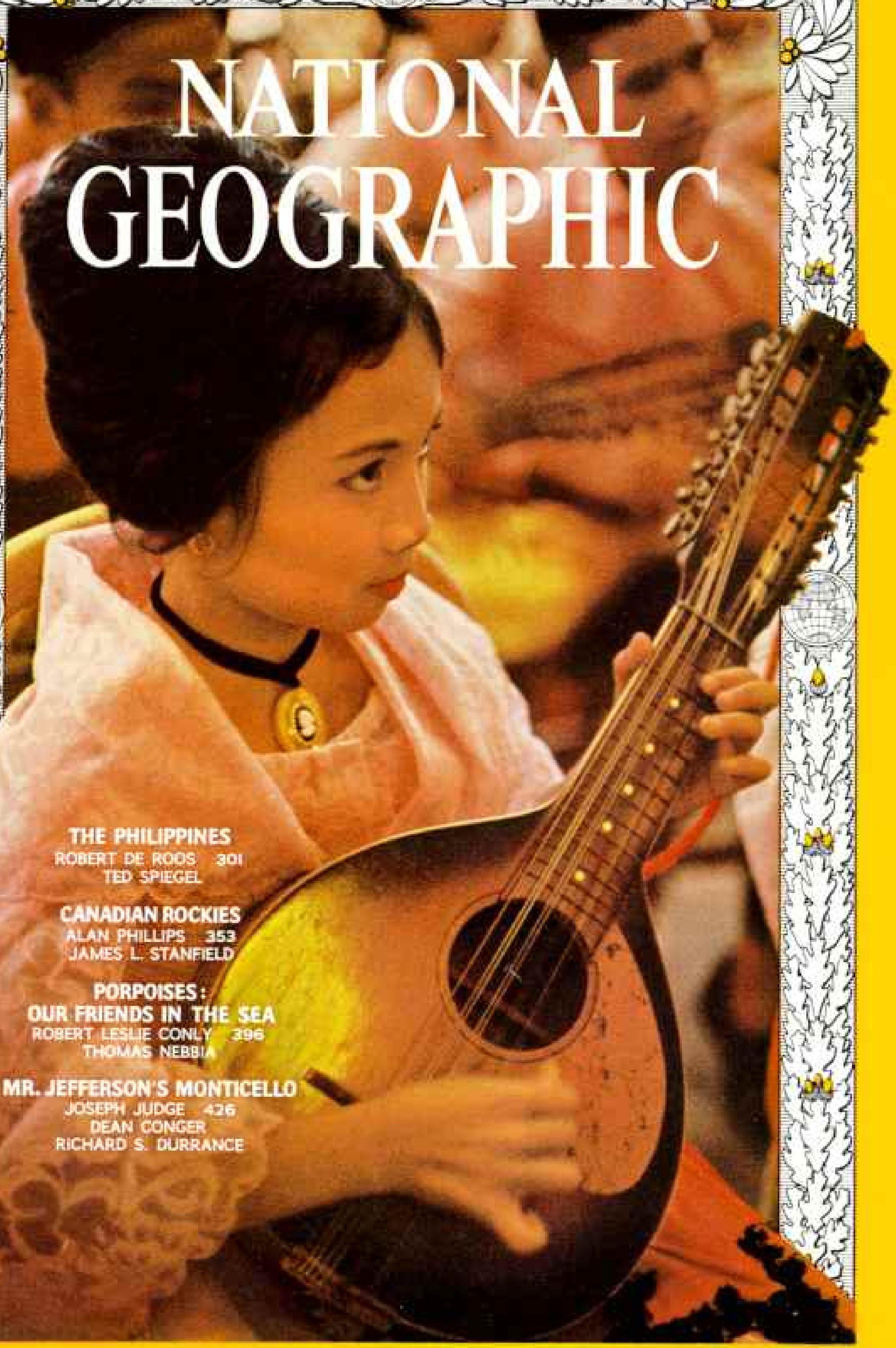
ATLAS MAP SUPPLEMENT: WESTERN CANADA (page 394)

VOL. 130, NO. 3 SEPTEMBER, 1966

NATIONAL GEOGRAPHIC



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

September, 1966

NATIONAL GEOGRAPHIC

THE PHILIPPINES
Freedom's Pacific Frontier

By ROBERT DE ROOS

Photographs by TED SPIEGEL

THOUGH I HAVE NEVER lived in the Philippines, I sometimes feel I grew up there. My parents were missionaries on Luzon shortly after this century began. As a child I was entranced by their tales of a ruggedly beautiful land, of rice terraces like green steps to the sky, of people who lived in houses on stilts, of Igorot men wearing nothing but G-strings.

Later, with millions of Americans, I admired the courage of the Filipinos as they fought beside us and stood firm through the terrible years of Japanese occupation. And I followed with hope and fascination their postwar plunge as a new free nation in Asia.

Republic Born on the Fourth of July

In two visits totaling two and a half months and 3,000 miles of travel, I found the reality far more exciting than I could have imagined. I learned that the young Republic of the Philippines—founded July 4, 1946—is a land of grace and many problems. It is a turbulent country, new to the ways of independence after four centuries of occupation by foreign rulers—Spain, the United States, and Japan. It is a country imbued with America's ideals of freedom, though corruption and poverty

Dark-eyed sea gypsy, whose wandering fisherfolk dwell in the southern Philippines, comforts a shy brother. Her island nation, born amid rubble of World War II, struggles to fulfill its promise as the Far East's first modern democracy.

Like temples to gods of plenty, manicured mountains of northern Luzon lift rice terraces to the heavens. Ifugao farmers bend over a glistening paddy field. To create these terraces, people of the Banaue region labored for more than 2,000 years, raising mortarless walls as high as 50 feet. Torrential rains water the staple crop.

Blue-jeaned troubadour of Sanga Sanga gnaws sugar cane while clutching a ukulele—the favorite music maker of Filipino teen-agers.

still keep that idealism from flowering fully.

Far more than wars and occupation, geography has fragmented the Republic of the Philippines. Its 32,600,000 people live on a galaxy of islands strung out north and south for 1,150 miles between the Pacific Ocean and the South China Sea (maps, pages 312-13).

No one knows how many islands there are; the republic itself says simply "more than 7,100." New islands appear from time to time as volcanoes thrust their smoking cones above the sea. And, after a few years of pounding by the waves, some of these new islands vanish.

The eruption of Taal Volcano on September 28, 1965, emphasized again the influence of titanic natural forces on life in the Philippines.

The volcano, rising as an island in Lake Taal, 40 miles south of Manila, roared for three days and blasted out untold tons of mud and glowing pumice (pages 306-7). Fields and houses were buried under siltlike ash. Two hundred people lost their lives, and thousands of homeless on the island and around the lake were taken to relief centers.

Six weeks after the eruption, I went out to visit Taal Volcano with Dr. Arturo Alcaraz, chief volcanologist of the Philippines, and Dr. James G. Moore of the U. S. Geological Survey, a volcano expert sent by President Johnson to investigate the eruption. We drove along one of my favorite roads, a modern highway that seems to wander rather than rush between rows of tidy homes. The grass was a glossy green, with colorful explosions of poinsettias, hibiscus, plumed banana plants, and coconut palms. On the road we met buses that looked like parade floats, their rooftops laden with gaily colored vegetables and fruits.

Volcano Created "Hailstones" of Clay

"The eruption was not unexpected," said Dr. Alcaraz, "because the temperature of the lake had been rising. The people on the island were warned, and there was time for partial evacuation."

"Is it possible to predict exactly when a volcano will erupt?" I asked.

"No, not exactly," replied Dr. Moore. "It's like a balloon. You can say that a balloon will break when it is blown up, but it's difficult to tell exactly when."

Near the lakeside village of San Nicolas, Dr. Alcaraz stopped the car, and we walked to a 10-foot bank at the roadside.

"This is material laid down by an earlier eruption of Taal," he said.

With his knife he dug out several small hard clay balls; and Dr. Moore explained that they were accretionary lapilli—little mud marbles built up in the "explosion clouds" caused by the volcano.

"They bounced around in the turbulent upper air and built up, layer by layer, until they were heavy enough to fall," he said.

"It's hard to say when these fell—maybe 50 years ago, maybe 500. But similar ones formed during the recent eruption."

At the village we met a Filipino seismologist named Conrado Andal, who agreed to take us to the volcano in a 15-foot powerboat. As we got under way, I noticed bits of black pumice floating on the choppy water.

Before us loomed the island. From time to time portions of the cliffs broke off, sending up plumes of ash; from a distance it looked like smoke. A deep layer of dried mud, now much seamed by rain, covered the southern side of the island.

Mr. Andal recalled the nightmarish morning when Taal began to erupt. He had been on duty at the island's seismograph station.

"About two in the morning there was an explosion, with fire and a lot of noise," he said. "People were calling and screaming in

Family dines upstairs, livestock below at a farmer's hut on the island of Mindanao. Tethered carabaos, a species of water buffalo, labor as all-purpose beasts of burden; rooting hogs provide meat for the table. One- and two-room dwellings of bamboo and nipa-palm thatch still house most rural Filipino families, though concrete homes slowly spread from the cities.

Suburban shoppers, exchanging gossip in a supermarket near Manila, live in a different world from that of the *bundok*—a word adopted as "boondocks" by slang-loving American soldiers to describe back country.

PHOTOGRAPHS BY JOHN LAUSTEN, BLACK STAR (OPPOSITE) AND TED SPIEGEL, RAPHO GUILLUMETTE © N.G.S.

Crater-pocked time bomb, Taal Volcano rises from Lake Taal, 40 miles south of Manila. Dormant for half a century, the volcanic island suddenly erupted in September, 1965, blasting out the inlet at upper right and spewing ash and pumice from the new crater in the inlet. Steam shot a thousand feet aloft, spreading debris so thick that it buried scores of the cataclysm's 200 victims and their flourishing stands of coconut and banana. Two days later the volcano still belched (inset).

MANILA TIMES (RIGHT); KODACHROME BY TED SPIEGEL, RAPHO GUILLUMETTE (C) N.G.S.

Nearly 3,000 people lived on the five-mile-long by three-mile-wide island before the eruption; many have since returned to their homes. Water-filled crater at center of the large picture formed in a 1911 eruption that claimed 1,335 lives.

the dark. My wife wanted to get away, but I wanted to watch a little longer. The eruptions were not very strong at first.

"About half an hour later, a deafening blast shook the island. It was time to leave."

Conrado Andal jammed 20 women and children into the same small boat we were using. They started north, away from the volcano's eruption center. They had traveled about two and a half miles when another explosion split the night.

"There was a big volume of gas and steam," Mr. Andal said. "That was when the storm and electrical display started. It was just like Roman candles—flashes of red and yellow."

The eruption, possibly triggered by seepage of water from the lake into the depths of the earth, created its own thunderstorm. Billions of gallons of water, steam, gas, and mud churned into the air.

Mr. Andal remembered shouting to boatloads of refugees from the island to head north.

"I was afraid of the big waves that would come," he told us. His warnings could not be heard in the noisy night. Many of the volcano's victims drowned when seismic waves engulfed their overloaded boats.

On September 30, 1965, Taal spewed up a black cinder cone 1,000 feet in diameter. It formed a horseshoe islet (visible in inlet at upper right, page 307). Wisps of steam still escaped from the cone near the water line as we climbed its gently sloping side and had a picnic lunch on the rim.

"Boondocks" Borrowed From Tagalog

Taal's latest outburst is only one of many manifestations of nature's ruggedness in the Philippines. High mountain ranges and dense forest isolate parts of the islands. Mindoro Island remains largely unmapped. The east-central coast of Luzon, the chief island, is an almost unknown land peopled by nomadic hunters. Luzon's *bundok*, or mountain, country, has become famous as "the boondocks"—military slang for just about as far from civilization as a person can get.

Less than 60 miles northwest of Manila, near the gorges of the Maronut River, I found myself in a primitive world. I visited a village of Aetas, the Negritos—"little blacks"—who hunt with bow and arrow. They have barely entered the age of agriculture.

The first Aeta I saw, a naked little boy, ran as fast as he could to spread the word that strangers were near. In the village—a collection of low, leaf-covered shacks on either side of the jeep road—I counted four women in ragged shifts, 14 naked children, and a diminutive man wearing a dark-blue G-string. That was all, except for two hogs, two chickens, and a desultory dog. The other men of the village were out clearing the forest for future fields of rice and *camote*, a kind of sweet potato.

My interpreter handed out cigarettes to all except the babes in arms. The Aetas put the lighted ends in their mouths—and they smoked that way with seeming relish.

Flowers Brighten a Primitive Life

There was a striking lack of "things" in the village: no shoes, no towels, no stoves, no radios, no guns—none of the trappings of civilization. Some of the huts had a store of logs to provide smoky heat during the cool nights.

The only tools I saw were a handmade machete—fashioned from a file—a hammer, and a primitive anvil. Their owner, Juan de la Cruz—the Philippine equivalent of "John Smith"—hammered out an arrowhead for me, using a nail as raw material. He produced an object of precise symmetry and beauty. It took him about an hour.

There in that possessionless village I saw two little flower gardens, containing perhaps ten plants. One, no more than two inches high, was ringed by a tiny palisade of wood chips. The thought of those flowers stayed with me. In that hamlet, so bereft of material things, someone needed a splash of color against the black, damp soil for the good of his soul.

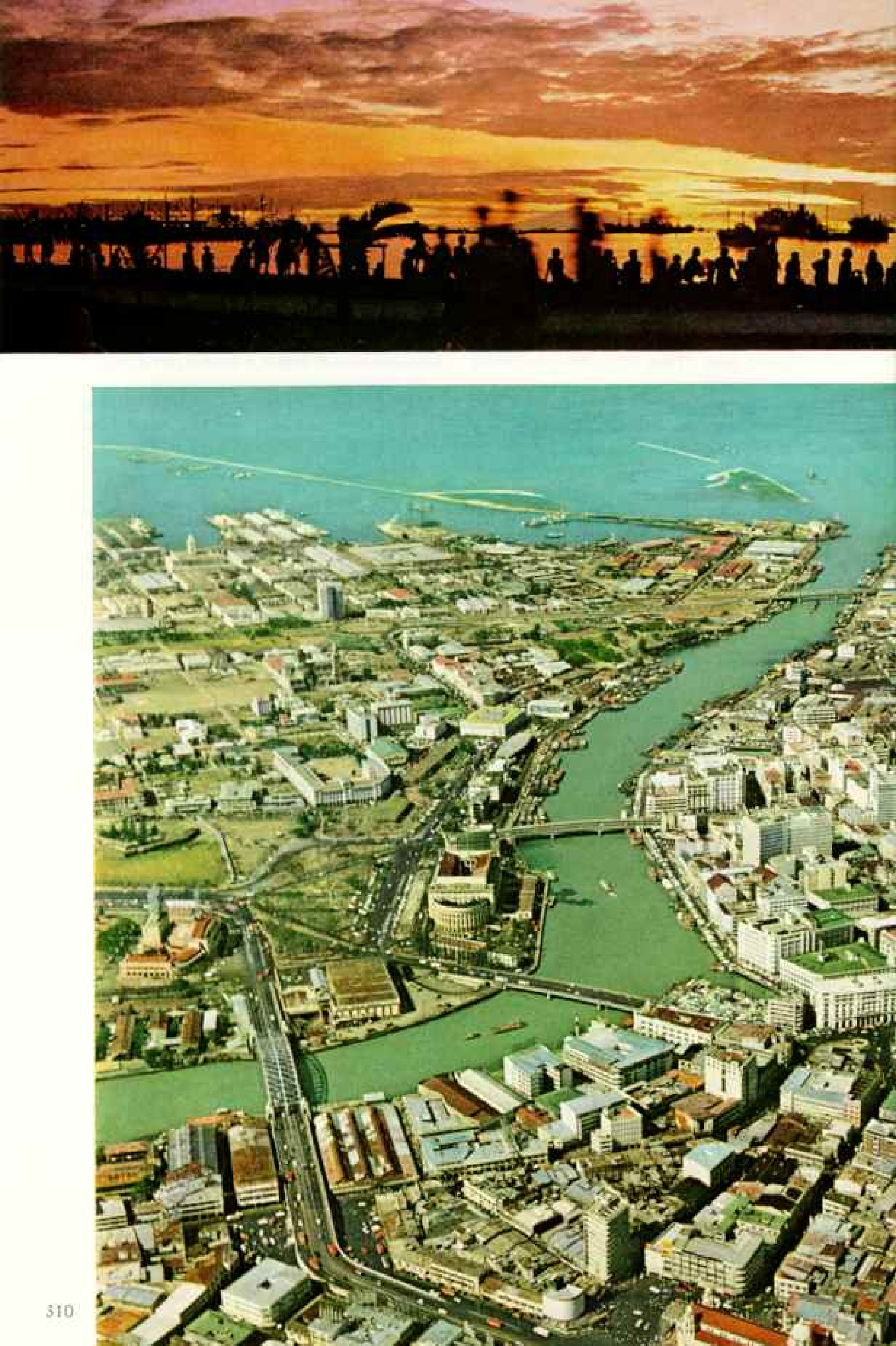
As among the Aetas, wherever I went in the Philippines hospitable people greeted me.

On the first of my two visits, however, I started with a misconception. As my Philippine Air Lines jet nosed downward after the long night passage across the Pacific, I looked on a green and watery land.

Nowhere was there motion. I made a note: "We arrive drowsy in a drowsy land."

An hour later I was being buffeted by Manila's traffic, as undrowsy and as menacing as

"In her presence the flowers bloom . . . the music bursts forth": So martyred Philippine patriot José Rizal wrote of another young beauty, the fictional Maria Clara, whose name Filipinos give to the dress here worn by a *bandurria* player. The musician's full-sleeved blouse and scarflike *pañuela*, of embroidered pineapple-leaf fiber, top flaring petticoats and skirt. Member of a youth club, she plays in Manila's Luneta Park.



U. S. NAVY, NATIONAL ARCHIVES (BELOW); PHOTOGRAPHED BY TED SPIEGEL, HARPO GUILLEMETTE © N.G.S.

Fiery sunset over Manila Bay, always spectacular, casts its spell over a picket fence of admirers. United States ships bound for Viet Nam ride at anchor in the magnificent natural harbor. Here Commodore George Dewey's U. S. Asiatic Squadron vanquished a Spanish fleet in 1898, opening the islands' Yankee era.

Rising from the ruin of war, cosmopolitan Manila crowds a dog-leg bend of the Pasig River. In a 1945 view (above), bombs, shells, and fire have shattered bridges, gutted the round-ended post office on the far riverbank, and scarred most other structures. Today traffic crowds streets and new river spans, and skyscrapers rise in the Escolta, the central business district. Fingerlike breakwaters reach into Manila Bay. Nearby landmarks recall bonds between Filipinos and Americans. Across Manila Bay lie Bataan and Corregidor, stained with blood shed in common cause. On a knoll overlooking the city, acres of white stones mark graves of World War II servicemen in the American military cemetery.

From the city, Spanish missionaries spread their Roman Catholic faith through the archipelago, and Yankee governors brought the land toward nationhood. Today the Philippine President and Congress sit in Manila, although suburban Quezon City, the official capital, ultimately will house the government. Job-seekers have swelled the population in and around Manila to 2½ million —one in thirteen of the nation's people.

any I had ever encountered. It is more than traffic. It is a kind of good-natured battle: cars versus "jeepneys" (World War II jeeps turned into agile jitney buses), jeepneys versus trucks, trucks versus *calesas* (high-wheeled, horse-drawn gigs), and all mechanical things against the nimble pedestrian.

I found downtown Manila a hopping, skipping gallopade, danced to the hysterical melody of a thousand horns. "It's like this every day," my taxi driver said happily.

Philippine jeepneys blaze with circus-wagon paint jobs, chrome, arched tops, and rakish fenders (page 317). Drivers splash affectionate names as well as paint on their chargers: I Love You Truly, Love Hunter, One More Chance, Morning Star.

Ranks of Crosses Mark War's Cost

Manila, astride the placid Pasig River, looks less like an Asian metropolis than an American city. American corporate and brand names blink from neon signs.

The Spanish influence lingers on in walled gardens, central plazas, grilled windows, and heavy colonial churches. But this does not make Manila a beautiful city. It has an unfinished look, and that is no wonder: Manila took the worst pounding of any capital in the world during World War II, with the possible exception of Warsaw. It was left four-fifths demolished (preceding page).

Rain fell quietly when I visited the United States military cemetery at Fort William McKinley, just outside Manila. The flags of the United States and the Philippines hung damply from tall staffs. Stark white markers—17,180 of them—march across the green grass.

I read the names of a sergeant from Texas, a merchant seaman from South Dakota, a Philippine Scout from Batangas. Many times I saw only these words: "Here rests in honored glory a comrade in arms known only to God."

Two stone arcades, curved like supplicating arms, bear the names of 36,279 men of United States fighting units who lie in unknown graves. Mosaic maps in shining colors reminded me of the places where brave men gave their lives for liberty: Bataan, Leyte Gulf, the Coral Sea, Cebu. . . .

The war left all the Philippines a desolation. A million men and women died—thousands in prison camps, other thousands in guerrilla forays in the hills. Hundreds of thousands saw their homes destroyed.

The scars of war remain. Gaunt skeletons of buildings still stand in parts of Manila. Intramuros, the venerable walled city that

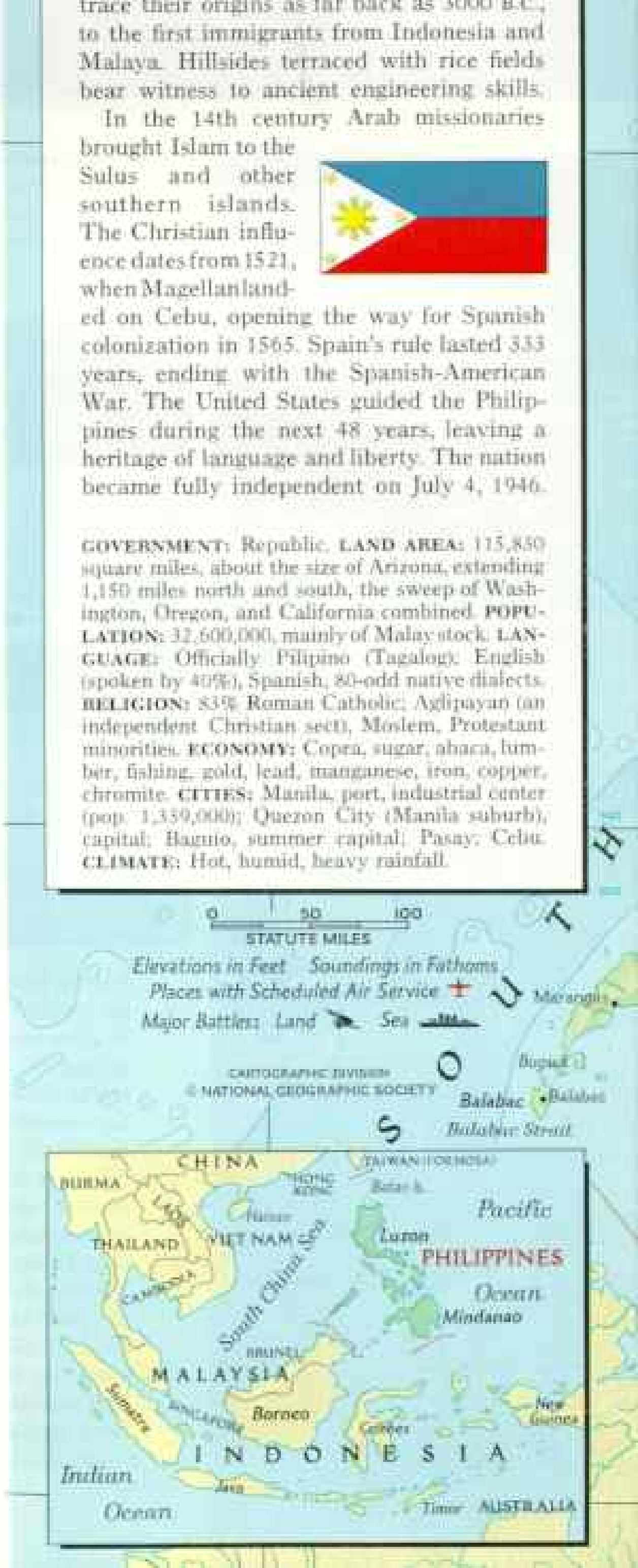
PHILIPPINES

MORE THAN 7,000 ISLANDS and islets rise from a partly submerged mountain chain to form the Philippines. Largely tropical wilderness, 90 percent of the islands are uninhabited, 60 percent unnamed. Two-thirds of the population lives on the two largest islands, Luzon and Mindanao.

Predominantly of Malay origin, Filipinos trace their origins as far back as 3000 B.C., to the first immigrants from Indonesia and Malaya. Hillsides terraced with rice fields bear witness to ancient engineering skills.

In the 14th century Arab missionaries brought Islam to the Sulus and other southern islands. The Christian influence dates from 1521, when Magellan landed on Cebu, opening the way for Spanish colonization in 1565. Spain's rule lasted 333 years, ending with the Spanish-American War. The United States guided the Philippines during the next 48 years, leaving a heritage of language and liberty. The nation became fully independent on July 4, 1946.

GOVERNMENT: Republic. **LAND AREA:** 115,850 square miles, about the size of Arizona, extending 1,150 miles north and south, the sweep of Washington, Oregon, and California combined. **POPULATION:** 32,500,000, mainly of Malay stock. **LANGUAGE:** Officially Pilipino (Tagalog). English (spoken by 40%), Spanish, 80-odd native dialects. **RELIGION:** 83% Roman Catholic; Aglipayan (an independent Christian sect), Moslem, Protestant minorities. **ECONOMY:** Copra, sugar, abaca, lumber, fishing, gold, lead, manganese, iron, copper, chromite. **CITIES:** Manila, port, industrial center (pop. 1,359,000); Quezon City (Manila suburb), capital; Baguio, summer capital; Pasay; Cebu. **CLIMATE:** Hot, humid, heavy rainfall.



120°
125°
Babuyan Channel
Cape Bojeador
Bangui
Santa Ana
Port San Vicente
Aparri
Bacarra
Laoag
San Nicolas
Dingras
Valley Head
LINGAYEN GULF
The Allies, landing here January 9, 1945, survived four days of brutal air assault to begin one of the most extensive land campaigns of World War II
Cabugao
Vigan
Tuguegarao
Narvacan
Candon
Ilagan
Bessang Pass
May 17 - June 14, 1945
Palanan
Roxas
Banaue
Cauayan
Santiago
San Fernando
Bauang
Lingayen Gulf
Bayombong
Bolinao
Baguio
Casiguran
Bani
Dagupan
Lingayen
San Carlos
Santa Cruz
San Jose
Baler
Cabanatuan
Gapan
Concepcion
LUZON
Angeles
BATAAN DEATH MARCH ENDED HERE
San Fernando
Polillo Islands
Olongapo
Malolos
Bataan Jan 7 - April 9, 1942
Quezon City
Bataan
MANILA
Lamon Bay
Corregidor
Manila Bay
Santa Cruz
San Pablo
San Nicolas
Lubang
Lubang Is.
Batangas
Jose Panganiban
Labo
Daet
Calauag
San Miguel Bay
Pandan
Jog Pt.
Lagonoy
Catanduanes
Virac
Naga
Iriga
Ligao
Legaspi
Sorsogon
Boac
Santa Cruz
Marinduque
Calapan
Naujan
Mamburao
MINDORO
Pinamalayan
Sablayan
Bongabong
Roxas
San Jose
Mindoro Strait
Tablas Str.
Romblon
Sibuyan
Sibuyan Sea
Mindoro Dec 15, 1944
Busuanga
Coron
CALAMIAN GROUP
Culion
Semirara Islands
Bulan
San Bernardino Str.
Laoang
Catarman
Masbate
MASBATE
Cataingan
Calbayog
SAMAR
Catbalogan
Borongan
Visayan Sea
Biliran
Leyte
Tacloban
Basey
Ibajay
Kalibo
Pandan
Roxas
Culasi
PANAY
Januay
Iloilo
Pototan
San Jose
Cadiz
Bacolod
Bogo
Ormoc
LEYTE
Baybay
Abuyog
Hilongos
Leyte Gulf
LEYTE GULF
Japan's naval power was smashed in the decisive battle of October 23-26, 1944
Oct 20 - Dec 26, 1944
Cebu
Toledo
Balamban
Mactan
La Carlota
Guihulngan
Panay Gulf
Dinagat
Maasin
Cauayan
Sipalay
Hinobaan
Bayawan
Tanjay
Dumaguete
Siaton
Siquijor
BOHOL
Surigao
PROPOSED FERRY
Siargao
Mindanao Sea
Camiguin
Cabadbaran
Butuan
Gingoog
Esperanza
Dapitan
Dipolog
Oroquieta
Ozamiz
Iligan
Iligan Bay
Cagayan de Oro
Malaybalay
Marawi
Sindangan
Liloy
Labason
MINDANAO
Bislig
Lingig
Maramag
Kibawe
Siocon
Pagadian
Illana Bay
Malabang
Tagum
Panabo
Baganga
Caraga
Cotabato
Moro Gulf
Datu Piang
Kidapawan
Davao
Davao Gulf
Mati
Lupon
Zamboanga
Basilan Strait
Isabela
Lamitan
Basilan
Digos
Sulop
Malalag
Koronadal
Tacurong
Lebak
General Santos
Kiamba
Glan
Jose Abad Santos
Sarangani Bay
Sarangani Islands
Miangas (Palmas) Indonesia
Cape San Agustin
Busuanga
El Nido
Taytay
Agutaya
Coyo Islands
Cuyo
Araceli
Dumaran
Roxas
Imuruan Bay
Malampaya Sound
Bacuit Bay
Puerto Princesa
Aborlan
Quezon
Cagayan Islands
Cagayancillo
PALAWAN
SOUTH CHINA SEA
SULU SEA
Pangutaran Group
Pangutaran
Turtle Is.
Sandakan
Jolo
Siasi
Tapul Group
SULU ARCHIPELAGO
Tawitawi
Bongao
MALAYSIA (SABAH)
CELEBES SEA
PHILIPPINE SEA
Cagayan Sulu
San Miguel Is.
Bancoran
MANILA BAY
MacArthur's stubborn defense of Bataan denied use of Manila Bay to the Japanese for five months, December 7, 1941 to May 6, 1942
A month of bitter house-to-house fighting ended when the Allies secured Manila March 4, 1945.
In the most notable victory of the Spanish-American War Commodore George Dewey defeated the Spanish fleet here on May 1, 1898.
Fall of this island fortress on May 6, 1942, ended organized resistance to Japanese occupation.
Orani
Samal
Abucay
Balanga
Pilar
Limay
Cabcaben
Malinta Tunnel
Corregidor
Caballo
Bulacan
Marilao
Novaliches
Obando
Polo
Malabon
Caloocan
Quezon City
Pasig R.
MANILA
Makati
Manila American Cemetery and Memorial
Pasay
MANILA INTERNATIONAL AIRPORT
Parañaque
Las Piñas
Cavite
Bacoor
Imus
Muntinglupa
STATUTE MILES
0
5
10

was once all of Manila, was almost leveled during the liberation of the Philippines.

Yet I found it a fascinating place. It spoke to me of the days when Spanish captains-general ruled the land (page 322). It spoke of treasure-laden Manila galleons standing out to sea from Intramuros for the stormy, scurvy-ridden voyage across the Pacific to Acapulco.

A few years ago Intramuros contained an unsightly and unsanitary morass of squatters' shacks incongruously scattered among modern office buildings, the stone bulk of San Agustin Church, and the ruins of Fort Santiago. Mayor Antonio J. Villegas took drastic action to remove this blight on the city. He sent bulldozers crashing into the area, reducing the shacks to kindling.

Manila is desperately overcrowded. Before the war, it held about 625,000 people. Today, the city proper counts 1,339,000, and the area more than 2,500,000.

One answer to the housing shortage can be found at Makati, a planned community adjoining Manila (pages 316-17). Seventeen years ago Makati comprised 3,000 acres of marginal farmland—a place of swamps, snakes, rice fields, and tangled grasses. Today it is a model of homes, parks, and commercial centers.

Forbes Park, the executive section of Makati, is as fine a residential area as any on the globe. It is called "the Philippines' richest barrio" (as the smallest political districts are known). But Makati is not for the rich alone. Dislocated squatters, including some from Intramuros, bought lots at low cost, with easy repayment. The subdivision now returns 12 million pesos ($3,090,000) annually in taxes. The squatters have become productive, tax-paying citizens.

KODACHROME BY TED SPIEGEL, RAPHO GUILLUMETTE © N.G.S.

President Ferdinand E. Marcos relaxes with his family at Malacañang, the Philippine White House. Beginning a four-year term last December, the republic's sixth popularly elected leader warned: "We are in crisis. . . . Only by severe self-denial will there be hope." The war hero and former legislator wears a traditional *barong tagalog* shirt. His wife Imelda once reigned as "Miss Manila."

Nation Changes Slowly

Great areas of the Philippines call out for similar solutions. But progress comes slowly. There is not enough money to erect needed buildings, string power lines, provide water, and establish the other supporting services.

After a period of haphazard building, Manila today watches handsome new buildings change its skyline. I visited the elegant Philippine American Life Insurance building, a louvered black structure rising from a gray-white marble first floor. In a patio I saw a magic garden where water

lilies, palms, and ferns grow near a cooling fountain. A congress of red dragonflies, buzzing like tiny helicopters, hovered over the water lilies.

Everywhere the trees of Manila are splendid: magnificent star apples with dark-green glossy leaves and shining flowers; the curious kalachuchis with trunks like melting candles. On a Sunday afternoon in the Luneta, I found that great green park polka-dotted with balloons and colored parasols. Ladies promenaded in their prettiest summer dresses. Children frolicked around the tall monument honoring José Rizal, the martyred Philippine hero executed by the Spanish in 1896.

Spanish Palace Housed U. S. Generals

A short taxi ride away, rambling, gleaming white Malacañang stands amid acacia trees on the banks of the Pasig River. Before Malacañang became the presidential residence, it regally housed Spanish and then American governors. The wrought-iron fence that encloses its grounds bore until recently the elaborate coat of arms of Spain.

A Philippines Constabulary sergeant, in stiffly pressed khaki, let me peer into the room where Gen. Douglas MacArthur worked when he was adviser to the Philippine Commonwealth's first President, beloved Manuel Quezon. The sergeant next opened the door of a small staff office used between 1935 and 1939 by a little-known lieutenant colonel—Dwight D. Eisenhower.

The American occupation of the Philippines was a result of the Spanish-American War, which began with the sinking of the battleship *Maine* in the harbor of Havana, Cuba. During the war, the United States sent Commodore George Dewey into Manila Bay on May 1, 1898, to destroy the Spanish fleet. The Spanish thereafter gave up the city with only token resistance.

At war's end Spain ceded the Philippines, Guam, and Puerto Rico to the United States, receiving $20,000,000 in compensation. The cession caused a dilemma. Filipino patriots, who had risen in arms against their Spanish rulers in 1896, wanted the Americans to go home when the shooting stopped. They revolted when the United States, fearing that Germany or Japan might take over the strategic archipelago, decided to stay.

President William McKinley sent troops to suppress the uprising and decreed that the Philippines should remain under the United States flag until the Filipinos were ready for self-government. The United States promised independence when that day was reached—a pledge redeemed in 1946.

William Howard Taft, later to become the 27th President of the United States, was appointed Civil Governor of the Philippines in 1901. Energetically improving the islands' economy, roads, and schools during his two-and-a-half-year term, Taft won the Filipinos' respect and lasting affection.*

During the Taft years, thousands of idealistic teachers, engineers, hygiene experts, and administrators went to the Philippines to help convert the former colony to a republic.

Col. Jaime C. Velasquez, a West Point graduate who is now a development company official, remembers it well.

"I am part of the last age group to benefit directly from American teaching," he told me. "The wonderful schoolteachers landed right after Dewey, and they came into our communities and taught us the things we needed to know. They taught us modern rules of sanitation. They taught us English."

Said a Filipino graduate of Harvard, now a prominent Manila businessman: "Under the Americans, we had the very fundamental things: the freedom to inquire, the freedom to move, the freedom to create, the freedom to complain. That gave us a spirit of curiosity, a restlessness of spirit, a feeling of ebullience. This is finding expression today in the younger men who are moving into business and government leadership."

English Leads 80-odd Tongues

Perhaps the greatest boon left by the United States was the English language. During the American occupation it was the language of instruction. Today it has become the most common tongue in a land where more than 80 recognized dialects are spoken.

The chief dialects—Ilocano, Bikol, Cebuano, and Tagalog—are of Malay origin. Pilipino, or Tagalog, prevails as the "official" language, although only about six million Filipinos speak it.

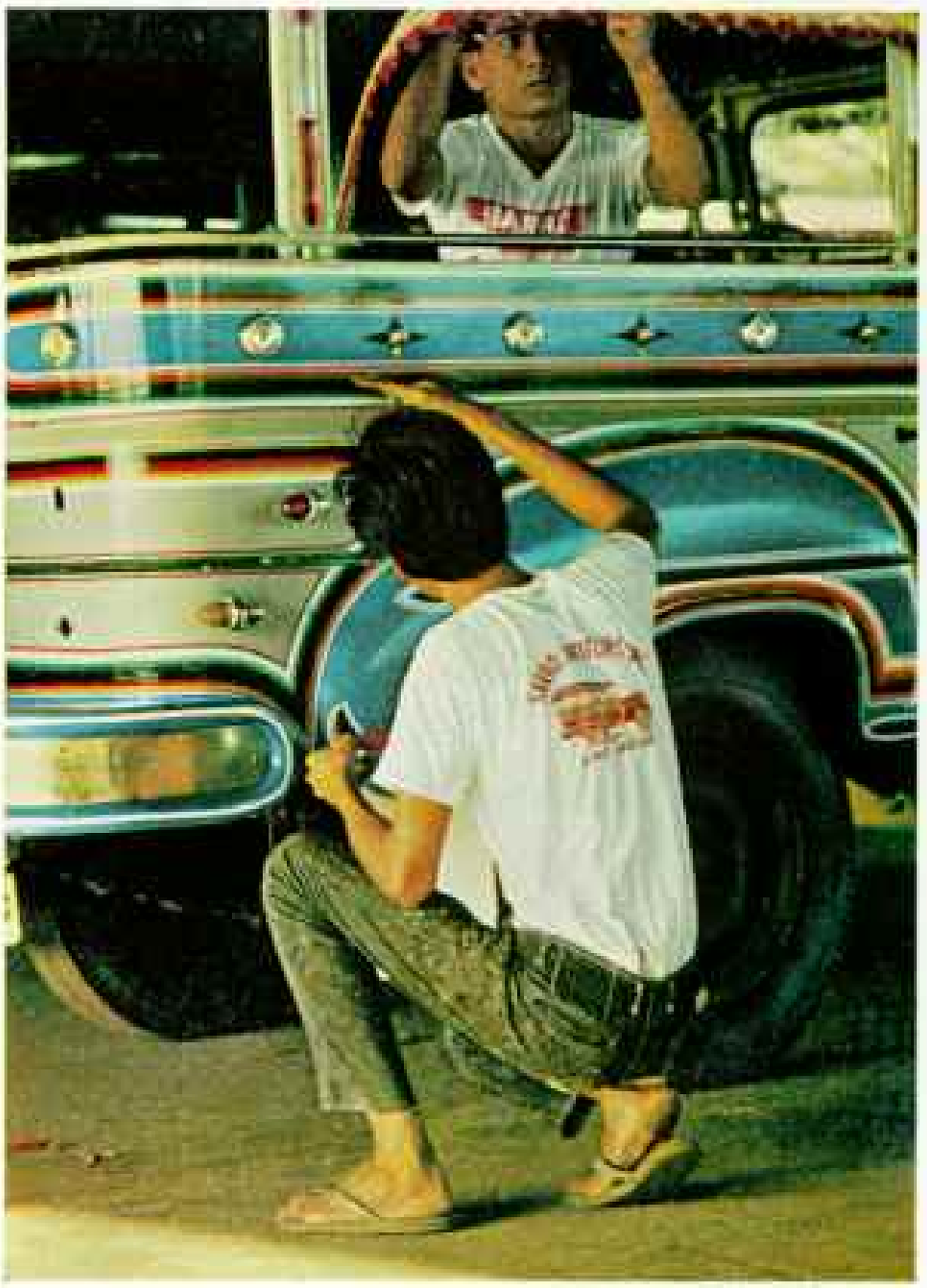
Malays predominate in the island chain. The modern Filipinos are best described as a mixture of peoples—a combination of Malay, Spanish, English, American, and Chinese immigrants.

The Chinese, now 400,000 strong throughout the islands, have always held a special, uncomfortable position. When the Spanish first occupied Manila in 1571, some 150 Chinese

*Taft contributed two articles on the Philippines to NATIONAL GEOGRAPHIC, published in August, 1905, and February, 1908.

EXTERIORS (RIGHT) AN

Walls of steel, glass, and concrete line Ayala Avenue, main street of Makati, ultramodern satellite city of Manila. Begun 17 years ago, the model community stands on former rice fields and snake-infested swamp. Many of the republic's largest corporations escape Manila's congestion by establishing headquarters in these buildings. Though a welder works on a new structure at left, shortage of building materials slows Makati's growth.



Transformation: War-surplus jeep emerges as a "jeepney," the lavishly decorated jitney of Manila. Firms like Sarao Motors, Inc., of Las Piñas, buy and assemble U.S. Army jeep parts, then add oversize bodies glittering with paint, chrome, and reflectors—often to the purchaser's specification. Drivers squeeze in 10 to 12 passengers.

Commuter's nightmare: Crowding a dugout *banca* to the point of swamping, office workers are paddled across the Pasig River to jobs in Makati. Executives may live near their offices in Forbes Park—a residential area referred to as "the Philippines' richest barrio," or community. But Makati's developers also offer low-cost building lots.

lived there. Chinese trading junks had plied Philippine waters for centuries.

The Spanish mistrusted the non-Christian Orientals, but needed their skills and trading ties with China. The Chinese population grew rapidly, restricted to a special district outside the walls of Manila but within easy reach of its guns.

From time to time the nervous Spanish swarmed out of Intramuros to kill Chinese. In 1603, some 23,000 were massacred, almost ending the profitable Chinese trade that brought goods for the galleon fleets.

Today the Chinese are still subject to discriminatory laws. One alien law—in the Philippines "alien" means mainly those Chinese who are not citizens—forbids them to enter retail trade. But the Chinese still dominate that trade, have a large hand in the copra business, and generally control the rice and corn markets.

Filipina Wives Own *Sari-sari* Stores

Some Chinese comply with the law banning them from retail trade by taking Filipina wives and putting businesses in their names. They operate thousands of *sari-sari* stores—little stands that carry small inventories of staple foods, sewing supplies, fruit, soft drinks, and so on. Many have expanded into full-fledged supermarkets and other stores.

The Chinese are not harmed, but they are harassed from time to time. Mayor Villegas earlier this year ruled that shops in Manila's Chinatown must replace signs in Chinese with signs either in English or in Tagalog.

From the melting pot of races in the Philippines, a questing people has emerged. Tempered by struggle, imbued with tenets of freedom, they are seeking—and finding—a national identity. In 1965 they chose 48-year-old Ferdinand Marcos as sixth President of the country (page 314).

"President Marcos must make up his mind very early about some very basic things," Dr. Leonides S. Virata, president of the Philippine Chamber of Industries, told me.

"Smuggling, which has been a national disgrace, is now a national calamity. The country is being strangled by corruption and smuggling.

"An alarming amount of money is involved—from 300 million to 500 million dollars a year, more than a billion pesos. This is money that should go to lubricate the gears of the economy. Instead it is being siphoned away by illegal trade: actual smuggling, plus 'technical smuggling' on the docks—lowered or forgotten payments of duties arranged by bribery—and pilferage on a vast scale."

"Not One Hero Alone Do I Ask. . . ."

President Marcos is well aware of the state of his nation. In his inaugural address he stated the facts baldly:

"The Filipino, it seems, has lost his soul, his dignity, and his courage. Our people have come to a point of despair. We have ceased to value order. . . . Our government is gripped in the iron hand of venality, its treasury is barren, its resources are wasted, its civil service is slothful and indifferent, its armed forces demoralized and its councils sterile."

To rally his people, President Marcos made a stirring appeal: "Not one hero alone do I ask from you, but many—nay, all."

The Republic of the Philippines has been in critical condition every day of its life.

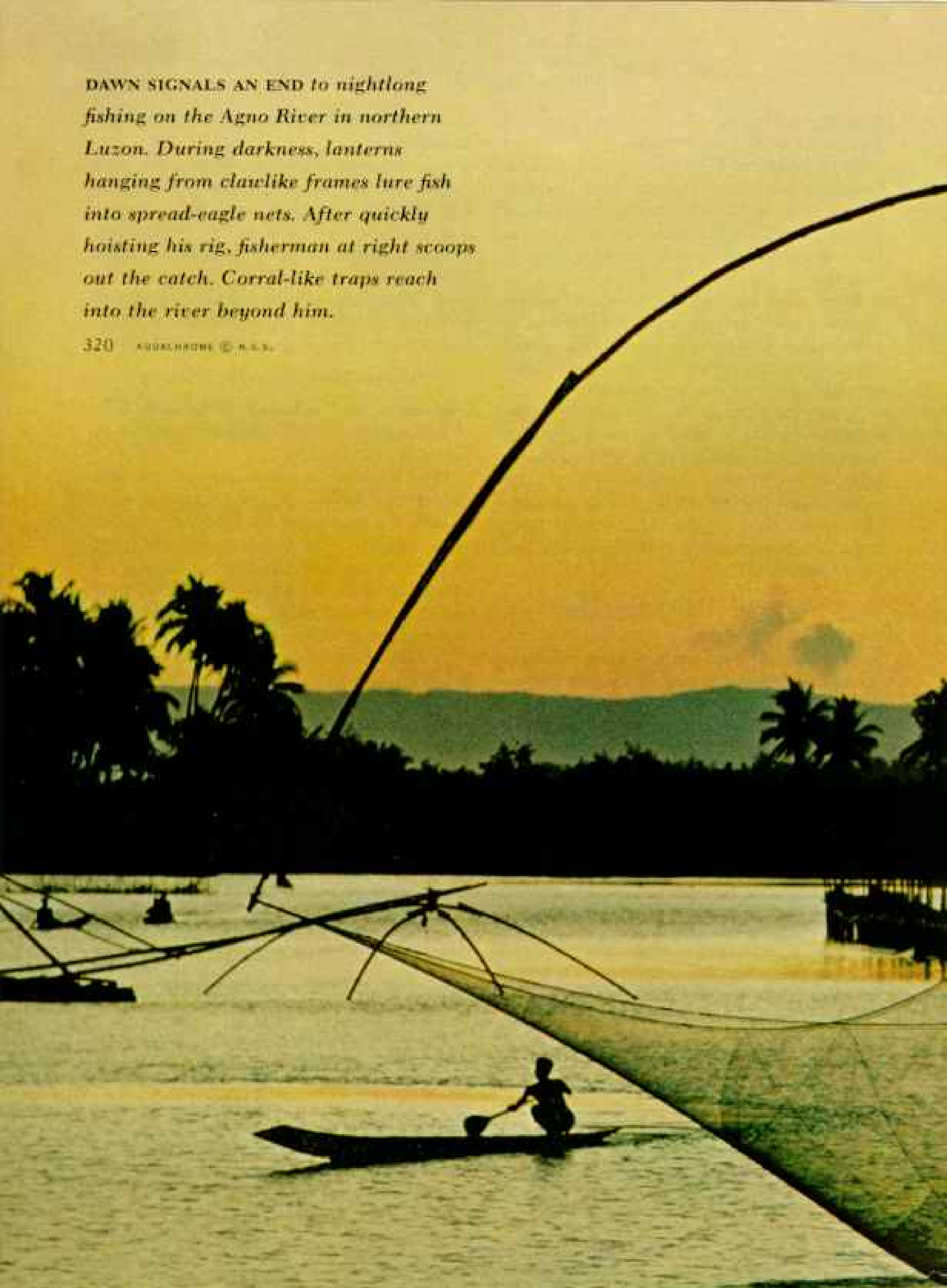
"The republic was born at the worst possible time," said a Philippines senator. "The country was in ruins after the Japanese occupation. The farm animals had been eaten. There was no seed. There was no machinery for industry. Most of the schools and libraries had been destroyed. Public records were lost.

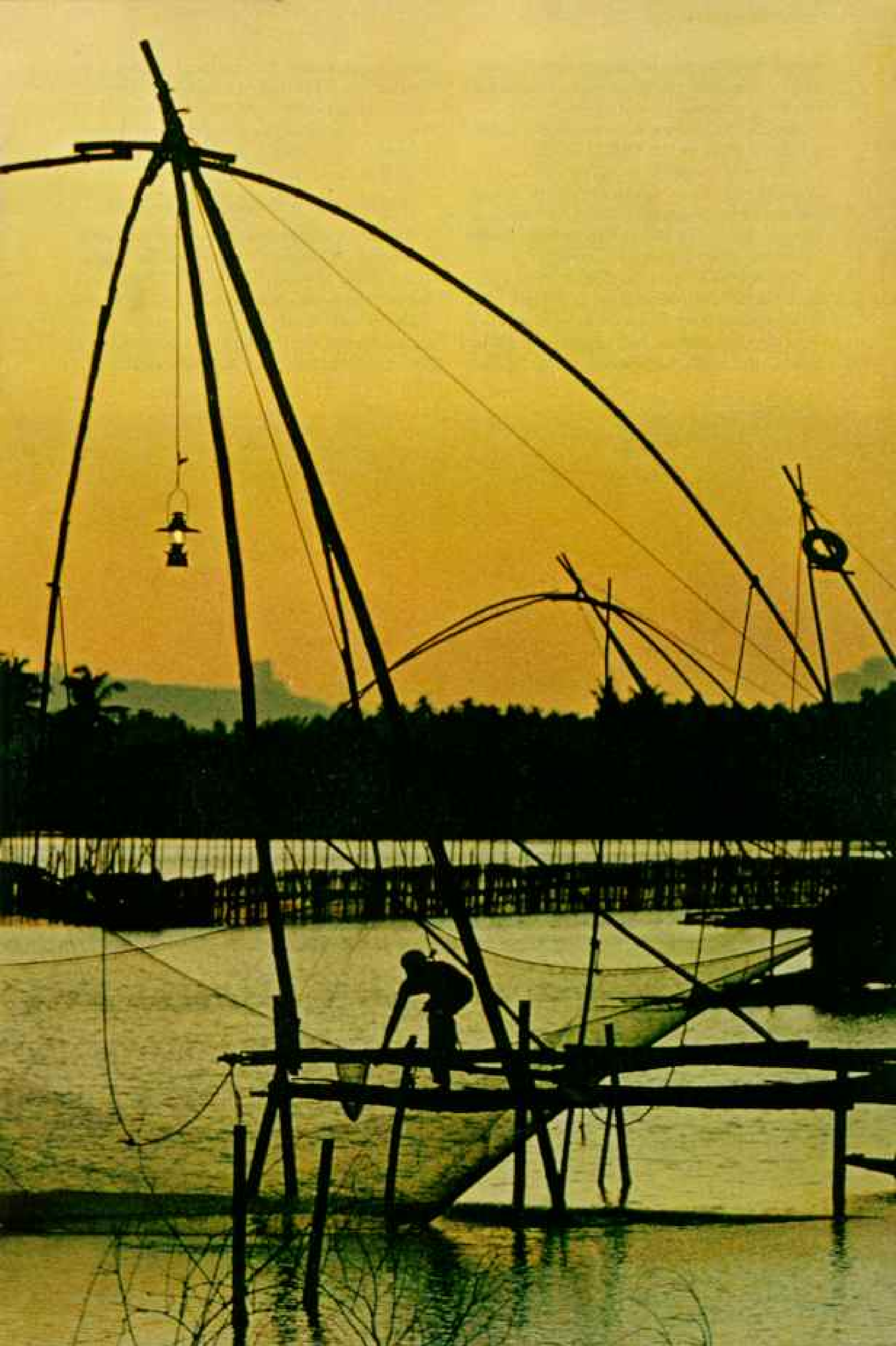
"Under the best conditions it takes a certain time to forge a democratic nation. Yet many are disappointed that the Philippines—starting at zero—has not achieved its goals in two short decades."

There have been anti-American demonstrations in Manila. But when I called on President Marcos, he said, "There is a big reservoir of good will established by our long partnership in government with the United States. That association was culminated by our common stand at Bataan and Corregidor and later. We are too close to the last war to

Twisting up Christmas spirit, young swingers compete in a Yuletide dance contest at Barrio Bigbiga in Luzon's Tarlac Province. Fiesta-loving Filipinos liberally spice religious devotion with fun. The islanders begin perhaps the longest Yuletide observance in Christendom with a 4 a.m. Mass on December 16. Brass-band parades, caroling, pageants, contests, feasting, and worship continue through January 6. Each barrio honors its patron saint with a similar but shorter annual event.

DAWN SIGNALS AN END *to nightlong fishing on the Agno River in northern Luzon. During darkness, lanterns hanging from clawlike frames lure fish into spread-eagle nets. After quickly hoisting his rig, fisherman at right scoops out the catch. Corral-like traps reach into the river beyond him.*





forget. Most of our people are temperamentally committed to democracy and friendly relations with the United States."

But the Philippines does not regard itself as a branch office of the United States.

"Our role is not to advance the cause of Western democracy in Asia or be the outpost for anybody or anything in Asia," declared former Vice President Emmanuel Pelaez. "Our role is simply to be ourselves."

Gen. Carlos P. Romulo, former Ambassador to the United Nations and the best-known Filipino abroad, now is Secretary of Education.

"The outstanding fact about the Philippines," the small, surprisingly youthful-looking statesman said to me when I visited him, "is that we have had six national elections since independence. And after an election there is no liquidation of candidates. No one is exiled. The result is accepted by all. That is what I call a maturing democracy."

Filipino Press: Embarrassing but Free

Another mark of Philippine democracy is a free press. "There is not the slightest censorship," General Romulo told me. "Sometimes our press is embarrassing, but it is very free."

Democratic institutions and a free press are legacies of the United States occupation. I saw other aspects of that heritage: elections at

Staunch friend of America, Carlos P. Romulo talks with students on the campus of the University of the Philippines in Quezon City. Soldier, author, and now Secretary of Education, he served as President of the United Nations General Assembly and for 7½ years as Ambassador to the United States.

Hoary battlement guards Intramuros, Manila's heart. Golfers tee off where a moat once glistened. Japanese fortified the 400-year-old walled city for a last-ditch stand in 1945. Few ramparts survived.

the barrio level, a sincere belief in the freedoms of men, and a raging desire for education.

The University of the Philippines occupies new buildings in Quezon City, the official capital of the Philippines, just east of Manila.

"We have 17,500 students from all over Asia," General Romulo said. "This university is the anchor of democratic faith in this area."

He urged me to visit the International Rice Research Institute adjacent to the University's College of Agriculture near Los Baños. Although the institute, a joint effort by the Ford and Rockefeller Foundations, did not begin its work until 1962, it has already shown results.

Research Redesigns the Rice Plant

"Perhaps the biggest step so far is the change we have made in the architecture of the rice plant," ventured Dr. Robert F. Chandler, Jr., director of the institute.

"In three and a half years we have reduced its height from more than five feet to little more than three. The object is to produce a plant which will not bend or break in the wind and monsoon rain—and still will yield well."

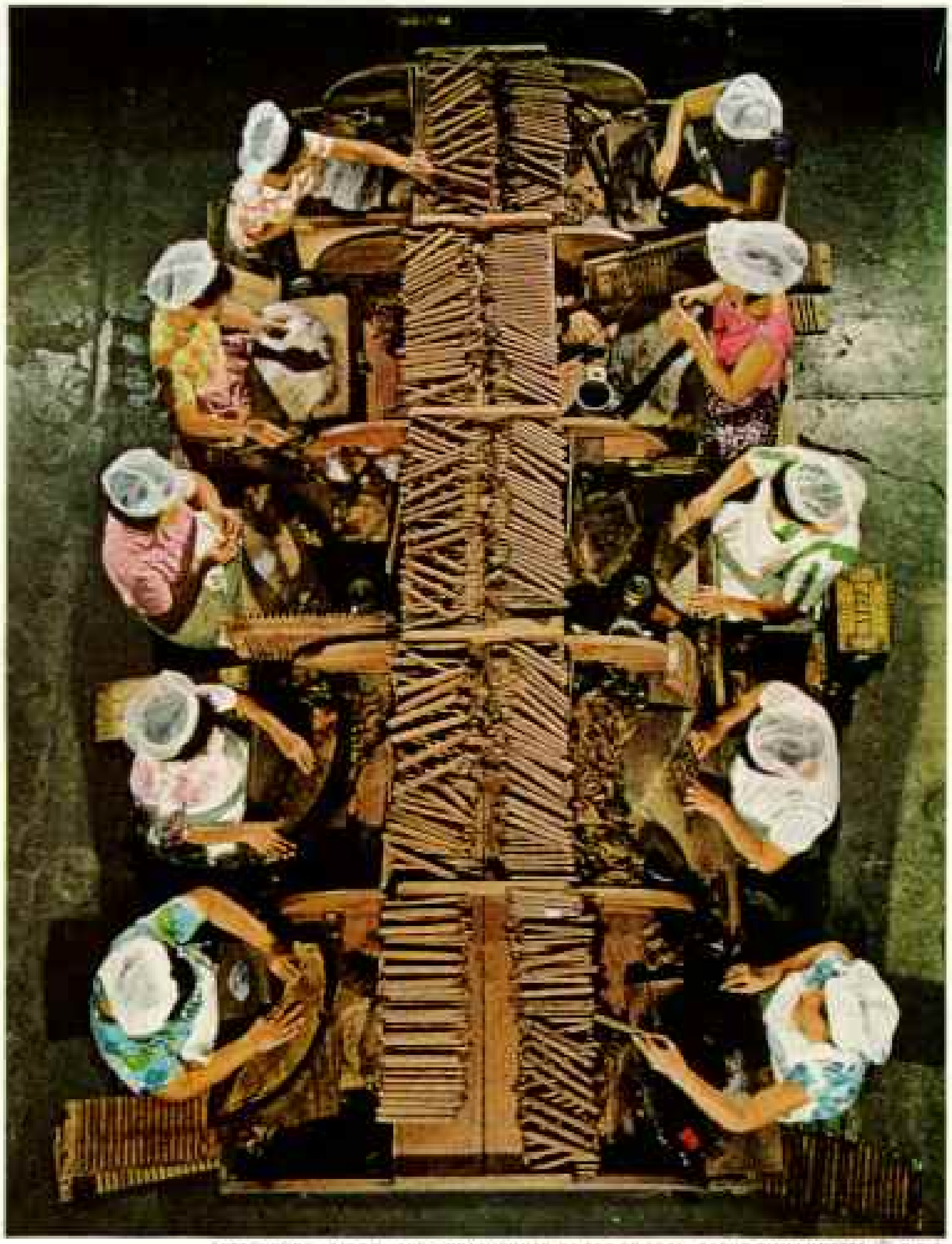
The institute has collected 10,000 varieties of rice from all over the world. Electrified fences guard the experimental plots against rats, and "bird boys" wander the fields to keep off feathered raiders.

The Filipinos' thirst for education is unquenchable—but some students are being shortchanged. Educators see danger in the commercially run schools that call themselves universities. "What we really need," they say, "are vocational schools."

I discussed this with Governor Benigno S. Aquino, Jr., of Tarlac, a province of central Luzon. At 32, he is one of the brightest lights in the Philippines.

We stood in a room where he charts the progress and problems of his province. He pointed to a diagram. "Here is where the trouble is," he said. "The school dropouts start at the fourth grade. They can read and write, but that's all. We have a high literacy rate in the Philippines—83 percent—but I don't know how much thinking these people can do."

To supplement inadequate schooling, Governor Aquino



EKTACHROME (BELOW) AND KODACHROMES BY TED SPIEGEL, RAPHO GUILLUMETTE © N.G.S.

Panatelas pile up as dexterous women roll aromatic leaf in the Manila plant of Tabacalera. Distinctively flavored Philippine cigars command premium prices around the world. Spanish missionaries brought tobacco culture from Mexico four centuries ago, giving the islands a famous commodity—and a habit. Women of Luzon's highlands flourish giant stogies, some so large they require two hands for manipulation.

Specks on a checkerboard, rakers collect crystalline residue from salt-evaporation beds that line the shore of Manila Bay. Blazing sun draws water from the shallow, dike-enclosed ponds, flooded with brine from the bay. Salt beds convert to fish-raising ponds in the rainy season.

Beauty marks from her youth, tattoos etch the arms of this cigar-smoking Bontoc grandmother.

has established a technological school to train mechanics, engineers, and agricultural specialists. The University of the Philippines also has a branch in Tarlac.

"We bring barrio chiefs in for week-long seminars," Governor Aquino said, "to teach them the things they need to know to improve their barrios: How to raise chickens, how to dig an artesian well, how to make a sanitary privy, how to avail themselves of government help. We follow up with three-man teams in jeeps, who go out into the barrios and supplement the teaching of the seminars."

Handful of Huks Still Holds Out

Tarlac and Pampanga, the province to its south, harbor the remnants of the Hukbalahaps, Communist guerrillas who waged a fierce civil war in the early 1950's.

Ramón Magsaysay, a former wartime guerrilla, then Secretary of Defense, crushed the Huk rebellion by force and persuasion. He did not hesitate to shoot the Communists, but he offered land in Mindanao to those who surrendered. The final key to Magsaysay's victory was the arrest of almost the entire Huk leadership.

Magsaysay was elected President in 1953. His term began with high enthusiasm, but ended in tragedy when he died in an airplane crash on Cebu Island in 1957.

At the time of my visit the surviving Huks —now called the Hukbo Mapagpalayang Bayan, or People's Liberation Army—were fighting among themselves. The feud was personal, between two leaders, rather than political. Two days before I visited Tarlac, seven men of one group had been killed in an ambush by another.

Col. Manuel Yan, Chief of Staff of the First Philippine Constabulary Zone, combats these outlaws with about a thousand men. "Troops are posted in every town," he said, "to prevent action by the Huks."

Later Governor Aquino told me, "If the troops withdrew, the landowners wouldn't harvest a single seed. Huks would burn the crops. They operate like the Mafia. They have a protection racket." In all, the Huks influence perhaps eighty barrios out of more than a thousand in the two provinces.

Instead of bandits, I found men of mercy near a town named Angeles. At Clark Air Base, the tremendous United States installation that occupies 157,000 acres in Pampanga and Tarlac Provinces, I watched a C-130 from Viet Nam lumber up to the apron. Dark-blue buses and ambulances clustered around before its propellers stopped turning.

The ponderous rear door lowered, and doctors, nurses, and medics quickly went to work. Within 20 minutes after the plane touched down, its cargo of wounded and ill were under intensive care at the base hospital.

The efficiency of the well-trained medical crews was a little saddening: They obviously had had a lot of practice in handling wounded men (page 349). Critical cases are treated at Clark. Others get preliminary treatment and then are flown to Okinawa, Japan, Guam, Hawaii, and the mainland United States.

"We have more than 50,000 people on the base now—about double the number we had before Viet Nam," an Air Force colonel told me. "We go on no missions," he continued, "but we back up the Viet Nam theater, supply all the aircraft they need, and maintain the planes. This is the chief base for air supply of Viet Nam."

Magellan Brought Christianity to Cebu

Some 400 miles southward from jet-age Clark lies old Cebu, in the central Philippines (map, page 313). As my plane reached the island, the rice fields shone in the last light of day like pieces of the thin, translucent Capiz seashell that Filipinos often use in windows.

But by the time we neared the city of Cebu, dark clouds had gathered. Sudden lightning slapped the hills. When we touched down, it was raining hard.

Third largest city of the Philippines after Manila and Quezon City, Cebu was the first to be Christianized. Magellan, in the service of Spain, landed here in 1521, the first European to reach the island chain. What may be the original cross brought by him stands in a downtown street. Cebuanos light slender white candles at its base.

The Spaniards changed the name of the archipelago, which Magellan had called the St. Lazarus Islands, to the Philippine Islands in honor of Crown Prince Philip, later King Philip II. When Spain decided to push a military and spiritual invasion, Miguel Lopez de Legazpi began it at Cebu in 1565.

With blackened faces, grotesque costumes, and Mardi gras spirit, masqueraders at Kalibo imitate Negritos from whom Malay migrants purchased Panay Island. Dating from the 13th century, the exuberant 10-day carnival once so startled marauding Moros, islanders recount, that the Moslem pirates sailed away never to return.

Cebu struck me as a jingling, jostling town, overrun by horse-drawn, two-wheeled *tartanillas* that function both as taxis and as buses. I was told there are 6,000 of them. A bustling new section of the city, reclaimed from the bay, nears completion. Yet people here say Cebu is a *mañana* town.

"I am always glad to get back to the peace of Cebu after a trip," a merchant told me. Even the diligent Chinese take time off for a leisurely cup of tea and a game of mah-jongg.

Magellan Died on Mactan Island

One day I crossed the channel that divides the islands of Cebu and Mactan. A monument to Magellan rises on Mactan, where the Portuguese-born explorer died at the hands of native warriors.

Spain's influence lives on in the island's industry of making guitars and ukuleles. In Barrio Abuno I saw men and boys fashioning the instruments by hand. Polished to a high gloss and inlaid with mother-of-pearl, a guitar takes three days to complete.

Apparently the craft has deep roots in the island. When I asked, "Where did you learn to make guitars?" a young man answered, "From our forefathers, sir."

A 45-minute plane ride carried me from Cebu to Dumaguete, on the sugar island of Negros. Palms fringed the sea. Then the road became a passage through bright sugar cane.

At the town of Bais I met Miguel Franco, manager of sugar and paper mills owned by the giant Tabacalera Company. The paper mill converts bagasse, the residue of crushed sugar cane, into 30 tons of bond paper and 10 tons of paperboard a day. In the sugar mill we walked amid massive gear wheels, rollers, and nuts and bolts all strewn about.

"Now is the time we make repairs, while the cane is growing," Mr. Franco said.

While in Dumaguete I visited Silliman University, started as a Presbyterian school in an old Spanish home in 1901. Fifteen barefoot boys were the first student body.

Today the university—still supported by United States churches—has an enrollment of nearly 3,500. Its campus includes a medical center, a new theology quadrangle, a good library, a high school and elementary school for practice teaching, an engineering building, and a school of nursing. Silliman is an excellent university, as are the Jesuit Ateneo de Manila, the University of the Philippines, and the Philippine Women's University.

When I returned to Manila, I went to the National Museum to learn about recent archeological discoveries made by its staff.

My taxi stopped at the side door of the museum, and I stepped into an amazing room. It displayed case after case of Tang, Sung, and

EXTACHROME (OPPOSITE) BY TED SPIEGEL, RAPHO GUILLUMETTE; KODACHROME BY JOHN LAUNOIS, BLACK STAR © N.G.S.

Blur of feathered fury transfixes anxious partisans clustered about Kalibo's cockpit. Family fortunes may ride on the outcome as the wiry gladiators battle to a finish with razor-edged steel spurs. Ardent bettors, the islanders reserve their greatest enthusiasm for cockfighting. The smallest barrio boasts a cockpit which, by law, operates only on Sundays and holidays.

Eighth Commandment admonishes laborers at a Basilan Island coffee plantation—a reminder that widespread pilferage and rampant smuggling strain the young democracy's economy. A gong made from an old shell casing signals work periods.

Ming dynasty porcelains and pottery, and similar ware from Thailand. Chief anthropologist Dr. Robert Fox explained the hoard.

"We excavated 1,300 graves of 14th- and 15th-century Tagalogs in Batangas Province," he told me. "The Philippines has more antique Chinese trade pottery and porcelain than China, and more Siamese wares than Thailand. The reason is simple. In Siam and China, plates and jars were in daily use, and most of them were broken. Here they were used ritually and as grave furniture and thus were not destroyed."

The porcelain and pottery give evidence of an early trade between the Philippines and China and Siam. Treasures of the East were bartered in the Philippines for pearls from the Sulu Sea, gold, and hardwoods.

Robert Fox has found pottery dating a thousand years before the Christian Era in caves on Palawan Island, where he is digging with the support of the National Geographic Society. "We've found stone tools more than 30,000 years old, and we now know of 83 cave sites," he told me. "Palawan is the real archeological excitement now."

Moslem Moros Flee a Christian Saint

Dr. Fox introduced me to Galo B. Ocampo, director of the National Museum and a man of rapid action. Three minutes after we met he asked, "Do you want to go to Dapitan?"

"Sure," I said. "Where is Dapitan?"

"It's where Rizal was exiled," he said. "Be at the airport at six tomorrow."

The next morning, at Manila International Airport, we boarded a Philippines Air Force C-47 for the three-hour ride to Mindanao, the big southern island (map, page 313). The plane angled down over coconut palms that looked from the air like exploding star shells. Skimming a jumble of thatched roofs, we rolled onto the airstrip at Dipolog, then traveled by car a dozen miles farther.

Dapitan was aglow for the fiesta celebrating its 400th anniversary. Sound trucks wound slowly around the plaza blaring rock-'n'-roll music; horns on decorated pedicabs cheeped with the mindless constancy of day-old chicks, and over all resounded the cracked clanging of the bells in the parish church.

At noon the bells, in galvanized iron towers, set off a prodigious ringing. With ferocious yells, a band of turbaned "Moros," waving wooden swords, breached the crowd and drove toward the church door. There they were met by the image of Santiago Matamoros, carried by four men. A red umbrella

Like thousands of eyes, coconuts split for drying stare at harvesters on Mindanao. A skilled worker (below) scoops out copra, the dried meat, with a blade stapled to his stool; he can strip 1,400 halves an hour. The Philippines supplies half of all coconut products in world trade. Supporting one in every four citizens, the bountiful coco palm also bestows food and materials for homes and furnishings.

KODACHROMES BY JOHN LAUNOIS, BLACK STAR © N.G.S.

protected the saint from the sun. The Moros retreated as Santiago advanced.

This pageant represents the Battle of Covadonga in 718, in which Saint James is believed to have appeared to rally the Spanish against Moorish invaders. For his battlefield exploits, he won the title Santiago Matamoros—Saint James the Moor Killer.

When Spanish priests first reached Dapitan in 1607 (the same year the first permanent English settlement in the New World was established, at Jamestown, Virginia), the village was frequently pillaged by Moro pirates. Santiago Matamoros was seized upon as a patron

saint who could protect the town from the "Moors"—actually Moslem Filipinos.

In the afternoon we made our way to the national park on the site of the exile home of José Rizal, the national hero of the Republic of the Philippines.

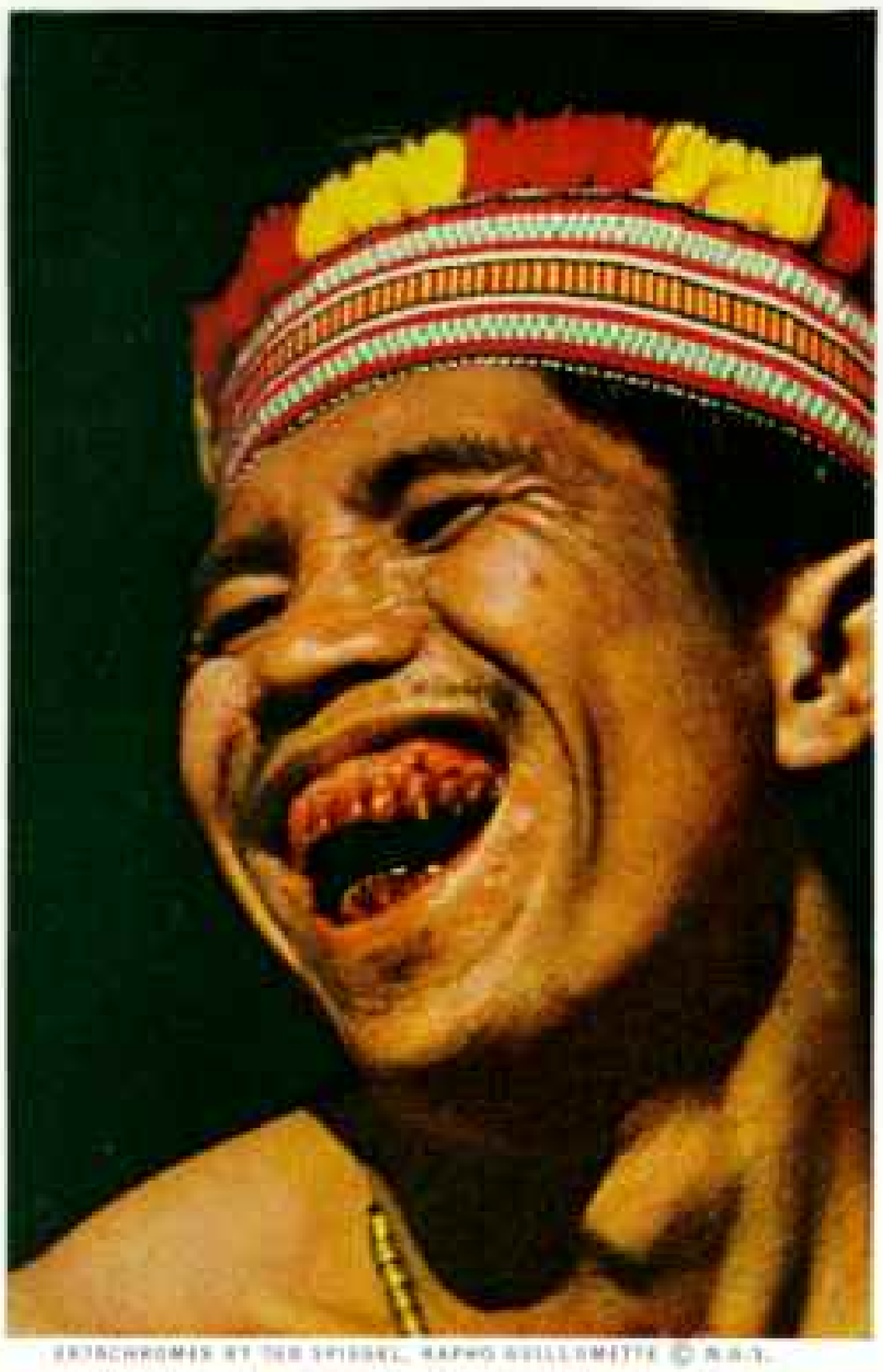
Here, in buildings he fashioned himself, Rizal lived from 1892 to 1896. The reconstructed buildings stand in an idyllic grove of giant bauno, narra, talisay, and ipil trees. A constant shower of delicate pink blossoms fell from the bauno trees like sweet-smelling rain, making pink puddles on the ground.

Poet, painter, ophthalmologist, José Rizal sparked a revolution with his fervent novels, *Noli Me Tangere* and *El Filibusterismo*. They tell of the terrors of life in the Philippines under the Spanish. The Spanish banned the books, but Filipino patriots smuggled them into the country and read them aloud to their countrymen. Dissatisfaction with Spanish rule flamed into action. Although Rizal believed in moderation, his name became a symbol of revolt.

To end his Dapitan exile, Rizal volunteered to serve as a doctor for the Spanish forces in Cuba. Before his ship reached Spain, he was arrested, returned to Manila, court-martialed, and executed by a firing squad on December 30, 1896. Today the anniversary of Rizal's death is a national holiday.

When Galo Ocampo climbed aboard the military plane and flew back to Manila, I stayed behind. I was headed for Zamboanga, on the westernmost tip of Mindanao. Zamboanga is a delight of flowers. Cascades of bougainvillea and white orchids cover the fronts of almost all the houses.

Now I had entered Moslem territory. Many Moslem men wear turbans or the little velvet caps called *kopia*, and both men and women wear *kantio*—long, loose cotton pants. Spanish is heard frequently, as well as the local dialect, *chabacano*—"bamboo Spanish."



Teeth stained with betel juice, an Ifugao revels at a *cañao*, a feast asking his gods for a bountiful rice yield. Asians chew the betel-palm nut, sprinkled with lime and wrapped in leaves, as a mild stimulant.

Like golf-course fairways, rice fields claim lowlands between tawny, coco-palm-fringed hills on Bohol Island. Farmers use more land for rice than any other crop; city dwellers figure living costs by its price.

Bright Fish Glow in Zamboanga's Market

Arab missionaries, proselytizing for Allah, reached the Philippines long before the Spaniards. But their efforts to convert the Filipinos had not reached all the islands when the Spanish—themselves ardent missionaries for Catholicism—arrived. Islam remains strong in the Philippines only in Mindanao, Palawan, and the Sulu Archipelago.

One morning I wandered through Zamboanga's fish market, awed by the variety of marine life displayed on wet boards along the quayside (page 338). It included remoras, sharks six feet long, and diamond-shaped rays with violent blue spots. Some of the fish looked more like enameled jewelry than fare for a simple meal. One jet-black fish had a bright-red splash, like a stroke from an artist's brush, behind its gills.

Barefoot boys and housewives pattered toward home, carrying dinner by the tail.

That evening I sat on the sea wall in Zamboanga and watched the sun set behind mother-of-pearl clouds. The sea lay flat and glossy, and the distant hills of Basilan Island looked like the farther shore of a lake.

Bajao women—sea gypsies (pages 301 and 338)—drifted in *vintas*, outrigger canoes, by

the sea wall. The sun turned the sea a gentle pink. The sails of the vintas turned pink, too, and so did the clouds. The hills faded to a soft blue and disappeared, and it was night.

A whole galaxy of pinpoint lights gleamed from the wharf, where three ocean-going vessels were loading copra. I heard a flurry of ships' bells, saw fires being lit on nearby vintas, and sniffed the good smell of roasting fish drifting on the slow breeze.

Next morning I boarded a launch for the 90-minute ride to Basilan Island. All the seats were taken, so I scrunched in by a rooster morosely confined in a plastic-mesh shopping bag. There was a convincing odor of copra.

Moslem women nursed babies and chatted amiably. One woman wore a bright-blue blouse with buttons of gold and pearls. Eight enormous pearls graced her bracelet.

Coconut Palm: Tree of Plenty

Once ashore, I rode a battered jeep to the Menzi Plantation, one of the show places of the Philippines (page 329). There I was greeted by young Onofre Griño, who handed me a cup of coffee, grown, roasted, and ground on the plantation. "We also grow rubber, black pepper, coconuts, and cacao," he told me.

In a soft rain we drove through graceful coconut groves. Useful as it is beautiful, the

coconut thrives on the coastline, where most of the people of the Philippines live. These islands lead the world in production of coconuts. The crop returns more than $250,000,000 a year in foreign trade and forms a mainstay of the economy (pages 330-31).

Coconut palms are cornucopias of good things, yielding much more than copra and coconut oil. Processed coconut shells may end up as high-grade charcoal, gears, cups, and buttons; the natural fibers of the husk make hats and strainers; leaves find use in brooms, roofing, and packaging. The

Angry and armed, Moros hear the entreaty of a finger-wagging peacemaker. Jolo Mayor Birely Abubakar cajoles youths from outlying villages to halt a feud triggered by an elopement, a violation of Moslem marriage ritual. The Moros, famed for ferocity and courage, lived by piracy until recent years. Never subdued by Spain, they bitterly resisted United States occupation. But the gallantry of Capt. John J. Pershing, later General of the Armies, won their grudging admiration. Loyal allies in World War II, Moros waged bloody guerrilla warfare against the Japanese.

Pedicab cavalry engulfs jeepneys on the teeming waterfront of Jolo, trading center of the Sulu Archipelago. Until banned recently as nerve-racking nuisances, jangling bells on pedicab wheels added to the din of this marketplace where shoppers haggle for transistor radios, brassware, wavy-bladed krises, smuggled cigarettes, or pearls. Seat of the Sultan of Sulu, Jolo remains the spiritual capital of the Moslem domain—several hundred small islands and part of Mindanao.

Man-powered pile driver sets wooden pilings into Jolo's tidal flats—first step in building a Moro house in the Sulu Islands. A floor, walls, and thatched roof complete a one-room dwelling. Simple furnishings include sleeping mats and earthen hearth.

Forsaking the land, a Samal village on stilts plants its feet on the tide-washed fringe of a coral atoll in the Tataan Islands. Sea and breeze keep houses cool. Fishermen use their watery basements amid the pilings as parking places for their *vintas*—bright-sailed outrigger canoes.

flower-stalk sap gives a fermented drink, *tuba*.

We passed a water-filled ditch. "Don't tell me you have to irrigate, with all the rain you have," I said.

"Yes," Griño answered. "Indiscriminate logging and burning of the forest by squatters have destroyed so many trees that the climate of Basilan has changed. Rainfall used to be distributed uniformly all during the year. Now we have long dry spells."

Jolo Christians Live in Fear

I could not get a boat to Jolo, capital of Sulu Province, so I took a plane. I was glad I did. The landing was spectacular. The plane came in very low over the Sulu Sea, almost brushed bamboo and nipa houses, and landed with a whoosh not two blocks from town.

Jolo is an isle of fear: Its Christians live in dread of the Moslems, who form 98 percent of the populace. Moslems, "going *juramentado*," sometimes set out wildly to kill Christians.

"They believe that if they have killed a Christian before they die, they will enter heaven on a white horse," I was told.

So it took courage for my volunteer guide, Benjamin Tan, to drive me to the provincial capitol outside the city. "It stands in a dangerous district," he said, adding that the governor used the building only occasionally.

We saw but one person there: a guard in a white T-shirt, a rifle loosely cradled in his arms. In the main corridor of the building a cow gravely chewed her cud. We drove on to palm-tousled Mobo Beach, where a Japanese war vessel rusted in the gentle surf. Then we headed back to Jolo.

At Notre Dame of Jolo College, maintained by the Oblates of Mary Immaculate, I talked to Father Cuthbert Billman, a tall man in a white cassock.

"We go out of town all the time, and we certainly are Christians," he said. "But we don't proselytize. We try to solve problems through education. We try to build some of the bridges Pope John XXIII talked about."

The Notre Dame College student body is 75 percent Moslem.

Whatever else it may be—and it certainly is one of the fascinating small cities—Jolo must be the noisiest spot on earth. In a span of two minutes I noted these sounds: Bing Crosby singing "Happy Birthday to You" on

Nomads of the Sulu Sea, Bajaos spend most of their lives afloat. A fisherman sorts his catch in a shallow dugout. For living quarters, Bajaos build elaborate houseboats on hulls carved from single tree trunks, some as long as 50 feet.

Bajao beauty pack: With *borak*, a paste made of ground rice, fruit, and leaves, teen-agers seek to improve their complexions. Bajaos marry at an early age—a boy as soon as he proves he can live independently and support a wife. Then his father will purchase a bride for him and present the couple with a houseboat, a clay stove, cooking pots, sleeping mat, spear, and fish net.

Harvest of the sea changes hands by the quay at Zamboanga, where Moro fishermen come to sell their catch. Despite the abundance of fish along the Philippines' thousands of miles of coastline, the extensive use of man-made ponds, and the gradual modernization of fishing practices, the nation must still import fish to meet its people's needs.

EKTACHROME © NATIONAL GEOGRAPHIC SOCIETY

a loud juke box, trumpet practice next door, a radio with a suffering singer, boys kicking tin cans on the pavement, children chanting the Koran, gravel thrown into a wheelbarrow, a dozen dogs barking, a plane taking off from the airport, school children singing, traffic and market noises, a clacking telegraph key, peddlers' cries, and the empty sound of two goats butting their heads together. Supreme over all this were the nerve-jangling bells rigged to the wheels of Jolo's pedicabs. Whenever the vehicles move, the bells ring.

Big red buses with slat sides roll into town at all hours, blazing the way with raucous horns. I was not enamored of the buses, but I liked the sign on their sides: "No Clinging Around."

When I sought passage to Sitankai and the Sulu islands with tom-tom names—Dongdong, Tawitawi, Sanga Sanga, and Sumbasumba—I was told, "You don't want to go there. They've got a shooting war going on."

Bullets fly in the southern seas between smugglers, hijackers, and customs men. Smugglers, using catamarans powered with two Mercedes-Benz engines, can make hundreds of thousands of pesos running contraband in from Borneo. They can afford the best equipment. Government boats haven't a chance.

Sulu Pearls Now Grow on Farms

The smuggling war has ended the profitable pearling trade in the Sulu Archipelago. "There are still lots of pearls, but they are all underwater," said Francisco Terol, manager of the Jolo Light and Power Co. "The pearlers won't go out because of the pirates."

I found a different story at Samal Island, in the Davao Gulf off southeastern Mindanao (map, page 313). There the Aguinaldo pearl farm, in a little cove, is guarded by spraddle-legged watchtowers. Searchlights crisscross

the place at night. Obviously, unexpected visitors are not welcome in these waters.

Daniel Aguinaldo, a Manila businessman, started the farm in 1958 by airlifting 12,000 white-lipped oysters from the Sulu Sea. The oyster, with a shell the size of a dinner plate, can manufacture white, pink, or gold pearls. Aguinaldo also raises black-lipped oysters, which form coveted "black" pearls.

The oysters grow in wire baskets suspended from bamboo rafts (page 342). These cast lattice shadows in the turquoise water, where hundreds of brightly colored fish dart in and out among the baskets.

Mindanao Finally Keeps Its Promise

A short launch ride across a narrow strait brought me to the bustling gulf-coast city of Davao on Mindanao. Called the "land of promise" so long that Filipinos have dubbed it "land of promises," the big, rich island now shows signs of living up to its expectations.

At Davao I saw progress everywhere: bales of blond abaca fiber—Manila hemp for fine rope—piling up on the docks; gigantic timber trucks delivering logs to plywood mills.

Visiting a nearby plantation, I saw groves of abaca plants, which resemble small banana plants. At the mill, men unloaded abaca stalks from little railway cars and threw them into a crusher. Then they rolled through "finger" machines that separated the fiber. When the fibers were washed, dried, and burnished, they were ready for market.

At Bislig, on the eastern coast of Mindanao, a paper mill designed to use forest wastes was being built. It represents one of Mindanao's promises made good—a papermaking process using Philippine hardwoods. Fifteen years of research went into perfecting the process.

The "grist" for this mill will come from the Bislig Bay Company's 395,000-acre timber concession. Resident manager William Godinez and woods boss Arthur Balch showed me around.

"When we hit the beach here in 1950," Mr.

Balch said, "there wasn't a single major logging outfit on this coast. Everyone thought we were crazy. They said the sea was too rough for shipping logs, and that there was too much rain for us to build roads."

As he spoke it was raining at Bislig, and the Pacific did indeed look rough. Only about 60 miles west lay the Philippine Trench, with one of earth's deepest soundings at 34,440 feet.

Driving into the forest, we passed huge earthmovers slogging through the mud.

"Logging's mostly a matter of building roads," Bill Godinez said. "There is no money unless the logs come out of the woods."

We stopped at a muddy clearing in the tall forest. Men standing on a platform sawed at the base of a lauan—a tree that reaches market as "Philippine mahogany" (opposite).

As we got out of the car, Bill Godinez pointed upward. A high-climber, his figure tiny against the bole of a 130-foot tree, adjusted his safety belt and started his power saw.

The saw snarled and bit into the trunk a hundred feet above the ground. With a tremendous crackling, the 30-foot crown bent slowly in a great arc and dived into the mud far below. Shattered branches and geysers of mud splashed into the air. The tree whipped violently, and I pitied the clinging figure of the man at the top.

Later I felt the earth shake as sawyers dropped two giant trees into the underbrush. I watched a yarder drag seven-ton logs through the woods, as if bringing huge fish to gaff. The forest rang with whistles, the rasp of saw blades, the shouts of men.

Forest Giants Mature in 70 Years

"We don't reseed," Bill Godinez told me. "The forest regenerates itself very quickly. We leave trees less than 24 inches in diameter. We'll cut those in 35 years. We'll be cutting today's seedlings 70 years from now."

More than half of the Philippines comprises forest and mountain land, and I saw much of it in the days that followed. I flew north from

EXPLOSIVE (LEFT) AND HOSE NOZZLE BY LEE SPIRES, © N.G.S.

Heart of a giant lies exposed in a Mindanao forest as a lumberman cuts its trunk into manageable logs for transfer to a sawmill. This red lauan and six other species of "Philippine mahogany" make up the bulk of timber exports. Much goes to Japan and Taiwan for processing into plywood and veneer.

Shiny with sweat, sinewy miners drill into the face of an underground copper mine of the Lepanto Consolidated Mining Company, in northwestern Luzon. Geological surveys reveal that the Republic of the Philippines possesses one of the most highly mineralized areas in Asia. Besides copper, Philippine mines produce chromite, iron, manganese, mercury, silver, and gold.

Manila to the Lepanto copper mine with operations manager Charles Foster and his wife Lucille. The trip took 57 minutes by plane; it would have taken 14 hours by jeep over twisting mountain roads.

Flying amid popcorn clouds, we soared over the Trinidad Valley, called "the salad bowl of the Philippines." Its fertile fields were spaced as regularly as lines on a ledger. In northwestern Luzon, Charles Foster brought his plane down smoothly on an airstrip laid out on a mountaintop.

Igorots Learn to Drive Locomotives and Blast Rock

I found Lepanto a thriving community, complete with schools, post office, hospital, police and fire departments, a women's club, and a golf course that leaps from peak to steep peak. It is the only beautiful mining camp I have ever seen. Most of the 1,350 workers are Igorots, primitive people who live in the hills.

"They come from villages the wheel hasn't reached," Mr. Foster said, "yet they quickly learn to drive locomotives, drill rock, and use dynamite."

Mrs. Foster founded Lepanto Crafts, Inc., to revive interest in weaving and give jobs to 200 women and boys. She led me through the weaving houses, open-sided and grass-roofed.

Igorot women, red and white beads entwined in their hair, their arms tattooed to the shoulders, worked primitive looms. Warps of brilliant blue, red, and green slashed diagonals from rafters to floor.

Charles Foster flew me on to the quiet old Spanish town of Vigan, on Luzon's west coast. Its cathedral was built in 1641, replacing a wooden chapel erected in 1574. In the plaza I saw signs urging the people to a greater morality. At one end, a stone José Rizal looks down from a fountain in which stand models of the islands of the Philippines. The neglected fountain contained no water. A goat grazed on Mindanao.

Hanging gardens of a pearl farm, baskets of oysters suspended from bamboo rafts sway gently in a Samal Island inlet. Large-lunged Moro diver, who stays submerged for as long as two minutes, checks the precious crop in the company of darting reef fish. After implantation with beads of mussel shell, the oysters take 12 to 18 months to produce a pearly coating (right). In the meantime, they must be cleaned of barnacles and other marine growths every three months.

A ring of watchtowers at this farm of Daniel Aguinaldo, a Manila businessman, guards his secluded cove; searchlights play on the waters at night to keep out thieves. Mr. Aguinaldo started his business with 12,000 oysters imported from the Sulu Sea after fear of pirates ended the pearl fishery there.

At Vigan I hired a jeep complete with an interpreter-driver, and headed south through rich countryside that resembled a well-kept park beside the blue sea. We turned sharply east near the town of Tagudin, and as the road began to climb, the country changed drastically.

Towering bamboo in feathery clumps choked deep gullies. Vines, shrubs, trees, and flowers grew in great tangles. The road became steeper. Waterfalls cascaded onto the road. Ferns and pines began to climb the hills with us.

Finally the jeep coughed over the last rise, and we stopped before a memorial commemorating the Battle of Bessang Pass, one of the last in the Philippines, fought from May 17 to June 14, 1945. It read: "The battle, spearheaded by the 121st Infantry of the United States Armed Forces in the Philippines, North Luzon, was conceded by the American military authorities as one of the most terrible and incredibly difficult battles in the entire war. . . ."

Bessang Pass. I was ashamed to think I had never heard of it. It seemed unbelievable to me that men could have climbed to this pass bearing the machines of war, under heavy fire from the Japanese.

Driving through the narrow pass, we rounded a curve, and I saw a hillside white with Easter lilies. They grew horizontally from the cliff, like trumpets in silent fanfare for the gallant men who died on those slopes.

Unwary Once Lost Their Heads in Bontoc

We drove on to Bontoc, the "capital" of Igorot country. Part of the town lives in the 20th century; the other part is 2,000 years old. Igorot men, wearing nothing but red-and-white G-strings, hunker down in conversation with friends dressed in khaki or denim. Many men carry short iron-tipped spears. It is arresting to see an Igorot, naked except for a G-string and long knife, wearing a plastic snap-brim hat in violent green.

A friend in Manila had warned me: "The mountain to the right of Bontoc is very delicate. Twelve farmers were killed there last week and their heads removed."

Although I had been practicing keeping my head when all about me were losing theirs, I was a trifle uneasy. No traveler wants to return home a head shorter than when he left.

Happily, I met Gabriel Dunuan, then chairman of the Commission on National Integration in Bontoc, and an Igorot himself. I asked him about the head-hunting.

"There is a lot of myth about that," he said. "It was the custom among the Igorots, but it is not going on now."

Mr. Dunuan's national commission is charged with establishing and raising cultural, social, economic, moral, and political levels for the republic's cultural minorities—among them tribes like the Ilongot that *do* still practice head-hunting. (A news item from Manila only last April warned Filipino picnickers: "It's Head-hunting Time Again.")

"It's quite a job," Mr. Dunuan said mildly, "something like starting a new nation.

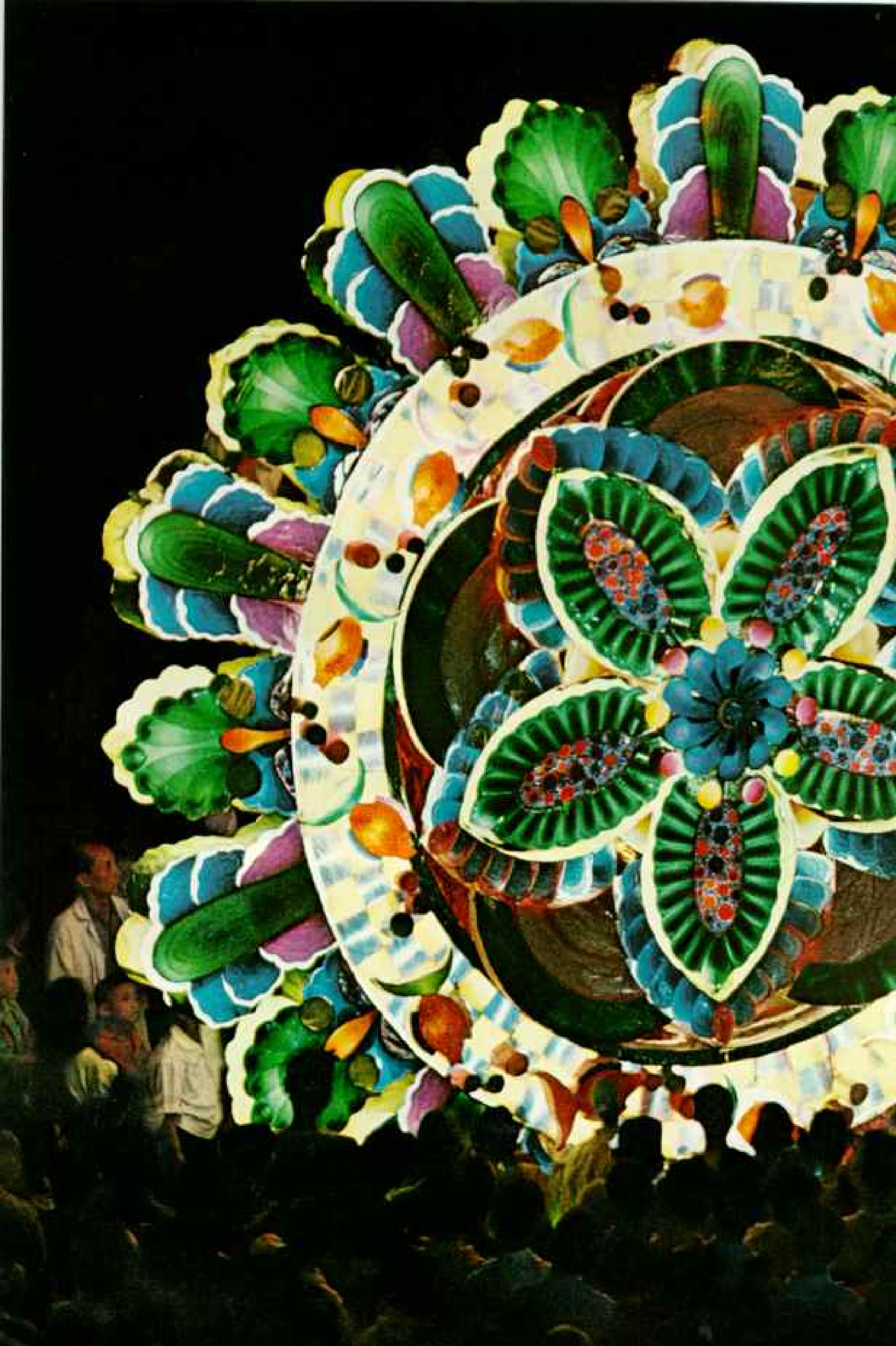
"I saw some Ilongots the other day," he said. "They are still naked. 'Look,' I told them, 'I wore a G-string until I was ten. I was fortunate to persist in education. That is the only difference between you and me.'"

Mr. Dunuan summed up the problem by saying: "The

Constant barrage of pesticides keeps insects at bay in a Mindanao citrus grove. Workers in a modern plant, at right, clean, sort, tint, and wax yellow Valencia oranges, using machinery designed for Florida growers.

Since World War II, the government has sent thousands of homesteaders to Mindanao to relieve the land shortage in overcrowded northern islands. Like the Indians of the American West, local Moro inhabitants resisted the intrusion; occasional skirmishes still take place. Nevertheless, settlers continue to move in, clear the land, and establish homes and farms.

EKTACHROME (BELOW) AND KODACHROME © NATIONAL GEOGRAPHIC SOCIETY



Philippines cannot become really great as a nation by neglecting the welfare of 10 percent of the population. These minority groups are the weakest link in the national chain."

That night the rain and wind began. I laid my head on a hotel pillow embroidered with red roses and the legend, "God Bless Me."

In the next couple of days my interpreter and I traversed the savage hills in a screaming typhoon, lost a wheel of the jeep, skirted landslides, and finally saw a raging river chop off the road at our feet. I often thought of that pillow.

I have been on many roads, but none so spectacular as the Bessang-Bontoc-Banaue highway. It scallops the flank of the mountains, and so steeply do the hills fall away that we literally rode at treetop level, mile after mile.

EKTACHROME © N.G.S.

Gloriously ablaze, a huge lantern lights Christmas Eve dreams in the eyes of a boy. Barrio residents of San Fernando, northwest of Manila, compete each Yuletide in parading the dazzling lamps, whose tracery recalls Gothic cathedral windows. Carried on a truck or jeep, each lantern contains hundreds of bulbs powered by a portable electric generator. Rousing band music accompanies the procession.

The chill rain became a whistling mass, and we entered a watery world as the jeep plunged gallantly along the steep road. The green mountains shimmered and disappeared and wanly came into view again.

We passed a rain-blurred sign: "Banaue Central Annex School—200 meters up." An arrow pointed straight up the mountain. A proper sign for a vertical country.

Terraces Stairstep the Mountains

The Banaue Valley was a bowl of pea-soup fog, but the screaming wind tore the clouds away to reveal one of the unbelievable sights of the world, the Banaue rice terraces.

Working on almost vertical hills, the Ifugaos have constructed rock walls to hold their paddy fields, walls which would stretch more than 1,000 miles if laid end to end (pages 302-3). This incredible handiwork resulted in nearly 100,000 acres of level ground!

My first reaction was simple disbelief. In the mists, the terraces resembled a mint-and-chocolate cake of gargantuan proportions. Foot-wide waterfalls slamming from terrace to terrace looked like birthday candles.

I could not stay to wonder at the sight. I was in real danger of being blown away.

We had a cup of coffee at Banaue. Outside, the wind whipped the trees and sent out spears of rain.

"How far to Baguio?" I asked.

"Four hours, sir."

"Can we make it?"

"It depends on the landslides, sir."

"We'd better try," I said.

It was a tense drive, a constant peering ahead to the next curve to see whether the road was still clear. We skirted landslides too small to stop us. Impromptu waterfalls clattered on the top of the jeep. The sodden hills began to give way. I became profoundly

Jungle iodine—milk of the pandakaki leaf—could save the lives of U. S. Navy fliers should they be injured in Asian bush country. Here they receive survival training from a Negrito instructor at a camp near Subic.

Viet Nam's bloody battles only five hours behind them, wounded American servicemen lifted by helicopter and plane arrive at the Clark Air Base hospital.

Gay leap into the Year of the Horse burns away evil and cleanses the soul for the new year. Mr. James Go Puan Seng, publisher of the Chinese-language *Fookien Times* of Manila, gallantly escorts a Filipina guest through purifying flames at an informal Chinese New Year's gathering.

conscious of the walls of rock and mud overhanging the road.

We never did make Baguio. The hissing Magat River chewed out the road a few miles beyond Bayombong. We backtracked to spend the night. Two sopping days later we wrung ourselves out in Manila.

War's Ruins Recall a Valiant Stand

Next day I boarded the sleek 68-foot *Flying Fish*, a hydrofoil boat that took me to Corregidor in less than an hour. The island lies low and green at the entrance to Manila Bay, three miles from Bataan (inset map, page 313).

I climbed aboard a Philippine Army truck and jogged up the road to the Malinta Tunnel, General MacArthur's headquarters from late December, 1941, to March, 1942. Malinta is empty now, but a sign at a lateral tunnel that served as a hospital reads:

> PLEASE MAINTAIN SILENCE, AND YOU WILL HEAR THE WAILING OF THE WOUNDED AND THE WHISPER OF DEATH

Bataan and Corregidor are two words deeply thrust into the history of both the United States and the Philippines. After the smashing air attack and invasion by the Japanese, the defending forces—four-fifths Filipino—were pushed back by strength of arms.

Finally, the only resistance was on the Bataan Peninsula and Corregidor. For months the heroic men and women held out in a battle they were fated to lose. Corregidor fell, but its defenders had not fought in vain. The hopeless stand delayed the Japanese military timetable by several months.

Guns of Corregidor lie in the ruins of a mortar emplacement, shattered by Japanese shelling at the start of the Pacific war. At its surrender, on May 6, 1942, the embattled fortress had kept Japan's navy out of Manila Bay for five months. With U. S. aid, the republic plans to establish a national shrine on this island at the bay's mouth.

Sea froths through war's wreckage on Leyte's Red Beach, where Gen. Douglas MacArthur fulfilled his historic pledge: "I shall return." A fisherman now plies his peaceful trade amid rusting mementos of the conflict.

My truck passed the long, narrow shell of "Mile-Long Barracks," bleached and white under the ipil-ipil trees. Nothing remains but pitted concrete, with stairs that lead nowhere and empty windows like eye sockets. Three mortars that defended Corregidor to the last are still in position, barrels lifted high.

The parade ground topside is empty. On three sides stand the shells of the headquarters barracks and administration buildings. Trees today have found footholds in these white concrete relics. The roofless post theater now holds a grove of monkeypod trees.

The truck ride was rough. The guide, a Filipino sergeant, said, "The next time you come, we will have a paved road and a bus."

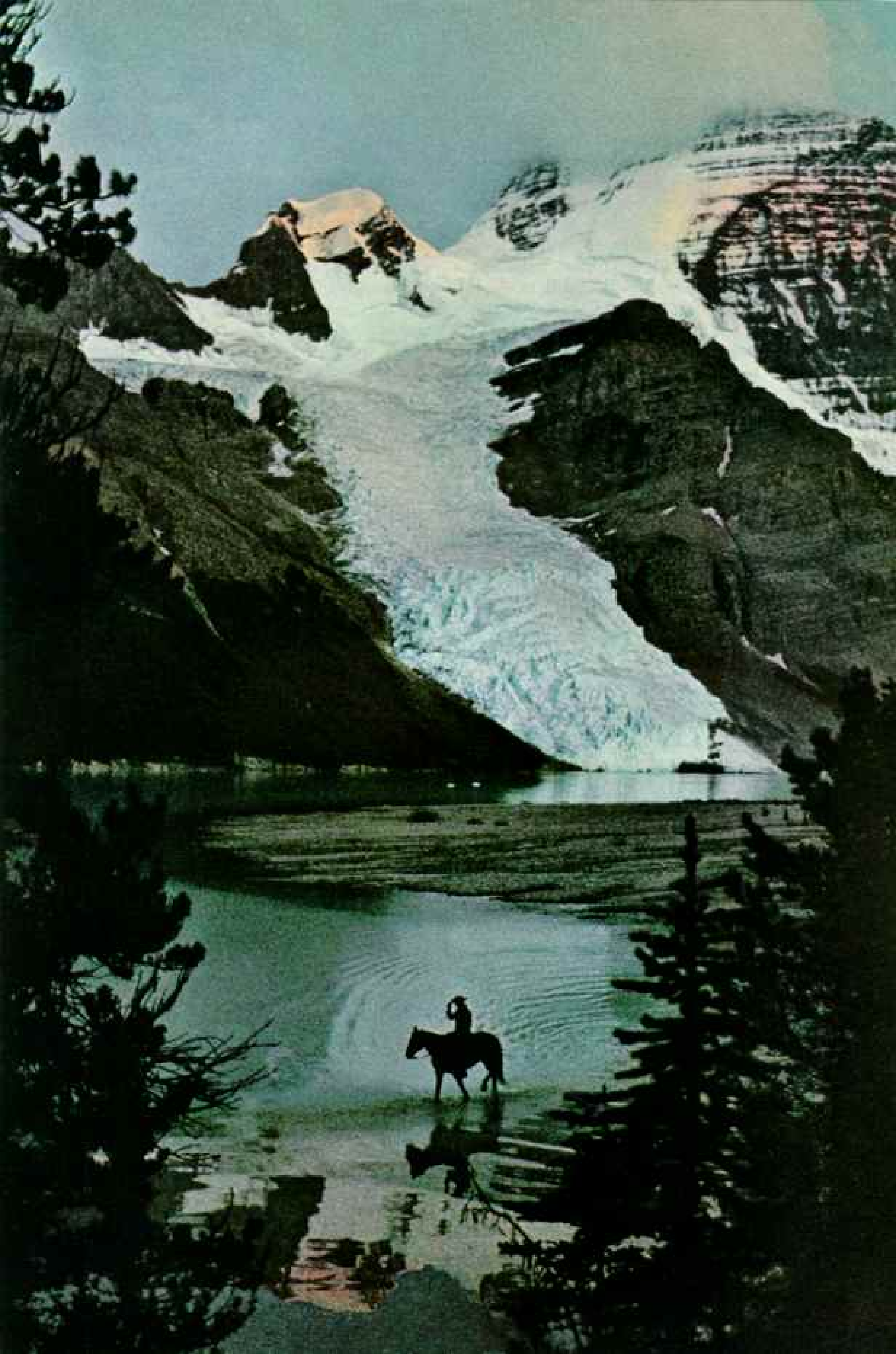
Throughout the Philippines, I had seen all the hallmarks of a developing country: The contrast between great wealth and besmirching poverty, the beginnings of a middle class, the race for education, the struggle for political identity. And I had met some dedicated men and women doing their utmost to help make the Philippines a modern country.

Dr. Leonides Virata, the brilliant young economist so concerned with smuggling, was one of them.

"We have a democracy, although it is noisy and expensive," he told me. "Democracy has taken root here, and it works. We were nourished in freedom, and that is the biggest dividend my people have received from America.

"Right now we are a hodgepodge, but unless we are victims of aggression or internal subversion, another 25 years will see us there."

THE END



Canadian Rockies, Lords of a Beckoning Land

By ALAN PHILLIPS

Photographs by JAMES L. STANFIELD

I WAS DRIVING through ranchland just north of the Montana border, and the mountains were merely a backdrop to the magnificent vista of prairie. They formed a saw-toothed, sunlit, white border, too perfect to be real, improbable as a painting for a boy's book of adventure.

Then I drove out of a coulee scented with wild rose, Alberta's emblem, to confront a towering wall of rock that struck my sight with an impact as solid as a blow. It rose so abruptly that the plain seemed to break in green-brown waves against it. Its brutal, naked beauty assaulted the senses. I felt awe at the mystery of creation that had heaved an ancient seabed thousands of feet into the sky. And the sense of adventure was suddenly overwhelming.

Few places in the world so vividly dramatize themselves as this southeast approach to Canada's Rocky Mountains. As you drive west on Alberta 5 into Waterton Lakes National Park, the land structure alters strikingly, symbol becomes reality, and this forbidding escarpment, still snow-capped in early summer, guards and emphasizes the region's isolation.

It may seem strange to describe this renowned region of Canada as isolated. "Canadian Rockies" are famous words. As the star attractions of a burgeoning tourist industry, they lure some four million visitors a year. But only a tiny percentage of tourists sees more than a fraction of these mountains.

In a 50-mile-wide column broadening to 85 in the north, these giants with the white packs on their shoulders march away in a series of summits to the Liard River, just south of the Yukon Territory. This column, almost a thousand miles long, is breached in only five places: by four rail lines with highways alongside, and by a road through the cut of the Peace, the only river crossing the entire range (see the Atlas Map supplement, **Western Canada**).

Lone horse, lone rider measure the majesty of the Canadian Rockies' highest peak. They ford a frigid arm of Berg Lake, named for its drifting chunks of ice, under the cloud-wreathed crown of 12,972-foot Mount Robson in the British Columbia park of the same name. Such grandeur typifies Canada's western mountains.

Unlike the United States Rockies, they have had no big gold strikes to pay for the highways that would make them accessible and weave them into the nation. The Canadian Rockies still seal off British Columbia behind a wall of high snow and higher shipping costs.

Unlike the Alps, which they resemble, they have few farms, no cities. Their only important resources are coal, gas, oil, wood, and water—incalculable wealth in water, but still largely undeveloped. Towns are few, mostly along rail lines. In between, except for park wardens, fire rangers, the odd trapper and prospector, geologists in summer and loggers in winter, the only people in these mountains are visitors bent on enjoying them.

The entire region, in fact, is a recreational area for the trail rider, climber, hiker, skier, rock hound, hunter, and fisherman. Here are valleys and lakes so remote that it is hard to believe other eyes have discovered them. This is one of the greatest wilderness regions on earth, overwhelming in its immensity, breathtaking in its beauty, a repository of scenery as it was before man came.*

Five federal parks help conserve this

superb adventureland. Four of them—Kootenay, Banff, Yoho, and Jasper—have adjoining borders encompassing more than 7,800 square miles, one of the biggest of all wildlife preserves (map, page 359).

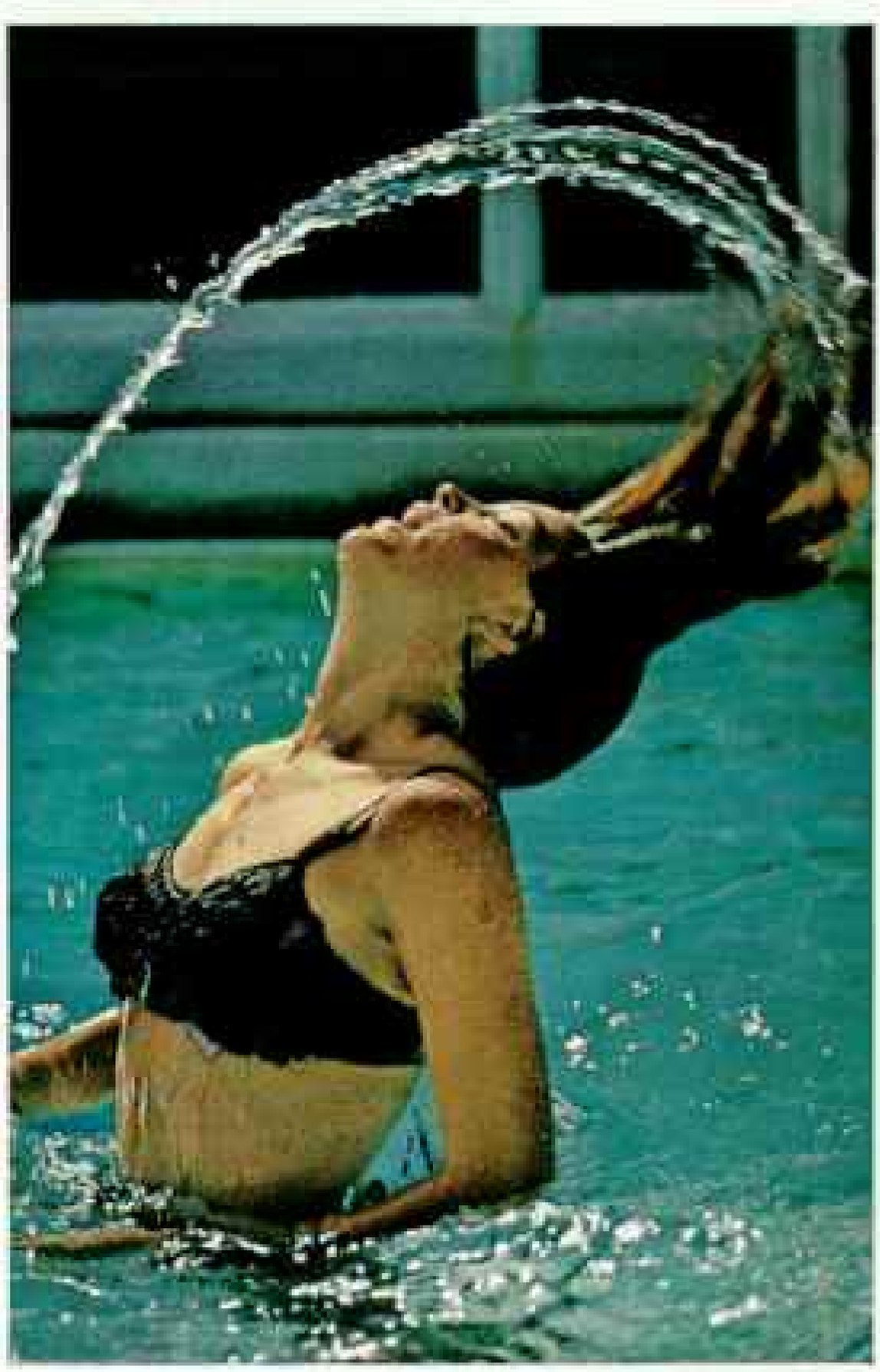
The fifth, toward which I was heading now, skirting the gray escarpment, merges with Glacier National Park in what is called, officially, the Waterton-Glacier International Peace Park. The only such preserve in the world, it was set up in 1932 as a symbol of

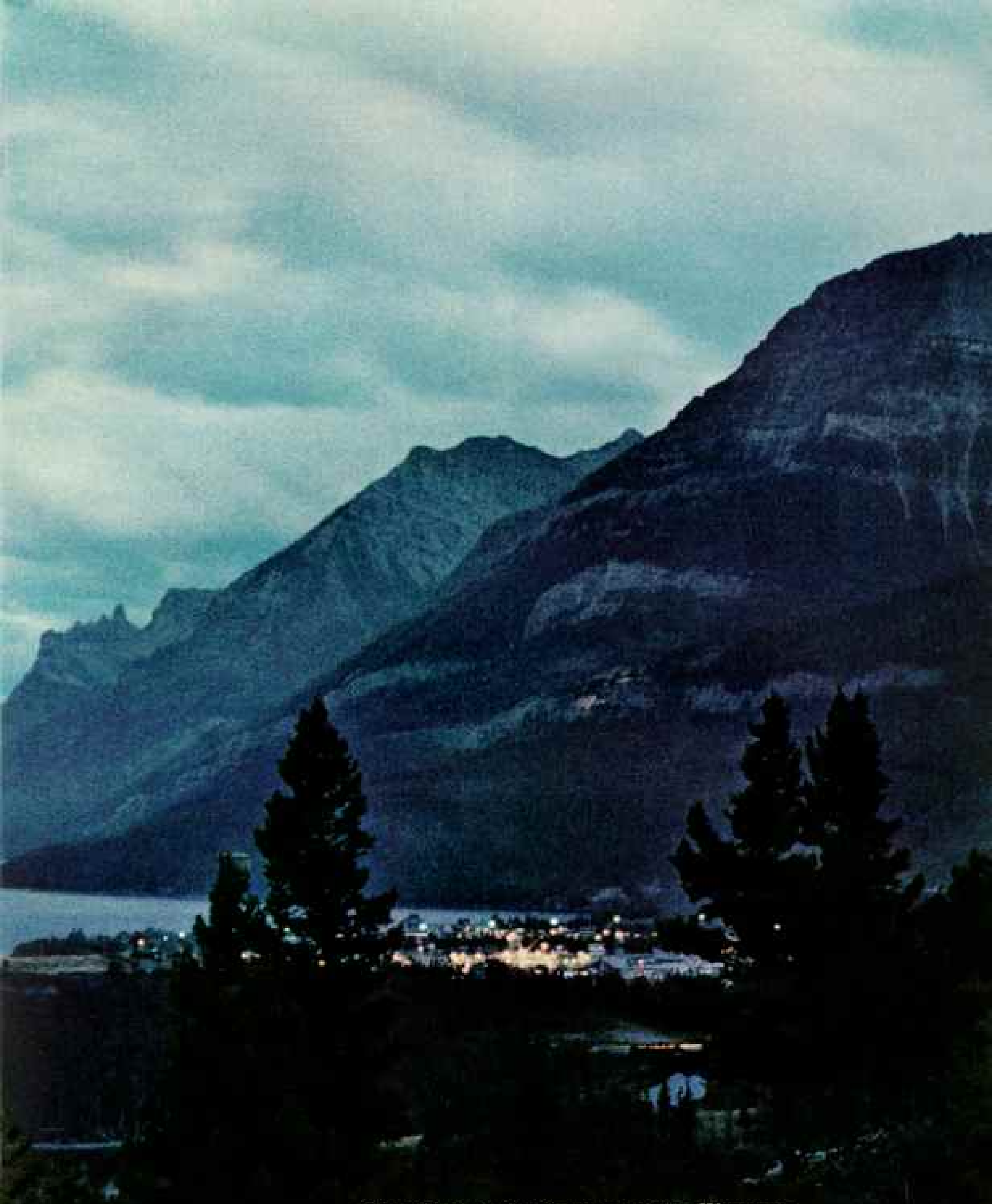
*See "On the Ridgepole of the Rockies," by Walter Meayers Edwards, GEOGRAPHIC, June, 1947.

KODACHROME (BELOW) AND EKTACHROME © N.G.S.

Racers pepper the frosted hills of Alberta's Mount Temple in Banff National Park. By night a roaring fire tempers the February chill and warms friendships at Sunshine Village Lodge. With runs to suit every skiing skill and powder snow that persists until May, the winter playground of Banff-Lake Louise teems with sportsmen from the entire continent.

Tossing her mane like a playful colt, a swimmer frisks in the pool of the Banff Springs Hotel. The resort's golden summers built its reputation and still draw the largest crowds of visitors.





CRADLED AMID MOUNTAIN GODS, *Waterton Lake reflects the soft glow of summer dusk at Waterton-Glacier International Peace Park. The spired Prince of Wales Hotel, alight on a promontory, shines like a temple. Waterton Park village rims the cove at right.*

good will between two neighbors, a mighty memorial to fraternity.*

The highway wound around the northernmost of Waterton's chain of lakes and on to the quiet dead-end village of Waterton Park. The little town's crisscross of streets fringed with pine and aspen bordered the seven-mile upper lake. Blue and still, reflecting its imprisoning mountains, the lake stretched south into the haze of Montana.

Climb a Rocky to Understand It

I engaged a pine-paneled motel room with a balcony facing the lake, took a shuddering plunge in the snow-fed water, then called at the gabled wood-and-fieldstone park office. The chief warden was Frank Camp, compact, alert, and friendly. "If you want to understand the Rockies," he said, "you should climb one."

In the morning Frank and I started up the west face of Mount Crandell, part of the eastern escarpment of the Rockies. We had left our name, route, and time of return at the office. If we did not get back when expected, a warden would organize a search party, for the wardens are the policemen, firemen, and caretakers of the parks—and often qualify as amateur zoologists and ecologists as well. A 7,800-foot Rocky has moods that can call for all these talents.

*George W. Long described "Many-splendored Glacierland" in the May, 1956, GEOGRAPHIC.

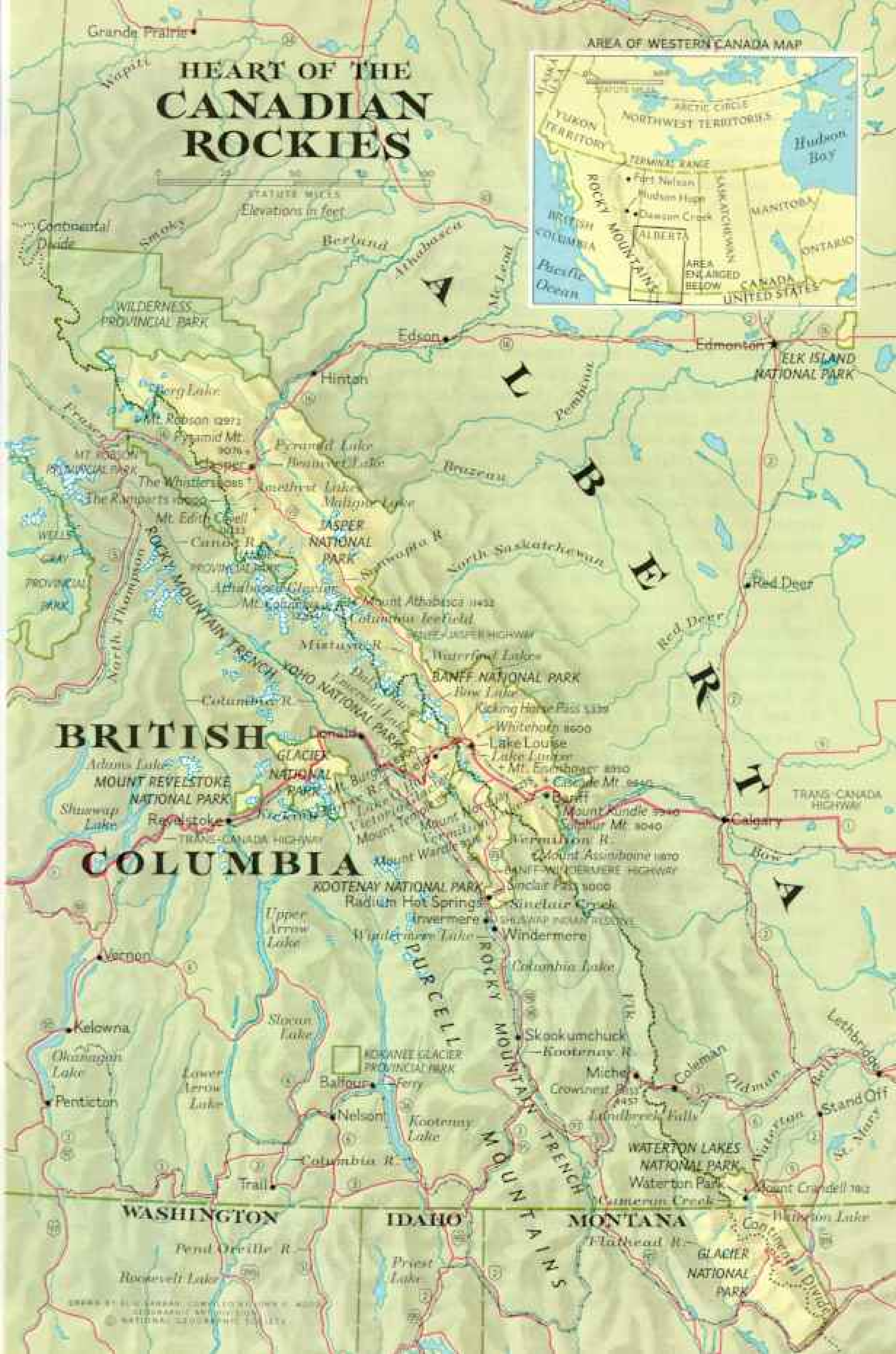
Peak-watchers and picturemakers jam a roofless bus, ideal for viewing glacier-carved heights and turquoise lakes of the peace park on the Canada-United States border.

The author: Following World War II duty with the Royal Canadian Navy, Ontario-born Alan Phillips lived for a year in a cottage in Canada's western mountains, where he found the solitude ideal for reading and writing. A versatile free-lance writer, he contributed "Canada, My Country" to the December, 1961, GEOGRAPHIC.

Here on Whitehorn mountain, near Lake Louise, the author feeds a golden-mantled ground squirrel, named for its bright shawl.

"Park wardens complain that tourists try to take these little animals home," he says. "They're so friendly and handsome."

Skyscraping wall between the provinces of Alberta and British Columbia, the Canadian Rockies extend almost a thousand miles. Not a city lies within the region, and only a handful of settlements, but its federal and provincial parks add up to one of the world's largest wildlife preserves.


HEART OF THE
CANADIAN
ROCKIES
STATUTE MILES
Elevations in feet
AREA OF WESTERN CANADA MAP
ARCTIC CIRCLE
NORTHWEST TERRITORIES
YUKON TERRITORY
Hudson Bay
TERMINAL RANGE
Fort Nelson
Hudson Hope
Dawson Creek
ROCKY MOUNTAINS
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
Pacific Ocean
AREA ENLARGED BELOW
CANADA
UNITED STATES
Grande Prairie
Wapiti
Continental Divide
Smoky
Berland
Athabasca
McLeod
WILDERNESS PROVINCIAL PARK
Edson
Edmonton
ELK ISLAND NATIONAL PARK
Hinton
Pembina
Berg Lake
Mt. Robson 12972
Pyramid Mt.
Pyramid Lake
MT ROBSON PROVINCIAL PARK
The Whistlers
The Ramparts
Mt. Edith Cavell
Maligne Lake
Brazeau
JASPER NATIONAL PARK
Sunwapta R.
North Saskatchewan
ROCKY MOUNTAIN TRENCH
North Thompson
WELLS GRAY PROVINCIAL PARK
Mount Athabasca 11452
Columbia Icefield
Mistaya R.
Waterfowl Lakes
Red Deer
BANFF NATIONAL PARK
Bow Lake
Kicking Horse Pass 5339
YOHO NATIONAL PARK
Columbia R.
Whitehorn 8600
Lake Louise
BRITISH
Donald
GLACIER NATIONAL PARK
Adams Lake
MOUNT REVELSTOKE NATIONAL PARK
Cascade Mt.
Banff
Shuswap Lake
Revelstoke
Mount Rundle
Sulphur Mt. 8040
Calgary
TRANS-CANADA HIGHWAY
Vermilion R.
Mount Assiniboine 11870
Bow
COLUMBIA
BANFF-WINDERMERE HIGHWAY
KOOTENAY NATIONAL PARK
Sinclair Pass
Radium Hot Springs
Sinclair Creek
Invermere
Windermere
Upper Arrow Lake
Columbia Lake
PURCELL
ROCKY MOUNTAIN TRENCH
Vernon
Kelowna
Okanagan Lake
Slocan Lake
Skookumchuck
Kootenay R.
Elk
Michel
Coleman
Crowsnest Pass
Lethbridge
Oldman
KOKANEE GLACIER PROVINCIAL PARK
Lower Arrow Lake
Penticton
Balfour
Ferry
Nelson
Kootenay Lake
Stand Off
St. Mary
WATERTON LAKES NATIONAL PARK
Waterton Park
Mount Crandell
Cameron Creek
Waterton Lake
Trail
WASHINGTON
IDAHO
MONTANA
MOUNTAINS
Pend Oreille R.
Flathead R.
Priest Lake
Roosevelt Lake
GLACIER NATIONAL PARK
Continental Divide

We pushed through bush as dense as hair on a dog's back. It gradually opened, shrank, and gave way to shale and outcroppings of limestone. The air, which had gone down like dry champagne two hours back, became painfully thin.

On the long hump of Crandell's spine, we stepped over a knee-high forest, aspen and cottonwood 100 to 200 years old. The trees had been dwarfed by the cold, dry wind that funnels through these passes. In exuberant mood it can lift a traveler bodily off the trail, or force him belly-flat to escape the shrapnel-like shale in its jet stream.

Now we walked through flower gardens, meadows twinkling with color: cushion pinks two inches high with two-foot tap roots, purple gentian, yellow cinquefoil, a hundred different kinds of flowers so thick in each other's shadows that we could not help trampling them.

Far below me, pollen blew from the lodgepole pines in the puffs that can fool a warden into reporting smoke. Looking back, I could see where the pine thinned to fir, fir to grass, then moss. And now—nothing but rock, encrusted lime green and orange with lichen. We had climbed above the timber line into the tundra, in effect going north 1,400 miles in 4,000 feet.

Now one last ridge, a short incline, and the summit. In the United States Rockies the salient feature is lava; here it is ice. All around us peaks and ridges rose dark against the snow. Even Camp, accustomed to all this, seemed exhilarated, for the beauty of a summit gained by hard physical effort restores the ego of a man even while the awesome height reduces it.

St. Mary Canals Make 4,500 Farms Bloom

We cooled our drinks in a snow field that slowly melted in the sun, releasing its trickle of water for the prairies. For as far east as we could see and beyond, 200 by 75 miles, what had once been near-desert was pasteled green by 4,000 miles of canals. This was the St. Mary Irrigation Project. By harnessing the Waterton, Belly, and St. Mary Rivers, runoff from the Rockies is channeled to 4,500 farms.

We lunched and rested, while six bighorn ewes with lambs eyed us curiously from a ridge. Then, balancing on the heels of our boots, we glissaded down a snow field, gathering such speed that I once tumbled over and over. Then down a steep slope of the fine rock called scree, zigzagging, sliding, balancing, to revive our dehydrated cells at the cold, pure rush of Cameron Creek and follow its banks of boulders into town.

I dined with Camp at the Prince of Wales Hotel, carved and gabled in cedar, with great windows overlooking the lake (pages 356-7 and opposite). Its builder, the Great Northern Railway, recently sold it to a company headed by Don Hummel, the courtly ex-mayor of Tucson, Arizona. And Hummel, joining us, explained that since 1927 this had been "Waterton's manor house, the epitome of exclusiveness."

The exclusiveness ended in June of 1964 when a three-day rain turned Cameron Creek into a torrent. The lake flooded. Visitors fled. Townspeople sought safety in the hotel. And while the park staff was plowing the townsite clear of debris—more than 250,000 tons of silt, rock, and trees—herds of children raced through the lofty, carpeted lobby, pressing grubby fingers against the huge windowpanes.

"Until we became a refugee camp," said Hummel, "I had no idea the townspeople felt they weren't welcome here. But I think they left feeling

Baronial hall with wheel-shaped chandeliers lends old-world elegance to the Prince of Wales Hotel (pages 356-7), which opened its doors in 1927. The name honors Great Britain's Duke of Windsor, then Prince Edward, who owned an Alberta ranch. Fierce winds blew the 100-room chalet eight inches off center during construction; main beams still stand four inches askew. When floods inundated nearby Waterton Park village in 1964, townspeople took refuge in the hilltop hostelry.

differently about us. At least"—grinning in Camp's direction—"I see them up here occasionally now."

For the next few days I toured the 204 square miles of Waterton Lakes National Park, remembered by old-timers as a rustlers' hideout. I looked at waterfalls thawing under a July sun and found it hard to believe that in little more than two months the snows would again descend. The park gates would stay open, but the shops would close so tight that you wouldn't be able to buy a cup of coffee. And the population would drop from 10,000 to 230-odd, plus fox, sheep, deer, lynx, coyote, cougar, and bear. These animals come down to town to escape the snow of the high country.

"I've looked out my window after an early snowstorm and counted 20 bears," said a merchant and motel owner, Frank Goble. "One put his paw on my plate-glass front and just pushed it in. I finally shot one in my kitchen. Real mean; he wouldn't run."

Once a bear pulled out all the water pipes from under the local dance hall, and after they were fixed he came back and pulled them out again.

Grizzly Accustomed to Causing Panic

These were black bears, relatively harmless except when spoiled by handouts. But the mountains are also a sanctuary of the grizzly, a thousand-pound monster with three-inch spikes for claws.

So driving out of Waterton to Kootenay National Park, a five-hour trip to the other side of the Rockies, I took a gravel turnoff to a hilltop house called Hawk's Nest. Here Andy Russell, a man who knows grizzlies as few men would want to, lives surrounded by family, dogs, horses, guns, and books.

Russell is a big, dark, jovial naturalist-photographer, a long-haired, flamboyant man who likes to wear buckskins. He was just completing a book called *Grizzly Country;* he had gathered material for it during three years of stalking and filming the big bears.

"The second year we stopped carrying guns and started getting more pictures," he said, implying that a grizzly can sense a threat. "One day a mother and two cubs charged us at once. But we stood our ground—I've got pictures of hair coming up on a grizzly's back. We managed to stop the trio with a quick, sharp shout. Then we carefully backed to one side and let them go on up the mountain.

"Why did our command stop them? Here's an animal that everything has run from for thousands of years, and when you don't run, maybe it throws him out of gear."

Outdoorsman Prefers Bears to People

A grizzly, Russell claimed, only attacks when surprised, frightened, or wounded, and turns vicious only when ill.

"I like grizzlies better than I like some people," he said. "The bears seem more honest, more adaptable, and they know how to enjoy life better than we do. I'll always remember one great big old grizzly sliding down a snow field on Crandell, half a ton of bear tobogganing down the mountain. Then he'd go back up, look at the scenery, put up a paw, scratch his ear, and take off again on his rump with his foot still up."

Russell's chuckle died away. "They're more tolerant of us than we are of them. Slowly but surely we're killing them off, taking away their environment."*

His meaning became clear to me as I drove north, past groves of trembling aspen, past herds of whiteface cattle grazing flank-high in buttercups. The green carpet of forest leading into the foothills was slashed by half a dozen roads that led to natural-gas wells.

The sulphur smell met me before I could see the graceful silvery cylinders of Shell Oil's natural gas and sulphur plant, biggest extractor of sulphur in the world except for a plant in Lacq, France. I drove in beside a vivid yellow stack of sulphur blocks and a vat like a skating rink, in which orange-red liquid sulphur was hardening (following pages).

I called on the superintendent, Frank Wood. He was shipping sulphur, he said, to the U. S., India, the Soviet Union, Japan, and Australia.

Greeting daylight with a grin, his headlamp still glowing, a miner emerges from Alberta's Vicary pits near Crowsnest Pass. Vast seams underlying the Canadian Rockies hold one of the largest deposits of soft coal in the British Commonwealth.

Whitewash of snow hides begrimed houses and slag in the coal-mining town of Michel, British Columbia. Ice-stiff clothes lace the street in this telephoto view.

* In an effort to save the grizzly from extinction, Frank and John Craighead are conducting pioneer studies in Yellowstone National Park, with National Geographic Society support. For accounts of their work, see the GEOGRAPHICS of August, 1966, and August, 1969.

packing a product that as a solid "burns as slow as string," but as dust can explode like dynamite. He was pumping gas through a 1,500-mile pipeline to California. And getting to the gas and the sulphur meant drilling "where the geology is so smashed up you may be only a few feet or half a mile away from production."

His strangest problem, however, was the southwest wind called the chinook. It tobogganns down these slopes in winter, compressing and thus heating the atmosphere, bringing weather so balmy that lilacs have budded in January. The air in a chinook is so warm it can jump the temperature 40 degrees in ten minutes, so dry it can evaporate a foot of snow overnight. It lengthens the farmer's growing season, bares grass for the rancher's cattle. But for Wood it can mean adjusting the process temperatures in his plant to warm fronts that have been known to move in and out several times in an hour.

Fur Brigades Marched Up the Trench

Back on the highway I headed west, past the spray of Lundbreck Falls. I paralleled the southern line of the Canadian Pacific Railway through small towns that jostle each other to tap vast seams of soft coal, one of the largest deposits in the British Commonwealth.

Soon the swells of the cattle range began to lift into timbered foothills. The horizon shrank and I entered Crowsnest Pass, where I crossed the Continental Divide at 4,457 feet. From here on, the creeks flowed west, through British Columbia to the Pacific Ocean. And I rolled down out of the incongruous grime and beauty of the pass into B.C.'s extraordinary valley, the Rocky Mountain Trench.

The trench is one of the geological wonders of the world, a trough two to more than ten miles wide running the length of the Rockies in Canada, separating them from the older western ranges. It may have offered prehistoric man a corridor south. It did for David Thompson, greatest geographer of British North America, sent out in 1807 to explore the Columbia River for the North West Company. Its fur brigades later passed this way, their leaders resplendent in gold braid and attended by valets to impress the Indians.

My route curved north along the Kootenay River, with the snow-veined western face of the Rockies on my right. Occasionally a logging road, vanishing into the forest's green folds, emphasized the loneliness of the heights. In the trench, by contrast, cattle grazed on parklike slopes speckled with sage and

with the young firs sold for Christmas trees.

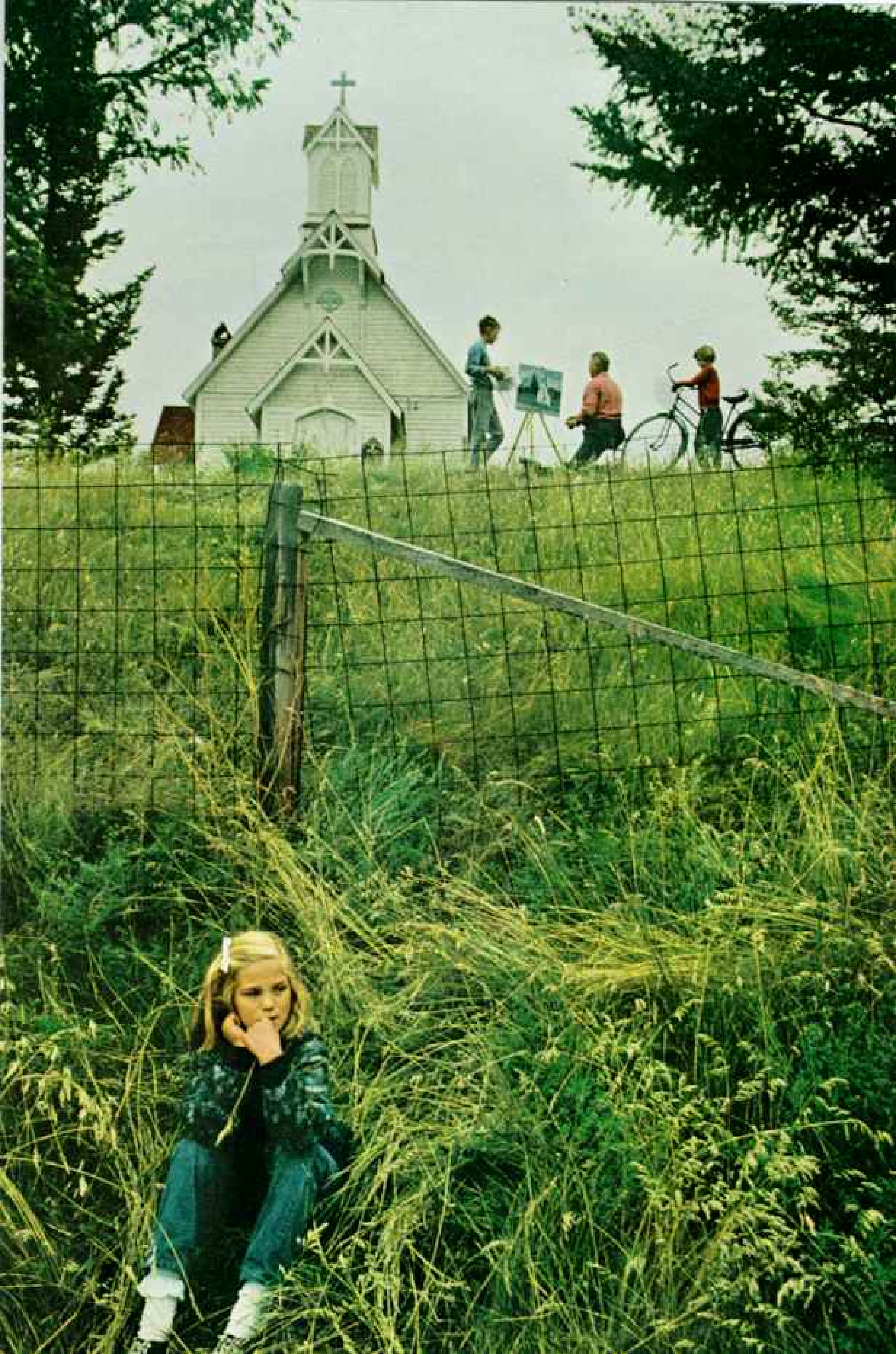
Now I wound above and along the blue-green headwaters of the Columbia, which flows northward here, but bends south behind the interior ranges of British Columbia. Beyond the Purcell Mountains off to my left, work was beginning on one of a series of dams in the upper Columbia drainage basin. When finished in 1973, they will end the annual threat of devastating floods in British Columbia, Washington, and Oregon.

As sunlight flushed the lower slopes, I skirted cottage-lined Windermere Lake and turned off at the pleasant resort town of Invermere. Here I called on Les Taft, the district forest ranger, a craggy, weathered man.

EKTACHROME (BELOW) AND KODACHROME BY JAMES L. STANFIELD © N.G.S.

Chemical chameleon, molten sulphur turns from red to yellow as it cools and solidifies. At the Waterton gas-processing plant of Shell Canada Limited, pipes gush forth a two-inch layer of the 300° F. liquid each day. Workmen spread it evenly in huge storage vats. When the layers accumulate to a depth of 20 feet, bulldozers crush the hardened sulphur and load it into rail cars. Most of it finds use in the making of fertilizer and sulphuric acid.

Bookish bathers soak in 113° F. waters at Radium Hot Springs in Kootenay National Park.



"From north of Crowsnest to south of Yoho," he said, "logging and forestry roads now penetrate to almost the heart of the Rockies. They make them accessible, if not by car, by foot or by pack horse."

And as logging for lumber gives way to pulp cutting, he said, the number of access roads will increase.

"This is a time of explosive growth for our pulp industry," Les told me. "Two Japanese firms have joined with Crestbrook Timber Company to build a sixty-million-dollar pulp mill at Skookumchuck on the Kootenay River. The industry has attracted investors from six other foreign countries. The money pouring into pulp in B.C. is fantastic."

But conservation practices, he said, would protect the wilderness, maintaining it "for the kind of people who want to go someplace no one has been."

Dusk was gathering as I passed the Shuswap Indian reserve, a scattering of cabins topped by the aerials of ubiquitous TV. Then the road forked east into Kootenay National Park, through a gash in the mountain wall cut by the foaming waters of Sinclair Creek. Overhead, the canyon walls bulged inward, and through this needle's-eye gorge, the most spectacular mountain gateway in Canada, I came to Radium Hot Springs, a mecca built on hot running water (page 365).

I checked in at the new motel across the street from the terraced Aquacourt, a government-operated complex of two pools, massage and change rooms, coffee shop, and sun deck. An evening mist was curling off the luminous blue "hot pool," where a thousand visitors splashed or basked with their backs to the mountainside, watching bighorn sheep on an opposite cliff. I jogged shivering down the wooden steps to join them.

The water was 113° F. and slightly radioactive, said the firm-jawed, wiry young lifeguard. "We get a lot of heat exhaustion and fainting. People who aren't in condition soak too long, people with rheumatism and arthritis. Some even drink the water. You see them sneaking it off." He laughed. "Still, they come in here in wheel chairs and walk away."

In the morning the pool was already crowded with people cooking patiently as I went down to meet Kurt Seel, the park naturalist. He took special pride in the new Redstreak

Docile goose accepts the familiar hands of the "gooseman," as the Hutterites of Stand Off, Alberta, call the lad who tends the flock in their communal colony. Hutterites descend from Austrians who immigrated to Dakota Territory in the 1870's and thence to Alberta half a century later. They wear homemade clothes and frown on smoking, dancing, and movies.

DETACHABLE (OPPOSITE) AND READ ANYTIME
INCLUDING PAGES 368-71 @ N.G.S.

Stolen church in Windermere, British Columbia, owes its fame to a devoted parishioner. Rufus Kimpton, prosperous merchant, could not bear to see the chapel abandoned when the Canadian Pacific Railway in 1899 moved residents and their homes from Donald to Revelstoke. Without asking ecclesiastical permission, Kimpton had the church disassembled, shipped by rail and river barge, and re-erected at Windermere, 85 miles away, near his new home.

Snow-dusted goliaths encircle the town of Banff, a pool of greenery and sun-sprinkled glitter in Banff National Park, Alberta. Here the law gives animals equal rights with people. With impunity, a moose may chase a housewife home from market, or a beaver gnaw down a gardener's favorite tree.

View from Sulphur Mountain surveys the Bow River, Cascade Mountain at left, and castlelike Banff Springs Hotel, lower right.

Mountain camp and trailer sites, set on circular drives amid fir and pine. The central washrooms had hot showers and plugs for electric razors. Families sunned in collapsible chairs or chatted with neighbors while wives readied frozen dinners over naphtha fires.

Days in Sun Add Zest to Living

It seemed to me a suburb transplanted. But Seel, a German immigrant, had found in these mountains a sense of freedom that altered his view of life. He saw in this exodus to the Rockies, requiring new campsites by the thousands, a significant trend.

"You take a man who's surrounded by noise and bustle and crowds all year. He's got to get away or lose his sanity. He's got kids, he can't afford a motel, so he goes to a campground.

"We take these people on hikes up a mountain and talk about what we see. At the start they say, 'Three miles! I'll never make it!' You know, I can't get them down! From ten people a month we've got 500 hiking, and one day we'll have 5,000. We open their eyes to a new world. It may not change the adults' values, but I think it will change the children's."

From Radium Hot Springs I headed north on the Banff-Windermere Highway. It mounts to Sinclair Pass, picks up the meandering green-brown Kootenay River, then veers into the main ranges through the Vermilion River Gap. High on a ledge of Mount Wardle I could make out three flecks: mountain goats. A coyote loped across the road. A little rain spattered down, and scudding clouds added melodrama to vistas of brooding grandeur.

The Vermilion gets its name from iron oxide that paints its graveled bed rust-red. At a sign, "Paint Pot Nature Trail," a path led into the pine and spruce. It crossed a brown bog and followed a yellow brook to its source: three ocher-laden pools in a strange, still clearing of bare, reddish clay.

The pines encircling the pool suppressed all sound, and in this timeless hush I half expected Indians to appear, for the Kutenai once used this ocher as dye.

Two miles on was Marble Canyon, with its fractured glassy-gray slickensides dropping sheer for 200 feet to swirling water. Now I was scaling the spine of the continent; the peaks of the Divide reared above the glaciers

Lords of the peaks, bighorn sheep roam free of human threat in the sanctuary of Banff National Park. Massive, curling headgear helps in butting duels during the mating season. Nimble-footed bighorns tread lofty ledges on spongy hoof pads that grip the bare rock.

Picture window works two ways: Apartment dweller in Banff admires a buck mule deer, which returns her stare. When snow becomes too deep at higher elevations, deer often move down into town and panhandle through the streets.

Cheek pouches stuffed with seeds and nuts, Columbian ground squirrels gorge before winter's long dormancy. They must keep alert for grizzlies and golden eagles, or end up as a meal themselves.

like canine teeth. And then I crossed the imperceptible hump into Alberta and Banff National Park, speeding toward the battlement of Mount Eisenhower, nee Castle.

Bald Pate Tops Mount Eisenhower

I remembered General Eisenhower's comment when they changed the name of the peak in his honor in 1946: "I've never seen a picture of the mountain, but I'll bet it has a bald head." And it has; its bare crest has been a landmark since 1885, when the Canadian Pacific Railway completed what was then one of the world's longest lines, 2,900 miles, through this Bow Valley. It was one of the great engineering epics of all time.

Constructing the mountain passages exacted a high price in lives, perhaps as many as 250. But completion of the line was a condition for bringing British Columbia into the Canadian confederation. Thus the CPR's U.S.-born builder, William Cornelius Van Horne, helped save the confederation and opened a new era for the Canadian Rockies as well. The government in 1885 set aside ten square miles to preserve the hot springs, a move applauded by Van Horne, and near Siding 29 he built an inn. The settlement was named for Banffshire, Scottish birthplace of George Stephen, first CPR president.

The CPR about this time began operating ocean liners as well as trains, and made Banff a fashionable stop for such passengers as the Maharaja of Indore. The original ten square miles ultimately became 2,564. And as the private railway car gave way to the private

automobile, Canada's best-known small town became its busiest.

A stream of traffic wound through a corridor of lodgepole pines that thinned to homes, motels, and then a wide western main street swarming with people: Visitors in Stetsons fresh from Calgary's annual Stampede, visitors browsing in shops still geared to the old-time carriage trade, visitors eating in their trailers wedged into the curb.

I drove out past trails and tennis courts to Van Horne's rebuilt inn, the 589-room Banff Springs Hotel. It is one of the largest, grandest mountain-resort hotels in the world. It rises above a bend of the Bow River, terraced, turreted, baronial, a relic of a grandiose age, flaunting its defiance of nature (pages 368-9).

Bellboys in green kilts wrestled with mountains of luggage in the opulent lobby. Gone were the days when guests came for the season and dined in full dress. Now they wear shorts and stay an average of 2.2 days.

In the morning I boarded the half-mile-long gondola lift up Sulphur Mountain to the yellow-pine, red-roofed teahouse near the summit. A girl in Tyrolean costume served me a cup of steaming tea, and amid the "ohs" and "ahs" of new arrivals I viewed the spectacle until an Indian in beads and eagle feathers stepped off the lift and went into a dance calculated to focus the cameras.

Redskins Invade Banff Once a Year

Banff was about to celebrate Indian Days, an annual four-day pageant that began with some 30 Stony braves parading on ponies down the main street. Quilted, beaded, befeathered, led by two red-coated, self-conscious Mounties, they ran a gantlet of visitors, costumed no less outlandishly, to the park administration grounds and back. Behind them, so close that I thought at first it was part of the parade, came a yellow street-cleaning machine, tidying up after the horses.

Out at the sports field beneath Cascade Mountain, where several score painted skin tepees were pitched, Indian and town kids were swapping horseback rides for bicycle rides. Sport-shirted Indians were still arriving, hauling their horses in trailers. One mother stepped out of a Cadillac and strapped her papoose to her back.

I took in a lively rodeo and came back at dusk for the dances. "This the chicken dance," said an Indian elder in a black business suit and white Stetson. "Imitation of prairie chicken in mating season. Only place in world you can learn it. Arthur Murray no teach."

Next day I trekked up Tunnel Mountain to the Banff School of Fine Arts, above and apart from all the fun-and-buck-chasing below. Here a faculty of nearly 200 teaches summer courses to 1,200 students from all over the world.

Black Bear Attends a Class Lecture

When I came here first in 1949, this had been little more than a clearing, and a large black bear had wandered into the lecture room and sat down. Now boys and girls in slacks and leotards relaxed on a sweep of lawn that had the manicured look of a campus. Dr. Donald Cameron, the school's director, a silvery-haired, bushy-browed Canadian senator, started out as the son of a homesteader. Now he nears his long-time goal of making Banff a Canadian Salzburg.

"We chose this site for its inspirational value," he said. "Each year our summer-long festival of recitals here concludes with a two-week concert tour of Alberta and British Columbia, and even into the United States."

The coming of snow no longer means hibernation for the tourist industry. Winter business is growing by 10 percent annually, and new ski runs, ski lifts, and lodges are being developed.

In January snow piles car-high by the roadsides. It quilts the mountains and tufts the evergreens. It clumps like marshmallow topping on the buildings. It covers the defects of architecture, erases the 20th century, and gives Banff a cozy, old-fashioned look reminiscent of lap robes and sleighbells.

On my last winter visit I stayed at the Timberline Hotel outside town at the foot of Mount Norquay. My room overlooked the great timbered valley of the Bow. When I

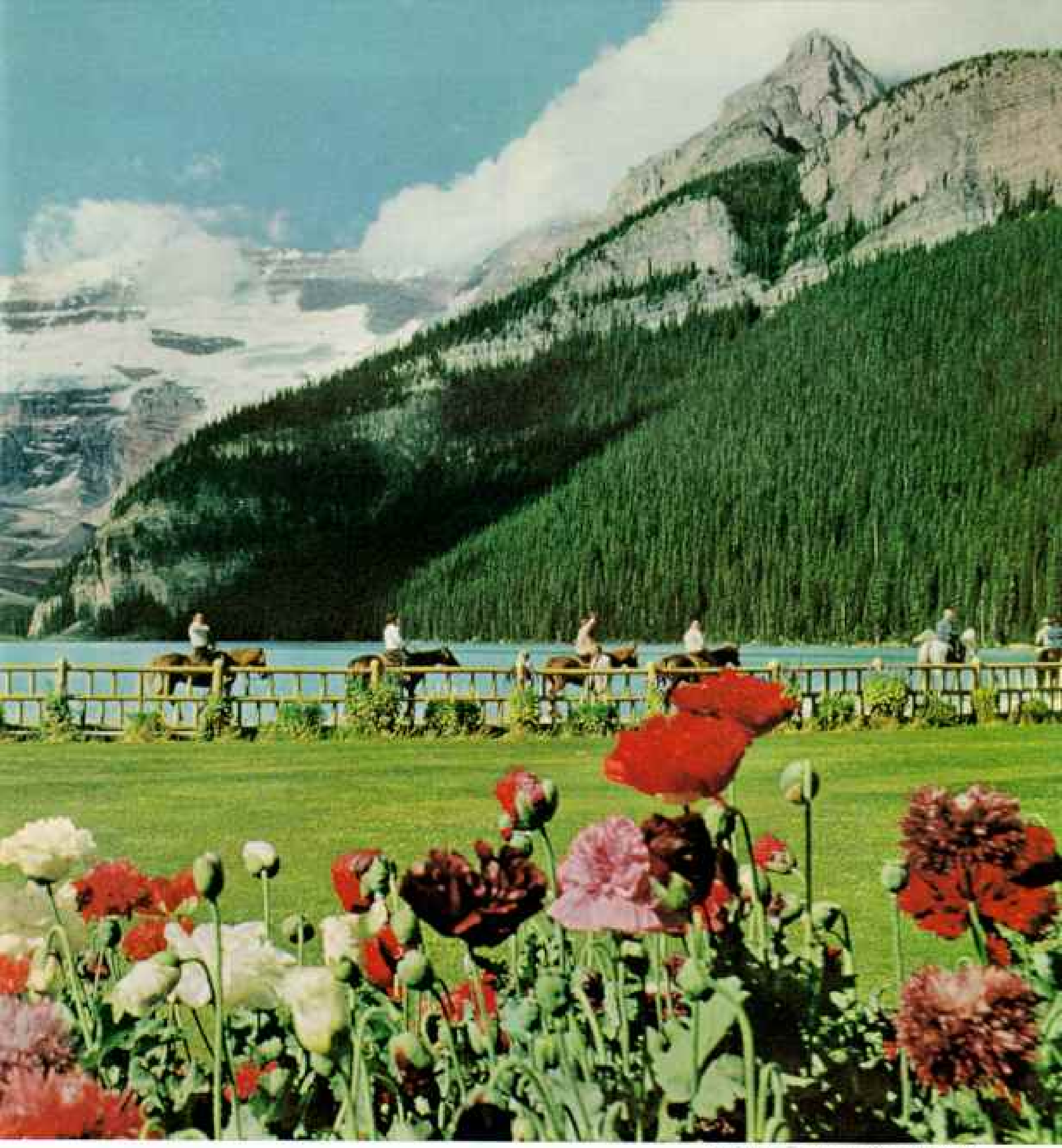
Juggling hoops and jingling bells, Sarcee tribesman George Heavenfire cavorts in the chicken dance, mimicry of a courting prairie cock. Eagle feathers bob from his back. Each July, Sarcee, Stony, Cree, Blackfoot, Blood, and Peigan Indians pour into Banff and pitch tepees beside Cascade Mountain. They come for Indian Days, half a week of rodeos and parades. Once nomadic buffalo hunters, tribesmen today live on reservations and raise cattle and horses.

rose, at 7:30, the lights of Banff were still twinkling in shadow. As I dressed, I watched the sky pale. The mountains emerged as spectral masses. The pines lifted up their points in a jagged frieze. And finally the sun cleared Mount Rundle and moved down the misted side of Sulphur, transforming it into a flowing fountain of color.

And the snow had brought down the animals: a bighorn ram and its herd, an eight-point buck, and two other mule deer. Throughout my leisurely breakfast they posed for pictures outside the big glass wall of the dining room and staged seriocomic battles for scraps, a continuous and charming floor show. And, as I sipped coffee, some sixty elk came single file down the mountainside into the forest and out again, finally vanishing across the ice-locked Vermilion Lakes, a never-to-be-forgotten wilderness vignette.

Outdoor Swim on a Frosty Evening

One January day I drove up Norquay to the ski area; the thermometer said 20 below, but it was dry and pleasant in the sun. The rope tows and disk-seated poma lifts were moving up the lower, easier runs, and the chair lift was ferrying skiers up to the teahouse



below the 8,275-foot summit, where a two-mile downhill run begins. The snow crunched and sparkled, but the only skiers on the run when I arrived were members of the Canadian national ski team. Their practice session made a fine spectacle.

By 4:15 sun and skiers were gone and dusk was gathering. I drove up Sulphur Mountain to the hot outdoor pool—still open in midwinter—and watched the moon rise above the ice-sheathed trees as I floated in mist, feeling my muscular tensions ease away. Then down to town for snails, filet mignon, and hot wine at the Mountainholm, après-ski center

Named for a princess, fed by a queen, Lake Louise reigns in alpine splendor. Melt from distant Victoria Glacier nourishes this mile-high jewel of the Rockies, christened Louise after a daughter of Queen Victoria. Locked in the wilderness, it eluded discovery until 1882. Thundering avalanches on the glacier attracted a surveyor of the Canadian Pacific Railway, which built the lakeshore Chateau Lake Louise (page 377). Riders jog past gardens of giant poppies to a trail through evergreen forests.

Chateau Lake Louise winks at young lovers adrift at twilight. The stately hotel, rebuilt and enlarged many times, opened its doors in 1894. Bagpiper Robert Irvin (opposite), an entertainer at the hotel for the past 12 seasons, wears the MacGregor tartan while skirling for guests.

Growing bigger by the minute, the one that got away remains a vivid memory. Older brother casts into Lake Louise, hoping to catch a rainbow or a cutthroat trout.

where young men and snow bunnies dance to a swinging combo.

The whole area is still a stronghold of the hard-core skier. From Banff it takes only 40 minutes by bus to reach Sunshine Village, an elegantly rustic new lodge centering a spider web of ski runs.

From here you can look south and see Assiniboine, "Matterhorn of the Rockies," 11,870 feet. And from Assiniboine Lodge skiers may join a spring helicopter junket to neighboring snow peaks.

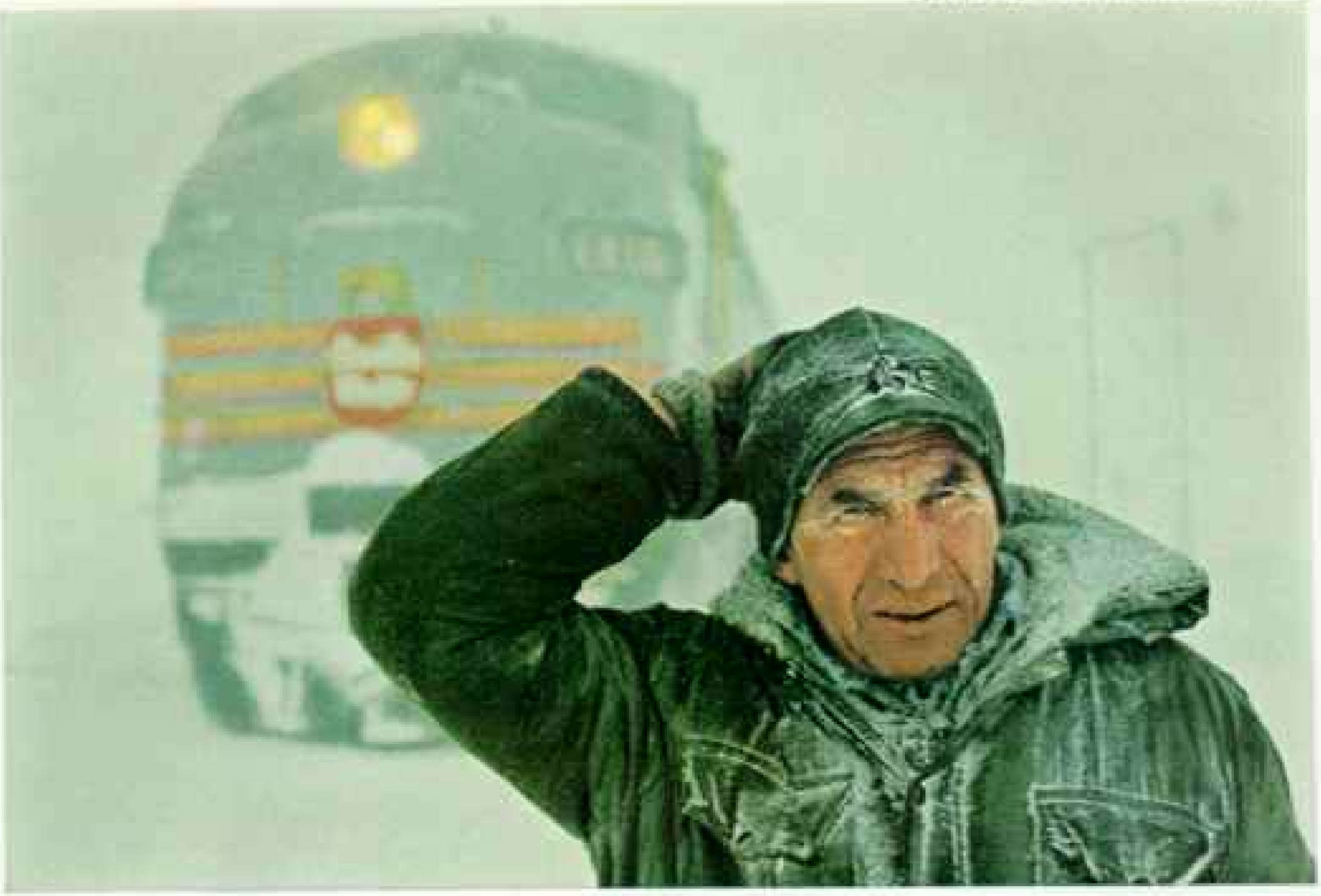
To the northwest, the white crowns of the Rockies lead like giant steppingstones to Lake Louise, hub of an area served by five lifts, including one that gives you a two-mile ride. Fifty minutes from Banff, the area has everything, from two Olympic runs to ski touring in the unbroken snow of a hundred square miles of high country.

But in July the sport is climbing, and an Alpine Club team from Japan had come to Banff to climb Mount Temple. I met them in the administration grounds. They were getting a briefing from Walter Perren, chief warden in charge of the search-and-rescue school in which wardens of all parks train.

Perren didn't look like one of the foremost Swiss guides of his day. He was small and unassuming, with wisping hair above twinkling eyes. But he had made 140 ascents of the Matterhorn, and he had been digging out frozen bodies and saving stranded people longer than any other man in the Rockies. Once he brought seven avalanche victims down from Temple.

"We get people from everywhere dropping in," he said. "Last year just in Banff we had 400 parties climbing—there are quite a few first ascents left, smaller peaks. You have to go in by horse, or walk. The snow doesn't get so firm and settled here as in the Alps, and a few people are caught in avalanches. We get fatalities every year due to taking chances, or lack of experience, or no guide. A guide is like the captain of a ship. If one of his party doesn't come back, *he* doesn't come back."

There was fresh snow on Temple as I drove northwest from Banff to that huge brick and



stucco institution called Chateau Lake Louise. The sunrise here has been described as "one of the ten greatest sights in the world," so I put in a call for 4 a.m. But morning came veiled in chiffon and did not strip its last wisp for four more hours, when the sun was striking the French doors facing the lake.

Not even the buses disgorging their tour loads every five minutes could diminish the near-perfection of that scene: the swaying masses of poppies, red, yellow, white, and orange; the intense blue of the lake; and its pinnacled backdrop, cleft to frame the gleam of Victoria Glacier (pages 374–5). Indeed the tourists merely accentuated the drama of Victoria, which rumbles, moves, and drops its ice in thundering explosions down into the desolate notch of Abbot Pass.

Train Stalled by a Strolling Moose

Adjoining this snow bowl is Yoho National Park, 507 uncluttered square miles of timbered, tilted rock on the western side of the Divide. It is reached through Kicking Horse Pass on the Trans-Canada Highway, superbly banked around the steep mountain.

East of Field, the park headquarters, I stopped to watch the CPR's transcontinental "Canadian" on its slalom course through the famous Spiral Tunnels. Like a silver snake chasing its tail, the train appeared and disappeared, twisting along the most contorted railway line on the North American Continent. From the dome car the passengers waved, and I waved back with the camaraderie born of shared emotion.

The surrounding mountains had all been flayed by avalanches. Snow builds up so high here that animals often use the cleared track as a right of way. Once a strolling moose slowed the east-bound transcontinental to a crawl, until the animal slipped and stuck in a trestle. The train crew dislodged it, whereupon it resumed its course, forcing the train to creep through the tunnels. Another moose on the track was so enraged by the train's whistling that he turned and charged, coming off second best.

For two days I lingered in Yoho to visit O'Hara, that favorite of lake connoisseurs (pages 380-81); Emerald Lake, which mirrors Mount Burgess, the mountain on Canada's ten-dollar bills; and Takakkaw Falls, Canada's highest waterfall, spuming down, down from Daly Glacier like a skein of twisted muslin for 1,200 feet. Yoho merits its name: an Indian exclamation of wonder.

From Yoho I backtracked to Lake Louise to head north on the Banff-Jasper Highway, paralleling the Divide for almost 200 miles.* The peaks grew higher, sharper. Glacier seemed to merge with glacier in an almost continuous icecap. Here is one of the great scenic highroads, a true avenue of giants.

*Ralph Gray wrote of this road in "From Sun-clad Sea to Shining Mountains," in the April, 1964, GEOGRAPHIC.

Nearly blinded by storm-lashed snow, Anthony Decicco of the Canadian Pacific Railway strives in subzero temperatures to keep switches open on 14.4 miles of track called the Big Hill, stretching east from Field, British Columbia. Climbing up to Kicking Horse Pass on the Continental Divide, the line spirals through tunnels cut into two mountains—one of the world's epic feats of railroad building.

Racing a rainbow, cars cross the Rockies on the Trans-Canada Highway, an asphalt ribbon draping the nation from Victoria, British Columbia, to St. John's, Newfoundland. Opened in 1962, the road today stands completed, although improvements continue.

From glacier-fed Bow Lake, source of Calgary's water, I dropped to muskeg and moose by the Waterfowl Lakes. Then I followed the Mistaya and North Saskatchewan Rivers to the Rockies' apex and climax: the Columbia Icefield. Here the largest cluster of peaks in these ranges cups the biggest body of ice in the Rockies.

The icefield can be properly called "mother of rivers." Its melt runs to three oceans: down into the Columbia River and to the Pacific; down the North Saskatchewan and into Hudson Bay and the Atlantic; and down the Athabasca, the Slave, and the Mackenzie Rivers to the Arctic Ocean. It is a vast reservoir of moisture which its glaciers ration out to the thirsty lands below (pages 384-5).

Icy Arm Offers Instant Winter

Over more than 100 square miles, the Columbia Icefield smothers the Rockies like an octopus with tentacles hanging down into the valleys. As the main road climbs Mount Athabasca and enters Jasper National Park, it comes within a mile of one of these ice arms: a drive-on glacier that offers instant winter to summer motorists who detour to visit it.

The Athabasca Glacier is not beautiful. The Columbia Icefield Chalet, a weather-beaten brown, stands starkly by the road, an isolated cell of civilized comfort. And across from it, in front of a long and dirty-white tongue of ice lapping at a small, dun-colored lake, lies what looks like an enormous construction site: huge heaps of gravel and boulders left in the glacier's retreat. It is drab, soil-less, but impressive. It is our world as it looked at the end of the Ice Age.

With Warden Max Winkler, a giant of gentle manners only 13 years from his native Bavaria, I took a side road to a parking place above the ice. Then in a beetlelike blue-green

EVERGREEN APRON *shields the lap of Yoho National Park in British Columbia, where trails wind and climb for 250 miles. A vista of Lake O'Hara, caught in a glacier-carved bowl, rewards these hikers. Yoho, an Indian word, signifies awe and wonder.*

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

"Bucking" pine trees into eight-foot lengths, a cutter wields his chain saw in western Alberta. Logs at the Hinton mill of North Western Pulp & Power, Ltd., form stacks five stories high (below). Stripped of bark and chipped into pieces the size of a quarter, the wood enters giant pressure cookers to be "digested." Later the pulp is bleached, dried, and cut into sheets. Then it goes to other plants for use in such products as photographic paper and cardboard.

Smoke billowing at sunrise, the Hinton plant cooks wood chips into pulp. Chain-link fence patterns the brightening sky.

EKTACHROME (OPPOSITE) AND KODACHROME © N.G.S.

snowmobile, we jolted down onto the glacier. Its surface was seamed and ridged, soiled with rock dust. Under the summer sun scores of glistening rivulets were running. Above us, flurries of snow gusted down from the ice-encrusted peaks.

Near the middle of the seven-mile-long glacier we stopped, and Max and I left the snowmobile to explore on foot. Ahead the ice flowed like lava over a cliff.

"Up there on the skyline," Max said, "it's a thousand feet thick. On top, on the icefield, it's two or three thousand feet. New snow pressing down makes the bottom warmer, more plastic, and it's squeezed out. For 15 years the glacier has moved ahead 200 feet a year but melted nearly 300 feet each summer, for a net loss of almost 100 feet. Where it moves down over that cliff, blocks as big as freight cars break off."

The snowmobile was now out of sight, but the cliff seemed as far away as ever. What had looked to me like several hundred feet was actually several thousand, Max said. We walked back through a gullied white landscape without reference points, wind-scoured, gashed by crevasses, some narrow and still opening slowly, some wide enough to engulf the snowmobile.

Jasper's Wonders Made on a Giant Scale

Like the frosting on a cake, the icefield topped the Continental Divide as I drove along the frothing Sunwapta River with Gerry Campbell, assistant chief warden of Jasper National Park.

Soon we came to the Athabasca River, brown with silt, and watched it lunge over a cliff to a canyon, bouncing iridescent spray a hundred feet above the trees. Most of these Jasper attractions are on the same scale as the 4,200-square-mile park, biggest in the Rockies.

We skirted the Marmot Basin, a sheltered high valley that someday will become famous as the nucleus of a powder-snow skiing area. Nearby, a red-and-cream sky tram was hoisting summer sightseers up to the stony summit of The Whistlers.

Gerry took time to extol the view that this 8,085-foot mountain affords. From the balconies of its chalet, you can glimpse on a clear day the solitary tip of the highest peak in the Canadian Rockies, 12,972-foot Mount Robson, 48 miles to the northwest in Mount Robson Provincial Park (pages 352-3).

Closer at hand, the snow-covered dome of Mount Edith Cavell dominated the vista to the south. Early in the last century, when the

Blackfoot Indians blocked the southern passes, Cavell had been "the Mountain of the Grand Crossing," for this wide, wooded, open, sunny Athabasca Valley had been Britain's only route across the mountains.

The valley had only one settler then, a fair-haired North West Company factor, Jasper Hawse. His cabin was a welcome sight to explorers and trappers, who could count on a sizzling buffalo steak and a grizzly pelt by the fire. Jasper, his wife, and children vanished on a raft in the rapids of the Fraser. Near the town that now bears his name, the Canadian National Railways has built an alpine log-cabin village that commemorates his reputation for hospitality.

Centerpiece of the Canadian National's luxury resort is a low-slung, glass-and-stone lodge that preserves Jasper's casual atmosphere; it is not unusual to see a bear gallop

up the manicured footpaths hotly pursued by shutterbugs of all ages and stages of undress. On rare occasions you can still get a buffalo steak, and the CNR, North America's biggest railroad and archrival of the CPR, claims the Athabasca Valley route is still the only way to cross the continent.

The scenery is little changed since Jasper Hawse's time. "A fellow was out for a hike near Edith Cavell the day before yesterday,"

Mother of glaciers, the Columbia Icefield straddles the Continental Divide in Banff and Jasper National Parks. The field's melt, feeding three rivers, the Columbia, Athabasca, and North Saskatchewan, reaches the Pacific and Arctic Oceans, and the Atlantic through Hudson Bay. Dozens of glaciers, including Athabasca at left, flow from more than 100 square miles of ice-choked gorges. Mount Columbia, highest in Alberta, towers 12,294 feet at right in this southward view.

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

ROUNDCOLOR (ABOVE) BY EDNA LEONARD—HARRY ROWER, O'NEILL & ASSOCIATES, LTD.; KODACHROME BY JAMES L. STANFIELD © N.G.S.

said Campbell, as he dropped me at the lodge. "Fog came down. He got all confused, went over the wrong pass, and got really lost—for a day and a night. He was unable to start a fire. He panicked, lost his glasses, wallet, watch. Luckily a warden met him. He was pretty far gone from exposure. What a mess! Clothes all torn. Feet all blistered."

But for travelers like myself some things had changed. The mountain water piped into the outdoor pool beside Beauvert Lake, transparently clear and green, had been warmed to exactly 70° F. A telephone call brought a waiter steering a bicycle with one hand and balancing a loaded tray on the other. A staff of 600, mostly college students, took care that the rugged outdoors never really intruded—except for the animals.

Three Bears Breakfast on the Lawn

"The bears are unbelievable," said manager Ted Van Dyke. "A couple of years ago three guests in Outlook Cabin ($150 a day for four) decided to have their breakfast served on the lawn. The place settings were laid, the food was on the table, when along came three bears. Each selected a place and proceeded to eat. A chambermaid saw them and snapped their picture" (opposite, upper).

I strolled around to the golf course, the work of a brilliant designer, the late Stanley Thompson. On the ninth hole, in the shadow of Pyramid Mountain, he shaped the green and bunkers so that golfers teeing off looked down on a huge recumbent female form, which he called Cleopatra. It was just a bit too much. The CNR pared the curves. They claimed that the scenery and animals were already distracting enough.

"We have a water hole on the tenth and a bull moose once took it over," said the grizzled greenskeeper, Jack Milligan. "For two months all the golfers had to shoot over him."

Bears have been known to sit on the benches and watch golfers tee off; occasionally they amble out and take a swat at the ball themselves. Black bears sometimes turn on sprinklers and root in the flag cups, and herds of elk use the fairways for a battleground in the fall mating season.

Shutterbugs Give Name to an Island

Great branch-antlered elk browsed by roads lined with brown-eyed Susans as I reconnoitered some of Jasper's lakes. At Pyramid you could catch splake, that curious cross between speckled and lake trout. Maligne Lake, in a region so somberly beautiful that the Indians held it in superstitious awe, has been so often photographed that one of its islets is called f/11.

Animals are a major attraction even in Jasper, a town smaller than Banff, quieter, centered around the CNR station and the flower-bordered park office. Deer were eating the flowers as I came in to catch the Edmonton train. From Jasper north to the Peace River highway, 250 miles, there was no road through the Rockies. To continue my trip, the most practical method was via plane from Edmonton, "gateway to the north."

Next day in a Piper Apache I re-entered the Rockies along the Peace, an olive-green rent in a rumpled blanket of bush. The only signs of life as we flew west were smoke from a couple of logging camps and a steel barge dragging a long boom of logs. And then the river disappeared beneath an enormous brown scar over which yellow diesel earthmovers swarmed like ants.

The bush pilot bumped down his plane near the tiny village of Hudson Hope. A sign read: "This is a private unlicensed airport. Persons using it do so at their own risk." We rented a car and drove past an aluminum trailer-town to the plywood offices of the company building the Portage Mountain Dam.

An engineer showed us around. It was gigantic. Four miles out, seven earthmoving machines were loading the world's longest conveyor belt, 15,000 feet, with fill for a dam 600 feet high and 1¼ miles long. It will flood 680 square miles, and create British Columbia's biggest lake. The powerhouse will ultimately generate 2.3 million kilowatts, some of

Who wants porridge when a full-course breakfast awaits the taking? Three black bears, ambling onto the lawn of the Jasper Park Lodge, spied the laden table and helped themselves. An alert college-student maid snapped the once-in-a-lifetime picture.

Room service rides a bicycle at Jasper Park Lodge. The waiter, also a college student, trained for his balancing act with plastic dishes. He serves a self-contained village—the main building and some sixty peeled-log cottages set amid groves of pine and Douglas fir beside Beauvert Lake.

The Ramparts: Early settlers saw a medieval fortress in this rugged wall of mountains, part of the Continental Divide, and named individual peaks Dungeon, Redoubt, Drawbridge, and Bastion. In a less

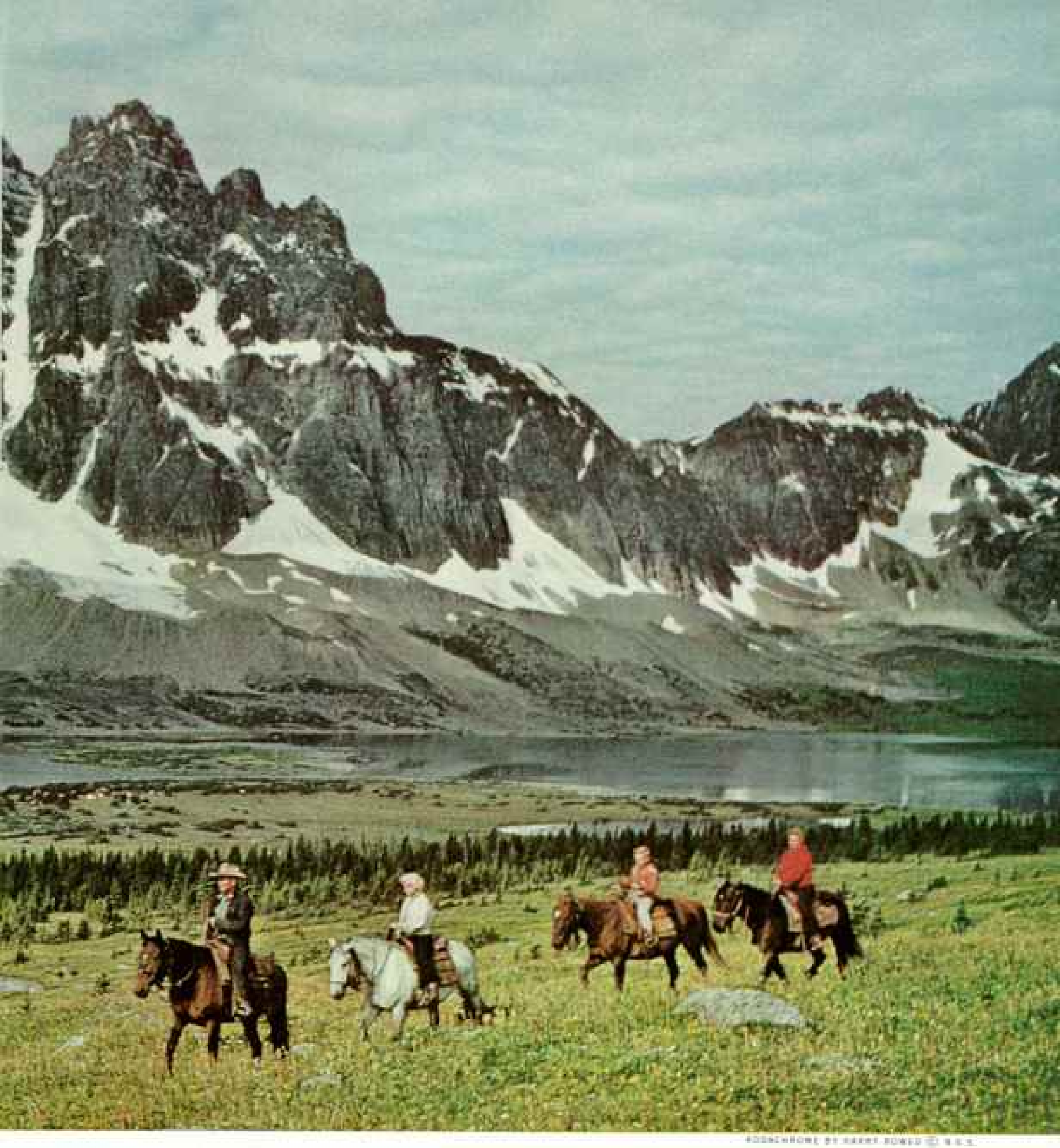
the cheapest power in Canada. The turbines will be the largest ever built outside the Soviet Union.

I examined part of a mammoth's tusk, an eight-inch yellow fragment of a two-and-a-half-foot tooth, bared by a "cat skinner's" tractor blade. Below the office, in scraped-off rock, were the clear, deep toe tracks of eight dinosaurs, come to light after a hundred million years—and doomed to vanish again.

From the dam it was 75 air miles to the Rocky Mountain Trench, where the Finlay and Parsnip Rivers collide to form the Peace. And for 150 miles up and down that long alley, I was looking at a forest soon to drown, to exist only in the memory of some fifteen resident families—trappers and small farmers.

We followed the Finlay north. Beyond the few lonely houses called Fort Grahame, it wove past sandbanks strewn with skeletal driftwood. The trench narrowed. We veered through a cleft in unnamed bare brown mountains, heading into what seemed a foam-flecked sea.

The sea became crags—gray, jagged, snow-veined, encrusted with glaciers. We banked



militant mood, they called the mirror lakes Amethyst, though their rock-gray waters here belie the name. Late snow etches fracture lines and skirts the bulwarks flanking Tuquin Valley, haunt of fishermen.

east and the silvery glacial torrents broadened, browned, and branched through yellow-green muskeg speckled with caribou, that gentle roving reindeer that symbolizes the north on the back of Canada's 25-cent coins. Then east again, over foothills, queer flat-topped mesas. And beyond them the low, flat sprawl of Fort Nelson, last supply center south of the Yukon, bisected by a long, straight khaki slash: the Alaska Highway.

A rugged, crop-headed lounger in jeans watched me disembark. He studied me while I asked him where I might find Dr. Gordon Taylor of the Geological Survey of Canada.

Taylor's camp, he said, was 160 miles west.

I had thought Taylor would meet me, but the bush-ringed airport was empty. "How would I get there?"

He had a quick tight grin. "Phillips? I'm Gord Taylor."

In a truck with a stone-pitted windshield we drove through a half-deserted Nelson. A sign on a barbershop read, "Closed on account of fire." Some 225 men and ten aircraft were off in the foothills fighting fires that already had ravished 40,000 wooded acres.

"A couple of years ago," said Gord, "they didn't bother to fight fires. There were some days when you could hardly see the sun for smoke." But now the prospect of a pulp mill here has given the timber commercial value.

Our route led us straight for the Rockies, up the side of Steamboat Mountain, studded with trucks that have spun off the road in winter. In this country chunks of highway, loosened by seepage, will slide without warning down the mountainside. We rolled past Summit Lake, over the Racing River and the Toad, shallow green streams so swift that they cannot be forded even at knee-level.

Mountain Drafts Take Toll of Aircraft

We passed a motorcycle towing a boat, a truck hauling a car, a helicopter stranded in a creek bed. "Ours," said Gord. "It broke down in flight and made an emergency landing. The country here is strewn with wrecks. Wind currents can be wicked. Steamboat Mountain has four helicopters and three fixed wings to its credit. Summit Lake has five helicopters and four fixed wings."

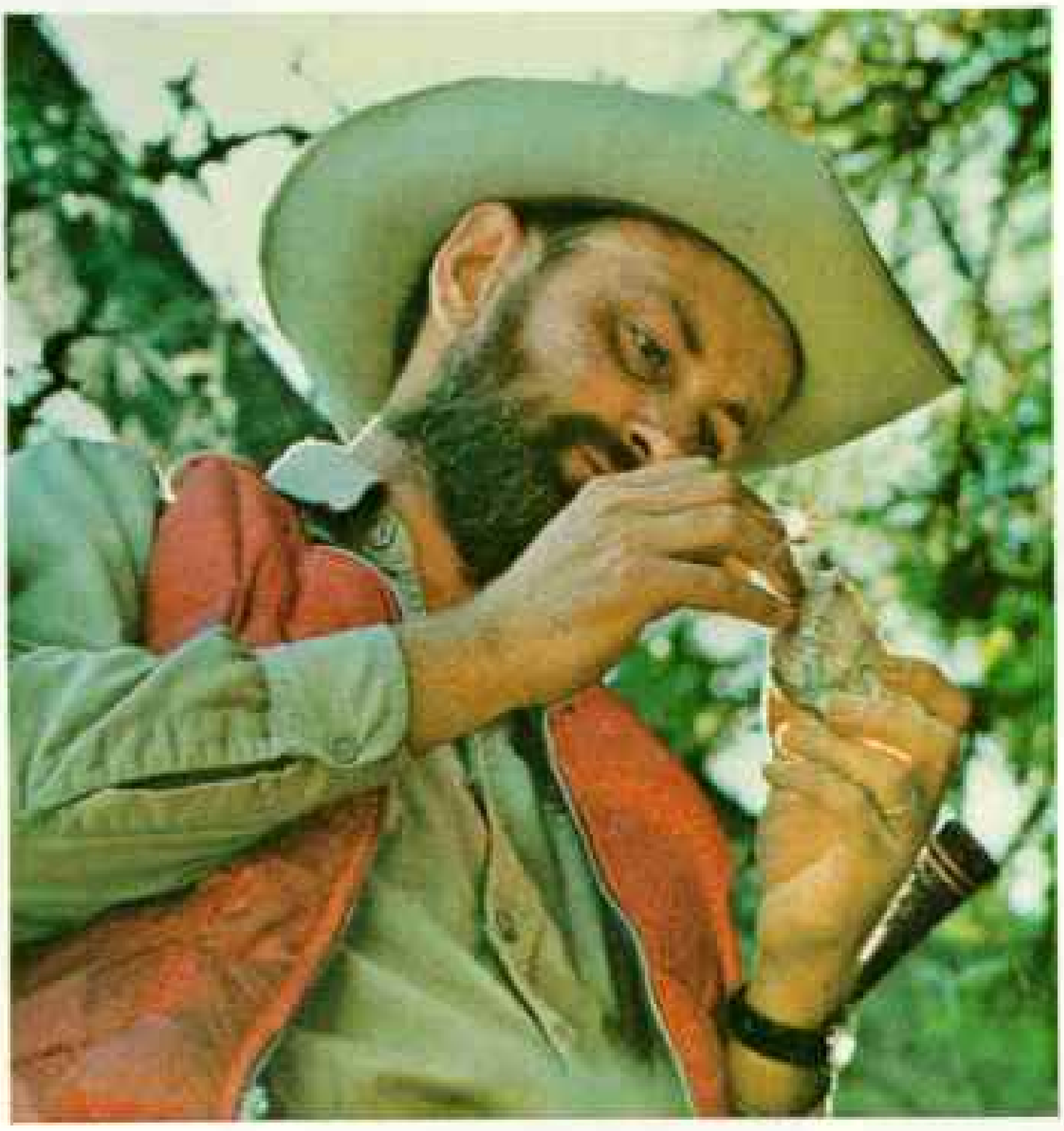
We were bordering the long deep-blue expanse of Muncho Lake with the pale-gray Sentinel Range sheering up to the east. At Mile 463—measured from Dawson Creek, British Columbia—we jolted off the highway onto gravel and rutted dry moss. Ravens flitted through stunted spruce sheltering a dozen white tents (following pages). Beside the lake stood a red-and-blue Bell helicopter. A sign read, "Geological Survey Rest Camp."

This was Operation Liard, a 16-man field party. They were measuring and analyzing each rock bed in the 250 miles of mountains between the Peace and the Liard Rivers. For five years Taylor had backpacked these peaks, coping with grizzlies, black flies, and flash floods, to turn out the first detailed map of the northernmost Rockies.

Wild and broken, Tumbling Glacier spills massive blocks of ice into Berg Lake with resounding splashes. The icy sheath mantles Mount Robson (pages 352-3), which rises almost a mile and a half above the lake and so dwarfs it that boaters often doubt its one-mile width until they try to cross it.

Crampons crunching into a glacier on Mount Robson, climbers approach a crevasse. Second oldest of British Columbia's provincial parks—after Strathcona—Mount Robson remains an unspoiled wilderness, a home fit for the king of Canada's Rockies.

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



Scientist Richard Procter searches for clues to mineral resources near the Terminal Range, northernmost of the Rockies. Living in the wilderness for months at a time, he and 15 other members of Canada's Geological Survey analyzed rock beds and mapped 40,000 square miles, a three-year project completed in 1965.

Long day ends at Muncho Lake, where August twilight lasts all night. Geologists catalogue rock samples in their tents as a last field party returns by helicopter. Scientists of the Geological Survey have tramped mountains and muskeg since 1842 to draw detailed portraits of Canada. Their maps guide highway engineers, railroad builders, and prospectors—Canada's modern-day pioneers.

"It's just one more piece in the jigsaw puzzle," he said. "If we get enough pieces, some day we may get the picture of what happened here seventy million years ago, when the Rockies were born."

After supper I drove north with Gord and some colleagues along the Terminal Range. We rode half an hour in the pale afterglow of a sunset that even now, at July's end, would last until sunrise only three hours later. Then the range tapered off to a bald, unnamed dome bulging out of a green cowl of spruce.

"The last mountain," said Gord. "The end of the Rockies."

Beyond stretched the Liard Plateau, its forest razed by fire. The humpbacked hills were magenta with fireweed, the first plant to come back, and through it bristled dead gray spars like quills on a porcupine. From a rise you could see hills rolling north in a smokelike haze out of which looped the broad brown surge of the Liard River.

"The Liard was one of the routes to the Yukon gold rush," Gord said. "About 12 miles down it narrows to a gorge and spurts through like a fire hose. So many prospectors were lost, they named it 'Rapids of the Drowned.' A group from the British Columbia Hydro & Power

Authority was up this week looking it over."

At Mile 498 we parked off the highway. Across a swamp was a rank growth of spruce, birch, and fern. It enclosed a blue-green steaming pool: the field party's weekly bathtub. "There are hot springs all through this area," said Gord. "Waterfalls. Fantastic rock piles—we call them hoodoos. The only people who see them are geologists and bush pilots."

Northernmost Rockies a Primeval World

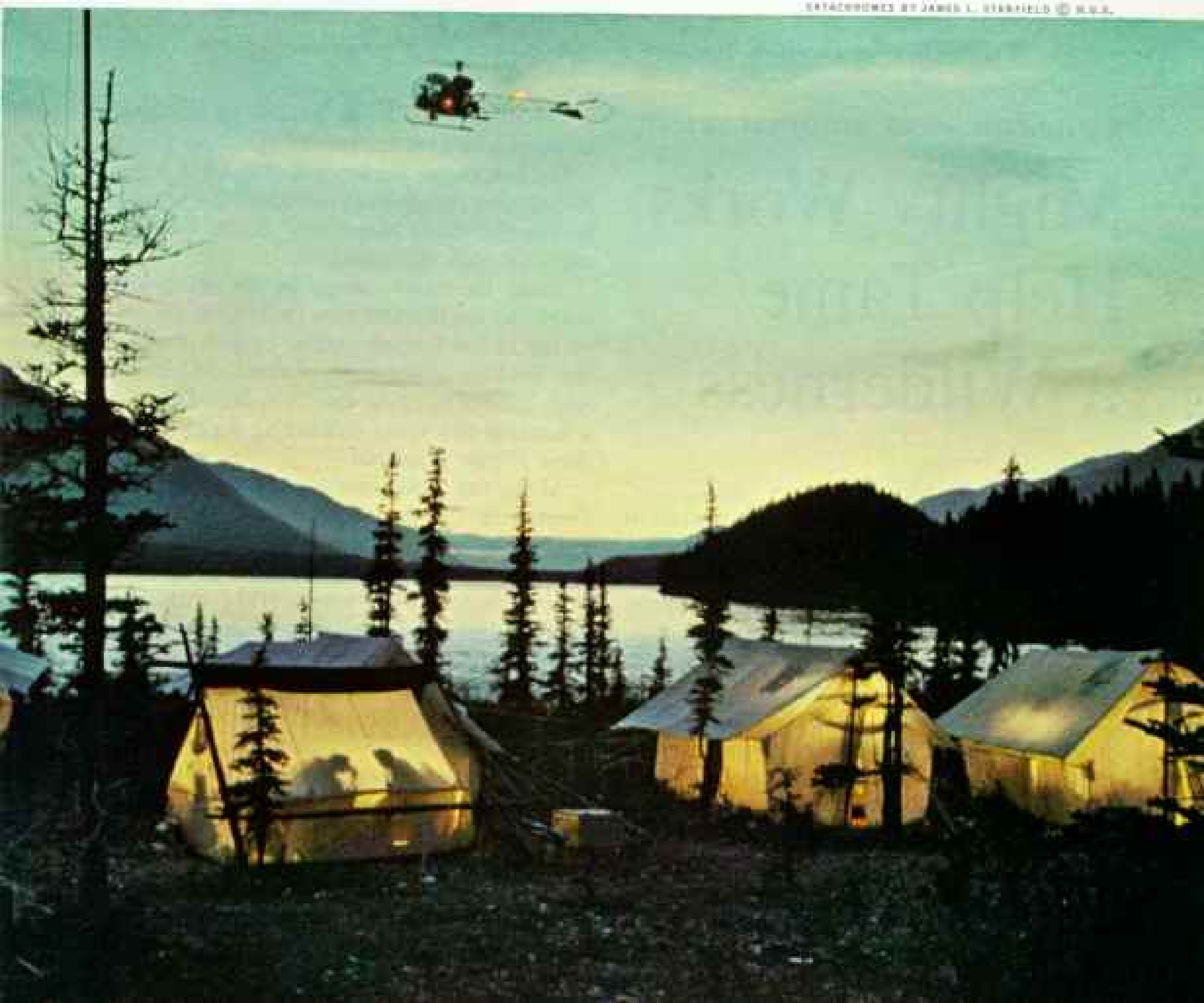
I had my last look at the Rockies in the patched-up helicopter, swaying as in a Ferris wheel while mountains slid out beneath us. We followed the Gataga River, running like spilt chocolate milk through mud flats.

The timber retreated. The alpine meadows thinned. Snow whitened gullies and ridges, and above them the cloud-surfed peaks reared like reefs in a frozen sea. High on a barren slope, four Stone sheep turned toward us the black heads prized by big-game trophy hunters; we were 200 miles beyond the northernmost range of the bighorn.

We landed on a snow-slabbed ridge to gas up from a cache. Glaciers uncoiled from clefts on every side. There was no pattern to the ranges, no human associations. It was prehistoric chaos, as raw as a world in crucible.

The ridge was shale, patched with clumps of yellow lichen, that strange internal partnership of an alga and a fungus, eroding the rock with its acids a millimeter a century, creating soil for a new succession of plant life. A piece of shale cracked off and fell, lost forever to the mountain. In a few eons, gravity, lichen, frost, wind, and rain would level one of the highest, hardest masses in the world.

The sense of mystery was strong: the mystery of this rock, a substance from the earth's depths pushed skyward to sink again, like tidal waves in infinitely slow motion. In the grandeur of these northernmost Rocky Mountains, the most arrogant mind must sense its temporalness. They confront us with the mystery of change, the challenge of adventure: What lies beyond, beyond the next mountain range, beyond the known? THE END



Locked between arms of river and sea, Vancouver springs toward the sky. Here man-made

Canada's west mapped anew

Mighty Works Help Tame a Wilderness

AS HENRY KELSEY pushed westward in the 1690's to Canada's vast plains, he often jotted his observations in verse. Of what is now part of Manitoba, he wrote:

This wood is poplo ridges with small
ponds of water.
There is beavour in abundance
but no Otter.

Fur that Kelsey sought as an emissary of the Hudson's Bay Company no longer underpins Canada's economy. But ponds and rivers and lakes—the nation treasures a third of all the world's fresh water—make a patchwork of blue on the National Geographic Society's new map of **Western Canada**.*

Distributed as a supplement to this issue of the GEOGRAPHIC, the 25-by-19-inch map is the 51st in the Society's World Atlas Series. Its printing brings to 161,000,000 the number of 11-color Atlas Maps now in the hands of users all over the world.

Sharp contrasts emerge in the sweep portrayed by the map, an area two-thirds the size of the entire United States. Jagged peaks of the Rockies tower over prairies that merge with tundra to cover the Canadian Shield—a mineral-rich crust containing rocks almost three billion years old.

Along the moist, fiord-laced Pacific coast, Douglas firs grow bark almost a foot thick; yet interior valleys lie cactus-dry. Out of the black earth and golden grain of the prairies thrust the forested Cypress Hills, with mule deer, lodgepole pine, and other flora and fauna usually found in the mountains far to the west.

Storied names dot the map: Yukon, Klondike, Dawson of gold-rush days . . . Calgary, with its Stampede and its cattle-country lodging spots that are dubbed "moo-tels" . . . newly

*Additional copies of the **Western Canada** map can be obtained for 50 cents each, postage prepaid, by writing to Dept. 340, National Geographic Society, Washington, D. C. 20036.

DIAGRAMS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER BRUCE DALE © N.G.S.

towers and cloud-flecked peaks guard Canada's prosperous doorway to the Pacific.

climbed and christened Mount Kennedy.

Other names recall waves of immigrants that opened up the land—Hungarians at Esterhazy, Scandinavians at Stockholm, Germans at Strasbourg in Saskatchewan. The Vancouver area—shown in an inset—grows roses into December, while arctic cold grips Snag in the Yukon, whose −81° F. stands as the lowest ever recorded in Canada.

Meanwhile, man's handiwork changes the land—and the map. A black line crosses the Peace River in British Columbia, where the Portage Mountain Dam takes shape. Three tunnels—each big enough to shelter a five-story building and as wide as a four-lane highway—reroute the river while workmen raise the 600-foot-high dam; it will create a lake 240 miles long and a power source of more than two million kilowatts.

New Rail Line Taps Vast Wealth

Another black line, snaking from the town of Peace River, Alberta, to Hay River, Northwest Territories, marks the new Great Slave Lake railway. Pushed across 360 miles of muskeg, forest, and swirling river, the line penetrates to a mineral-laden district rimming a lake as large as Belgium. Gold, uranium, copper, iron, oil, and gas have been found; a spur to Pine Point taps what may be the world's largest deposit of lead and zinc.

From Fort Frances to Mabella in Ontario, the red symbol of a new paved road wriggles across a chain of bridges to join the Trans-Canada Highway. That artery now bypasses bustling Winnipeg and takes a short cut between Donald and Revelstoke in British Columbia's Selkirk Mountains, avoiding a great loop to the north. Dotted red lines, too, show the watery route up the Inside Passage plied by the new Alaska ferry.*

Along the United States border, town symbols speckle a populous strip where new factories and apartments sprout. Ninety percent of Canada's 19,516,000 people live within 200 miles of the international boundary.

In contrast, western Canada offers some of the world's most beguiling open spaces, including the famed Canadian Rockies (page 353). Almost inaccessible Wood Buffalo National Park, nesting site of the rare whooping crane, ranks as the world's second largest game reserve, after South-West Africa's Etosha Pan. In such northern fastnesses, the cry of the loon and howl of the wolf ring in a still-virginal land. THE END

*W. E. Garrett described "Alaska's Marine Highway" in the June, 1965, NATIONAL GEOGRAPHIC.

Porpoises: Our Friends in the Sea

By ROBERT LESLIE CONLY
Assistant Editor

Illustrations by National Geographic photographer THOMAS NEBBIA

SLEEK, SWIFT, *and models of gentleness, porpoises whisk a wide-eyed hitchhiker through a pool at Hawaii's Sea Life Park.*

KODACHROME © N.G.S.

AFTER STUDYING porpoises off and on for more than a year, I find myself answering the same question over and over again. It's people who ask it, not porpoises: Are they really as smart as humans?

I answer with some hesitation. I say, "I don't think so—at least not in the same way as humans."

On the other hand:

• The porpoise has a brain bigger and in some ways apparently more complex than man's. I met one smart porpoise that could even speak English quite clearly. At the start of a practice session I've heard him say cheerfully to his trainer, "All right, let's go." He could also count from one to ten.

• In opaque water, or in pitch dark, a porpoise can locate and identify small objects many feet distant. It does this by sonar, or echolocation. A biologist I met in Hawaii, Dr. Kenneth Norris, ran some tests to find out just how good this sonar is. He found that, blindfolded, a female bottlenose could tell—from five feet away—the difference between a 2½-inch ball

and a 2¼-inch one. But when he tried to trick her by asking her to choose between two balls the same size, she refused to try. Dr. Norris said: "She was asking me, 'Whom are you trying to kid?'"

• A seven-foot porpoise named Tuffy made headlines last summer when he joined the U. S. Navy's man-in-the-sea program, Sealab II, off San Diego. Tuffy did not stay with the divers, who lived for 15-day periods at 205 feet, but acted as their liaison with the surface. He wore a plastic harness and carried mail wrapped in a waterproof tube; he also took tools to the divers, and when one diver pretended to be lost in the murky water (visibility 10 feet), Tuffy swam to him with a nylon lifeline to lead him back to Sealab (painting, pages 420-21). The divers were skeptical at first, but not for long. There will be other Tuffys in future undersea experiments.

Travel Nerves Afflict Dolly and Dinah

Last October, sitting in the Bahama Islands on the edge of Hurricane Elena, I watched the beginning of a long series of experiments to study the behavior of porpoises in the open sea—specifically, their sonar ability. Financed by the Navy, the experiments began off Andros Island in a harbor called Middle Bight, where the water is usually crystal clear and you can see what the porpoises are doing.

The Navy uses sonar on its ships and submarines to locate objects in the sea. Porpoise sonar, however, is much more accurate than man's, and the Navy wants to know how it works.

Our expedition consisted of a physicist, a staff of associates, divers, and trainers, a 65-foot research vessel, *Sea Hunter*, and two trained Atlantic bottlenose porpoises named Dolly and Dinah. Aboard *Sea Hunter* we had elaborate underwater listening equipment (hydrophone, amplifier, speaker, earphones, volume meter, tape recorder, and so on), and a small bright-yellow, two-man submarine.

As usual with such experiments, especially in their early stages, all did not go smoothly. For one thing, there was the hurricane. Although it did not actually descend on us, it turned the sky a thundering gray and kept the ship-to-shore radio crackling with alarm.

For another, Dolly and Dinah arrived from their home training ground near Marathon, Florida, in a nervous state. They had been transported by plane, truck, and boat to Middle Bight, and although they had been carefully bedded down on thick foam rubber and kept wet all the way, they obviously had not enjoyed the trip.

They showed their resentment when we took them off the boat and put them into their pen, a roomy fish-net-and-coral enclosure at the water's edge. Without a backward glance they leaped over the side of the pen and

Built-in grin expresses the true nature of the bottlenose porpoise, friendly and intelligent jokester of the deep. Beloved by mariners since earliest times, the warm-blooded, air-breathing mammal—known to many as the dolphin—has a brain larger than man's. The animal's amazing sound-sensing system for navigating in dark or murky water functions more accurately than man-made sonar.

Leaping for her lunch, 8-foot-long Vicki performs at Chicago's Brookfield Zoo. Like other trained porpoises, she enjoys crowds. Cooperative and fun-loving, the animals rarely display hostility to humans and in captivity behave in a tolerant way toward other sea creatures. Yet in the ocean they defend themselves against sharks, and the males battle during mating season.

ZOO
AT
BROOKFIELD

Trapped! A bottlenose netted in shallow Biscayne Bay off Miami, Florida, wheels and splashes to escape from the seine that surrounds it. Collecting team from the Miami Seaquarium dropped the half-mile-long net in a huge circle around a school of porpoises; now they draw the noose tighter. After disentangling flippers and flukes, they lift one captive—a baby bottlenose—into the skiff (below). Unwilling to separate mother and young, they turned it loose moments later to rejoin its parent outside the net.

streaked for the horizon, heading toward Africa. I thought to myself, well, that ends *that* experiment.

The scientists, who had worked with these porpoises for months, were unperturbed. One of the trainers set forth in an outboard motorboat. In about 15 minutes, to my amazement, the boat came buzzing back with Dolly and Dinah following, leaping and splashing in the bright blue water. The trainer had called them to the boat with a pinger, a battery-powered underwater signaler resembling a flashlight (page 407). After a few tries he got them back into their pen through a gate, fed them some fish, and taught them that this was their new home.

No Echo Problems in Open Sea

During the next few days we made tape recordings and measurements of background noise—the underwater sounds of the sea around *Sea Hunter*, against which the porpoises must compete if they are to hear their own sonar echoes. Then we took the listening gear over to the porpoise pen.

I put on the earphones. Others listened to the loudspeaker as the scientists watched a flickering needle that measured sound volume. I heard at first only the sea noise, a constant soughing whisper.

Then, at a signal, the porpoises zeroed in on us, using their sonar as they came. I heard a snap, sharp as a rifle shot but higher pitched; then another, then an ear-piercing, rasping buzz. The volume needle shot across the dial, and Dolly and Dinah appeared beside the hydrophone. They rolled over and smiled toothily, awaiting their reward. They got

True albino porpoise, Carolina Snowball frolics as a trainer cleans a viewing window at the Miami Seaquarium. Captured off the South Carolina coast, the pink-eyed beauty lived in this $100,000 pool built especially for her. "Gentlest animal we ever had," her four trainers agree. Carolina's death last year saddened the entire Seaquarium staff. An autopsy revealed she suffered from liver and heart ailments and other complications.

it: a fresh fish apiece. Then they swam off and waited for the next call.

At this stage the signal was a simple slap on the water, meaning "Here's a fish," and the porpoises were only 50 feet away. Later they and their sonar would be tested at distances up to a mile.

For them it was an easy game. For the Navy it was the start of a year or more of testing. Almost all studies of porpoise sonar until now have been made in tanks, where echoes from the walls make accurate measurement impossible. The Navy scientists hope to learn the intensity and pitch of the sounds porpoises make as they swim in their natural environment, the open ocean; how far off they can identify objects; and how well.

Can they, for example, distinguish between a lead ball and an air-filled plastic bubble of the same size? The Navy also hopes to record not only the sounds they give out, but the echoes they get back, which they must interpret to "see" by sound.

The little yellow submarine? On this trip, we tried only to get Dolly and Dinah used to it. Eventually they will learn to follow it underwater, and the scientists will find out how depth affects their sonar.

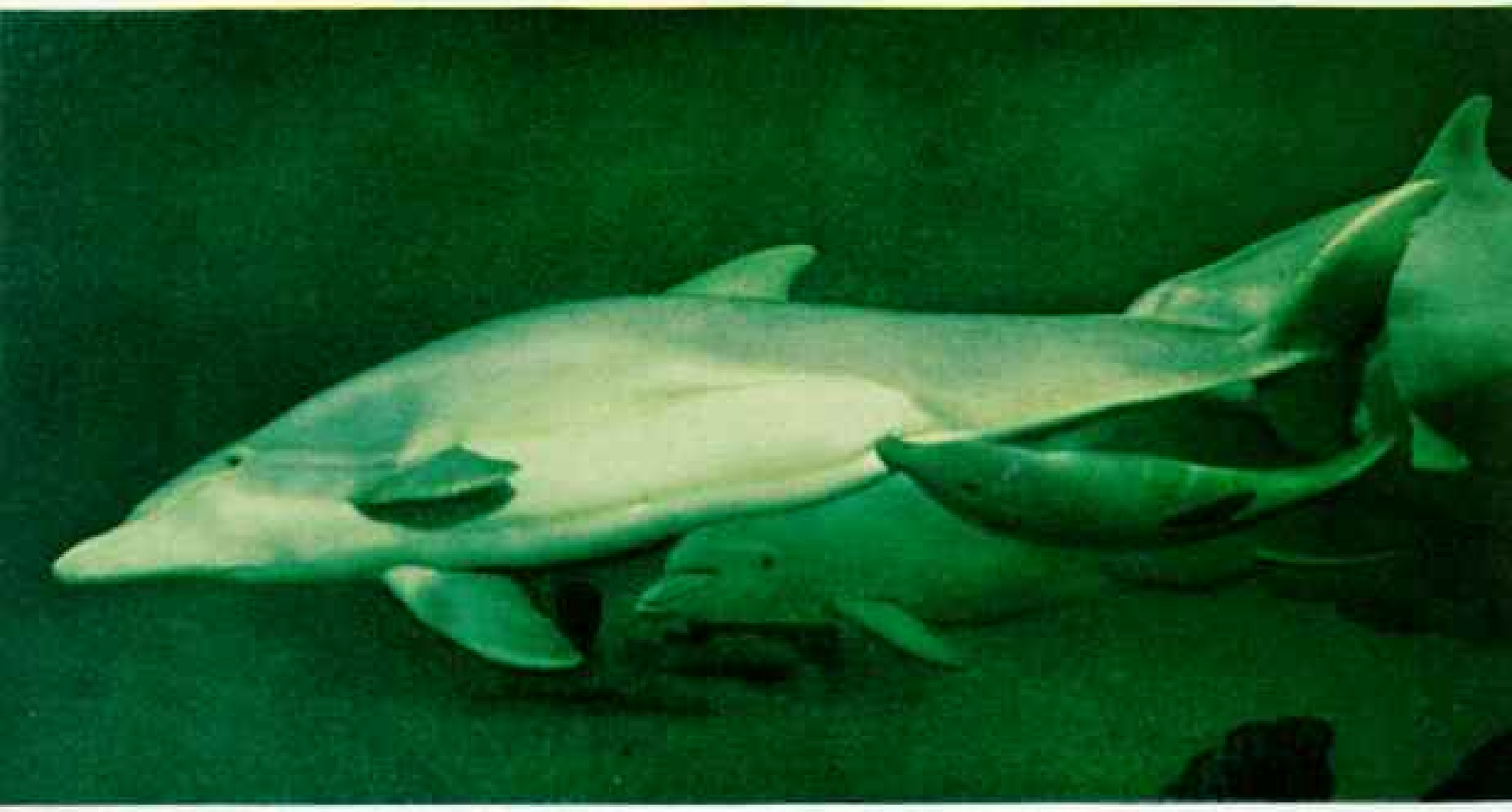
This research project is one of many studying what porpoises can do. In recent months

Greek cup from the sixth century B.C. illustrates a belief popular among the ancients that dolphins were men turned into sea creatures. Painting tells the story of Dionysus, god of wine, who was kidnapped by pirates. To punish the evildoers, he made the mast sprout grape-laden vines, and when the panic-stricken crew leaped into the sea, he changed them into dolphins. The State Museum of Antiquities in Munich, Germany, preserves the handsome relic.

Birth of a dolphin: Females conceive, deliver, and nurse their young much like other mammals, but all underwater. Following a year-long gestation period, the newborn emerges tailfirst (above and right). Within a few hours the 30-pound, 3½-foot-long baby bottlenose begins to nurse (below). Feeding requires only a few seconds, thanks to the mother's ability to squirt the milk—rich in both fat and protein—into the infant's mouth. Baby-sitting friend of the mother, here swimming alongside, will help care for the youngster for several weeks.

Marineland in Florida witnessed the first successful birth in captivity in 1947; more than thirty have been recorded since in U. S. oceanariums.

EXTRACTED FROM MARINELAND OF FLORIDA © N.G.S.



I have seen dozens of similar experiments on both coasts of the mainland United States, and also in Hawaii and the West Indies.

For right now porpoises are the subject of an almost unprecedented wave of curiosity and investigation. Not only is the Navy studying them, but so are scientists financed by the National Institutes of Health, Air Force, National Science Foundation, and numerous universities and private research groups.

Quite aside from sonar, there are other things about the porpoise that fascinate scientists. Psychologists, for example, want to find out how it uses its large and highly evolved brain. Porpoises use an astonishing variety of sounds to communicate with one another. Are they really "talking"? If so, can we learn to talk to them, and they to us?

Is It a Dolphin or a Porpoise?

These questions and many more are under study by biologists, physicians, physicists, psychologists, and others. Though much remains to be learned, they have already come up with some astonishing answers.

There is one basic question, however, that the scientists may never agree on: Should these animals be called "dolphins" or "porpoises"? To me, the answer seems simple enough: Use whichever word you prefer.

Some authorities say the dolphin has a beak, the porpoise a blunter nose. Both names have been used since classical times (page 411). But in the United States most people, including biologists, now call them all porpoises, and dictionaries accept this as common usage.

The name porpoise has one big advantage: It avoids confusion with a bright-colored fish that is also called a dolphin. And whatever you call it, the animal we're discussing here is not a fish, but an air-breathing, warm-blooded mammal with a body temperature about the same as our own.

All porpoises (or dolphins, if you like) are members of a much larger group of mammals, the scientific order Cetacea, or whales. Technically, a porpoise is a small whale, a toothed whale as opposed to a baleen whale, which grows much larger and has no teeth. A porpoise, like its close cousins the killer whale and the pilot whale, very definitely has teeth—a mouthful of them, long and sharp (pages 413 and 422).*

There are more than 50 known species of dolphins and porpoises. They inhabit all the oceans of earth and some of the rivers. There are fresh-water porpoises, small and primitive, in the Amazon, the Ganges, and other warm rivers. But the kinds well known to man are relatively few, and of these the most familiar is the Atlantic bottlenose, *Tursiops truncatus*. This is the friendly, intelligent animal with the built-in smile that you see in most commercial porpoise shows (page 398).

There are two other species almost as well known: the common dolphin (*Delphinus delphis*) and the spotted dolphin (*Stenella plagiodon*). Both have a trait that endears them to people: they like to play with boats.

A friend of mine, a yachtsman and former United States Navy officer, had a startling experience recently. One dark night, in the North Atlantic off Halifax, he stood alone on watch in the bow of his boat. Suddenly he saw a luminescent torpedo streaking toward him through the water. Before he could sound an alarm, he heard a snort and realized to his relief that it was a porpoise. Another one joined it; they swam up, played around the bow, rubbed against the side of the boat in a friendly way, and then took off.

I have had similar experiences myself, in both ships and small boats, in the Atlantic. Suddenly the boat is surrounded by porpoises, leaping, splashing, and racing off the bow.

Why do they do it? First, they are probably attracted by the boat's sound; though their ears are as small as pinholes (located just behind their eyes), porpoises have incredibly keen hearing. Second, they seem to have an instinctive knowledge of hydrodynamics.

*See "Making Friends With a Killer Whale," by Edward J. Griffin, GEOGRAPHIC, March, 1966; and "Whales, Giants of the Sea," by Remington Kellogg, January, 1949.

As the bow of the boat moves forward, it creates a pressure wave, and the porpoises somehow know that if they position themselves in this wave they will get a free ride. When I watch over the bow, I see them gliding through the water, scarcely moving a muscle, like a child being pushed on a sled.

Fifty Million Years Under the Sea

It is probably this playful habit that has led to some wild stories about porpoise speed. I have met sailors and fishermen who are sure they have seen porpoises swimming as fast as 40 knots. The U. S. Navy, intrigued by the possibility (submarines are shaped somewhat like porpoises), ran a long series of tests and found that it just wasn't so. Unassisted, most of the species they clocked could go only about 15 to 20 knots. Those 40-knot porpoises, Navy scientists concluded, were getting a big boost from the bow wave.

The bottlenose is not so prone to play around boats, but it is the favorite of commercial oceanariums and of scientists. It likes shallow water—off Florida it inhabits sheltered areas like the Intracoastal Waterway, Biscayne Bay, and Florida Bay—and hence is relatively easy to catch by net. This species has been observed, measured, weighed, dissected, and tested more than any other dolphin, and most of the following generalizations on the animals and their behavior are based primarily on the bottlenose.

Porpoises are descended from land animals,

though their earliest ancestors, of course, like ours, came from the ocean. After adapting to life on land, the ancestors of porpoises, for reasons no one knows, went back to the sea. This happened about fifty million years ago; and just what the land animal was like no one can be sure, for the "missing links" in its evolution are lost beneath the sea.

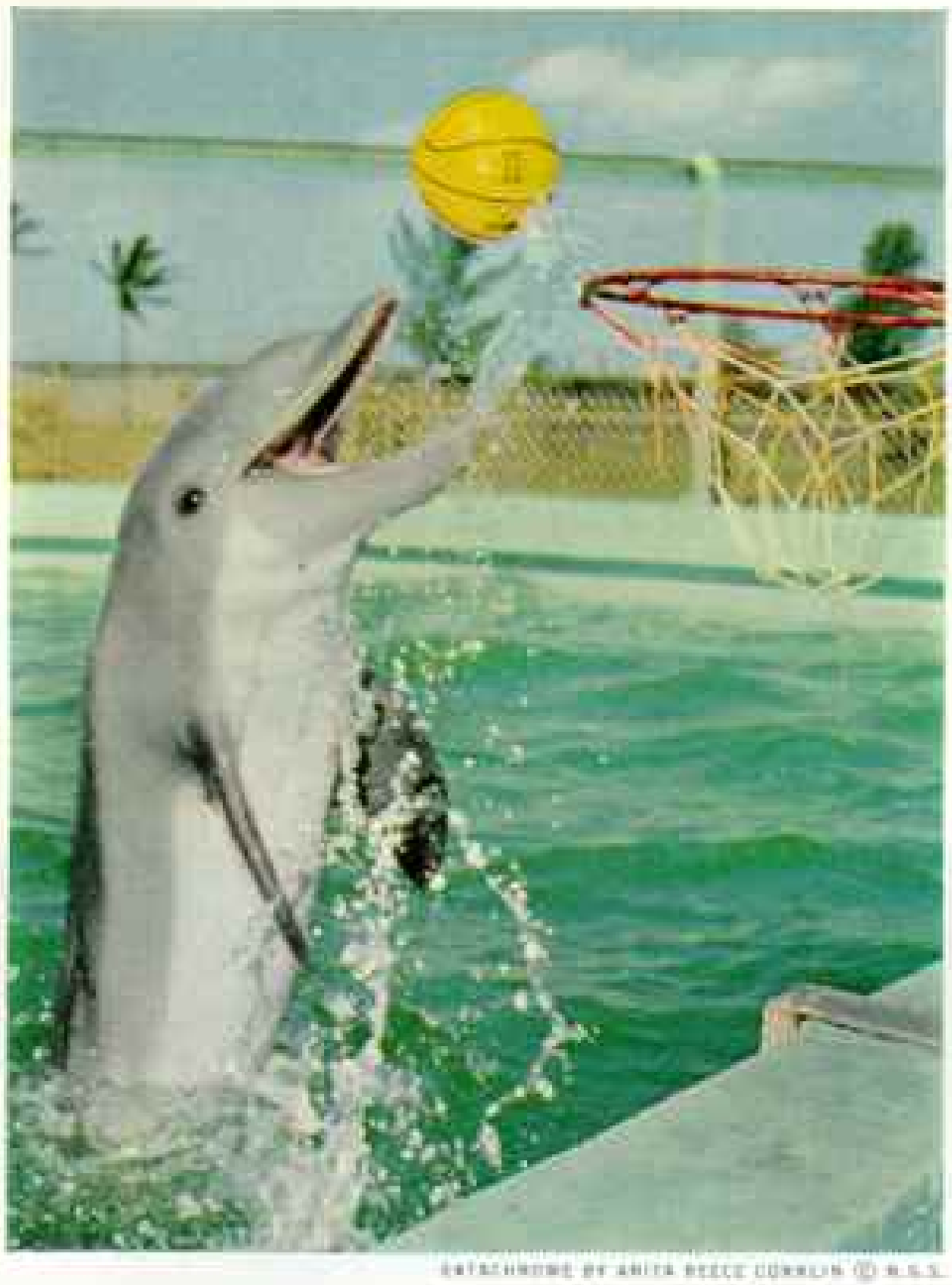
It is certain, however, that the land mammal went through a long process of readapting to life in the water. Its body grew streamlined and its legs disappeared, though porpoises still have finger bones in their flippers. Its nose turned into a blowhole—one large nostril about the size of a quarter, with inner and outer valves to seal out the water.

When a porpoise surfaces for air, it opens

Serve us first, two hungry porpoises seem to say as they beat their playmates to the dinner table at Miami's Seaquarium. Fed five times daily, adults devour three to four pounds of herring, mackerel, and blue runner at each meal. Lack of appetite means illness and calls for prompt treatment with antibiotics and vitamins.

Porpoises take catnaps between shows, swimming slowly, usually with at least one eye open. But even then they rise every minute or so to breathe.

Bull's-eye leap through a blazing hoop: Splash performs with spectacular nonchalance, thrilling spectators at Marineland of the Pacific in Palos Verdes, California.



Two more points for high-scoring Sonny Boy. The offspring of Carolina Snowball (page 401) chalks up a basket in a game at the Seaquarium. The normally colored young bottlenose was captured with his albino mother four years ago.

the blowhole wide and breathes with one tremendous gasp, inhaling 4 to 10 quarts of air in less than half a second, so that it always sounds winded.

Its breathing, unlike man's, is conscious—the porpoise must surface and gauge wave size before inhaling. So it sleeps only in snatches, usually with one eye open.

The porpoise developed tail flukes for propulsion; they grow out horizontally, not vertically like a fish's, which is one way you can always tell the mammal from a shark. These flukes, combined with two flippers and a dorsal fin, give a porpoise astonishing agility, which it needs to catch the 15 to 20 pounds of fish a day it must eat to live. It is probable —though biologists are not sure of this yet—that digesting the fish also provides water, since most species of porpoise have no access to fresh water.

Porpoises usually mate in the early spring, and the baby appears a year later. It is born alive, underwater, tailfirst (page 402). If it were born headfirst like most mammals, it might drown during birth. In aquariums—and presumably in the wild, too—when the mother is ready to give birth she emits a peculiar whistling noise, and another female swims to her side to help her.

The assistant hovers by the mother's side, and when the baby emerges (a newborn bottlenose weighs about 30 pounds and is about 3½ feet long), she may help the mother take it to the surface for its first breath. From then on, for the next several weeks, she will act as the mother's helper; together they guard the baby, keeping it close by their sides. When the mother leaves the baby to feed, her friend baby-sits.

I have watched a mother porpoise nurse her baby, a tricky thing to do underwater with an offspring that must rise to breathe every 30 seconds or so. Nature has solved this problem neatly by equipping the mother with a special set of muscles near her mammary glands (which are located in the same area as a cow's udder, below and to the rear). When the mother feels the baby nuzzling her, she contracts the muscles and squirts the milk into its mouth, all in one great gulp. The meal is over in a few seconds, and the baby then comes up for air. This is repeated several times an hour.

Of all the porpoise's characteristics, the most remarkable are its huge brain, its intelligence, and its friendliness. These three things have most consistently attracted man's interest. Ancient Greek and Roman legends tell of porpoises rescuing shipwrecked mariners and making friends with children.

Marineland Performers Show the Way

It was this same intelligence that started modern studies of porpoises, albeit more or less by accident. In order to study the animals, you must have them available in reasonably large numbers. That is an expensive proposition, involving tons of frozen raw fish, large tanks, and filters and pumps to move thousands of gallons of fresh sea water.

The porpoise, as it turned out, was smart enough to pay for all this himself. Here's how it came about: In 1938 a group of investors opened, near St. Augustine, Florida, the first big commercial aquarium, Marineland of Florida. The prime attraction—they thought —was to be the strange and colorful fishes

of the open ocean. But they also caught a few porpoises and put them in their tanks.

Marineland was a success.* Thousands of people paid to come in, but it soon became obvious that the porpoises were stealing the show from the fish. Without training, they invented tricks and games of their own. They would pick up sea shells and other debris from the tank floor and throw them to the customers. If someone tossed them a ball, they would toss it back. (They still do—you can play catch with a porpoise any day at Marineland.)

Mr. William Rolleston, president of Marineland, told me what happened next: "It seemed obvious that if a porpoise could do tricks like this, he could be trained to do even more. But first we had to find a trainer."

So a telephone call went from

*See "Marineland, Florida's Giant Fish Bowl," by Gilbert Grosvenor La Gorce, NATIONAL GEOGRAPHIC, November, 1952.

PHOTOGRAPHS BY GEORGE F. MOBLEY (ABOVE) AND THOMAS NEBBIA © N.G.S.

"Come." "Go." "Stay near the boat." Dolphins named Dinah and Dolly obey such commands in Bahama waters, where researchers study their remarkable aptitude for locating—and identifying—sounds underwater. Dinah answers a summons beeped in code by the electronic pinger in a diver's hand. Ordered to follow a motorboat (below), the pair frisk in its wake. The U. S. Navy, vitally concerned with the need for ever-better sonar, backs the experiments.

BOTTLENOSE (BELOW) AND ARTIST-DRAWN BY THOMAS NEBEN © N.G.S.

Marineland to Ringling Bros. and Barnum & Bailey Circus—where else?—asking if they knew of an unattached animal trainer. It just happened they did. His name was Adolf Frohn, born in Hamburg, Germany, a man with long experience in animal shows.

"So I talked to Adolf Frohn," said Mr. Rolleston, "and asked him if he would train porpoises for us." He would, and did, and became the world's first professional porpoise trainer.

Seven Pins Mean Fish for Susie

I found Mr. Frohn at the Seaquarium in Miami, teaching a young bottlenose named Susie how to bowl. Facing her training tank he had an alley, a set of tenpins, and a ball the size of a grapefruit. He set up the pins and threw the ball into the water. Rising on her flukes, Susie eyed the pins, then slid back into the water, picked up the ball with her beak, and sent it rumbling up the alley. Down went seven pins.

"Good Susie," called Mr. Frohn, and tossed her a fish.

Later, when Susie got careless and missed, he said, "*No* good Susie," shook a finger at her, and she got no fish.

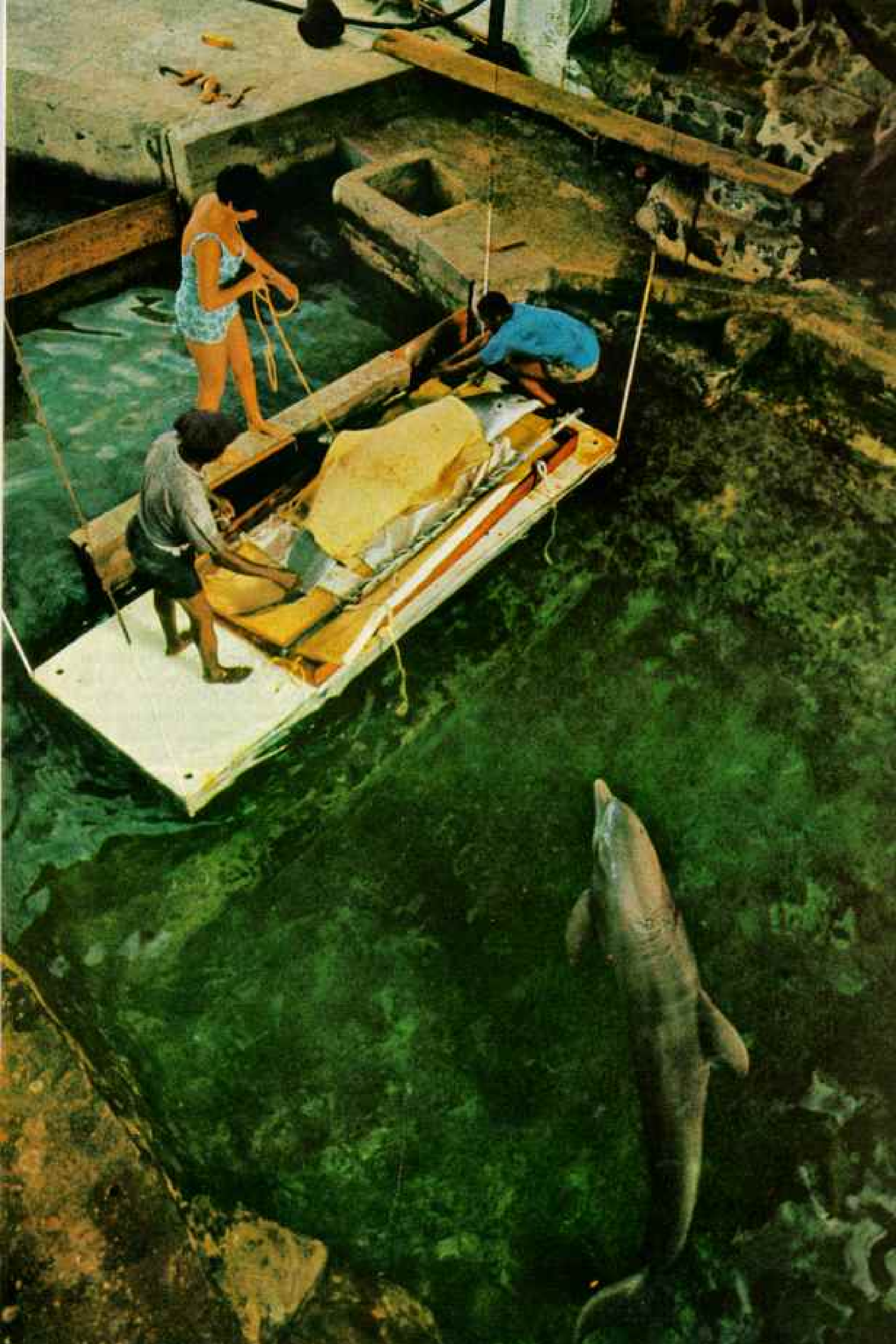
When the lesson was over, Mr. Frohn and I sat down to talk.

"When Mr. Rolleston first asked

Going to a "consultation," Peter the dolphin rides an elevator-stretcher (right) to the second floor of Dr. John C. Lilly's Caribbean laboratory on St. Thomas in the Virgin Islands. His poolmate Pam keeps a watchful eye on the proceedings.

Peter relaxes on his pallet (upper left) as Dr. Lilly, in white shirt, and assistant Margaret Howe, foreground, supervise the transfer.

Many years of study of the dolphin have convinced this research neurologist of its high degree of intelligence. Now he and associates seek new ways to communicate with the mammal. Captive animals at the sun-washed retreat live in a pool hewn from shore rock and constantly refreshed with salt water lapping through the gates (left).



Clamps padded with foam rubber hold a patient during studies at Dr. Lilly's Miami laboratory. Respirator at center pumps air to the lungs during anesthesia, since the dolphin's breathing is conscious, not automatic like man's. Polygraph recorder at right monitors heart and muscle activity.

Like a playful puppy, Peter nudges researcher Margaret Howe, his constant companion for 2½ months at the Virgin Islands laboratory. Whenever she left him, he wailed with loneliness. Her experiences led to new techniques for teaching dolphins and communicating with them.

PHOTOGRAPHS BY THOMAS NEBBIA © NATIONAL GEOGRAPHIC SOCIETY

me about coming to Marineland," Mr. Frohn recalled, "I said, 'I don't know how to train porpoises.' But then I thought, well, neither does anybody else, so I decided to try."

He trained a bottlenose named Flippy, the world's first performing porpoise. Flippy at first learned to pull an aluminum float up and down the tank. On the float sat a pretty girl in a bathing suit.

Porpoise shows have come a long way since then. There are now more than a dozen in the United States, and several are opening in Europe. At the two Marinelands—St. Augustine and Los Angeles—at the Miami Seaquarium, Hawaii's Sea Life Park, and the rest, people spend millions of dollars to watch a bewildering assortment of tricks. Porpoises not only bowl, they play baseball and basketball (page 406); they dance, race, jump through hoops, ring bells, raise flags, and a lot more.

A bottlenose named Flipper was the star of a Hollywood movie not long ago; others, same name, different dolphins, have played the hero of a weekly television drama (page 423).

Squeaky Conversation Greets a Stranger

At Sea Life Park, a beautiful oceanarium near Honolulu, there is a large porpoise pool called "Whaler's Cove," with a model whaling ship in it. It looks like a tropical lagoon and, sure enough, at the end of each show a Hawaiian girl is pulled through the water by two porpoises (pages 396-7). She does not ride them—porpoises will not ordinarily let humans get on their backs—but holds their dorsal fins with her hands.

After the show I tried this trick myself. Dressed in swim trunks, I dived into the cove with seven porpoises, to a weak round of applause from GEOGRAPHIC photographer Tom Nebbia. The porpoises, knowing a nervous man when they saw one, politely retreated across the pool. Underwater I could hear them talking in high-pitched whistles—about me?

Finally one of them dashed in my direction, then another, and in a few minutes they were all around me, bumping me gently with their sides, beaks, and tails, though they never stayed still long enough for me to hold their fins for a ride. Five of these porpoises, incidentally, were of a type called spinners, because they whirl like tops when they jump out of the water (page 416).

Porpoise training, like other wild animal training, almost always begins with natural behavior. Thus when the trainers at Sea Life Park saw the spinners spin, they taught them to do it on cue—and there was a new act for

Astride his seagoing steed—a dolphin—the mythical hero Taras clutches a trident and a wine cup. The 2,300-year-old coin, from a Greek colony in Italy, reflects the esteem that Mediterranean peoples felt for the animal.

The friendly dolphin

"In the reign of the late lamented Augustus, a dolphin that had been brought into the Lucrine Lake fell marvelously in love with a certain boy, a poor man's son, who used to go from the Baiae district to school at Pozzuoli. . . . And when the boy called to it at whatever time of day, although it was concealed in hiding it used to fly to him out of the depth, eat out of his hand, and let him mount on its back . . . and used to carry him when mounted right across the bay to Pozzuoli to school, bringing him back in similar manner, for several years, until the boy died of disease, and then it used to keep coming sorrowfully and like a mourner to the customary place, and itself also expired, quite undoubtedly from longing."

1,900 years ago . . .

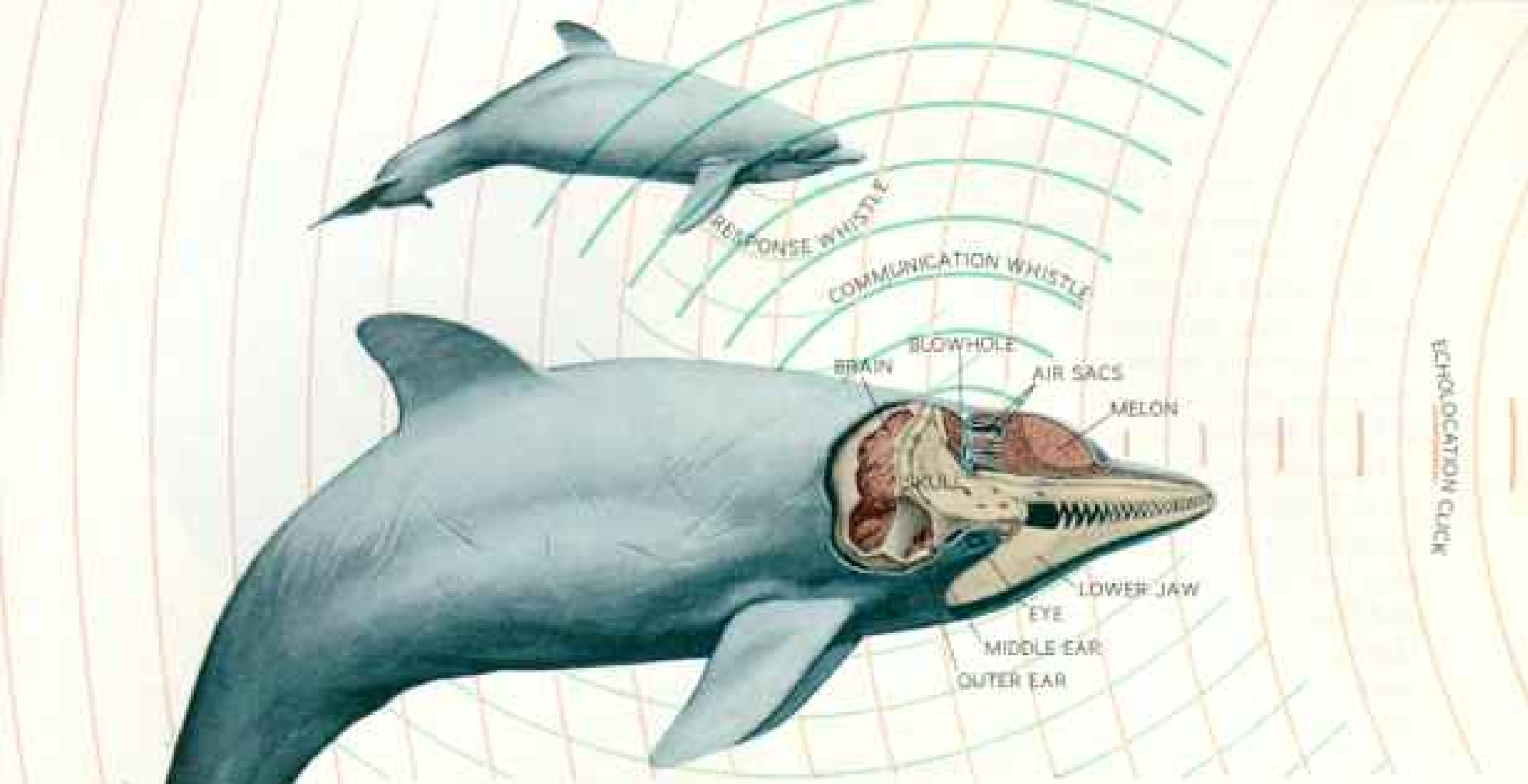
PLINY THE ELDER, NOTE, A.D. 23-79

"We two girls had got the idea of having ourselves slowly towed . . . behind the boat [in Long Island Sound]. Carla was on the rope behind me, when I felt the first nudge and thinking it was she, ignored it. The second time I was nudged, I looked around to see a large and graceful form curving out and away from me. From the first instant, I felt no fear, only surprise and wonderment. So playing with the porpoises came to be a part of my vacation life. . . .

"The second summer . . . I took my first porpoise ride. I began to put my arms gingerly around them and they would slip through and glide away. Finally I got to the point of holding on for longer periods by grasping a fin, and several times my playmates actually towed me round in a large circle. . . ."

. . . and today

SALLY STONE, CRANFORD, N.J., "A PORPOISE'S NATURALIST," 1958



Versatile sound maker, the porpoise on the surface utters a loud half-squeak, half-whistle. This is the distinctive cry that delights aquarium visitors, the "voice" of television's Flipper. But beneath the waves the porpoise can make different and far more significant sounds, as the diagram above portrays.

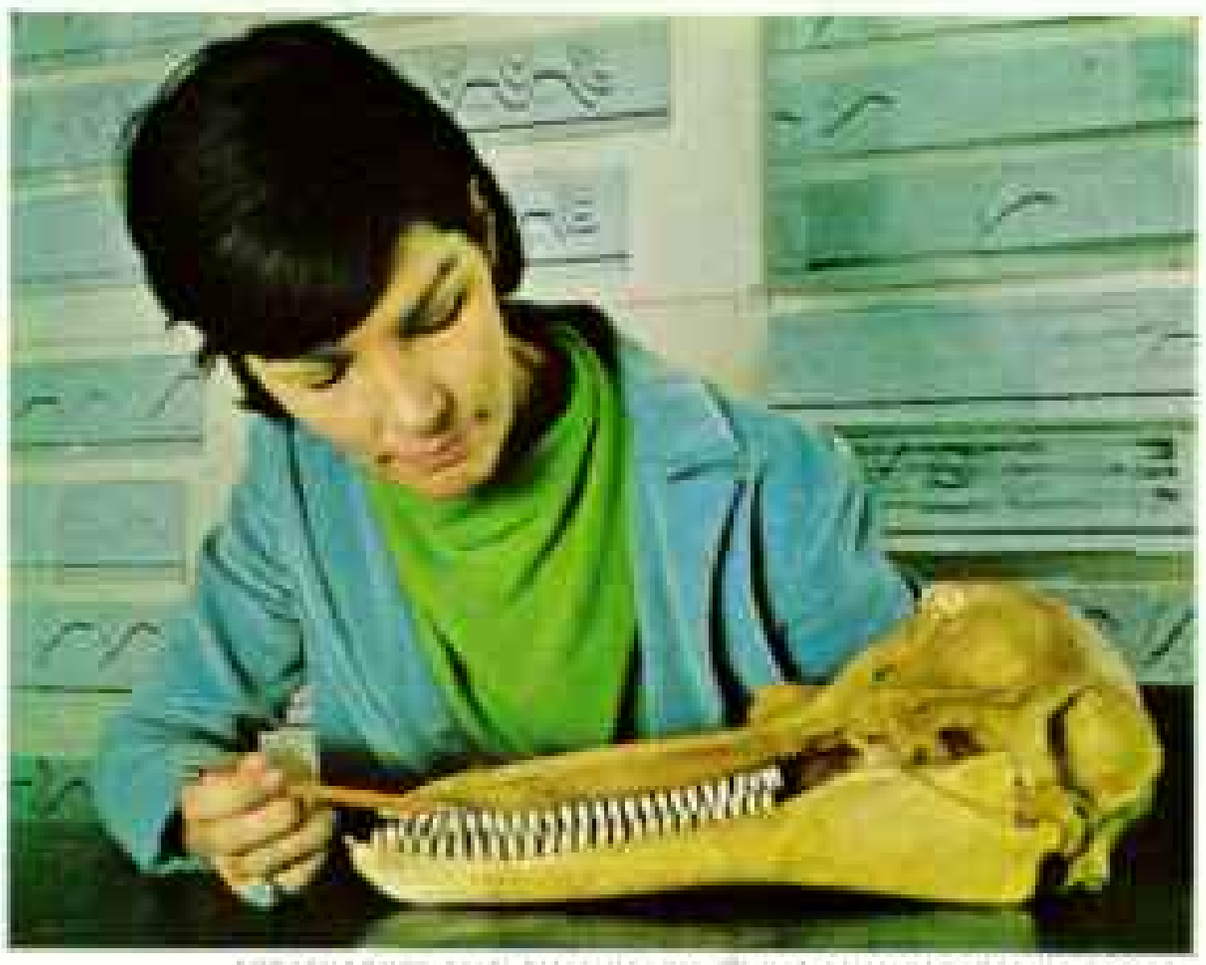
In complex tests, scientists discover new facts about the mammal's remarkable sonar, or echolocating ability. To obtain an acoustical picture of his underwater world, the porpoise creates clicklike noises; many believe they make the sound by forcing air from two sacs near the blowhole. The clicks may pass through the fatty melon tissue. Each lasts only a split second, but combines frequencies varying from the lowest audible pitch up to at least 170,000 cycles per second—about ten times higher than man can hear. Swimming forward, clicking all the while, the porpoise

Porpoise Sonar: HOW IT WORKS

ILLUSTRATION BY ROBERT W. NICHOLSON
CARTOGRAPHIC ART DIVISION
© NATIONAL GEOGRAPHIC SOCIETY

sweeps his head back and forth in a scanning motion. Suddenly he hears echoes from his clicks. A stronger echo on one side points the direction of prey or predator. Time interval between sending and receiving tells the distance to the object. Variations in echo-sound reveal its size and nature.

To communicate with porpoise friends, he "whistles" signals that last from ½ to 3 seconds, in about the same pitch range that humans hear. Amazingly, porpoises can send and receive echolocation clicks and communication whistles simultaneously.



ASHACHROMES BY THOMAS NEBBIA © NATIONAL GEOGRAPHIC SOCIETY

Spike-edged jaws of a dolphin can cut a fish in half with one bite of sharp, even-sized teeth. In a sea battle it also butts with its beak and lashes with its powerful tail. Spectrograms on wall behind Mrs. Lilly compare dolphin and human sounds.

Can man and dolphin communicate? Dr. Lilly "talks" with a flippered student in a sound-proofed room at his Communication Research Institute in Miami, Florida. "One, two, three, four," says Dr. Lilly into a microphone. "Da-da-da-da," mimics the dolphin in a squeaky, high-pitched voice. One animal correctly copied 92 of 100 vocal sequences.

the show. If a trainer at Marineland sees a porpoise who likes to jump, he teaches it to jump higher, or through a hoop, or over a bar, and rewards it with a fish. If trainers see one that is naturally adept at tail-walking (that is, standing upright, half out of the water, by beating its flukes), they reward it for walking farther and higher.

The porpoise quickly grasps what is wanted; it also learns its name and understands words, whistles, cues, and hand gestures.

At Sea Life Park I watched two young trainers, Miss Dorothy Samson and Miss Randy Lewis, teaching a porpoise named Makua a new trick. Christmas was only a few weeks off, and they wanted him to pull a bright-red sled mounted on Styrofoam runners. Cooperating beautifully, Makua permitted himself to be harnessed to the sled, then set off around the tank. Every so often Miss Samson tossed a fish ahead of him.

After three times around, however, Makua tired of this game and decided to liven it up by swimming on his back. He flipped over with a happy smile, and his harness fell off. Miss Samson stopped throwing fish.

Makua realized he had blundered. He looked at the harness dangling in the water, picked up one of the straps in his mouth, and tried for the next five minutes to put it back on. He never did succeed, but Miss Samson gave him a fish anyway, for trying.

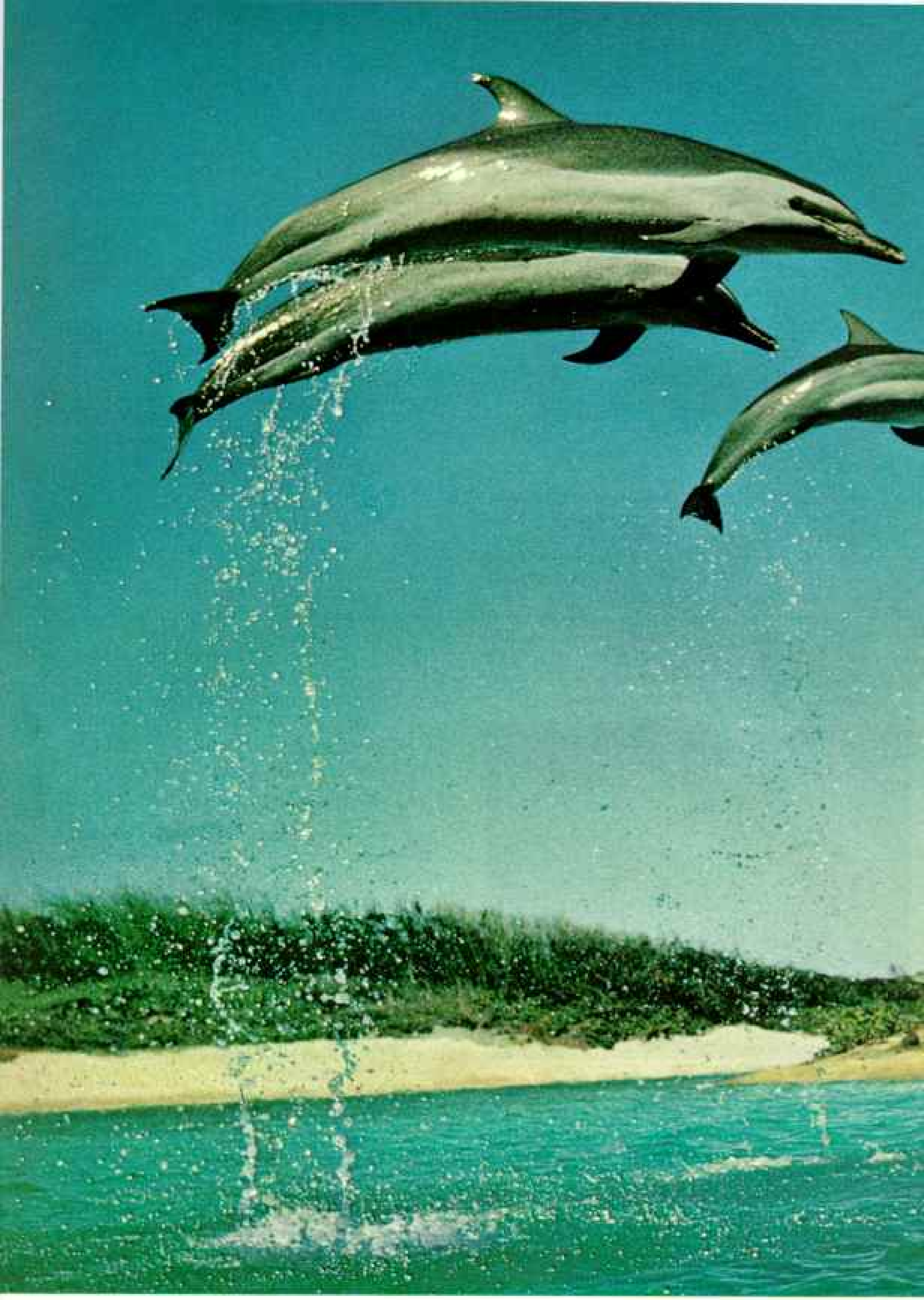
Showmanship Paves Way for Science

All this, of course, is show business and not science. Yet it was because porpoises were such a golden success commercially that they became available for study. Porpoise catching became a routine business, though a highly skilled one (page 400), and hundreds are now snared or netted each year.

After Marineland opened, word got around that these were not just ordinary animals, and scientists began writing to the management: Would they provide specimens for research and experimentation?

Marineland would. Its own interest, at first, was in learning how to keep the animals alive. Healthy porpoises will live in captivity 20 to 25 years. (No one knows their average life span in the wild.) But porpoises get diseases just as people do, and have to be given antibiotics and vitamins, or tranquilizers when they get nervous.

One of the earliest experiments was an analysis of porpoise milk. A group of biologists from the University of Chicago worked out a "formula," and in case you ever find



Rocketing in graceful precision, porpoises at Sea Life Park near Honolulu, Hawaii, arch their streamlined, sunlit bodies 12 feet above a man-made lagoon. They sometimes

learn to perform in the spectacular ballet after only a few days of training. At show's end two porpoises tow the girl through the water from islet to land (pages 396-7).

yourself with an orphan baby bottlenose on your hands, here's the recipe: five parts evaporated milk, five parts water, three parts heavy cream, one-half part lactalbumin (milk protein). A newborn infant will drink three pints of this brew a day—warmed, of course.

Bats and Porpoises Share a Skill

Modern porpoise research tends to concentrate in three main fields: their sonar, their intelligence, and their "language." Combining all of these, there is also a new field: their potential usefulness to man undersea.

As long ago as 1947, Arthur F. McBride, then curator at Marineland, noticed that porpoises seemed able to "see" nets even at night in murky water. In his notes (later published posthumously), Mr. McBride raised the question: Could the porpoise have a sonic sending and receiving apparatus like the one that lets bats fly safely in the dark?

The ability of bats to echolocate has long been known; their sonar is so efficient they use it to find and catch flying insects for food.*

Echolocation, or sonar, had also been widely used by the Navy before and during World War II, and its principles were well understood. Expressed simply: You send out a "ping" and wait for an echo. The direction, intensity, and time lag of the echo tell you where and how far away a foreign object is.

In the 1950's a number of scientists got to work on porpoise sonar, most notably

*See in NATIONAL GEOGRAPHIC: "How Bats Hunt With Sound," by J. J. G. McCue, April, 1961, and "Mystery Mammals of the Twilight," by Donald R. Griffin, July, 1946; in "Birds That 'See' in the Dark With Their Ears," February, 1965, Dr. Edward S. Ross told how South American oilbirds navigate by similar means.

William Schevill, a biologist at Woods Hole Oceanographic Institution in Massachusetts, and Dr. Winthrop N. Kellogg, a psychologist then at Florida State University in Tallahassee. Dr. Kellogg spent nine years at his research, and eventually wrote a book about it, a classic called *Porpoises and Sonar*.

Dr. Kellogg was given two porpoises by Marineland and studied their vocalization and hearing ability. He learned that they make two basically different kinds of sounds, a whistle and a sharp, percussive click. The animal can produce these clicks one at a time, or rattle them off so fast (hundreds per second) that they sound like anything from a rude Bronx cheer to a bark.

Dr. Kellogg concluded that the whistle is probably an emotional sound, not used in echolocation. For example, when a mother porpoise is separated from her baby, both will whistle plaintively until they are reunited.

The individual clicks, he found, contain a wide range of frequencies—or vibration rates—from about 20 cycles per second to 170,000 and possibly higher. Moreover, studies of porpoise ears have shown the animals can hear at least as high as 150,000 cycles; a normal human, by comparison, can hear only to about 16,000. If the porpoise had sonar, Dr. Kellogg decided, this must be the apparatus (illustration, pages 412-13).

Next, he and Dr. Schevill tried a series of simple tests. They taught their porpoises that on a given signal (an underwater sound) they would get a fish. The scientists would then "hide" the fish in murky water, at night, and sound the signal. They also put hydrophones into the water and listened.

The results were dramatic and incontrovertible. The porpoises would emit bursts of clicks, locate the fish, and swim toward it, clicking as they went. Dr. Kellogg found that his porpoises could even tell the difference, by sonar, between a 6-inch spot and a 12-inch mullet (they liked spot better).

Red-footed booby meets his host, Taylor A. Pryor, who designed and manages Sea Life Park. Many sea birds find sanctuary in the 20-acre preserve. Mr. Pryor also heads the affiliated Oceanic Institute for marine research.

Spinning as they leap, dolphins cavort on cue in Whaler's Cove at Sea Life Park. Flicking a switch aboard the vessel, their trainer, left, sends an electronic signal underwater, and the troupe goes into action. Each artful and seemingly effortless exhibition earns the acrobats a fish reward.

Do Dolphins Talk Among Themselves?

Others picked up where Dr. Kellogg left off. In the pleasant living room of his house near Sea Life Park, Dr. Kenneth Norris told me about his work with a bottlenose named Alice.

This was done at the University of California at Los Angeles, where Dr. Norris teaches zoology. He and Dr. Ronald Turner taught Alice to choose between two steel balls, a small one only 1½ inches in diameter, and a big one of 2½ inches. When she chose the big one, she won a fish.

"Then," said Dr. Norris, "we blindfolded Alice and gradually increased the size of the smaller ball. Choosing blindfolded between a 2-inch ball and a 2½-inch, Alice never made a mistake in hundreds of tries. Even when it was 2¼ against 2½, she was successful most of the time, though she made occasional errors. That ¼-inch difference is so slight you can hardly see it with your eyes *open*."

So it was established that porpoises use sounds to locate and identify objects. Do they also use them to "talk" to one another? One fascinating dolphin experiment, still going on as you read this, indicates that they may.

Dr. Jarvis Bastian, a psychologist at the University of California at Davis, taught two Atlantic bottlenoses, Buzz, a male, and Doris,

a female, a complicated game. Each had two underwater levers to press, one on the right, one on the left. Dr. Bastian cued the animals with an auto headlight; a steady light meant "push the right lever," whereas a flashing light meant "push the left lever." Having no hands, they pushed with their beaks.

Simple enough. In their tank at Point Mugu (the same Navy laboratory that trained Tuffy), the two dolphins quickly mastered the difference between steady and flashing, right and left. The reward, each time they got it right: a fish apiece.

Buzz Knows Which Lever to Push

Now Dr. Bastian introduced a new complication. When the light came on, Doris had to wait. If she pushed first—no fish. Only after Buzz pressed his lever was she to press hers. Again the dolphins mastered the trick.

Then came the last step: Dr. Bastian put a partition between the porpoises. They could still hear one another underwater, but only Doris could see the headlight. When Dr. Bastian turned it on, she stationed herself in front of her levers and waited politely, as she had been taught. At the same time, however, she gave off a burst of underwater noises—and somehow, out of sight behind the partition, Buzz knew which of his levers to push.

Was she telling him? Or was he guessing, somehow, from clues Dr. Bastian could not detect? If so, Buzz was a shrewd guesser, for in dozens of tests he scored almost 100 percent correct. Dr. Bastian draws no conclusions as yet. He is a careful researcher, and, as I said, the experiment is continuing.

Whether or not Doris was talking to Buzz, I can draw one conclusion of my own. It is this: That merely to master the routines of

PHOTOGRAPHS (BELOW) AND RESEARCHERS © N.G.S.

Blindfolded but not lost, a dolphin proves his sonar equal to sight by finding and poking a lever. Biologist Kenneth Norris rewards him with a fish dinner at Sea Life Park. In another test, conducted by Dr. Norris at the University of California at Los Angeles, a dolphin with eyes covered distinguished between steel ball bearings almost identical in size.

Clocking a dolphin's speed, scientists race Keiki, a Pacific bottlenose, over a measured water course near Sea Life Park. His top pace: 19 miles an hour. Other species have reached 26 mph. Flipping his flukes and squeaking loudly (below), Keiki rides a canvas stretcher to the raceway, watched by the author, right.

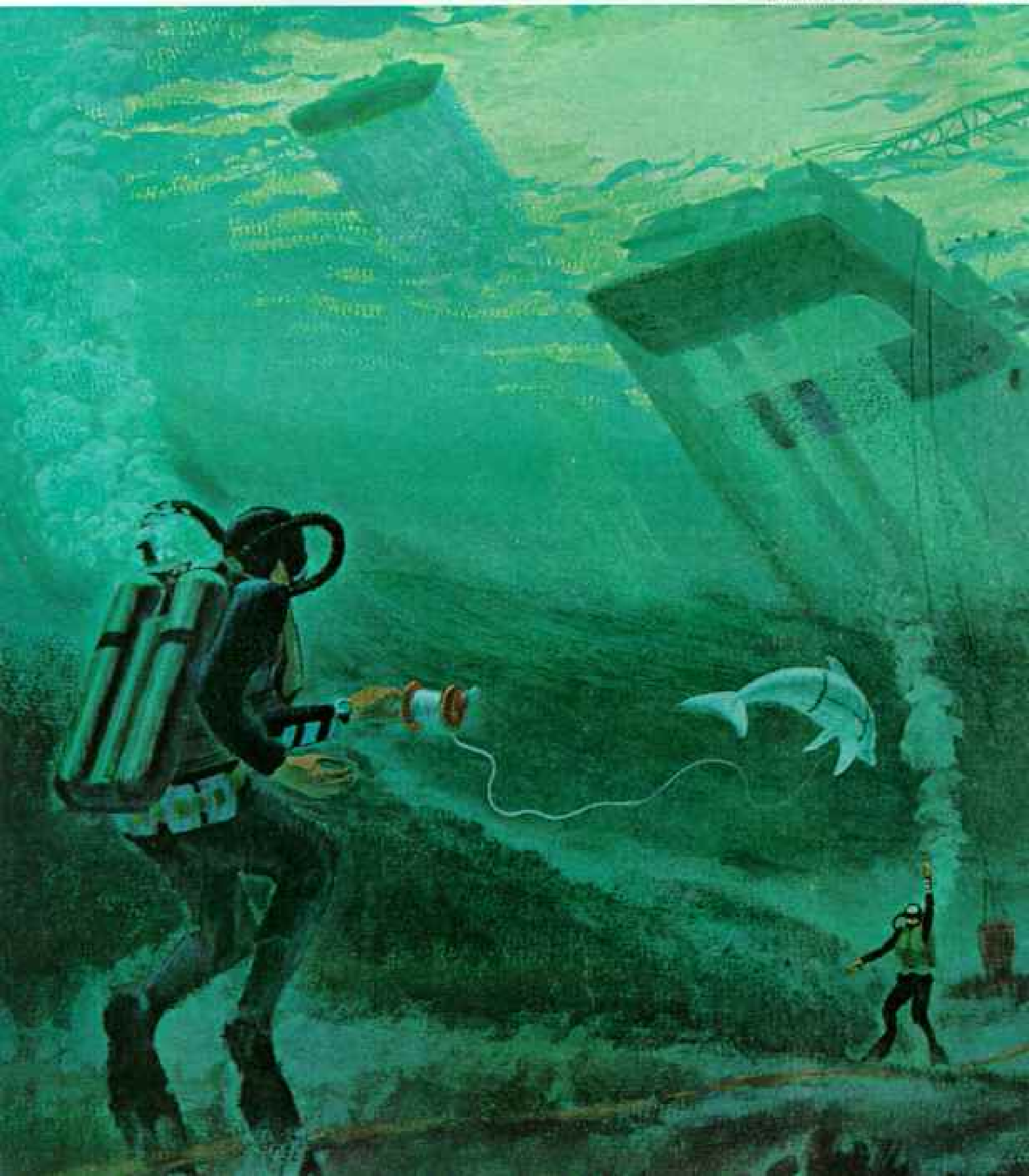
experiments like this, regardless of results, porpoises have to be smart. Every time I watch them, I am astonished again at how eager they are to cooperate, and how quickly they grasp what's wanted.

To me this is the most fascinating part of all porpoise studies: their intelligence. Here the scientific community is sharply divided, with no love lost between sides.

There are those who think the bottlenose is perhaps a cut above dogs or horses—a fairly smart animal but nothing more. And there are others who think dolphins are, in their own way, just about as intelligent as people.

But their way is not the same as ours. They live in a different environment; they are weightless when suspended in water, and, without the aid of airplanes or rockets, they move freely in three dimensions. They have no hands or fingers, and they do not build.

One man who is working hard at this problem of intelligence is Dr. John C. Lilly, who



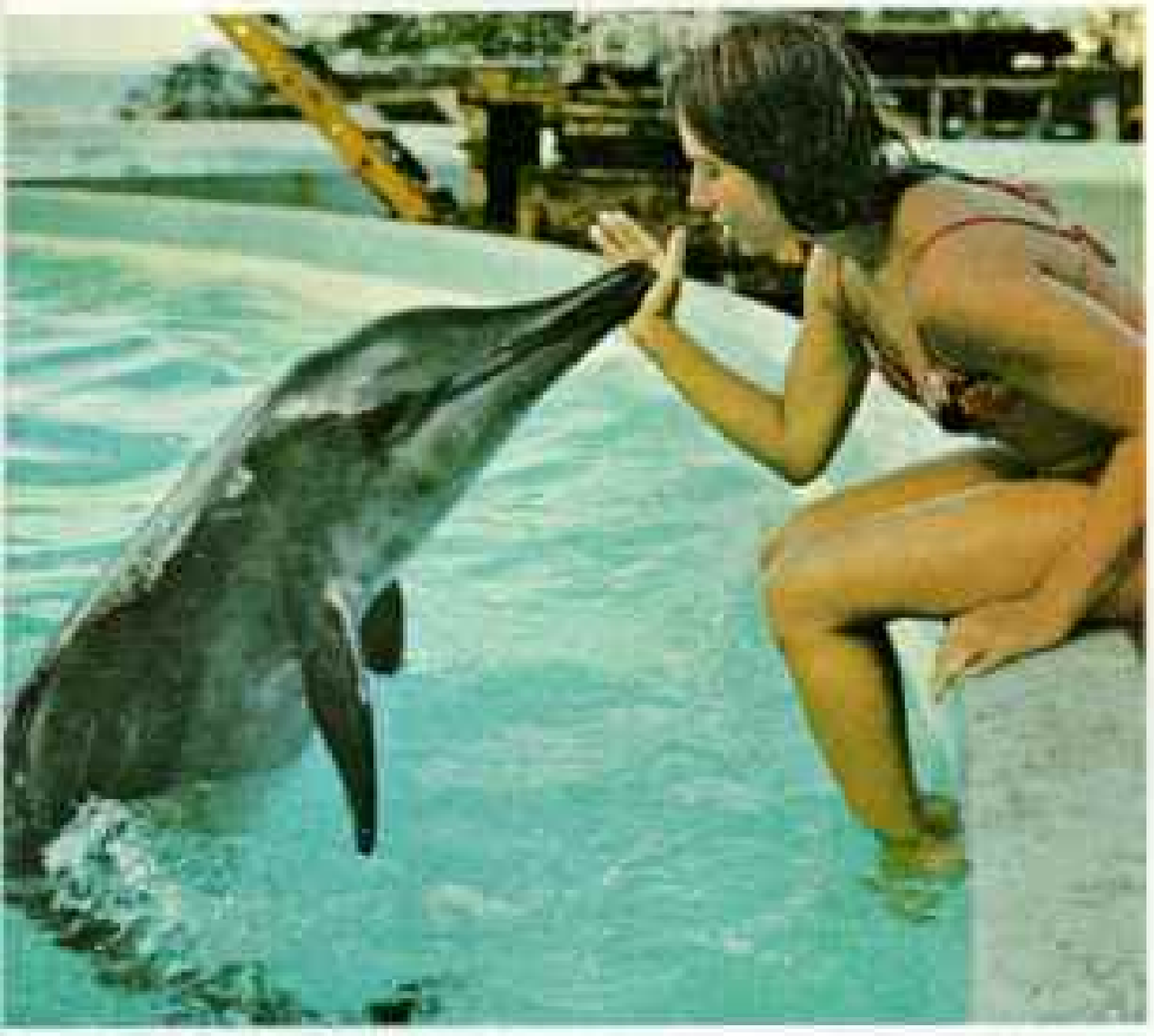
first grew interested in dolphins at Woods Hole, Massachusetts, in 1949. Dr. Lilly is also known for his studies of monkey and human brains. Earlier he worked in biophysics at the University of Pennsylvania Medical School, where he had earned his M.D.

Seeking Limits of Dolphin Intelligence

Dr. Lilly became fascinated with the bottlenose: its large brain, its apparent intelligence, and its seeming ability to communicate. So in 1959-60 he built his own dolphin laboratory on a peninsula of the island of St. Thomas in the Caribbean (pages 408-9).

Thus was born the Communication Research Institute, of which Dr. Lilly is director. The CRI, as it's called, has since expanded into a bigger (indoor) laboratory in Miami, but keeps the one on St. Thomas, too, and it was there that I first met Dr. Lilly and three of his dolphins, Peter, Pam, and Sissy. He has four more in Miami. Incidentally, he refers to his

St. Bernard of the sea. Tuffy swims to a "lost" aquanaut in a simulated rescue near Sealab II, an undersea station 205 feet deep in the Pacific off La Jolla, California. After John F. Reeves has hooked the line to Tuffy's harness, the porpoise, called by a buzzer, streaks toward "lost diver" Kenneth J. Conda, 50 feet away. NATIONAL GEOGRAPHIC artist Robert C. Magis exaggerates water clarity; actually the men could see only a few yards. Tuffy (above) responds to another diver's low-frequency signals; he sometimes homed on the sound from 500 yards away. The animal carried mail and tools to 10 divers submerged in Sealab II.



EXTACHROME (ABOVE) AND KODACHROME BY THOMAS HERON © N.G.S.

animals, all bottlenoses, strictly as "dolphins," never as porpoises.

Broadly speaking, Dr. Lilly and his colleagues at CRI are trying to find out what dolphins can do: How much they can learn, how well they remember, how they think, what they know. He does not believe that bowling and hoop-jumping—"circus tricks"—are the measure of a dolphin's ability.

Dolphin May Think Faster Than Man

In his book, *Man and Dolphin*, Dr. Lilly begins: "Within the next decade or two the human species will establish communication with another species: nonhuman, alien, possibly extraterrestrial, more probably marine. . . ."

This idea, seemingly fantastic, has urgent interest for scientists working with the National Aeronautics and Space Administration, the Air Force, and the Navy, because astronauts may someday have to communicate with life elsewhere.

One of Dr. Lilly's major studies is to find out whether a dolphin can learn to talk to us, or we to it, in either English or dolphinese. This is a tedious, step-by-step process, and has led him into strange bypaths. Recently he has been programming a computer in his Miami laboratory for testing a dolphin.

"Their thought processes," he explained, "seem to be much faster than ours. Everything a dolphin does, including talking and thinking,

Like the races of man, the 50-odd species of porpoises differ in size, shape, and color. Slender beak and sloping forehead distinguish *Steno bredanensis*, here nuzzling the palm of a poolsider at Sea Life Park (top).

Amazon River dolphin, *Inia geoffrensis* (center) docilely submits to an X-ray at Sea World in San Diego, California.

Jet-black body and white flanks identify *Phocoenoides dalli*, a resident of North Pacific waters. At a Navy laboratory at Point Mugu, California, trainer Debbie Duffield works with the only one in captivity.

Flipper to the rescue. Like Lassie, Fury, and television's other animal stars, the bottlenose called Flipper proves man's boon companion in moments of crisis. For the "Red-hot Car" episode of the video series, producers sank an automobile in the ocean off Nassau. Cameraman Jordan Klein, director Ricou Browning, and actor Luke Halpin (left) wear scuba lungs for the sequence. Flipper and several stand-ins alternate in shows filmed at different locations.

it does at high speed. So when it works with a man, a dolphin quickly loses interest. We're hoping the computer can keep up with it."

Dr. Lilly's best-educated animal was a bottlenose named Elvar, who lived in a tank in Miami. When I went to his tank he greeted me by flicking about a quart of water at me with his beak, soaking my face, shoes, and everything between. This, I gathered, was his way of saying hello.

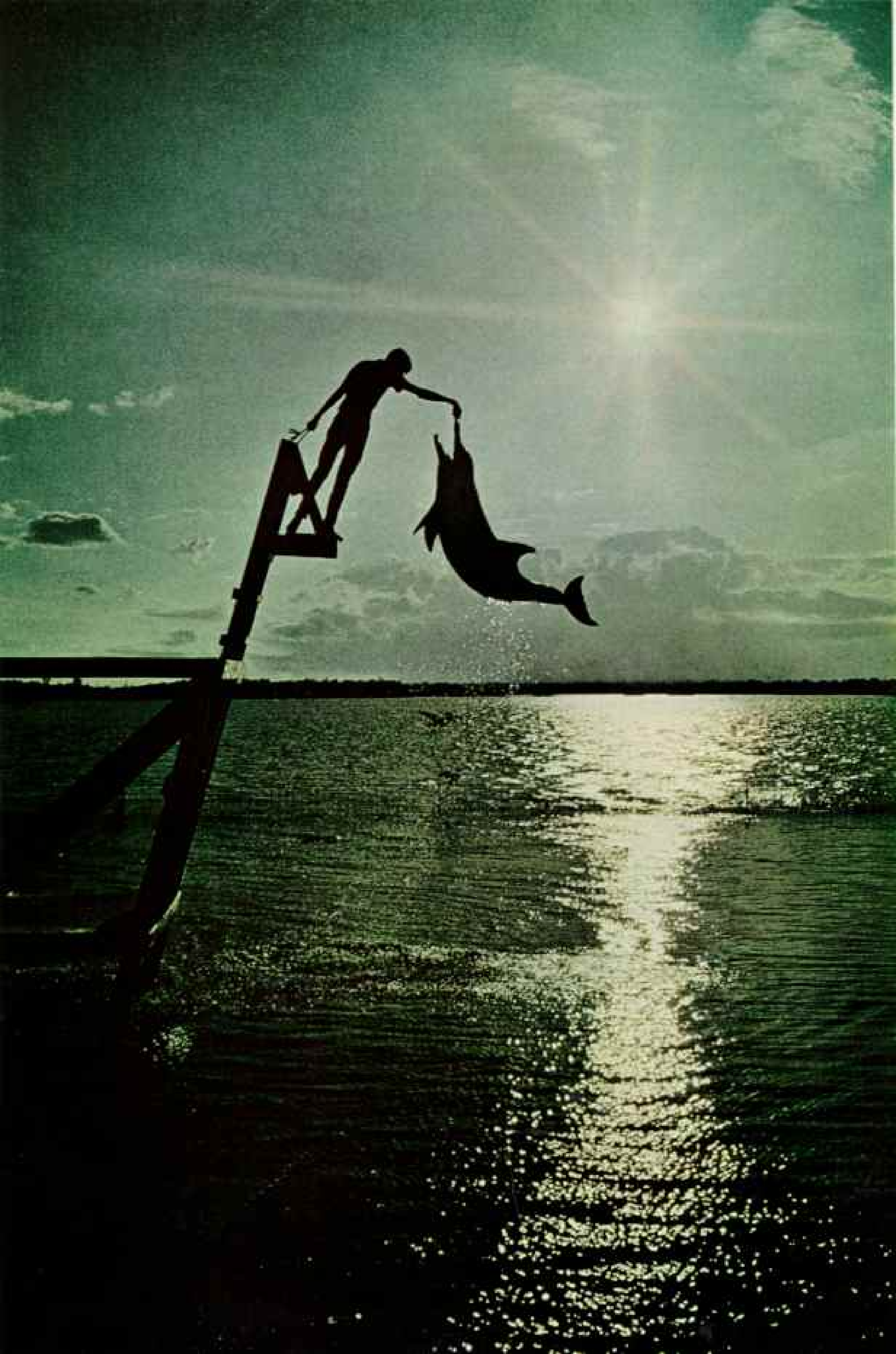
Elvar, after several years' training, had not really learned English. He had a natural talent for mimicry, however, and it was he who said at the start of a training session, "All right, let's go!"

Other dolphins have learned similar phrases. They say them in high, ducklike voices, sometimes quite clearly, especially when recorded and slowed down on tape. The trouble is, there is no indication they know what they're saying. It seems to be parrot speech.

In another experiment, Elvar worked with numbers. Dr. Lilly discovered that if he read Elvar six syllables, for instance, the dolphin, though he might get the sounds wrong, nearly always responded with six syllables. Dr. Lilly ran a long series of tests on this, using groups of one to ten syllables, and Elvar scored better than 90 percent correct.

Book Will Detail Porpoise's Brain

In another part of the Communication Research Institute I watched a different investigation in process. This is a detailed, area-by-area study of the bottlenose's brain, cross-sectioned and stained. Working with a



team at the Harvard Medical School, Dr. Peter Morgane, a colleague of Dr. Lilly's, has so far mounted six brains in transparent sections so thin that each brain provides about 3,800 slides. (The brain of a 300-pound bottlenose weighs about 1,700 grams, compared to 1,400 for a 150-pound man.) The end object is to produce a definitive book on the dolphin brain, scheduled to appear late in 1967.

I asked Dr. Morgane what he had learned so far. Is the brain really as good as a man's?

He smiled. "'Good' is a vague term," he said. "There are many standards by which to judge brain quality. By most of these a dolphin's compares very favorably to a man's.

"Take the cerebral cortex, for example. That's the convoluted outer part of the brain responsible for the highest memory and thought functions. To judge its quality you may ask: How complex are the convolutions? A dolphin's cortex has at least twice as many folds or convolutions as a man's.

"Or you may ask, how many brain cells in the different cortex areas? A dolphin has at least 50 percent more than a man. Another criterion is what we call 'layering' in the cortex. A rat or a rabbit has four layers of cell types in most of its cortex; monkeys and men both have six, and so do dolphins.

"So we can say this much: The bottlenose dolphin has a very large, complex, and highly evolved brain. Does this mean intelligence? Not necessarily. But you can be sure of one thing: When such a complicated organ is evolved over millions of years, it must be used for something more than just random swimming and feeding."

Pelorus Jack Escorted Steamships

All of this, of course, does not add up to intelligent conversation with a dolphin. That's in the future, if ever. But even if porpoises never talk to us, we can still count them as our friends. They have proved this too many times to doubt it. I am not referring to the many stories of porpoises' rescuing humans; though personally I'm inclined to believe these, I can find little or no substantiation.

But there are other stories that cannot be disputed. There is, for example, Pelorus Jack, who for three decades, until 1912, escorted ships and boats across Admiralty Bay, New Zealand, on their way between Wellington and Nelson. Tourists used to make this steamship run especially to see him, and the people of New Zealand became so fond of him that a special law was passed for his protection.

Even friendlier than Pelorus Jack was another New Zealand dolphin, a female Pacific bottlenose named Opo. She appeared, in 1955, in Hokianga Harbour, and apparently she liked the sound of outboard motors, for soon she started following boats.

Opo Wins New Zealand's Heart

A little later she grew braver (or lonelier, perhaps, for she was always alone) and came to the beach at a little town called Opononi, where she swam with the bathers. She seemed to like the children best, and would play ball with them, allow herself to be stroked or held, and even let some of the smaller ones ride briefly on her back.

She was always gentle. If a child got too rough, she would swim away and would sometimes protest by slapping her tail on the water, but never near enough to hit anyone.

Opo's fame spread through New Zealand and around the world, and people crowded into Opononi to watch her, swim with her, and take her picture. They booked the single hotel up solid, caused traffic jams, and camped in tents along the road. The town erected a sign: "Welcome to Opononi, but don't try to shoot our Gay Golphin" (as the children called her). And once again a special law was passed to protect her.

But to no avail. One day in March, 1956, Opo failed to appear at the beach. Four boats searched the harbor—no Opo. Finally a Maori found her, dead, wedged among rocks which were out of water at low tide. One theory was that she had been stunned by a blast of gelignite, which some New Zealand fishermen used to kill fish.

A boat towed her back to Opononi beach, where a mournful crowd was waiting. Sadly they pulled her body ashore, buried her, and covered her grave with flowers. The grave is still there to see, a small monument to a dolphin's gentle friendliness and man's high explosives.

THE END

Vaulting skyward in a sunset encore, a bottlenose executes his last leap of the day at Santini's Porpoise Training School at Marathon in the Florida Keys. Dondi, a seasoned performer, soars almost 20 feet above the water to take a fish from his trainer.

A man and his dream: Thomas Jefferson, architect of American independence and third President, planned from his youth a hilltop home at Monticello—"Little Mountain." His 1771 sketch (right) closely resembles the original house, which followed the classical designs of Italian architect Andrea Palladio. After a sojourn in Europe—where John Trumbull painted this miniature of him at age 44—he returned and remodeled Monticello as we know it today. His country called him to service time and time again, but he always returned to the heights of Virginia's Albemarle County. "All my wishes end where I hope my days will end," wrote Jefferson—"at Monticello."

Mr. Jefferson's MONTICELLO

By JOSEPH JUDGE
National Geographic Staff

Illustrations by National Geographic photographer
DEAN CONGER and RICHARD S. DURRANCE

THOMAS JEFFERSON's bride never revealed her thoughts to posterity, but she might have had a word or two for her new husband on that bitter January night in 1772 when she first saw Monticello.

Eight miles from the "Little Mountain," Jefferson and his wife of 25 days were forced to abandon their honeymoon carriage at a neighboring estate as the heaviest snowfall in memory buried the road. With darkness falling, they mounted horses and pushed on through the storm. It was late at night before they struggled the final yards up the mountainside to their new home.

One hundred and ninety-three years later to the very day, I recounted that incident to my seven-year-old son Joseph as we drove up that same mountain, in lightly falling snow, to the same destination.

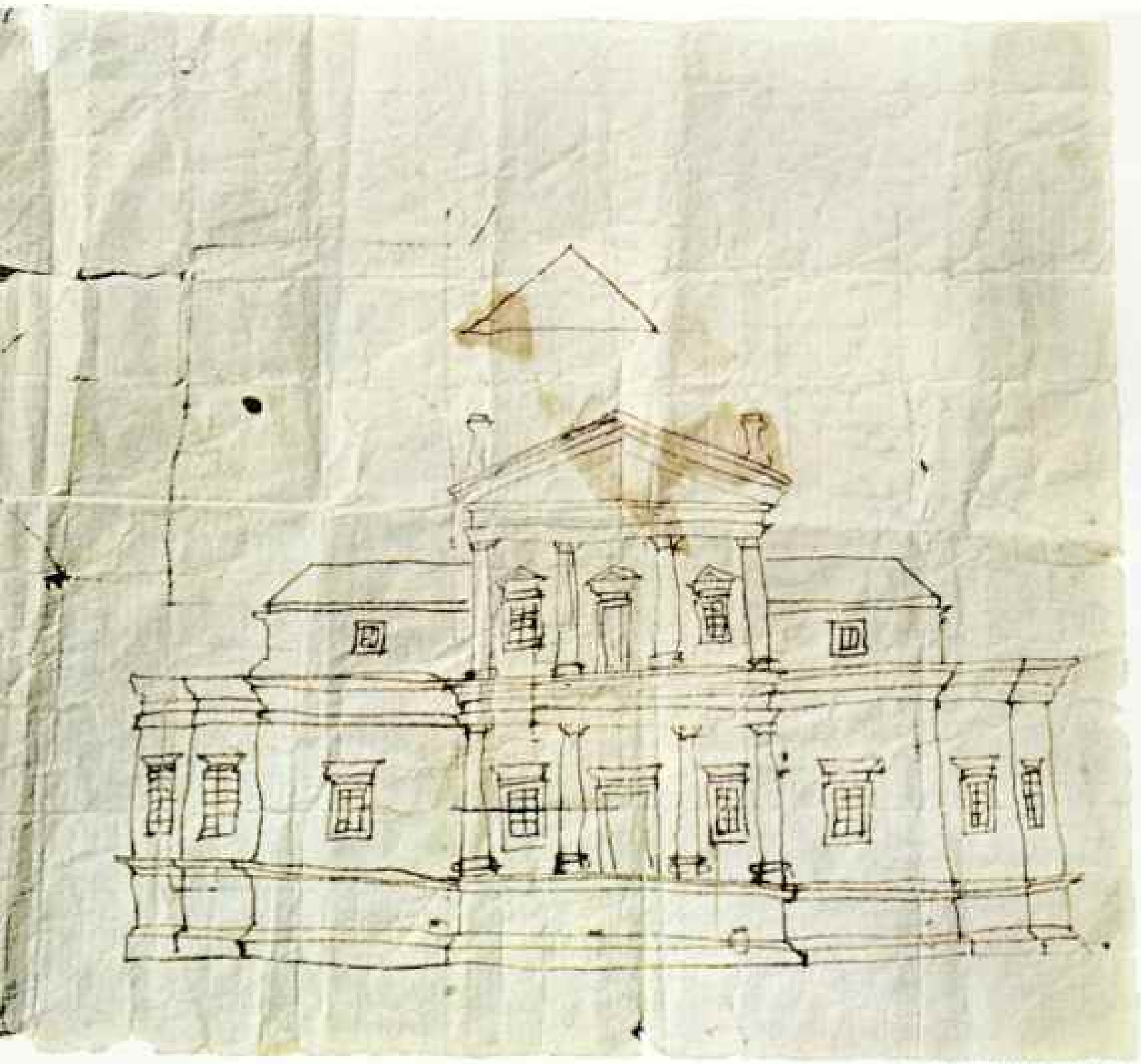
Martha Jefferson found a one-room cottage overlooking a wilderness of snow—and a cold hearth. We found what hundreds of thousands of others have known and loved: one of our country's supreme homes.

Neighbors Still Feel His Presence

The view from the Little Mountain was momentarily lost in flying flakes. As we hurried into the warmth of the gift shop, a cold wind broke over the crests of the distant Blue Ridge and swirled around our coattails.

Miss Ellen Herdt, who keeps the financial records for the Thomas Jefferson Memorial Foundation, greeted us at the top of a steep flight of stairs to her tiny office: "Welcome to Mr. Jefferson's home," she said.

The remark was typical of those heard not only at Monticello but throughout the foothill



country around Charlottesville, Virginia.* Our Nation's third President and the author of the Declaration of Independence is still very much alive to those who dwell in the valleys and hills he loved above all others.

"Most visitors think of this as a summer place," Miss Herdt said. "Frankly, I'm just as glad. By the time winter comes, we're about worn out. Last year we had 350,000 visitors; 60,000 went through in August alone."

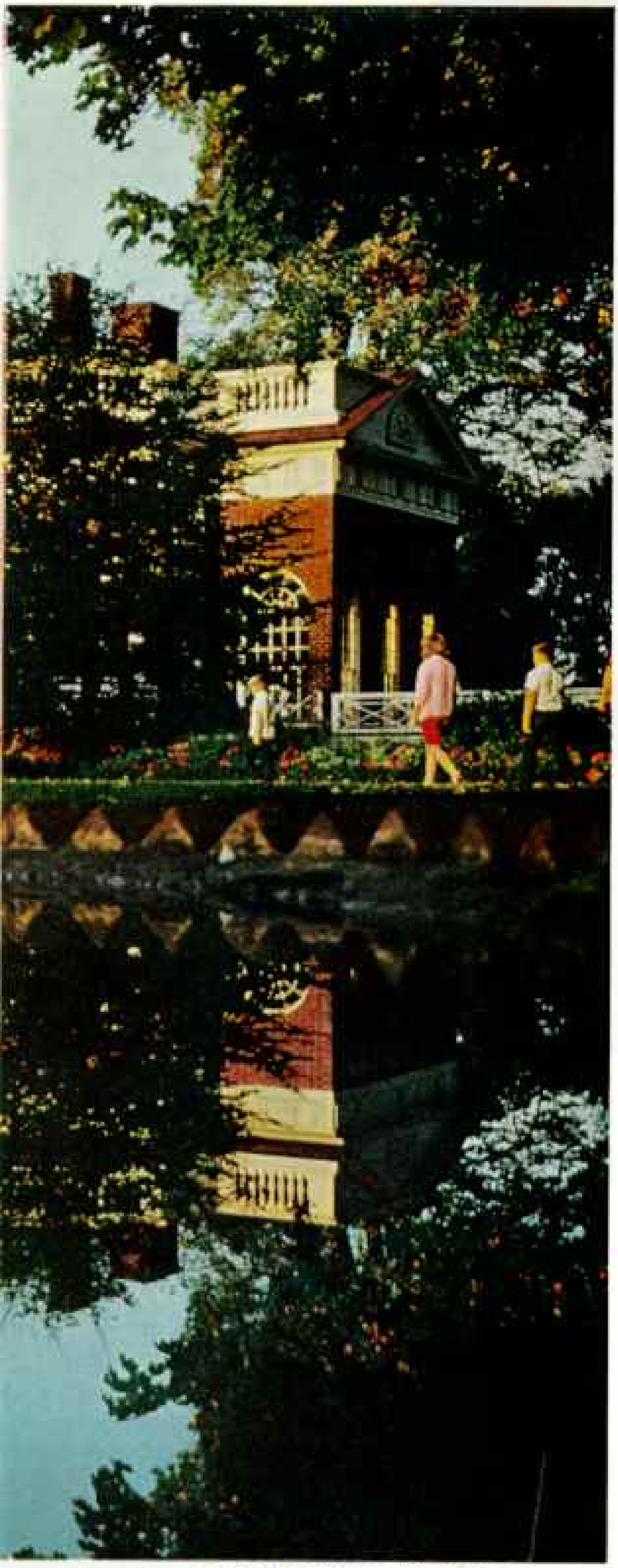
For me, too, Monticello had always been a summer place. I can still smell the roses that were blooming in the gardens there during my first of many visits more than ten years ago. I had come up from the hot welter of the highways just as an August afternoon was mellowing into gold beyond the mountains. I do not recall what I had expected to find, but I will not forget the sudden freshness of the wind, the clean scent of new-mown grass, the repose of rich lawns in the dappled blue shadows of great trees.

Even though the parking lot lay hidden under cars from 22 states (as I remember my tally) and scores of people ambled around the grounds, there was a feeling of privacy.

The surface of the small pond, that magic mirror forever bearing the image of the home (following pages), was wrinkled by the lazy feeding of fat goldfish. From the north terrace I watched the sun setting, its orange disk burnished by the welling currents from the warm valley. And in all that reach of space there was no sound but the sleepy drone of a bee that had found, as I had, sanctuary in summer.

*The May, 1950, NATIONAL GEOGRAPHIC paid a visit to "Mr. Jefferson's Charlottesville" in an article by Anne Revis (now Mrs. Melville Bell Grosvenor).

Fair face of a dream realized reflects in the mirror of a fish pond. From the columned portico of the west front, the Sage of Monticello watched grandchildren at play, organizing their games and races. Monticello's stepped shoulders around the dome disappeared with extensive



PHOTOGRAPHS BY RICHARD K. SUSSMAN © N. G. S.

decay in the mid-1800's. During renovation in 1954-5, architects following Jefferson's original designs replaced the dome's plinths,

Now my son and I set out to see Monticello in a different mood and season.

As Miss Herdt led us up the brick path from the gift shop to the mansion, we sensed the air of reverie that pervades the mountaintop. The wind sang songs of remembrance in the quiet woods. Then a band of hardy crows flapped up from the trees, as if to announce a change in the weather. Skies thinned, and the panorama opened before us.

The valley rolled away westward, with the bustling university town of Charlottesville seemingly asleep at our feet. Across the far horizon, the Blue Ridge raised a long, dark spine against the gray sky. To the east, the Piedmont region, dusty with distant snow, vanished in haze (map, page 432).

Even though Carters Mountain loomed over us to the southwest like a cow pasture in the sky, we felt that we were truly at the crown of the world.

Weights Reach the Cellar by Saturday

A hostess greets visitors under the four snow-white columns of the east portico of the house. But today Miss Herdt had offered to show us parts of the home ordinarily closed to visitors. First, though, we craned our necks to inspect one of Monticello's many marvelous gadgets.

Set into the ceiling of the Doric portico is a handsome compass rose with a pointer connected to an unseen weathervane over the roof. Jefferson often stood in his warm hall and noted its position on the dial.

In the only book he ever wrote, *Notes on Virginia*, Jefferson mentions that during nine months of daily observations, the wind at Monticello blew 172 days from the northwest and only 32 from the northeast. This was a point of pride with Jefferson, since he described the northeasterlies as "heavy and oppressive to the sprits [sic]," while the prevailing winds on the Little Mountain were "dry, cooling, elastic, and animating."

Cooling they were indeed, and we were animated to get quickly indoors.

We paused in the hall—a wide room overlooked by a five-sided balcony—for just enough time to inspect the ingenious seven-day clock, whose cannon-ball counterweights also serve to tell the day of the week.

"That is one of the few things of Mr. Jefferson's that were still here when the Memorial Foundation purchased the home in 1923," Miss Herdt said. "There were the clock, the folding ladder, the pier mirrors, and a few odds and ends. We've been able to recover

Profile of genius: Jefferson's camera obscura captures the image of the patriot, a copy of a bust by Jean Antoine Houdon. Miss Susan Milius (left), winner of the 1966 Jefferson essay contest for students of Charlottesville and Albemarle County, and a hostess, Mrs. William Baldwin, view the picture on a mirror inside the casing. Since the image can be seen only within the box, a separate exposure was superimposed in this photograph. In Jefferson's day, the device was used as a sketching aid.

Busts of Tsar Alexander I of Russia and Napoleon guard the parlor doorway.

168 pieces of furniture and 247 personal mementos. The curator, Mr. James Bear, can tell you more about it. He's upstairs. Saturday, in case you're wondering, is in the basement."

She pointed to a corner where six metal plates, each bearing the name of a day—Sunday through Friday—are mounted on the wall (page 433). As the six cannon-ball weights make their ponderous descent, they mark each day until Friday evening, then sink through a round hole cut in the beautiful floor to finish the week in the cellar.

Window Placement Conceals Four Levels

We walked down the north passage, a narrow hallway leading to the north piazza, and stopped at a niche in the wall that can easily be mistaken for a closet. It is one of Monticello's two stairways—by far the smallest and steepest stairs we had ever seen. These stairs are only 21 inches wide, and they rise at a 45-degree angle (right).

For young Joe, peering up into the darkness, the ascent represented a mountain climb.

"Didn't President Jefferson like stairs?" he asked.

Winter white drapes mansion and mountaintop. The home's two L-shaped terraces, seen through bare branches, cover utility wings set into the slope of the mountain. To avoid unsightly outbuildings, Jefferson buried servants' quarters, stables, kitchen, and storage rooms beneath the walkways. Light and air enter from the exposed downhill side.

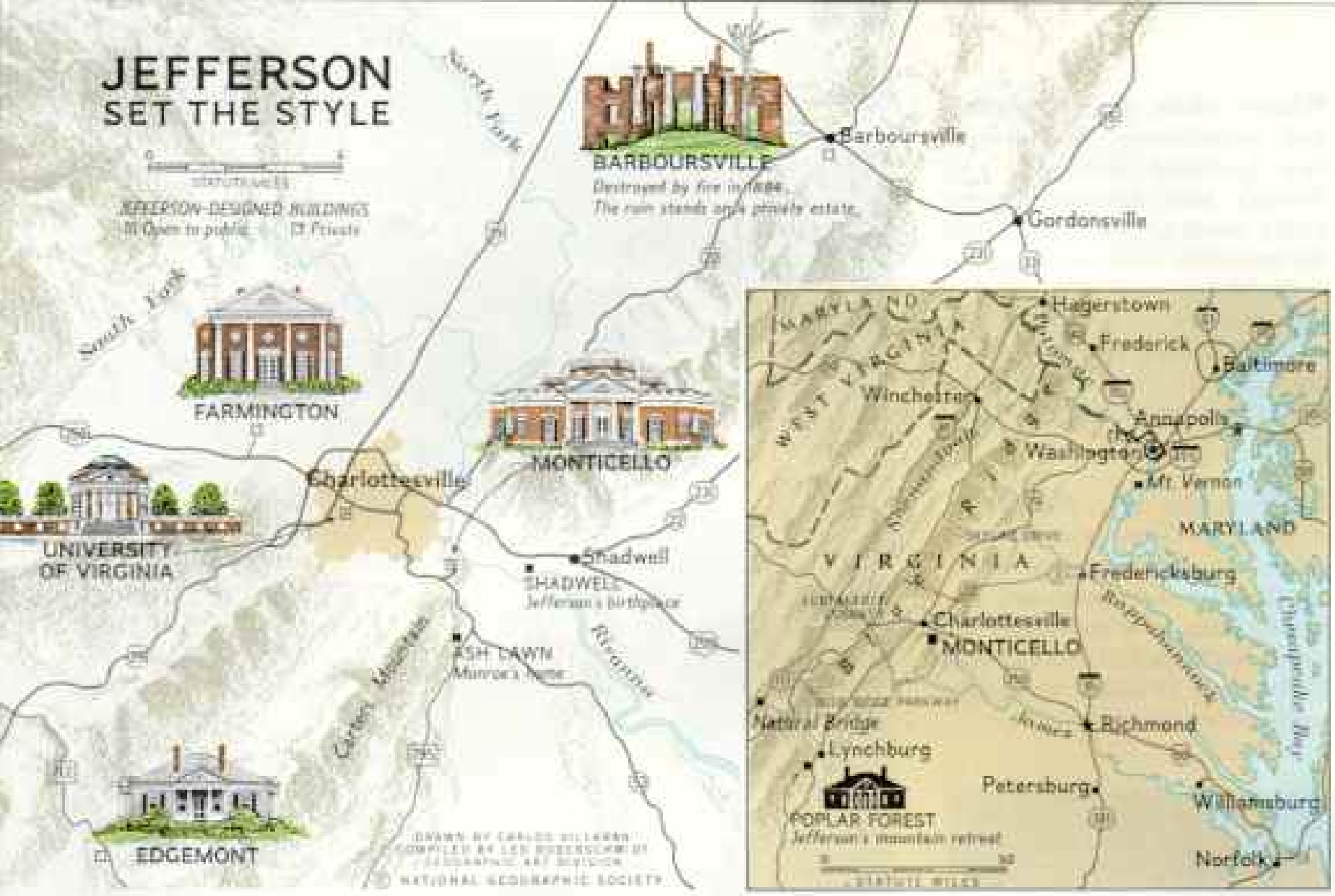
"Little ladder of a staircase," a visitor to Monticello in 1802 termed the stairway that led to her bedchamber. Jefferson, believing stairs took up entirely too much room, tucked two twisting flights, only 21 inches wide, into unobtrusive recesses.

"He liked little ones," Miss Herdt replied, "because they saved space and ensured privacy. I suppose you know this building incorporates an earlier house, built when Mr. Jefferson was a young man. Monticello then had one stairway flanking the entrance hall. When the home was enlarged, the old stairs were torn out. This entire east side of the house is new, so to speak."

Leaning over the high railing and looking up and down the narrow stairwell, I realized that Monticello, with its sweeping one-story exterior, is actually a building of four levels, counting the cellar.

We soon saw the reason for this illusion. The windows of the five second-floor bedrooms on the east front begin at floor level and end at eye level. From the outside, they appear to be the upper parts of the first-floor windows. The windows of the top floor are actually skylights hidden behind the graceful balustrade that circles the top of the house. The great architect thus managed to hide 35 rooms behind a single-story front (following page).

Guests at Monticello were comfortable. We paused in a



Contagion of good taste: The University of Virginia and plantation homes in the Charlottesville area proclaim Jefferson's influence with his neighbors. He designed Barboursville, Farmington, and Edgemont for friends and persuaded James Monroe to build at Ash Lawn. He also planned and built for himself at Poplar Forest a refuge from visitors who descended on Monticello by the score. "They came of all nations, at all times, and paid longer or shorter visits," recalled Jefferson's granddaughter, Ellen W. Coolidge.

Visitors still come. Last year 350,000 toured house and grounds. Groups enter the east front (left) and gather in the entrance hall (right) for an introductory talk.

Above elk and moose antlers brought back by the Lewis and Clark Expedition of 1804-1806 hangs the cannon-ball clock; another face shows on the portico. Wound up on Sunday, the clock's weights—cannon balls of the type used in the Revolutionary War—drop down the wall at right, marked off with the days of the week. The weights, seen behind the bust of Alexander Hamilton, tell it is Friday. A hole in the floor lets them sink to Saturday in the basement.

Rain or shine, they come to pay homage. The Marquis de Chastellux, a French nobleman who visited Monticello in 1782, so admired the home that he wrote, "Mr. Jefferson is the first American who has consulted the Fine Arts to know how he should shelter himself from the weather."

bedroom to imagine a roaring fire on the low hearth. Thick double doors kept heat in the room. The rope bed, hung from hooks in a cozy alcove, was once piled with handwoven blankets. Even the cutting winds of the mountain winter could not penetrate—but pity the servant who had to make such beds.

The mansion's crowning touch lies at the end of another climb up the steep stairs. This time, Joe skipped up like a mountain goat.

Jefferson called it his "sky room," but he made little use of the eight-sided chamber, especially in later years when rheumatism curtailed his stair-climbing.

His grandchildren, however, apparently loved it as a playroom. It provided an exquisitely formal background for their rainy-day romps, with its graceful dome arching upward in ordered squares trimmed with handsome molding. Through great round windows and a skylight, the rising spring sun would send its golden beams. In summer the shadows of clouds would drift lazily across the floor. During a midwinter storm, the room would shine with the glisten of the snow. And on an autumn night the stars would move in a brilliant processional. I longed to see the room in all its seasons.

Map Pinpoints Dispersed Treasures

We went back down Monticello's other staircase. James A. Bear, Jr., the affable curator, was waiting for us at the second floor. He is a dark-haired, sturdily built scholar, whose career has been divided between the libraries of Virginia and the Marine Corps battlefields of the Pacific and Korea.

His office occupies a bedroom directly over Jefferson's library. On the walls hang prints of Jefferson portraits, photographs of events at Monticello, and a large map of the United States studded with a little forest of red and black pins, clustered along the eastern seaboard but reaching to Texas and California.

I pointed to a pin in Texas and asked him what it meant.

"That represents a dozen spoons," he said. "Right here"—he pointed to Nashville, Tennessee—"are two beautiful goblets of silver. This one is a good silhouette of Jefferson in California, and here is a nice lock of hair in Washington, D. C. The black pins indicate something we would like very much to have. The red ones are of doubtful authenticity."

He pulled out a meticulous card index. It catalogued in hundreds of entries, by state, city, owner, and object, the vast number of Jefferson memorabilia dispersed during the dark years when the mansion was little more than a good brick barn.

When the third President died at 83, on July 4, 1826, he was at least $60,000 in debt. One estimate is $107,000. He was almost continuously in debt during his life, as were most of the land-poor Virginia aristocracy.

Hard Times Come to a Proud Mansion

The summer of 1826 had not faded into autumn before vandalism forced Jefferson's eldest and only surviving daughter, Patsy, to close the grounds. The following January, many of the mansion's priceless furnishings were put on the block to reduce the debt. In the next year, paintings were sold off in Boston. In 1829 the Jefferson library was dispersed at a sale in Washington, D. C.

In November, 1831, the almost empty house and 552 acres were sold to a Charlottesville druggist, James T. Barclay, for $7,000. No friend of history, he hacked down many of Jefferson's beloved trees in an attempt to raise silkworms. Even worse days were to come.

"After Jefferson's death," Mr. Bear said, "Monticello's treasures drifted away." He ran his thumb over the edges of the index cards. "We have had good luck in catching up to a lot of them. Right now we know of 367 persons and institutions who own enough authentic pieces to refurnish almost completely the entire first floor. There are also enough reputedly authentic objects in this file to fill several Monticellos, including at least six sideboards that were never, in fact, here."

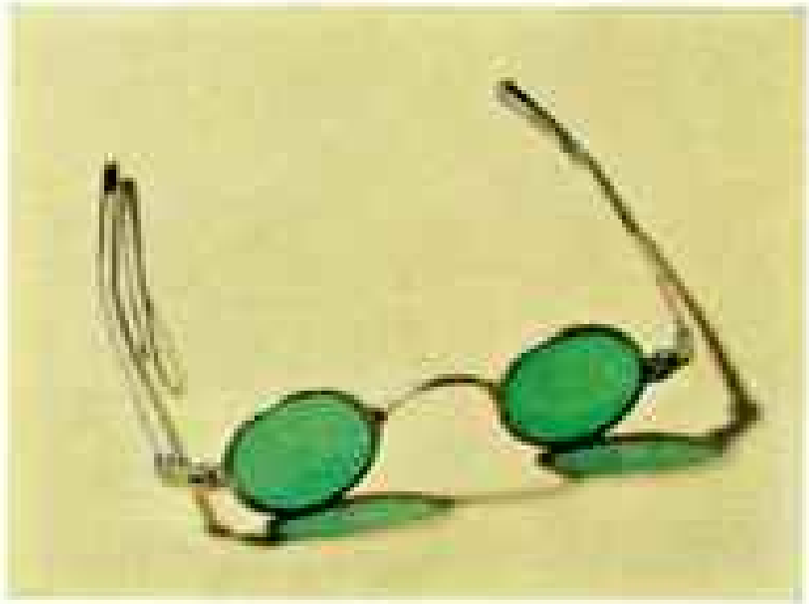
In addition to the furnishings file, the curator maintains similar indexes on the gallery of paintings, engravings, and statues that once adorned the house, and on the persons and objects that might have been at the dispersal sale of 1827. He has also indexed Jefferson's account books—a typescript running to several volumes and containing 50,000 individual entries. And he has assembled a medical chronology containing such items as Jefferson's own cure for indigestion—ride a few miles on a spirited horse.

"It may seem like tedious work," Mr. Bear said, "but things keep flowing in. Jefferson compounded our problem by commanding in his will that no inventory be made of Monticello because of the 'variety and indescribableness of the articles of property within the house.' In 1961, a good year, we obtained a

"Finest invention of the present age," said Jefferson of the polygraph. James A. Bear, Jr., Monticello's curator, shows how twin pens, ingeniously joined, write a letter and make a copy simultaneously.

Measuring the countryside around his estate, Jefferson used this theodolite to sight on nearby peaks.

SUPERIMPOSED BY JEAN CONDON (ABOVE AND CENTER); RICHARD S. DURRANCE (BELOW, LEFT); AND JOHN E. FLETCHER © N.G.S.



Early American sunglasses protected Jefferson's eyes from the bright glare of Virginia's summertime.

How far to Philadelphia? Jefferson—gleaner of information and lover of gadgets—attached this odometer to the axletree of his carriage and found the distance from Monticello to be 269 miles (as compared with 250 on today's highways). The device counted the number of wheel revolutions.

Silver urn, designed by Jefferson, dispensed coffee at his table. A French silversmith made the vessel in 1789 while Jefferson was Minister Plenipotentiary to the Court of France.

brace of pocket pistols, some silver spoons, a leg bone of a mastodon, a small table, a water color, one of a pair of dumbbells, spectacles with tinted lenses, a pocket balance, and a portable wine chest. That will give you some idea of the 'indescribableness.'"

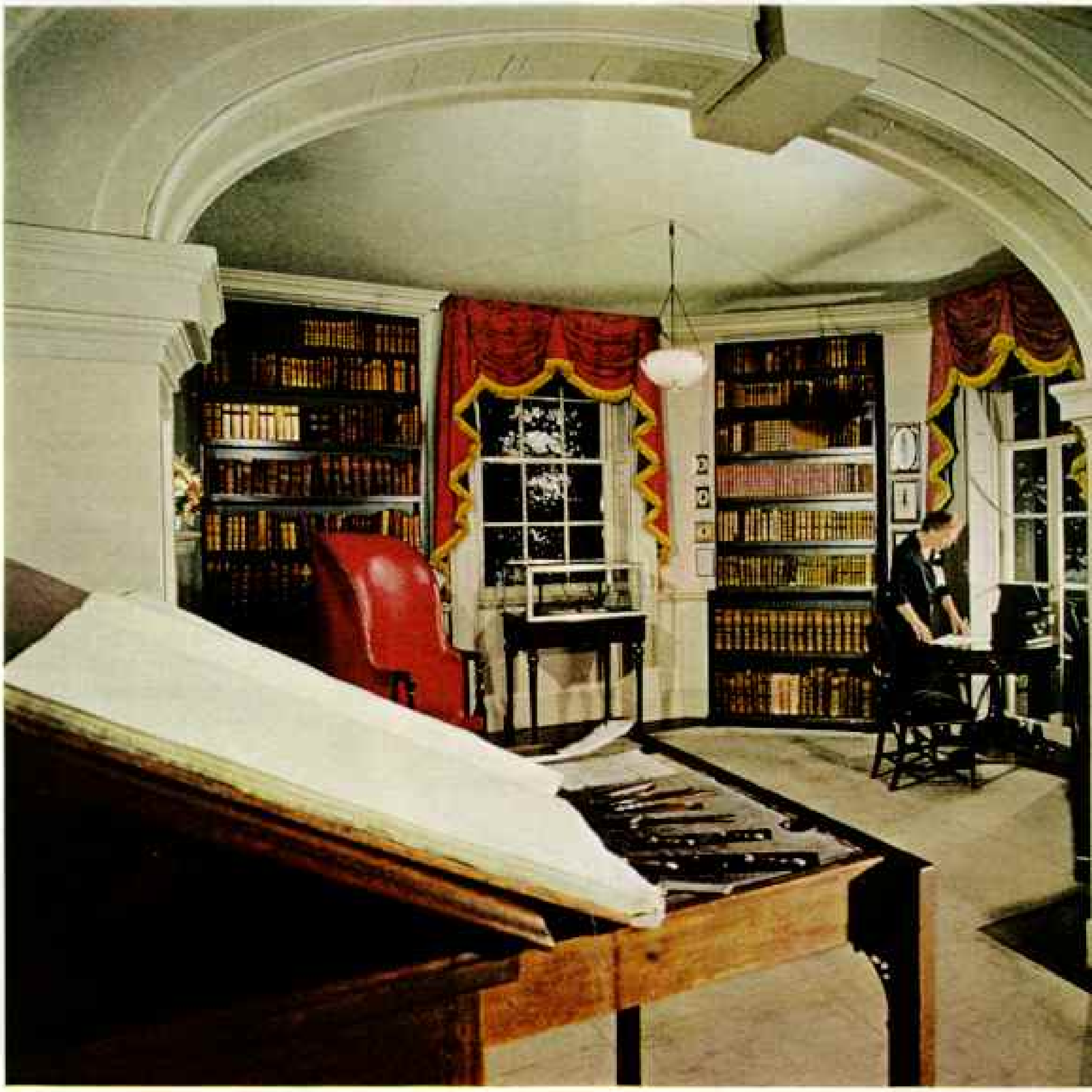
We walked across the passageway into another bedroom that seemed warm and sunny despite the gloom outside.

"This is one of the few things that have always been here," Mr. Bear said. A small slate tombstone, weathered by more than a century of Virginia winters, lay face up on a table. It bore the simple epitaph: "Priscilla Hemings, departed this life 7 May 1830."

"She was a slave," Mr. Bear told us. "Her family was here at Monticello for years. We think the slaves were buried about 300 yards from the east front. This was found a little north of that. It's the only thing like it we have found, although archeological digs have located the site of one of the estate's industries, a nail factory.

"Our great hope is to find the trash dump. What was trash to Jefferson would be pure gold to us."

Mr. Bear escorted us to the stairwell and promised to come down and shake hands before we left. When we arrived back in the hall, Mrs. Leonard Tilman, the chief hostess,



was waiting. She patted Joe on the shoulder.

"We don't see too many youngsters at this time of year," she said. "It's a pity. This is really a home for all seasons."

Above our heads as we spoke hung two pairs of enormous antlers, one of an elk and the other of a moose. They are mementos of the Lewis and Clark Expedition, which President Jefferson sent across a virgin continent following his purchase of the Louisiana Territory from Napoleon.*

They are also reminders of the barbaric splendor of the front hall when it served as Jefferson's private museum. Among the things remembered or recorded by visitors were two busts of Indians, male and female; a "facsimile" of the Great Pyramid of Egypt; various weapons, including some said to have belonged to Tecumseh; a map of the southern Missouri River made by a Ricara Indian chief; a painting on a buffalo pelt of a battle between the Osage and Pani tribes; the mounted heads of a bighorn sheep, buffalo, and deer; the teeth, thigh bone, and upper and lower jaws of mastodons.

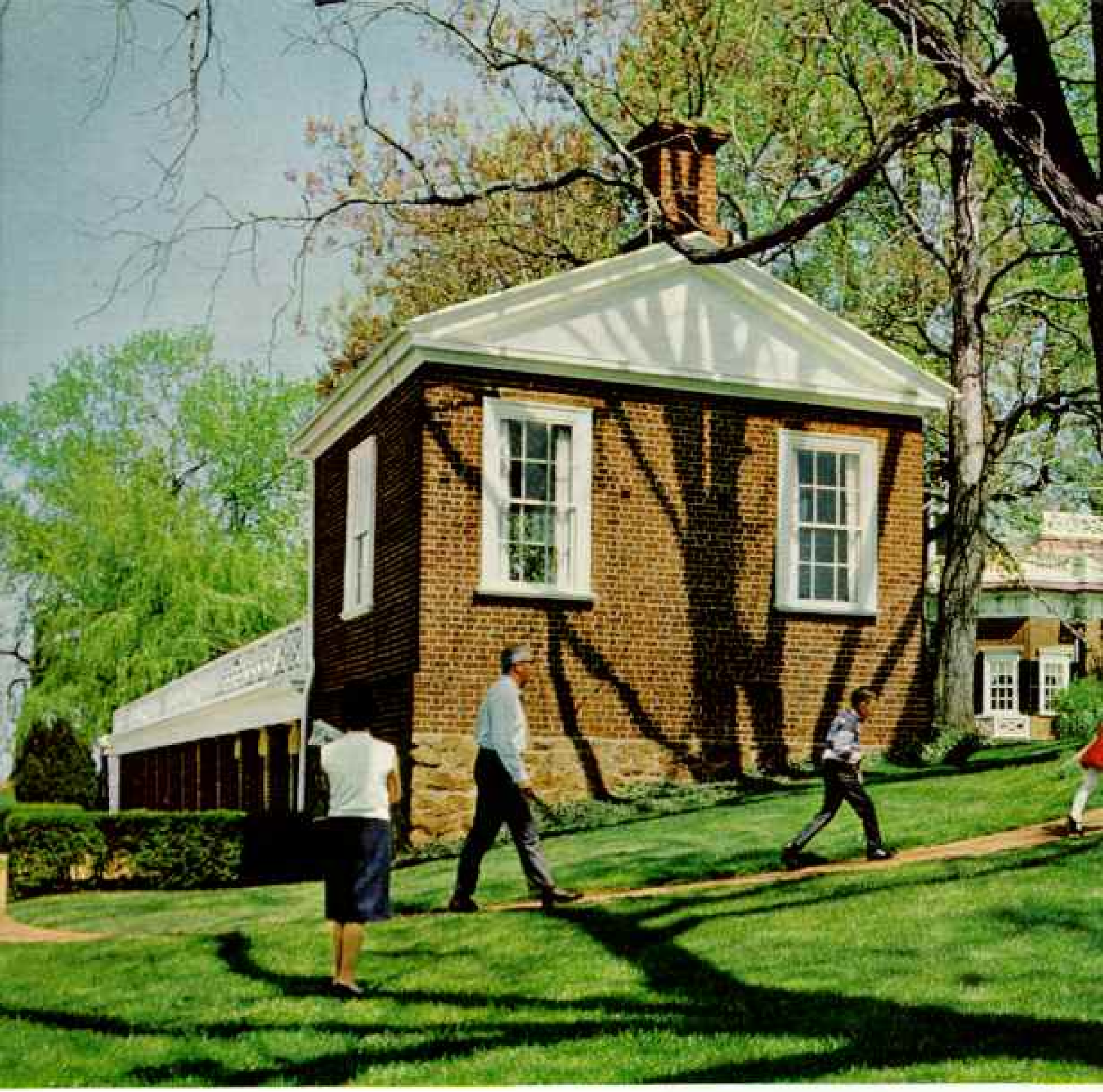
Between the hall and parlor are Jefferson's automatic glass doors. The works are in the floor—a chain wound in a figure 8 around

*Ralph Gray told of "Following the Trail of Lewis and Clark" in the June, 1953, GEOGRAPHIC.

"I cannot live without books," Thomas Jefferson wrote John Adams. An avid collector from boyhood, Jefferson accumulated three major libraries in his lifetime. The first burned at Shadwell, his birthplace. The second, numbering several thousand volumes, he sold to the Nation after the British fired the Capitol in 1814; it became the nucleus of the new Library of Congress. After the Sage of Monticello died in 1826, an auction scattered his third collection of nearly 1,500 books.

Slowly they come home. Almost nine hundred—some original, others of the same editions in contemporary bindings—line the shelves today. *Traité d'Economie Politique* and *Wright's Views of Society and Manners in America* (below) belonged to Jefferson, as did the brass statuette of Napoleon. Although Jefferson despised Bonaparte and called him the "Attila of the age," he owned several likenesses of him.

The self-taught architect meticulously inked his designs on the table in the foreground. He used the high-backed red leather chair while Vice President.



two cylinders, causing both doors to open at the same time. My son was openly delighted that a President of the whole United States had invented such a thing.

Parlor Once Displayed 48 Paintings

"One thing we miss," Mrs. Tilman said as we walked into the parlor, "is the gallery of paintings. You wouldn't believe it, but this room alone had 48 paintings in it."

Of the more than sixty oils that once graced Monticello, only nine have returned. Jefferson's utilitarian ideas about art are evident in the fact that not a single landscape ever adorned his walls, and only a few still lifes. He acquired busts and figurines along with historical pictures and portraits. His collection contained no fewer than 65 famous men, 28 of them Revolutionary War heroes or Founding Fathers. He had five likenesses of Napoleon, a man whom he detested but whose historical position was beyond question.

I wondered whether Jefferson had disdained landscapes at Monticello because the stately windows themselves provided an incomparable view. From the first, he built his home to suit the superb site. While other young Virginians were raising Georgian mansions along the humid river valleys and streams, he sought the mountains.

As early as 1768, when he contracted with a Mr. Moore to "level 250 ft. square of the top of the mountain at the NE end by Christmas" at a price of 180 bushels of wheat and 24 bushels of corn, he was dreaming about an unprecedented feature that today gives the home its character of air, light, and space.

The typical Virginia estate was a compact

Finishing touch, the north pavilion ended the main building operations at Monticello. Completed in 1809, the one-room bungalow sits at the end of one of the wings. After Jefferson's death, his son-in-law, Thomas Mann Randolph, stayed on here as a recluse.

Jefferson lived in Monticello's first structure, a twin to the north pavilion, while the big house rose under his direction. The young Virginian wrote a friend in England that it served him "for parlour for kitchen and hall. I may add, for bedchamber and study too." Here (right) he brought his bride, Martha Wayles Skelton, to the "honeymoon cottage," as it is now known.

little town. The large central house was surrounded, and often obscured, by a motley group of service buildings—kitchen, smokehouse, slaves' quarters, stables, laundry room. At Monticello, to keep the vistas open, Jefferson turned these outbuildings into a series of rooms, arranged them along passageways removed from the house, buried them in the sloping hillsides, and covered them with terraces. Tunnels connected the hidden wings to the basement of the house. Thus, just as he had managed to hide three stories behind a low façade, so Jefferson managed to hide virtually an entire estate under the brow of a mountaintop (page 431).

As we walked through the dining room, furnished now with its original table and chairs, I considered that there was a good deal of the practical in the arrangement. Here there would be no need for a serving boy to dash against a mountain gale with a frozen salver of stony pork chops. Instead he carried the covered dish along the comfortable passageway under the terrace, continued up the hidden staircase, and placed the dish on his side of the revolving service door. At the flick of a wrist, a hot dinner was

ready. The host, meanwhile, had only to step back from his chair, open a door in the side of the mantel, and hoist the wine up on one of his dumbwaiters (opposite, lower).

While Joe was experimenting with a dumbwaiter, I commented to Mrs. Tilman that it was a shame the house was no longer lived in, as it was obviously meant to be.

Mansion Survived Decades of Decay

"Oh, but you haven't seen the annual Founder's dinner," she said. "We hold it to mark his birthday, in conjunction with the University of Virginia's Founder's Day ceremonies, and it is absolutely the most beautiful sight in the world. The guests arrive on an April evening, when the gardens are the most redolent and beautiful. The house is lighted by 17 dozen candles. A quartet plays in the parlor, and dinner—a complete 19th-century menu—is served here at Mr. Jefferson's table. What gives me the most pleasure is knowing that Monticello is filled again, if only for one night, with the warmth of good company."

Her pleasure at the memory reflected a knowledge of the many dark years the great home had survived. After "Doc" Barclay's dreams of a silkworm fortune vanished, he put up a for-sale sign and departed for the Holy Land as a missionary. Monticello, a gem of American architecture, was sold in 1836 to a bachelor, U. S. Navy Lt. Uriah Phillips Levy, for $2,500.

The Levy family kept possession—on and off—for almost 90 years. As the clouds of the Civil War began to gather over Virginia in 1858, Lieutenant Levy moved away to New York, leaving a declining mansion in the hands of a caretaker, Joel Wheeler. The Confederacy seized the estate. When Levy died in 1862, he left the mansion to the people of the United States, but the will was broken.

For almost 20 years, while Levy's heirs contested the ownership, Monticello belonged to Joel Wheeler in fact if not in law. The monument over the third President's grave was hacked to pieces by curious travelers. The roads melted into the hillsides. Cattle were stabled in the parlor, whose broken windows looked out on desolation.

Dinners "half Virginian, half French," as Daniel Webster noted, came from Monticello's kitchen. Virginia ham and corn pudding might share the table with poulet marengo and blancmange, prepared according to recipes Jefferson brought from France.

Jefferson's birthday party brings a candlelit dinner every year for the Thomas Jefferson Memorial Foundation, which preserves Monticello. The foundation tries to hold the dinner as close as possible to the Virginian's birthday, April 13th. Mrs. Leonard Tilman, chief hostess at Monticello, lights the tapers. Once again laughter and conviviality will fill the house where Jefferson delighted in entertaining such guests as Madison, Lafayette, and Webster. The brilliance of their host once prompted President John F. Kennedy to remark at a White House dinner for American Nobel Prize winners that the President's Mansion had not seen so talented a gathering since Jefferson dined there alone.

Wine at his fingertips: Jefferson's dumbwaiters, among the first in America, occupy each side of his dining-room mantelpiece. Returning from France a connoisseur, Jefferson often advised his friends George Washington and James Monroe on choice vintages. "No nation is drunken," he said, "where wine is cheap; and none sober, when the dearness of wine substitutes ardent spirits as a common beverage."

With that in mind, I could appreciate the moment each year when Mrs. Tilman's 17 dozen candles rekindle the light of history on the famous mountain. The principal speaker at the university Founder's Day ceremonies is invited; his presence among the Memorial Foundation's directors would have pleased the founder of Virginia's state university.

The afternoon was darkening as Joe and I went to pay our respects finally to Mr. Jefferson's bedroom and study. The two rooms are separated by his bed, set in an alcove open on both sides. Over the bed is a clothes closet with three porthole windows.

The southern end of the house, occupied by the study, library, and conservatory, is—and always has been—the heart of Monticello. The personality of the author of the Declaration of Independence pervades these rooms. His telescope, swivel chair, revolving table, copying machine, magnifying glass, and architect's table—all stand as though he were momentarily absent (page 435 and opposite).

Best of all, his books are coming back.

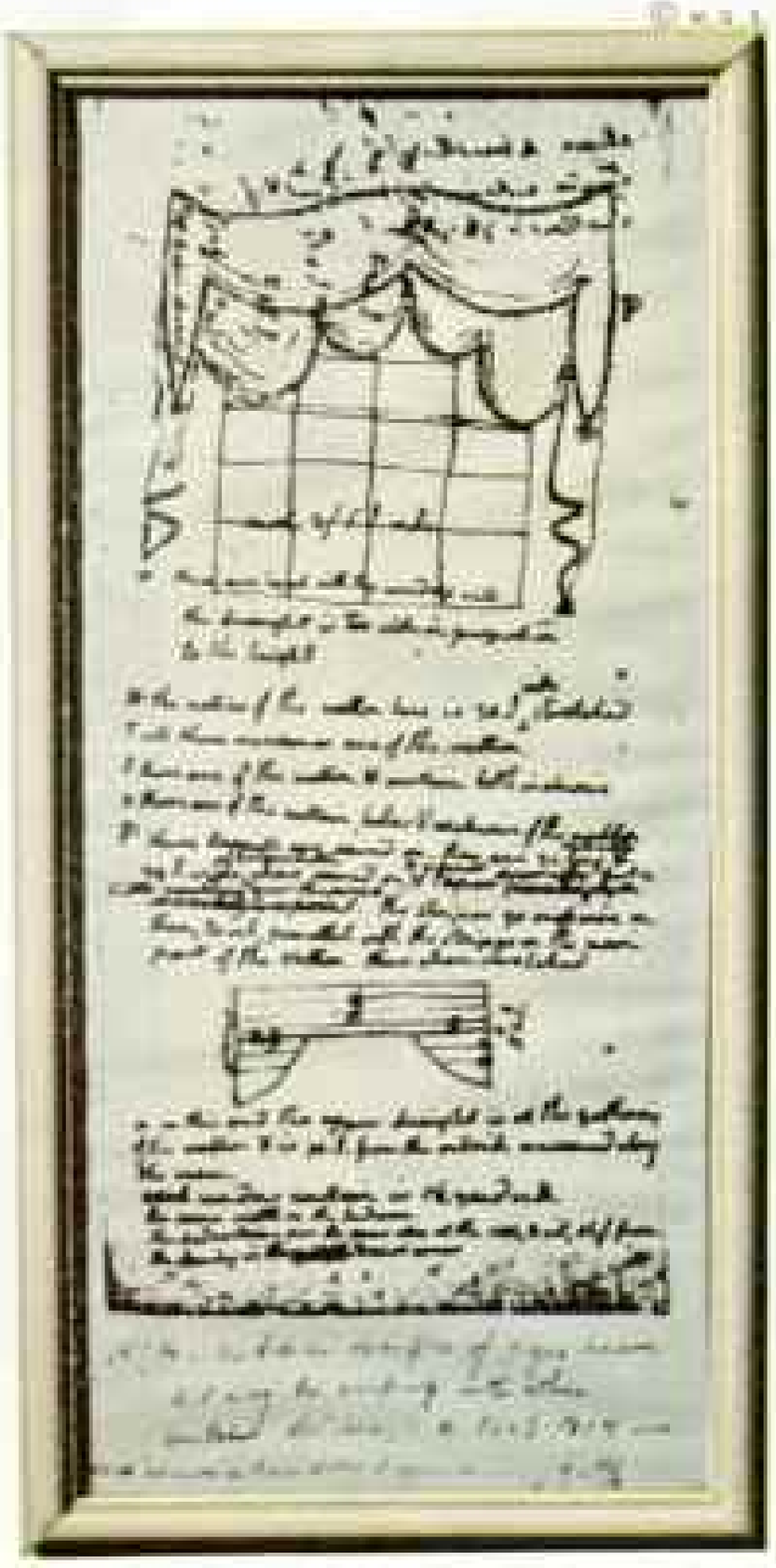
Jefferson's Last Library Grows Anew

During his long life, Jefferson assembled three major libraries and a smaller fourth one. The first went up in smoke with his father's house, Shadwell, just east of Monticello. The second, known as the "great library," held more than 6,000 volumes. They were destined to become the basis of our present Library of Congress.* After the British burned the Capitol and its Congressional library in 1814, the retired President sold his fine collection to the

*Albert W. Atwood explored "The Nation's Library" in the May, 1950, NATIONAL GEOGRAPHIC.

"**Sanctum sanctorum,**" one visiting lady in 1809 called Jefferson's bedroom-study; another, piqued by his insistence on privacy, wrote "he keeps it constantly locked, and I have been disappointed much by not being able to get in to day."

Time exposure blurs Jefferson's swivel chair, supposedly the first in America. Holes in the arms baffled custodians until the acquisition in 1962 of two brass candle holders that fit them exactly. Here sat the ex-President, trying to cope with the correspondence that deluged him after his retirement. He complained to John Adams that he received 1,267 letters in 1820.



Each detail in these rooms, as well as the rest of the house, received his fine touch. He designed draperies (left), windows, tables, even a stand for the telescope, seen in his study where Monticello's Superintendent Curtis Thacker peruses a book.

Jefferson's days drew to a close in July, 1826; confined to his bed, he remained lucid to the end. Fifty years had passed since he and the other Founding Fathers had declared for independence. He longed to see the dawn of the Fourth. He did, but no more.

United States. Within a month he spent $187 for the first books of the third library, which grew to 1,465 volumes on topics from agriculture to zoology. He kept a smaller library of classics and English novels at Poplar Forest, his private retreat near Lynchburg.

Mr. Bear joined us. We stood admiring the books (pages 436-7). "We've been collecting since 1955," he said. "Of course, we could never replace the great library, but we can restore the third one. We want only the same editions that Jefferson owned, in contemporary bindings. In 1957 we put in the first 450 volumes. We now have almost twice that many."

I took down a book—*Views of Society and Manners in America*, by Frances Wright.

"There were two copies of that here," Mr. Bear said. "One was presented to Mr. Jefferson by the author. The other was given to him by Lafayette in 1823. You are holding the Lafayette copy. It was bought by Charles F. Pond of Hartford, Connecticut, in 1829, when Monticello's books were sold in Washington."

We went back to the front walk by way of the south terrace steps. The wind was high in the trees.

Mr. Bear turned his coat collar up and said, "After Uriah Levy's will was broken, his nephew, Jefferson Monroe Levy, eventually became owner. The Thomas Jefferson Memorial Foundation finally purchased the Little Mountain in 1923 for $500,000. Close to that has been put into remodeling.

"I suppose it is too much to hope that we will get everything back in time. But between what has come back, and what we have been able to substitute for, Monticello today is in better condition, and is more like the home

AUTOCHROME BY RICHARD K. DURRANCE © N.G.S.

"**Our own dear Monticello**—where has Nature spread so rich a mantle under the eye? —mountains, forests, rocks, rivers." Thus Jefferson described the surroundings of his beloved home. "He placed his mind, as he had done his house," wrote French traveler Chastellux, "on an elevated situation, from which he might contemplate the universe."

that Jefferson lived in, and loved, than at any time since he died."

The short winter day was ending as we drove down the mountain. I stopped at the family cemetery, still maintained as private property by Jefferson's descendants.

Joe and I walked up the short flight of steps. Before us, the new monument over Jefferson's grave gleamed softly in the twilight. He chose to be remembered by three achievements now inscribed on the granite shaft: "Author of the Declaration of American Independence, of the Statute of Virginia for religious freedom, and Father of the University of Virginia."

"It doesn't say anything about him being President of the United States," Joe noticed, trembling now from the cold.

"He thought these things were more important," I told him. "That's why people like you and me come here."

As we left the mountain, the bright constellations of Taurus and Orion were swinging into the eastern sky. We watched them rise. Joe looked back, trying to pick the outline of the mountain from the dark sky. He asked me if every President was interested in prehistoric animals and stars. Watching his face, I could only be glad that one was.

NATIONAL GEOGRAPHIC SOCIETY

WASHINGTON, D. C.

Organized "for the increase and diffusion of geographic knowledge"

GILBERT HOVEY GROSVENOR
President, 1903-1954; Editor, 1899-1903, 1903-1954
Chairman of the Board, 1954-1966

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 330 explorations and research projects, adding immeasurably to man's knowledge of earth, sea, and sky. It diffuses this knowledge through its monthly journal, NATIONAL GEOGRAPHIC; more than 26 million maps distributed each year; its books, globes, and atlases; 30 School Bulletins a year in color; information services to press, radio, and television; technical monographs; timely exhibits from around the world in Explorers Hall; and now a nationwide series of programs on television.

Articles and photographs of travel, natural history, and expeditions to far places are desired. For material used, generous remuneration is made.

MELVILLE BELL GROSVENOR, *President and Editor*
MELVIN M. PAYNE, *Executive Vice President and Secretary*
ROBERT V. FLEMING, *Vice President and Treasurer*
FREDERICK G. VOSBURGH, *Vice President and Associate Editor*
LEONARD CARMICHAEL, *Vice President for Research and Exploration*
ROBERT E. DOYLE, *Vice President and Associate Secretary*
THOMAS M. BEERS, *Vice President and Associate Secretary*
VERNON H. BREWSTER, OWEN R. ANDERSON, HERMAN J. A. C. ARENS, WM. T. BELL, HERBERT T. HENDERSON, W. E. ROSCHER, C. VERNON SANDERS, *Associate Secretaries*
HILLEARY F. HOSKINSON, *Deputy Treasurer and Assistant Secretary*

ARTHUR B. HANSON, *General Counsel*

COMMITTEE FOR RESEARCH AND EXPLORATION

LEONARD CARMICHAEL, *Chairman*

ALEXANDER WETMORE
Vice Chairman
MELVIN M. PAYNE
Vice Chairman
Rear Adm. L. O. COLBERT
CARYL P. HASKINS
A. REMINGTON KELLOGG
Research Associate
Smithsonian Institution
Vice Adm. EMORY S. LAND
T. DALE STEWART
Senior Scientist
Office of Anthropology
Smithsonian Institution
MATTHEW W. STIRLING
Research Associate
Smithsonian Institution
JAMES H. WAKELIN, JR.
CONRAD L. WIRTH
PAUL A. ZAHL

and the Senior Officers of the Society
BARRY C. BISHOP, *Secretary*

BOARD OF TRUSTEES

THOMAS W. McKNEW, *Chairman of the Board, formerly Executive Vice President and Secretary (1932–1962)*

LEONARD CARMICHAEL
Vice President
National Geographic Society
LEO OTIS COLBERT
Rear Admiral, U. S. Coast and Geodetic Survey, Retired
ROBERT V. FLEMING
Advisory Chairman of the Board and Chairman, Executive Committee
Riggs National Bank
CRAWFORD H. GREENEWALT
Chairman of the Board, E. I. du Pont de Nemours & Company
GILBERT M. GROSVENOR
Senior Assistant Editor
National Geographic
MELVILLE BELL GROSVENOR
Editor, National Geographic
CARYL P. HASKINS
President, Carnegie Institution of Washington
EMORY S. LAND
Vice Admiral, U. S. Navy, Retired
Formerly Pres., Air Transport Assoc.
CURTIS E. LeMAY
Former Chief of Staff, U. S. Air Force
H. RANDOLPH MADDOX
Vice President, American Telephone & Telegraph Company (Ret.)
WM. McCHESNEY MARTIN, JR.
Chairman, Board of Governors
Federal Reserve System
BENJAMIN M. McKELWAY
Editorial Chairman, Washington Star
MELVIN M. PAYNE
Executive Vice President
National Geographic Society
LAURANCE S. ROCKEFELLER
Chairman of the Board, Rockefeller Brothers, Inc., and President Jackson Hole Preserve
JUAN T. TRIPPE
Chairman of the Board
Pan American World Airways
FREDERICK G. VOSBURGH
Assoc. Editor, National Geographic
JAMES H. WAKELIN, JR.
Former Asst. Secretary of the Navy for Research and Development
EARL WARREN
Chief Justice of the United States
JAMES E. WEBB
Administrator, National Aeronautics and Space Administration
ALEXANDER WETMORE
Research Associate
Smithsonian Institution
LLOYD B. WILSON
Honorary Board Chairman, Chesapeake & Potomac Telephone Co.
CONRAD L. WIRTH
Former Director
National Park Service
U. S. Department of the Interior
LOUIS B. WRIGHT
Director, Folger Shakespeare Library

Asst. Secretaries: CHARLES P. BIXEL, RAYMOND T. McELLIGOTT, JR.
Asst. Treasurer: WILLIAM H. McCAULEY

HERMAN J. A. C. ARENS, *Executive Assistant*; LEONARD J. GRANT, *Editorial Assistant*; and Judith N. Dimont, *Secretary to the President and Editor*; Lenore W. Kessler, *Secretary to the Chairman of the Board*

COVER: *Banduria* player wears the classic Maria Clara costume of her Philippine homeland (page 309).

NATIONAL GEOGRAPHIC MAGAZINE

MELVILLE BELL GROSVENOR, *Editor*
MELVIN M. PAYNE, *Executive Vice President*
FREDERICK G. VOSBURGH, *Associate Editor*
FRANC SHOR, *Associate Editor*
JAMES M. DARLEY, *Cartographer Emeritus*

EDITORIAL STAFF

Senior Assistant Editors: Allen C. Fisher, Jr., Gilbert M. Grosvenor, John Scofield
Assistant Editors: Andrew H. Brown, Newman Bumstead, James Cerruti, Robert L. Conly, Edward J. Linehan, Kenneth MacLeish (Foreign Staff), Carolyn Bennett Patterson, Howell Walker
Text Editor: Samuel W. Matthews
Senior Staff: Lonnelle Aikman, Jules B. Billard, William Graves, Stuart E. Jones, Robert P. Jordan, Nathaniel T. Kenney, Howard La Fay, Bart McDowell, Kenneth F. Weaver; *Senior Natural Scientist:* Paul A. Zahl
Foreign Staff: Luis Marden (Chief); W. Robert Moore (Emeritus), Thomas J. Abercrombie, David S. Boyer, Helen and Frank Schreider, Volkmar Wentzel; Kip Ross (Research)
Editorial Staff: Wayne Barrett, Thomas Y. Canby, Rowe Findley, Louis de la Haba, Joanne M. Hess, Werner Janney, Jay Johnston, Joseph Judge, Elizabeth A. Moise, Frank Sartwell, O. Mac White; Virginia H. Finnegan, Winifred M. Myers, Shirley Neff, Betty T. Sanborne (Asstts.); Dorothy M. Corson (Indexes); Rosalie K. Milford, Jeanne S. Duiker (Files); Arnvid Nygaard (Chief Translator); Mary W. McKinney, Sibyl Peck
Editorial Layout: Howard E. Paine (Chief); Charles C. Uhl
Book Service: Merle Severy (Chief); Edwards Park (Assoc. Chief); Seymour L. Fishbein (Asst. Chief), Ross Bennett, Anne Dirkes Kobor, Patricia Corrie Nicholson, John J. Putman, Betty L. Reece, Jr.
Geographic Art: Newman Bumstead (Chief); William Palmstrom (Asst. Chief); *Artists:* Lisa Biganzoli, Gilbert H. Emerson, Victor J. Keller, John W. Lothers, Robert C. Magis, Robert W. Nicholson, Isaac Ortiz
Research: George W. Beatty, Wilbur Q. Crowe, John D. Garst, Dorothy A. Nicholson, Eugene M. Scheel, John P. Wood
Special Publications: Robert L. Breeden (Chief); Donald J. Crump (Asst. Chief), Bruce Brander, Johanna G. Farren, Mary Ann Harrell, Geraldine Linder
Editorial Research: Margaret G. Bledsoe (Chief); Ann K. Wendt (Asst. Chief); Edith C. Berg, Margery G. Dunn, Jan Holderness, Levenia Loder, Frances H. Parker, Patricia Rosenberg, Elizabeth C. Wagner
Geographic Research: George Crossette (Chief); Newton V. Blakeslee (Asst. Chief), Leon J. Canova, Margaret Ladd, Virginia A. LeVasseur, Jean B. McConville, John A. Weeks
School Service: Ralph Gray (Chief); Arthur P. Miller, Jr. (Asst. Chief), Lisa Ridgley Fuller, Charles H. Sloan, Jana Knudsen Wheat
News Service: Windsor P. Booth (Chief); Matt C. McDade (Asst. Chief), Edward Cornish, Sabin Robbins, Paul Sampson; Isabel Clarke (Asst.)
Television Service: Robert C. Doyle (Chief); Guy Blanchard, David Cooper
Photography: Robert C. Ellis, Jr. (Chief); John McConnell (Asst. Chief), Elizabeth L. Dudley
Library: Esther Ann Manion (Librarian Emerita); Virginia Carter Hills (Librarian); Margery K. Barkdull (Asst. Librarian), Vera Cassilly, Katharine P. O'Donnell
Editorial Administration: Patricia M. Watkins

ILLUSTRATIONS STAFF

Illustrations Editor: Herbert S. Wilburn, Jr.
Associate Illustrations Editor: W. E. Garrett
Art Editor: Andrew Poggenpohl
Asst. Illust. Editors: Mary S. Griswold, Thomas R. Smith, Charles Allmon (Incoming Photographs); *Layout and Production:* Arthur A. Terry
Director of Photography: Robert E. Gilka. *Asst. Director:* Joseph Baylor Roberts. *Chief of Film Review:* Albert Moldvay
Photographers: B. Anthony Stewart (Chief); William Albert Allard, James P. Blair, Dean Conger, Bruce Dale, John E. Fletcher, Otis Imboden, Bates Littlehales, George F. Mobley, Thomas Nebbia, Winfield Parks, Joseph J. Scherschel, Robert F. Sisson
Picture Editors: Bryan Hodgson, O. Louis Mazzatenta, Charlene L. Murphy, Robert S. Patton. *Librarian:* Alan J. Lessel
Photo Lab: Edwin L. Wisherd (Chief); Milton A. Fried, Donald McBain, Robert S. Oakes, Claude E. Petrone, Carl M. Shrader, Guy W. Starling
Pictorial Research: Walter Meayers Edwards (Chief)
Artist: Walter A. Weber (Naturalist), Peter V. Bianchi
Engraving & Printing: Dee J. Andella (Chief); Joe M. Barlen, Frank S. Oliverio, William W. Smith

CARTOGRAPHIC STAFF

Chief Cartographer: Wellman Chamberlin
Associate Chief Cartographer: Athos D. Graziani
Asst. Chief: William T. Peele. *Base Compilation:* Charles L. Stern (Supervisor); James W. Killion. *Name Compilation:* Richard J. Darley (Supervisor); Donald A. Jaeger, Manuela G. Kogutowicz, George E. Stuart. *Map Drawings:* Douglas A. Strobel (Supervisor); John J. Brehm, Robert W. Northrop, Thomas A. Wall. *Map Editors:* Ted Dachtera (Supervisor); Russell G. Fritz, Richard K. Rogers, Thomas A. Walsh. *Projections:* David W. Cook. *Layout and Design:* John F. Dorr, Harry C. Siddeley. *Administrative Assistant:* Catherine M. Hart

SECRETARY'S STAFF

Administrative: Edwin W. Snider, Richard E. Pearson. *Accounting:* Jay Givens, George P. Fogle, Alfred J. Hayre, William G. McGhee, Martha Allen Baggett. *Cashier:* Frank S. Delk. *Statistics:* Everett C. Brown, Thomas M. Kerr. *Procurement:* J. P. M. Johnston, Robert G. Corey, Sheila H. Immel, Margaret A. Shearer. *Payroll and Retirement:* Joseph B. Hogan. *Membership Research:* Charles T. Kneeland. *Membership Fulfillment:* Roy J. Klockenbrink. *Promotion:* Stan Jennings, E. M. Pusey, Jr., Gordon Young, Phyllis Greene. *Personnel:* James B. Mahon, Frank A. Holman, Adrian L. Loftin, Jr., Nellie E. Sinclair. *Medical:* Thomas L. Harriman, M. D. *Explorers Hall:* T. Kenlon Beasley (Curator-Director)

EUROPEAN OFFICE

W. E. Roscher (Associate Secretary and Director), 11 Stanhope Gate, Mayfair, London, W. 1, England

PARIS OFFICE

Jacques Ostier, 6 rue des Petits-Pères, Paris 2e, France

ADVERTISING

Director: Hadley L. McDevitt, 630 Fifth Ave., New York, N. Y. 10020
Manager—Eastern: William A. Boeger, Jr., *Asst. Eastern:* John R. West, New York. *Midwestern:* William Turgeon, Chicago. *Los Angeles:* Jack V. Sheehan, *San Francisco:* Thomas Martz. *Automotive:* Joseph T. Feeney, New York. *Travel:* Robert W. Horan, New York

ICBM

InterContinental Business Machine

Forty *Gulfstream II*'s, Grumman's 585 mph fan-jet, have been ordered by leading corporations. Rolls-Royce Spey turbofan engines and a 3600-mile range will give *Gulfstream II* greater speed and endurance than any other corporate jet in the world. It will cross oceans. Or fly non-stop from New York to Los Angeles against a continuous 90-knot headwind with ten passengers, a crew of three and 500 pounds of luggage.

The cabin is designed for men who work in flight. It has plenty of space to walk around in, 73 inches headroom and a flat floor. A direct descendant of the fabulously successful Gulfstream I turboprop, the "flying boardroom," *Gulfstream II* is pure get-up-and-go, with Grumman guts when the going gets rough. It's one of the most thoroughly tested aircraft ever, with an expected life span of 50 years. No other corporate plane can touch it.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION

Bethpage, New York

DISTRIBUTORS: Atlantic Aviation, Wilmington, Delaware; AiResearch Aviation Service Company, Los Angeles 45, California; Timmins Aviation, Province of Quebec, Canada.

The toughest critics gave this performance rave reviews. What part did GT&E play?

General Telephone & Electronics research discovered a way to make reds redder and all colors brighter in color TV. With the rare-earth Europium phosphor.

When it was introduced, Sylvania, one of GT&E's family of companies, put this new TV on the line before America's most impartial critics. Consumers. In picture-to-picture competition with leading sets, 7 out of 10 picked Sylvania first for brightest color, 68% for clearest color picture.

What's behind Sylvania's star performance? A major advance in picture tubes. Created by GT&E research and Sylvania engineering.

New and better ideas keep coming from GT&E. Expect them anytime from any member of the family: General Telephone Operating Companies • General Telephone Directory Company • Automatic Electric • Lenkurt Electric • Sylvania Electric Products • General Telephone & Electronics Laboratories • General Telephone & Electronics International.

We're more than 125,000 strong and dedicated to Total Communications.

GT&E

GENERAL TELEPHONE & ELECTRONICS

Mystery people of northern Japan

WHO ARE THEY? WHENCE DID THEY COME? The Ainu (pronounced eye-noo) have features that seem more European than Asian. Their legends say they once lived in the sky. Recently a 72-year-old Benedictine nun, Sister Mary Inez Hilger, aided by a National Geographic Society research grant, traveled from Minnesota's College of Saint Benedict to Hokkaidō Island to study this vanishing culture. Here with robed elders beside a sunken fireplace, the eminent teacher-scholar and two Japanese assistants record the stories and songs of a people whose youths forsake old customs for modern ways. Grandmother at left had her lips tattooed as a girl to signify she was ready for marriage.

Your friends can share your pride in making possible such research. Nominate them for membership on the form below.

NATIONAL GEOGRAPHIC SOCIETY MEMBERSHIP CHECK ONE

$6.50 — CALENDAR YEAR 1967 MEMBERSHIP DUES INCLUDE SUBSCRIPTION TO THE NATIONAL GEOGRAPHIC.

Annual dues in the United States and throughout the world are $6.50 U.S. funds or equivalent. To compensate for international postage and exchange differentials, please remit: for Canada, $7.60 Canadian funds ($7 U.S. acceptable); for all other countries, $8 U.S. funds or equivalent. 90% of dues is designated for subscription to magazine.

18-MONTH MEMBERSHIP: Applicants who prefer delivery of their NATIONAL GEOGRAPHIC to start with the July instead of the January 1966 issue, may *upon request* become members and receive the magazine for 18 months from July 1, 1966 through December 1967. Upon expiration, such memberships will be renewable annually on a calendar-year basis. For 18-month membership check here ☐ and remit: for U.S. and its outlying areas, $9.75 U.S. funds or equivalent; for Canada, $11.40 Canadian funds ($10.50 U.S. acceptable); for all other countries, $12 U.S. funds or equivalent. *This is 1½ times annual fee.*

Life membership for U.S. and its outlying areas, $130 U.S. funds or equivalent; for Canada, $162 Canadian funds ($150 U.S. acceptable); for all other countries, $200 U.S. funds or equivalent. 8-66

NEW MEMBER

PRINT NAME OF AN INDIVIDUAL ONLY (MR., MRS., MISS)

STREET

CITY, STATE, ZIP CODE

Mail to:
The Secretary, National Geographic Society
Washington, D. C. 20036

☐ **I NOMINATE** for Society membership the person named at left. (Use separate sheet for additional nominations.)

☐ **(GIFT MEMBERSHIP)** I nominate and enclose $_____ for dues of the person named at left. Send gift card signed:

.....

☐ **I DESIRE INFORMATION** concerning membership and the NATIONAL GEOGRAPHIC. (Fill in at left.)

MY NAME

PLEASE PRINT (MR., MRS., MISS)

STREET

CITY, STATE, ZIP CODE

London pageantry: parades are colorful, frequent.

Where Pharaohs walked.

Flamenco dancers in Spain.

Bavaria, Germany—fairyland castles are really there.

In the fall, the real Europe comes out of hiding. Discover it with TWA

Soon the summer crowds will leave, and Europe will be left to you. A room with the view you want. A little cafe with a table waiting. The Continent is all charm, without the clutter. It's friendlier, gayer, more exciting. The new season brings out the best of the Old World. A word from you and it's yours.

Mail the coupon and TWA will send you free travel and tour folders. And once you've decided when and where, call TWA or your travel agent. Then quickly, it's TWA to London, Paris, Rome, Frankfurt, Milan, Shannon, Zurich, Geneva, Lisbon, Madrid, Athens.

No matter where you're going—Scandinavia, Eastern Europe or beyond—TWA is the best way to begin. On the way, enjoy StarStream Theater: wide-screen color movies* and eight channels of entertainment. Mail the coupon today!

New! TWA Worldwide Jet Credit! Lets you charge a fully-planned tour—round-trip air fare, hotels, sightseeing. No other airline credit plan like it!

We're your kind of airline.

*Presented by Inflight Motion Pictures, Inc. Optional at nominal charge.

A street in Paris in oils—while you watch.

The Dalmatian Coast, Yugoslavia.

Bouquet? The Spanish Steps, Rome.

Under the Swiss Alps.

TWA, Dept. 647, P.O. Box 25, Grand Central Station, N.Y., N.Y. 10017

Send me free $10 or $15 a day travel planner plus the following:

- ☐ Air/Sea Adventures
- ☐ Iberian Adventures
- ☐ Middle East Adventures
- ☐ Italian Adventures
- ☐ European Open Road Adventures
- ☐ East Africa and Around The World Adventures
- ☐ Ski Europe Adventures

Name_____

Address_____

City_____ State_____ Zip Code_____

Telephone_____

My travel agent is:_____

Free!

How to plan quality travel at $10 or $15 a day. Lists all the best hotels in over 50 cities abroad, and suggested daily itineraries.

Tour folders. Low cost adventures up, down, around 3 continents.

One reason our government had its telephone network a year early is that Western Electric is part of the Bell System.

A full-scale, nationwide telephone network now serves 1,250,000 Federal civil employees in 425 cities. Western Electric built the equipment for it.

Called the Federal Telecommunications System (FTS), its purpose is to help federal agencies serve you more efficiently by making nationwide phoning fast and economical.

Setting it up was no small job. And to make it even tougher, after part of it had been completed, the government asked us to finish the rest of it in one year instead of two.

It took a bit of doing. But Western Electric is part of the Bell System, so there are a couple of points to remember.

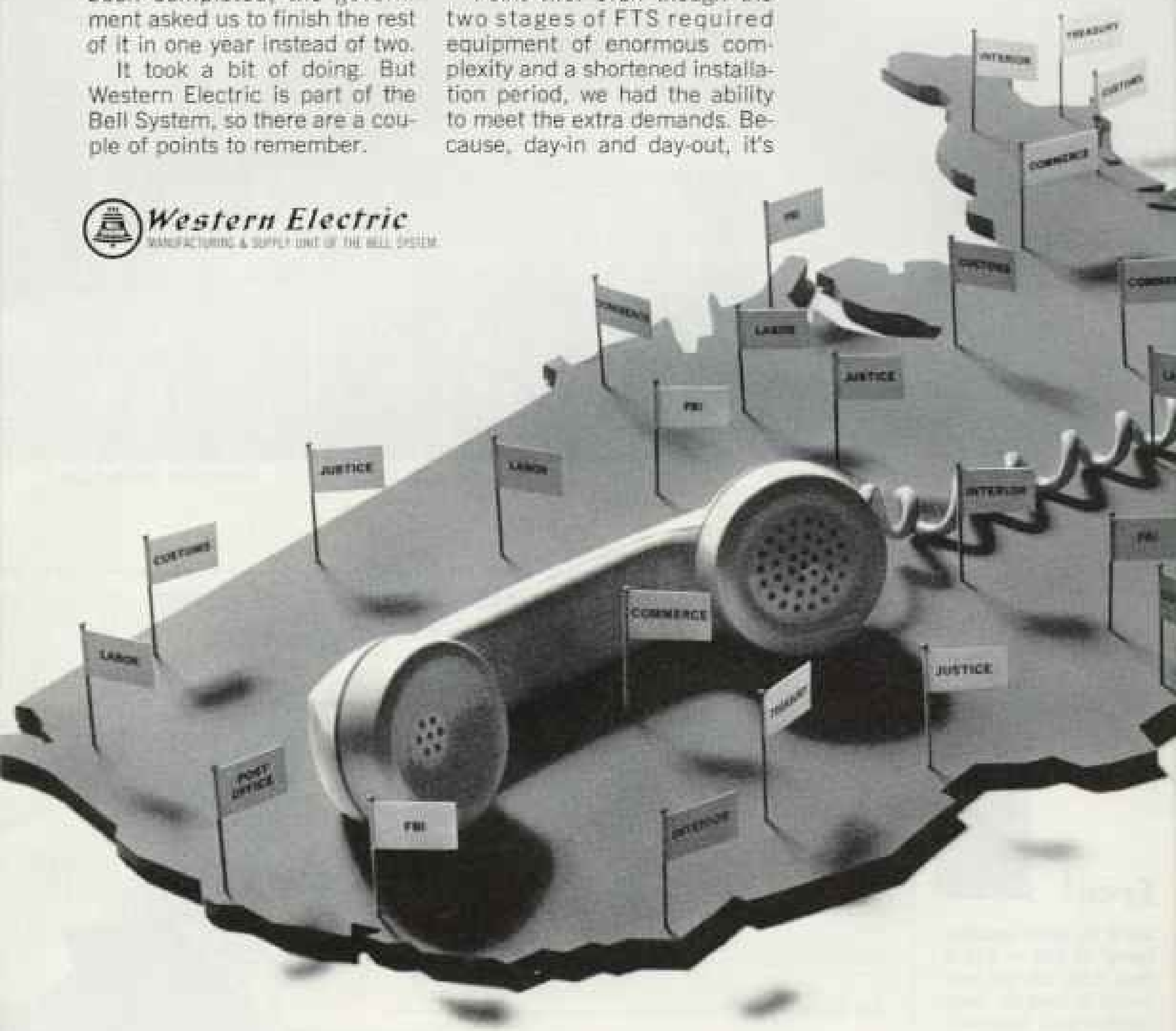
Point one: we did not have to go out and build the network from the ground up. It was, basically, already there—the one you use every day—the Bell telephone network.

The Bell companies just set aside certain portions of it, then we made and installed new equipment where necessary. It was here that our experience in making and installing compatible equipment over the years paid off.

Point two: even though the two stages of FTS required equipment of enormous complexity and a shortened installation period, we had the ability to meet the extra demands. Because, day-in and day-out, it's our job to help the Bell telephone companies to meet the public's demands for more and increasingly complex communications equipment.

And we do it because, as part of the Bell System, we are totally at its service. Because we have, since 1882, shared its goal of bringing America the world's finest telephone communications at low cost.

Western Electric
MANUFACTURING & SUPPLY UNIT OF THE BELL SYSTEM



Should your child
catch measles
and "get it over with"?

Ask your doctor.

Perhaps you've always felt
that measles is a trivial disease,
or nothing much to worry about.
But sometimes measles is vicious.

Every year, thousands of children die
of it. And, almost as tragic, measles often
causes serious complications—
permanently impaired hearing or lasting brain damage.

Now, new and effective vaccines help protect your
child against measles and its complications. Ask
your doctor when a vaccine should be given.

Vaccines, produced or distributed by Parke-Davis,
have helped bring great reductions in sickness,
disability, and death caused by the
communicable diseases of childhood.

PARKE-DAVIS
BETTER MEDICINES FOR A BETTER WORLD

1866 1966
100
ANNIVERSARY

Powered to tune in the world and FM, too . . . Zenith's famous 9-band Trans-Oceanic radio

Powered to tune in the world—the Zenith Trans-Oceanic® portable is the world's finest all-transistor radio. Super-sensitive reception for AM, international shortwave and amateur broadcasts, ship-to-shore and ship-to-ship, marine and FAA weather services. And glorious FM too! The Zenith Trans-Oceanic Royal 3000-1—now at your Zenith dealer's.

ZENITH®

The quality goes in before the name goes on

Specifications subject to change without notice.

discover real travel adventure

Want to visit exciting new places? Or maybe you'd prefer sunbathing in Florida or relaxing beside some inviting stream? Perhaps you know a road somewhere you'd like to follow to the end. It's all the same with an Airstream Land Yacht . . . good beds, bathroom, hot and cold water, refrigeration, heat and light independent of outside sources wherever you go—for a night, a week, or a month. Airstream Land Yachting means real travel independence—no time-tables, tickets, packing. You just tow your Airstream lightly behind your car and follow your travel whims wherever they urge you to go. Yes, it's the exciting, better way to travel here in North America or anywhere in the world.

write for interesting free booklet "World At Your Doorstep"

AIRSTREAM TRAVEL TRAILERS

AIRSTREAM INC. 10 CHURCH ST., JACKSON CENTER, OHIO • 12804 E. FIRESTONE, SANTA FE SPRINGS 10, CALIFORNIA

Go with Grace

On a 13-Day Luxury Cruise to the Caribbean.

A place to sleep. A seat in the dining room. A small table in the night club. Grace Line gives you these just as any other cruise.

Then why go with Grace? Because Grace brings a legendary elegance to Caribbean cruising. Because it's all first class—the most luxurious cruise going. Because Grace Line takes care of everything completely—for your comfort, your relaxation, your fun, your rest.

Plain and simple, we operate a quality cruise for people who want it that way. And for not too many people at a time—300 on a ship the size of a trans-Atlantic liner. And all Grace *Santas* are U.S. Flagships. That means a lot in terms of your own safety.

Beyond the ship itself, what about the ports Grace cruises you to? What's so unusual and special about them?

Grace Line has been sailing in the Caribbean since long before you were born. In Curacao, La Guaira (Caracas), Aruba, Kingston, Port-au-Prince and Fort Lauderdale, you get to see the best that's available. Grace has the experience to arrange it. It's a first class operation on land as well as at sea.

Yes—go with Grace! When you add everything together, you get a lot more of what you went for.

Grace also goes to the Pacific Coast of South America for 19- and 26-day cruises. We recommend them to you, too.

For more information, for reservations, call your travel agent.

GRACE LINE, 3 Hanover Sq. Digby 4-6060 or 628 Fifth Ave., Rockefeller Center, N.Y., N.Y.

Our homes in Melbourne and Sydney

We're no Johnny-come-lately to Australia...

. . . it took time to become the biggest insurance writer on the island-continent. We've been there for more than 100 years, and we plan to stay a lot longer. Our "homes" in Melbourne and Sydney testify to that.

Insure your business in Australia through Royal-Globe here. Get "on-location" service there.

Royal-Globe is your best insurance bet west of the Iron Curtain or south of the Bamboo, because we have more international representation than any other insurance company. Call on your Royal-Globe agent. He's listed in the Yellow Pages.

If it's in the Free World, Royal-Globe is there!

Our Wellington office—we're in New Zealand, too.

ROYAL-GLOBE INSURANCE COMPANIES • 150 WILLIAM STREET, NEW YORK, N. Y. 10038

Suddenly it's 450 B.C.

You're sitting under the stars on a lovely Greek night in the beautiful theater of Epidaurus. A hush falls over the audience. The chorus enters and begins chanting the first haunting lines of *Oedipus Rex*. The play begins. Suddenly, it's 450 B.C.

Go back to the beginnings of our world – to its very roots.

Come to Greece. Walk along those ancient Athenian streets where the flaming words of Pericles ignited that first glimmering torch of democracy. Journey to beautiful Delphi. Climb to the very spot where the Oracle predicted the fate of men and feel as the Greeks felt – close to the gods. Cruise in the deep-blue, fabled waters of the Mediterranean and visit the incredibly beautiful isles of Greece. And, like Odysseus, hear the siren-call of these almost unreal islands. Lufthansa's **Cruise of the Eastern Mediterranean** starts at **$729.***

Fly to Egypt and cruise up the endless Nile on the beautiful, new m.s. ISIS or m.s. OSIRIS on our **Journey Into Antiquity.** Discover the awesome beauty of the great archaeological monuments of the Nile. Explore the very depths of great temples and marvel at the heights man can climb to when his mind and body are kindled by the fire of religious belief. Lufthansa's Journey Into Antiquity tour, which includes trained archaeologists as guides, costs as little as $1,397.*

Go further into the Holy Lands. Stand on Calvary. See for yourself the streets of Bethlehem. And like many pilgrims before you, retrace the steps of the Wise Men. There's a special kind of beauty here that is both seen with the eyes and felt with the heart. Lufthansa's **Holy Land** tours start at $1,070.*

Pick the tour that fits your needs. For more information, call your Travel Agent or mail in this coupon.

*Prices based on 14-21 day ITX Economy Excursion fare from NYC, when applicable.

Lufthansa German Airlines, Dept. Y-9
410 Park Avenue, New York, N.Y. 10022

Gentlemen: Please send me further information on:

☐ Journey Into Antiquity ☐ Holy Land
☐ The Cruises to Eastern Mediterranean
☐ Have your Tour Expert contact me

Name_____

Address_____ City_____

State_____ Zip_____ Phone_____

My Travel Agent is_____

Lufthansa
German Airlines

Catch the action Down Under. See big booming cities like Sydney and Melbourne. Cheer yourself hoarse along with the world's greatest sports fans. Stand in the sunburned silence of the wide, brown Outback. You'll like Australia and the vigorous, outgoing Australians. It's all within your reach on Qantas, the airline with the jump on the South Pacific. More flights than any other airline—at least one a day. Your travel agent will carry the ball. Or Qantas—Australia's round-the-world airline.

QANTAS TO AUSTRALIA?

See the burst of new color in Virginia's sprawling Shenandoah National Park from a quiet overlook on Skyline Drive. Tour Blue Ridge Parkway for spectacular views of nature ablaze with fall foliage from late September through October.

Discover a New World of Color in VIRGINIA

Explore the weird world of the caverns in Shenandoah Valley—nine underground worlds, fashioned by time and forgotten rivers.

Browse among the footnotes of history, the personal mementoes from four wars, at the General Douglas MacArthur Memorial in Norfolk.

AUTUMN HIGHLIGHTS—The capital city of Richmond comes alive for the **National Tobacco Festival,** a week-long carnival of music, pageants, and night street parades, climaxed by major college football and the glamorous Tobacco Ball, Oct. 8-15. Relive the golden age of plantation life during **Virginia's Annual Autumn Pilgrimage,** two special weekends when private estates, centuries-old churches, and shrines are open to you, Oct. 7-9 and 14-16.

WRITE FOR FREE 100-PAGE PICTURE GUIDE, "Carry Me Back To Old Virginia," plus illustrated highway map. Learn about places to stay, things to do, on your autumn holiday in Virginia.

VIRGINIA DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

811 State Office Building, Richmond, Va. 23219 • Virginia Film Catalog Available

Discover America in VIRGINIA, birthplace of the nation

PAN AM

Whenever you want to go to the Caribbean, just raise your hand.

Better still, give us a call.

We have more flights to more of the islands you want than anyone else, at low, low fares. Example: a round-trip 17-day Jet economy ticket from New York to Jamaica is just $155.

As little as that to fly to a warm, inviting new world that's just a few hours away.

So let us take you there.

To Puerto Rico, possibly, where the rhythm is Spanish and the sun shines 363 days a year. Or St. Thomas, where the pace is rather torrid and the amenities rather deluxe. Or Martinique, where the tradewinds whisper in French. Or Barbados, where the English go native and the natives speak English.

We go to 15 islands in all, so take your choice. And leave the details to any Pan Am Travel Agent or any Pan Am office.

Wherever we take you, you'll enjoy the good feeling that comes from flying the very best there is.

That's easy to take, too.

World's most experienced airline

First in Latin America
First 'Round the World
First on the Atlantic
First on the Pacific

Ed Ellis didn't get a gold watch at retirement.

He couldn't care less.

You should have seen Ed's face the day he retired. He was all ready for the speech on company loyalty "over the many, many years..." and, of course, the suitably-inscribed gold watch.

He didn't get either one.

Instead, the boss simply got up and said, "Thanks a million, Ed. We'll miss you." Then he handed over a United Gift Certificate for two to Hawaii.

Have a ball, Ed. Glad to have you with us in the friendly skies of United.

"J.B. is a genius."

fly the friendly skies of United.

TAKE THE TIME

FOLLOW THE SUN

STRETCH out on the sunny open deck of an Orient-bound President Liner, and contemplate the pleasures ahead. Tonight you'll have a nine-course dinner—and you can look forward to a different menu every night. There'll be first-run wide-screen movies, dinner dances, costume parties, midnight buffets—and six weeks to enjoy it all.

Each First Class stateroom has a private bath, radio, telephone, and round-the-clock room service. Close by are deck sports, game rooms, and quiet lounges. Every two weeks, a great President Liner sails from San Francisco to Hawaii, Japan, Hong Kong and the Philippines. First Class round-trip fares start at $1519; Economy Class at $725.

Tour the Orient

Some of the most fascinating lands on earth await you during these 40-day cruises. Complete custom-planned tours, as short or as long as you please, can make the most of your time ashore. These escorted tours are easy-paced, but comprehensive.

If time is short, consider combining sea and air travel. On a 28-day sea-air cruise/tour, you can sail to the Orient, have ample time to explore it—then fly home, with the same round-trip discount privilege. Or you can take the luxury of extra time: a 54-day cruise/tour that shows you Honolulu, Japan, Hong Kong, Macao, Bangkok, Angkor Wat, and Singapore; then meet another President Liner for the voyage home. All tours include lodging, transportation, and sightseeing.

Around the World in 90 days

Choice accommodations are still available for the January 12 round-the-world cruise on the all First Class SS PRESIDENT ROOSEVELT. You'll sail from San Francisco and visit 23 ports in 15 countries. The passenger list is limited to 275 for maximum service and maximum comfort. Complete fares start at just $2600. For details and free brochures, see your Travel Agent, mail the coupon below, or write directly to American President Lines.

Please send details on:
☐ Orient Cruises ☐ World Cruise
☐ Custom-planned tours ☐ Sea-air combinations

Name _____

Address _____

City _____ State _____

My Travel Agent is:

American President Lines

Dept. 5B, International Building
San Francisco, California

Instant loading, easy zooming... and Kodak reliability

The Kodak Instamatic M6 Movie Camera makes movie-making a snap. Drop in the new super 8 film cartridge, and shoot the full 50 feet without having to flip the film. You get movies that are brighter and sharper than regular 8mm movies. The M6 Camera features an *f*/1.8 zoom lens from 12mm wide-angle to 36mm telephoto. The CdS electric eye looks through the lens for greatest exposure accuracy. Battery drive —no winding! Automatic film-speed setting! Many other conveniences make this and a super 8 projector (required to show super 8 movies) a most worthwhile investment. The Kodak Instamatic M6 Movie Camera is less than $160. Pick one up (by the fold-away pistol grip), and you've just taken the short course in great memory-making.

Price subject to change without notice.

KODAK INSTAMATIC M6 Movie Camera

From Drexel's Declaration grouping—a Motorola exclusive in solid state stereo

The first really fresh idea in stereo since solid state stereo?

It could be. Motorola has taken full advantage of solid state miniaturized components by putting all tuning controls *inside the lid*. Where they're up high. Easy to get at. Then, we've carefully matched these solid state components with others, throughout the system, for remarkably clear audio response. And, engineered in other great Motorola ideas —like a solid state cartridge with a "see-thru" head; solid state drivers for the exponential horns, sealed sound chambers; and solid state amplifiers with 300 watts of instantaneous peak power ouput, 150 watts EIA music power. We've created extras, too, like a separate, solid state cartridge, for playing those priceless old 78's. And topped it off with this full year guarantee. All parts are guaranteed for one full year from defects in materials and workmanship. Motorola Inc.'s guarantee covers free exchange or repair of any component proven defective in normal usage. Arranged through selling dealer. Labor extra. See X300 Stereo.

MOTOROLA

Moving ahead through excellence in electronics

Award of Excellence

From the Los Angeles Chamber of Commerce for the design of this Audio Master Control Center

Show a zillion slides and never jam one.

The KODAK CAROUSEL is the slide projector with the *horizontal* tray—and therein lies the secret of its jamproof operation. The horizontal tray makes the CAROUSEL Projector as dependable as gravity. It's gravity that lowers each slide gently, surely into place. Your slides are never forced into place. Never shoved or gripped in any way. And you're never embarrassed by a jammed slide in mid-show.

Choose from three models: The CAROUSEL 600 Projector gives you push-button control. The CAROUSEL 700, hi-lo light, push-button and remote control too. The CAROUSEL 800 has everything—hi-lo light, three-speed automatic slide change, remote focus, remote and push-button slide controls. From less than $80. Price subject to change without notice.

KODAK CAROUSEL Projector

Kodak
TRADEMARK

CLOCKS BY

Ridgeway

Think of the many places in your home that could welcome a clock like this—think of the warmth it would add—the serenity its golden chimes would bring. Gracious guardian of each golden hour, a Ridgeway clock is at once fine furniture and a family friend. Let us show you the many sizes and styles to choose from.

Send 25c today for a complete catalog . . . the "Story of Clocks" . . . other literature. Write Ridgeway/Division of Gravely Furniture Co., Inc., Dept. NG, Ridgeway, Virginia.

"The memberships I have sent have all given the greatest pleasure to those who have received them—and I have received many wonderful comments long afterward."

Give the gift that transcends the commonplace—membership in the National Geographic Society. Use order form on the third page of this magazine.

LIVE LONGER

... ride up and down stairs

If you can't, or shouldn't, climb stairs, the Dover EscaLIFT is the simplest and most economical answer to your problem. It can be installed on your stairway in a few hours. Operates on regular house current; seat folds out of way when not in use. Wonderful convenience for handicapped. Thousands in use around the world. Write for catalog.

DOVER ESCALIFT

Dover Corporation, Elevator Div.

Dept. R · P.O. Box 2177 Memphis, Tenn. 38102

---

36 FAMOUS AMERICANS!

4 OFFERS IN ONE – ONLY 25¢

1. Choice collection of 36 stamps bearing classic portraits of Andrew Carnegie, Alexander Hamilton, Sam Houston, Edison, Luther Burbank, Victor Herbert, and other famous Americans.
2. Scarce centennial picturing first U.S.A. issued 1847!
3. Selections of other unusual stamps, from our Approval Service, which you may return without purchases and may cancel service any time.
4. Complete NEW U.S. Catalog – 785 illustrations!

Send only 25¢ – TODAY.

H. E. HARRIS, DEPT. A-123
BOSTON, MASS. 02117

Can't read a note of music? Fine!

We've invented something for people just like you: people who want to make music *without* a lifetime of learning.

It's a completely automatic, visual playing guide called the Conn "Show-Chord" that shows you how to play basic chords without the aid of a book. "Show-Chord" never limits your ability; it helps you become proficient *faster*.

This amazing Conn feature is on Models 460 (illustrated) and 432. These are home spinet organs with solid state circuitry, built-in Leslie speaker, repeat percussion, choice of decorator styles.

Conn Models start at $895. Your dealer can arrange convenient terms.

CONN ORGANS / CONN PIANOS

Made by C. G. Conn Ltd., Elkhart, Ind., world's largest manufacturer of band and orchestral instruments . . . since 1875

BOTH FREE!

CLIP coupon, mail today.

1. "Caprice Capers II", a new LP record of organ music.
2. Helpful booklet, "How to Choose an Organ."

Mail To Dept. NG-1, Conn Organ Corp., Elkhart, Ind.

Name _____

Address _____

City _____ State _____ Zip _____

A fabulous weekend is just a short drive away.

Simply drive to the airport and board a Boeing jet.

This can turn any weekend into an extra vacation.

For example, take off Friday after work. In an hour, by Boeing jet, you can be in a city, a resort or a scenic center 600 miles away... with a whole evening and two full vacation days ahead of you.

On Sunday, there is no need to start back early. A Boeing jet can fly you home later that evening in an easy, restful hour.

More and more families are adding zest to their lives by turning weekends into extra vacations.

Think about where you'd like to go next weekend. It's only a short drive and a Boeing jet flight away.

Now flying Boeing jets: Air Congo, Air France, Air-India, Air Jamaica, Air Madagascar, All Nippon, American, Avianca, BOAC, BWIA, Braniff, Continental, Eastern, El Al, Ethiopian, Flying Tiger, Iran Air, Iraqi, JAL, Japan Domestic, Lufthansa, MEA, National, Northeast, Northwest, Olympic, PIA, PSA, Pacific, Pacific Northern, Pan American, Qantas, Sabena, Saudi Arabian, South African, TAA, TAP, TWA, United, Varig, Wardair Canada, Western, World. In service later: Aerolineas Argentinas, Air Asia, Alaska, American Flyers, Braathens, Britannia, Caledonian, Frontier, Lake Central, Mexicana, Northern Consolidated, Piedmont, Southern Air Transport, United Arab, Wien Air Alaska.

BOEING

1916—50th Anniversary Year—1966

10 bands cover the world

New Admiral AM/FM/SW Transistor Portable is a masterpiece of precision and performance. Widest possible coverage includes FM, plus extended AM, International shortwave, longwave, marine and amateur reception. Time zone map and dial, tuning log, three antennas, Alnico V speaker. Runs on eight "D" cells. Optional AC charger lets you play off AC outlet.

Admiral
MARK OF QUALITY THROUGHOUT THE WORLD

Admiral, Chicago. Admiral Canada, Ontario.

Don't Climb Stairs

Put an end to climbing stairs. Ride safely, effortlessly from floor to floor in a Sedgwick home elevator or Stair-Chair®. Quickly, easily installed, electrically operated. Nationwide service.

RELAX...RIDE A SEDGWICK ELEVATOR

Sedgwick MACHINE WORKS
259 West 14th Street, New York 11
ESTABLISHED 1903

New! Hard Cover RING BINDER

for Geographic School Bulletins

Keep your Bulletins in reference order—collect them into a permanent library! Durable cover lies flat in use. You do not have to punch your Bulletins as we include 35 pre-punched Attach-O-Strips to quickly make each Bulletin loose leaf. Complete set, $2.95 prepaid. U.S.A. Save on three sets, $8.50.
THE ALBERT ET CO., 211 S. Sharp St., Baltimore, Md. 21201, U.S.A.

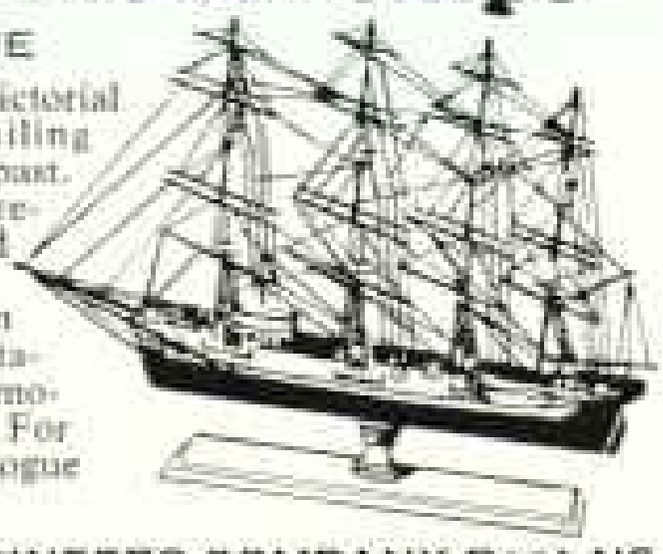
Bind your National Geographic Magazines in "Lifetime" covers. Write for details

- For a year's issues (38)
- Washable yellow Vinyl
- Multiple ring binder
- Full color front

A COLLECTORS ITEM:

antique model ships

CATALOGUE



Just out—exciting pictorial register of great sailing ships of the historic past. Masterful authentic reproductions created in limited editions by the finest European craftsmen. The catalogue itself is a memorable collectors item. For a copy of the catalogue send one dollar to:

NAUTICAL ENGINEERS COMPANY, Dept. NS
1180 Avenue of the Americas, N.Y.C. 10036

AUTHORS WANTED BY N.Y. PUBLISHER

A well-known New York book publisher is searching for manuscripts worthy of publication. Fiction, non-fiction, poetry, juveniles, travel, specialized and even controversial subjects will be considered. If you have a book-length manuscript ready for publication (or are still working on it), and would like more information and a free booklet, please write:

Vantage Press, Dept. NA
120 West 31st St., New York, N.Y. 10001

Picture yourself in beautiful Sintra, Portugal. But don't bring losable cash. Bring First National City travelers checks. They're good all over the world. But their big advantage is a faster refund system.

Other travelers checks are every bit as good as First National City Bank's

...until you lose them!

Other leading travelers checks, like First National City travelers checks, can be cashed all over the world. But if you think all travelers checks are alike, you may be in for a rude shock if you *lose* your checks.

With other travelers checks, elaborate and time-consuming inquiries often have to be made. It may be *days*—even *weeks*—before you get your money back. Who wants to wait?

But, if you lose First National City travelers checks, you don't have to worry. There are more than 20,000 places around the world authorized to give you a *fast refund—right on the spot!*

First National City travelers checks come from the *leader* in world-wide banking, and have been in use over 60 years. They are known and accepted in more than a *million* shops, hotels, restaurants, air terminals, etc., the world over.

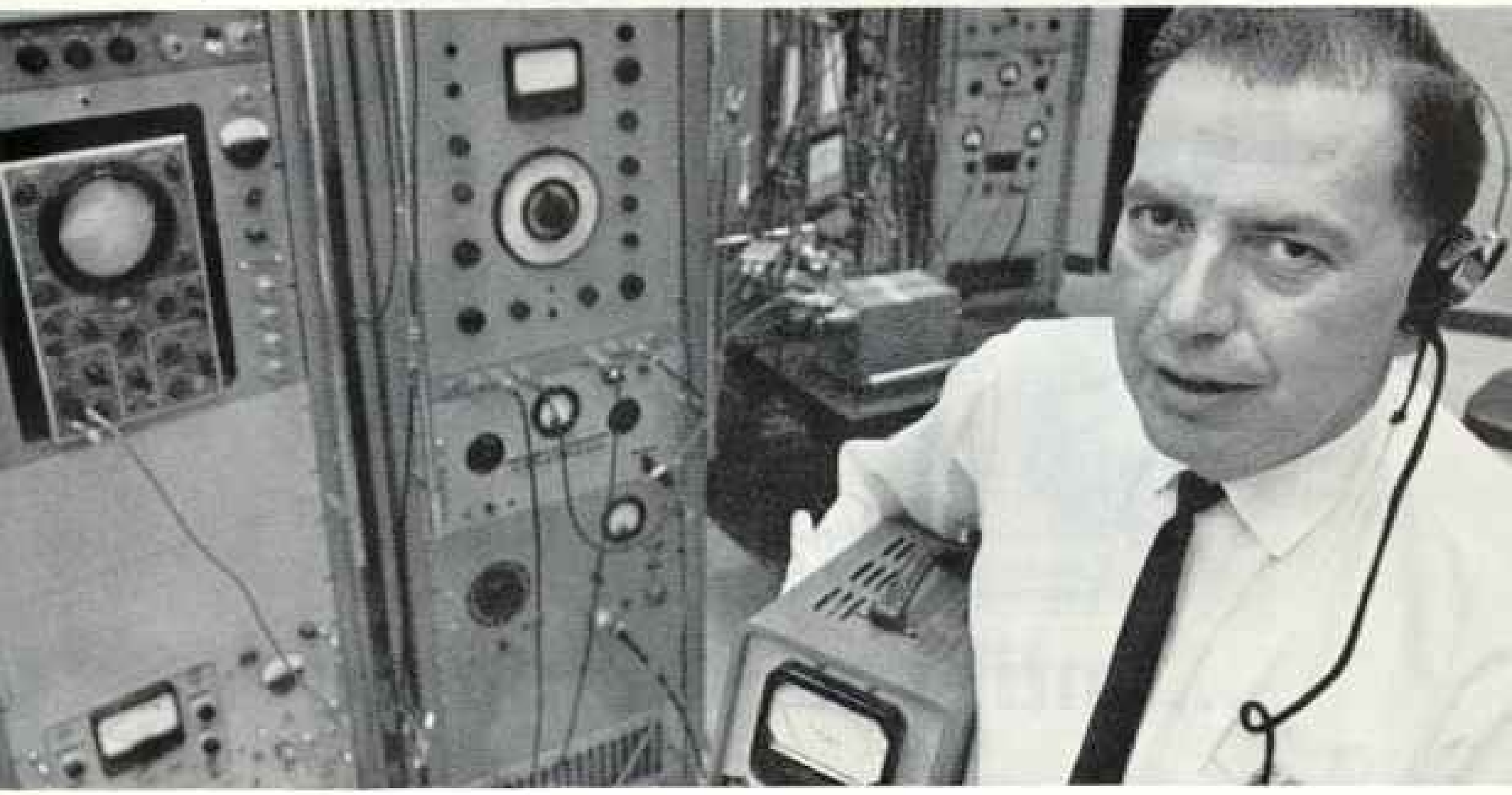
So, *insist* on First National City travelers checks. They cost just one cent per dollar.

Carte Blanche privileges. With Carte Blanche you can now purchase up to $300 of First National City Bank travelers checks—(or $50 in cash and up to $250 in travelers checks). Simply present your own check and your Carte Blanche card at any of more than 300 First National City Bank offices in 45 countries.

First National City Bank Travelers Checks Sold by banks everywhere

Gene Smith got the radio bug in 1927...

today he's an electronics analyzer at GM



The date: September 22, 1927. Gene Smith of Huntington, West Virginia, hunches over a radio crackling with static and the excitement of an historic fight—the second Dempsey-Tunney world heavyweight match.

But more importantly, for Gene, it's his first closeup look at radio, and he is fascinated with the maze of wire and tubes that somehow—miraculously—snatch the announcer's voice from the air. That fascination never cools.

First, Gene Smith built crude crystal sets. Then, he rebuilt a set operated off his father's car battery. Next a plug-in set, one of the first in the neighborhood. And radio was a big part of his life in the U.S. Navy, where he served as Radio Technician, 1st Class.

And then, in 1953, Gene Smith joined the Cadillac Division of General Motors and set up the Test Instrumentation Application Section. Today he heads up a crack team of technicians responsible for the accuracy of test equipment that helps make Cadillac the luxury-car leader.

There were three winners that eventful Fall day many years ago: Gene Tunney, Gene Smith and General Motors!

GM

General Motors is people making better things for you.

With a card like this, who needs cash?

Charge your whole vacation in Miami on your American Express Card.

One credit card lets you "Sign & Fly"® to Miami or anyplace around the world. Choose from 87 domestic and international airlines. Pay on your next bill or take a year to pay.

One card lets you drift to sleep at the Fontainebleau and 20,000 hotels and motels around the world.

One card lets you dine at 13,500 famous restaurants around the world.

One card lets you charge cars, gas, and gifts.

That one card is American Express, the worldwide travel and entertainment card.

AMERICAN EXPRESS

The Company for People Who Travel