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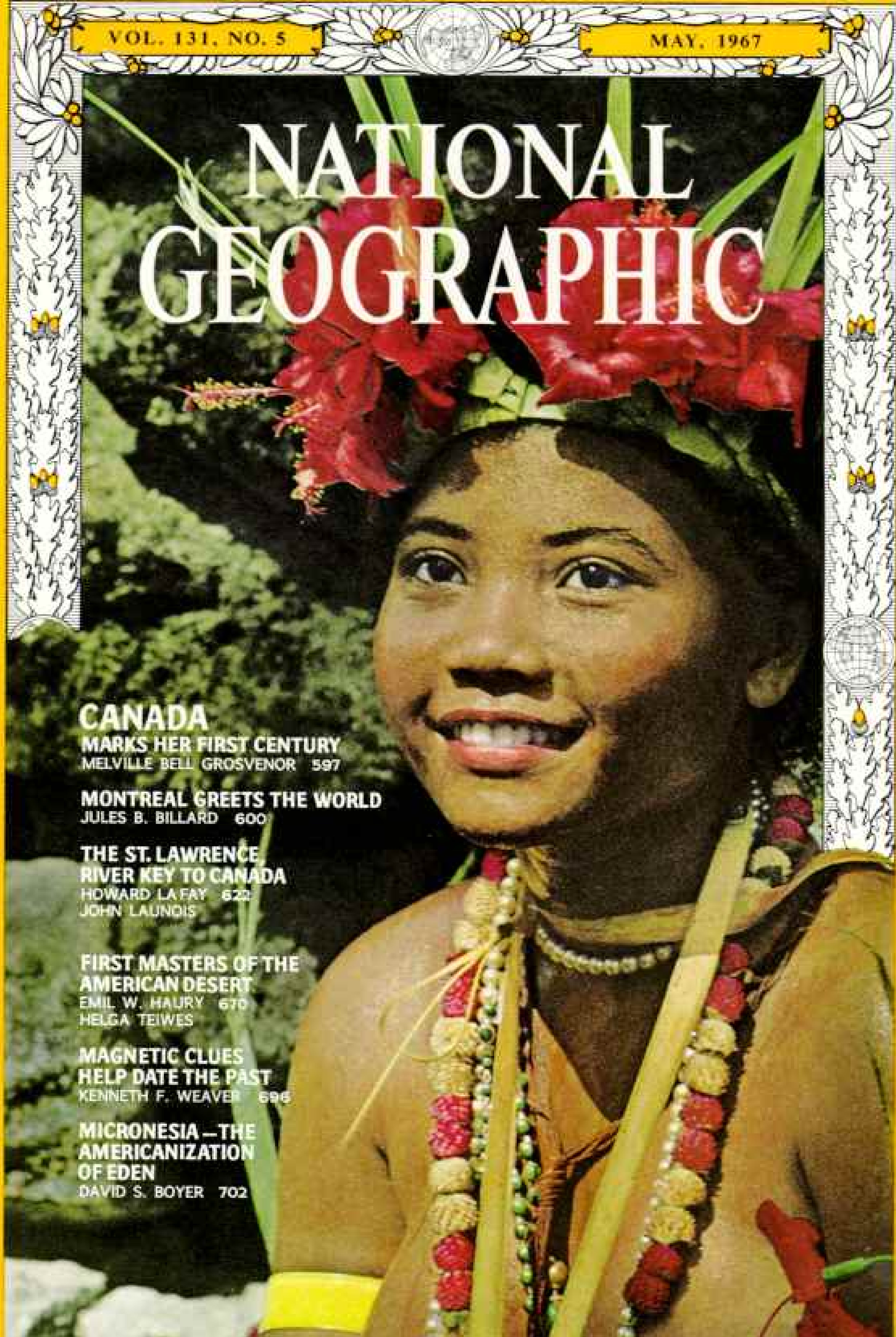

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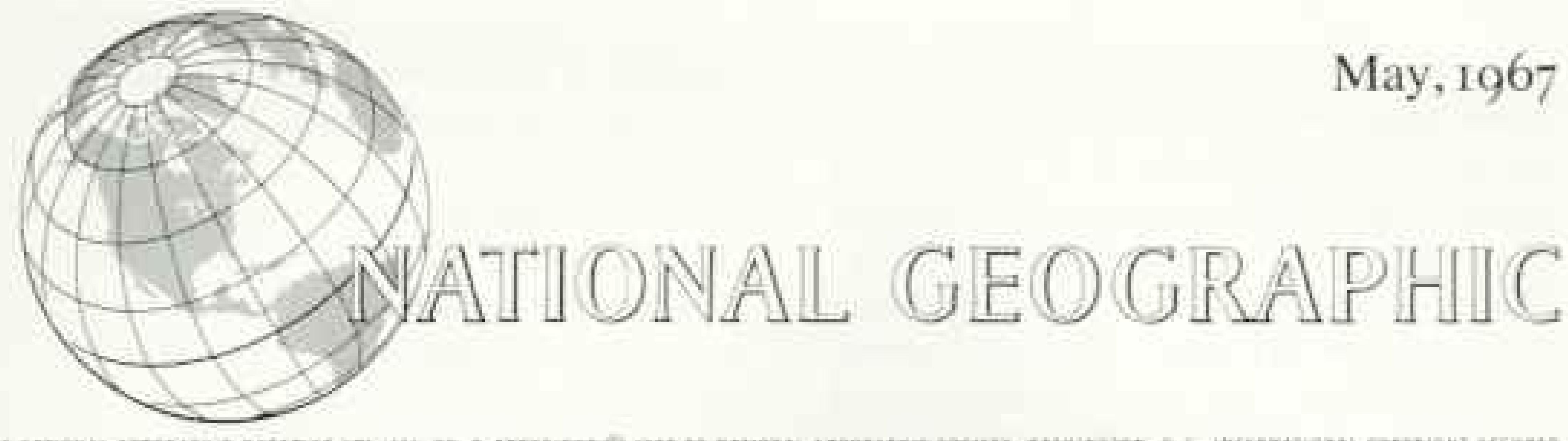

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Canada Marks Her First Century

THE ROMANTIC STORY of Canada stretches as long as the land itself. We can read the Canadian adventure in the ledgers of fur traders and in the logbooks of sailormen like Cartier and Cabot. We hear its history in a musket blast, a Mohawk chant, and even a Viking's boastful saga.

Yet old Canada is politically young. Across its nearly four million square miles, citizens this year are celebrating their first century of nationhood. It was on July 1, 1867—a clear, warm, "gladsome midsummer morn," as the Toronto *Globe* described it—that four provinces of British North America banded together as the Dominion of Canada.

Through the past century, Canadians and the National Geographic Society have developed the closest connections. Some 275,000 Canadians are fellow members of our Society; thousands of other members consider themselves part Canadian—and I am one of those. Every peacetime summer of my life I have spent on Canadian soil.

Among my earliest boyhood memories are the sweep and music of farmland at our family's Baddeck, Nova Scotia, summer home. There, across clean fields cleared of hardwoods by Scottish arm and ax, we could hear a kind of country carillon, the bells of cows and sheep gently pealing as herds grazed.

Spruce forests now replace the herds and flocks, so the sound of bells, like the music of the Gaelic tongue, is fading around Baddeck. But new sounds take their place: the whir of progress and the accents of immigrants.

In the past generation alone, Canada has welcomed 2½ million newcomers. They come from the British Commonwealth, of course, but also from Italy, Germany, the United States, Greece, the Netherlands, Portugal, France, Eastern Europe, and China.

ONCE I CRUISED by steamer through the Strait of Belle Isle, dodged icebergs, entered the St. Lawrence, and passed the massive and historic cliffs of Quebec on my way to Montreal. And there I heard the spirited speech of French Canada, made good friends, and came to appreciate the magnificent human variety of Canada.

In the ensuing years, through my car windshield, I have watched engineers build a great road system. The spectacular Trans-Canada Highway has been one of the outstanding developments in my lifetime. In every neighborhood we can see how this highway has opened up and stimulated commerce; it has attracted new industries and brought people together by encouraging travel and a new national unity. The 35 million U. S. travelers who visited Canada last year prove that a great highway system helps pay for itself.

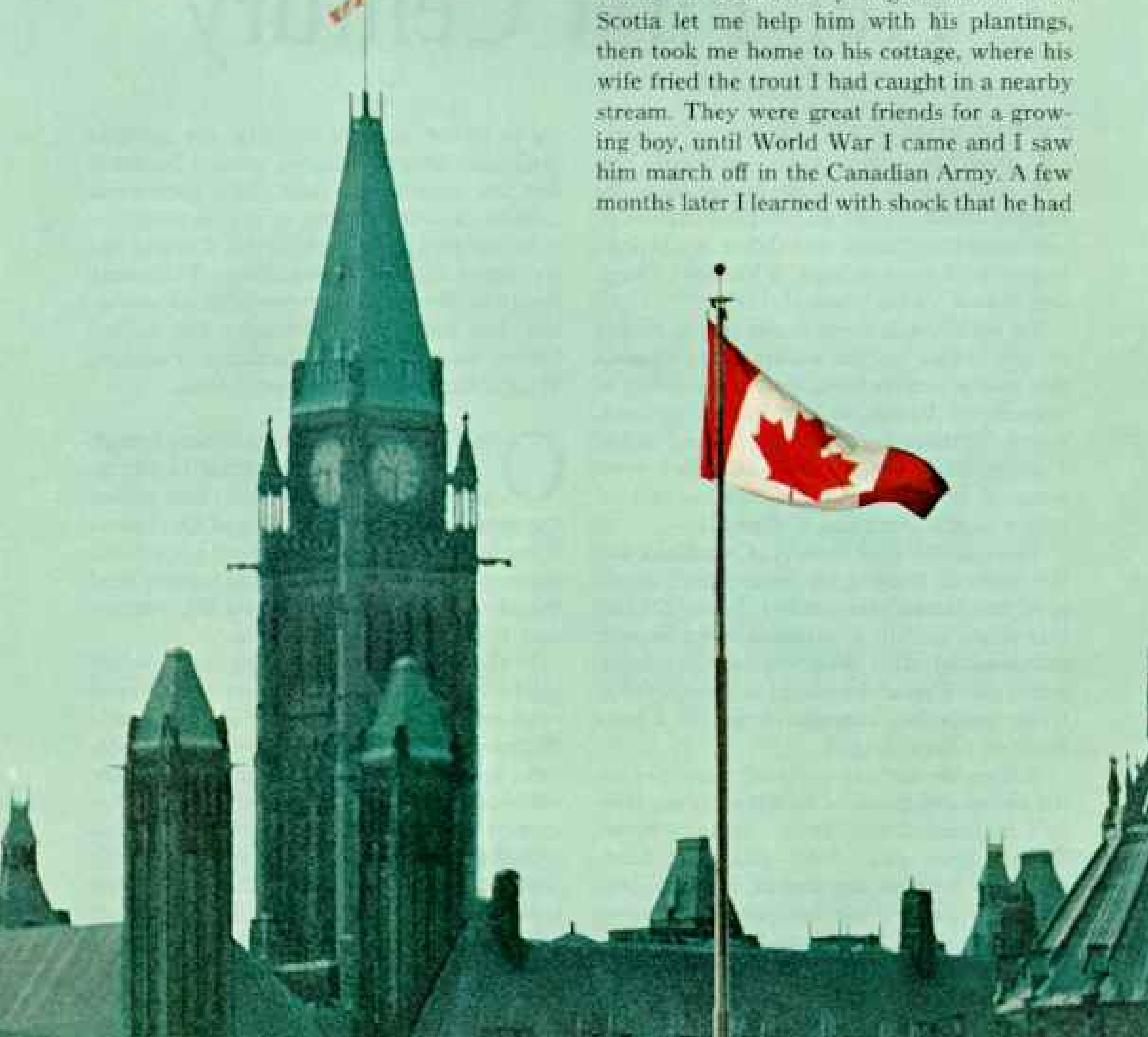
On NATIONAL GEOGRAPHIC assignments, planes have taken me the length and breadth of Canada, from above the Arctic Circle south to the Great Lakes, from the chill Yukon to the glorious scenery of British Columbia. Flying over the Northwest Territories, I marveled at the monster Mackenzie River as it spilled full grown from Great Slave Lake and spread far north to the Arctic. I viewed old forts, Indian trading posts; lakes, forests, mountains, and finally the great wheat harvests of the plains. In my yawl *White Mist* I have explored the rugged south coast of Newfoundland, taking salmon from its beautiful rivers.

As much as any land on earth, Canada has taught me the wonder of geography. The distance between cultures, like the distance between the Canadian provinces, is diminishing. Canada's new flag, the Maple Leaf, provides an example. I missed the traditional old emblem until a commodore from Montreal, of English descent, told me:

"In former days, one rarely saw the old flag in French Canada. The Union Jack design was too much a reminder of Britain. But now, I am glad to say, the Maple Leaf flag flies everywhere."

In my boyhood, Canada freed history from my textbooks. On the Cape Breton Island coast, I played among the toppled ruins of the old French fortress of Louisbourg. With 16,000 imaginary playmates, I stormed and defended the ramparts, re-creating the battle of 1758, when British and Colonial forces defeated the French upon this, the lower jaw of the Gulf of St. Lawrence. Today Canadians are restoring the massive chateau and bastions to their former glory.

But real wars are not play, and this I also learned in Canada. A young farmer in Nova Scotia let me help him with his plantings, then took me home to his cottage, where his wife fried the trout I had caught in a nearby stream. They were great friends for a growing boy, until World War I came and I saw him march off in the Canadian Army. A few months later I learned with shock that he had



been killed at Vimy Ridge in France. For the first time I came face to face with war—and with the heroic part Canadians have repeatedly played in world events.

It was a struggle for life itself that brought the Melville Bell family to Canada in 1870. They had already lost two boys to respiratory diseases, when doctors warned them that their last son, Alexander Graham Bell, was not expected to live more than a few months. So my great-grandfather moved his family to Brantford, Ontario, from Edinburgh, Scotland, in search of "a bracing climate and pure air."

Young Aleck found strength, inspiration, and eventually fame on the banks of Ontario's Grand River—his "dreaming place," as he called it. Throughout his long life he maintained the greatest affection for Brantford—"The Telephone City"—and for all Canadians. And these sentiments he shared with me.

THE DRAMATIC chronicle of Canada has long been recorded in NATIONAL GEOGRAPHIC. Seventy-five years ago, for example, this magazine published C. W. Hayes's account of an expedition through the Canadian Yukon, with a "combined party of four white men, eight Indians, and eleven dogs. . . .

"The country is very scantily peopled, and although we probably saw most of the natives inhabiting the White River basin, they only numbered altogether between fifty and sixty persons. . . ."

Not long ago, from a jetliner, I looked down on many of the 24 towns now dotting the blank area where those few Indians dwelt.

Through the years, distinguished authors—among them, Premier Sir Wilfrid Laurier—have contributed articles on Canadian development. In 1903, former U. S. Secretary of State John W. Foster, grandfather of John Foster Dulles, wrote for NATIONAL GEOGRAPHIC a review of the history of the U. S.-Canadian border: "The disagreements arose mainly from a want of correct geographic knowledge on the part of the negotiators."

Your Society has sought to increase and diffuse that knowledge about Canada through 21 research expeditions and more than a hundred magazine articles.

This May issue continues the great tradition. In these pages NATIONAL GEOGRAPHIC salutes 20 million Canadians on their national anniversary. Here we offer reports on Canada's exciting city of Montreal, with its Expo 67, and the St. Lawrence River heartland, where independence began, plus a special supplement map for members who plan to share in this celebration of a great century-old neighbor.

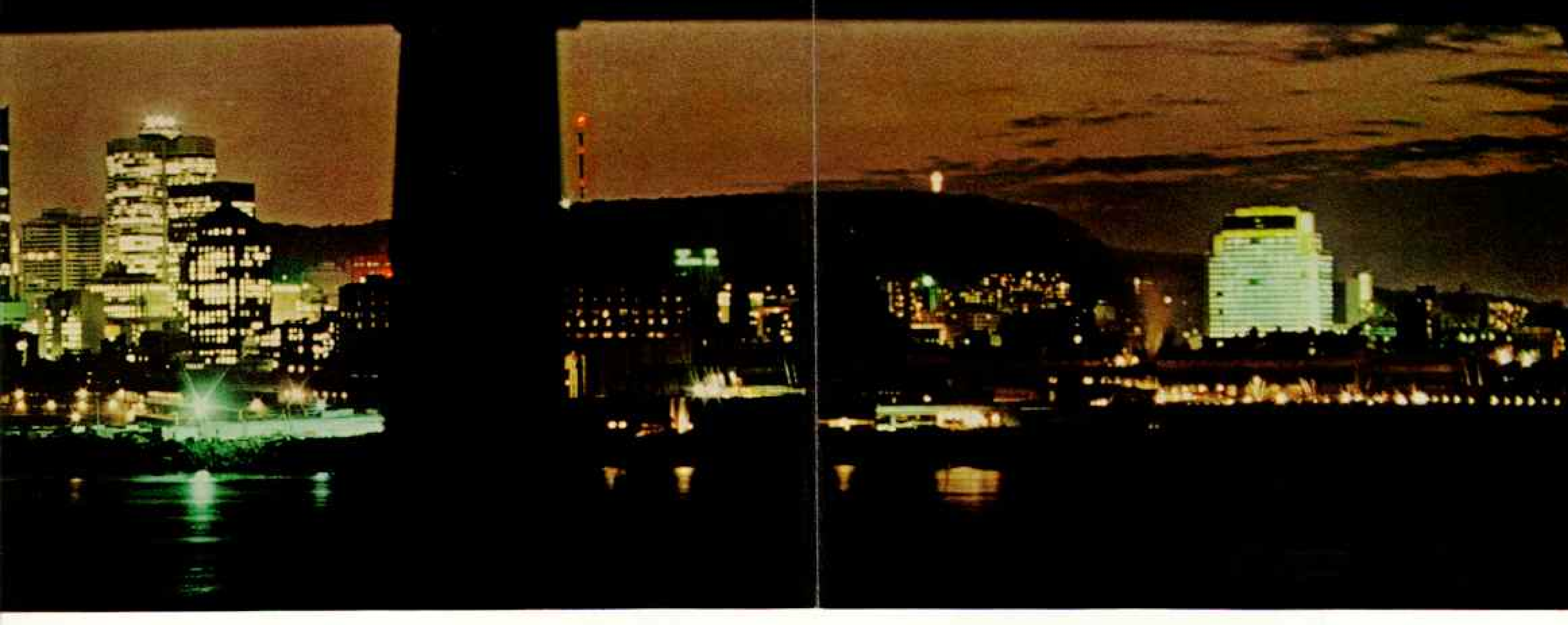
Melville Bell Grosvenor

PRESIDENT AND EDITOR

SYMBOL OF UNITY, *Canada's new Maple Leaf flag emblazons the sky above spired Parliament buildings in Ottawa, the capital. With gusto Canada celebrates her 100 years of confederation, and with hope and determination faces an exciting future.*

Montreal

KODACHROMES BY EMORY KRISTOF AND (TOP) JOHN LAUNOIS, BLACK STAR © N.G.S.; EXPO SYMBOL © 1963 FOR THE 1967 WORLD EXHIBITION



Greets the World

Glittering diadem of skyscrapers adorns burgeoning Montreal, host for Expo 67, Canada's world's fair. This twilight view from the Canadian pavilion on Île Notre Dame in the St. Lawrence River frames from left: hotel Château Champlain, Canadian Imperial Bank of Commerce, Place Victoria, Royal Bank of Canada, and Hydro-Québec, headquarters of the province's power company, at far right. From April 28 to October 27, the city celebrates its 325th birthday and the 100th anniversary of the Canadian Confederation with the only internationally sanctioned first-category exposition yet held in the Western Hemisphere.

On the following three pages, NATIONAL GEOGRAPHIC artist William H. Bond depicts the pavilions of 70 nations with exhibits illuminating the theme "Man and His World." Expo's symbol—the "O" in Montreal (left) —represents men of every nation with arms crossed in friendship.

Necklace of reflections in the camera lens rings the friendly faces of hockey-playing schoolboys (left).

By JULES B. BILLARD

National Geographic Senior Staff

SNOW powdered Montreal's skyline and the temperature hung in the chill 20's when I—without topcoat or galoshes —set out from my hotel for a stroll. Office boys in shirt sleeves and chic secretaries in leg-baring skirts and filmy blouses swept past as I ambled the stretching blocks of shops.

But neither I nor my fellow passers-by could boast of any polar-bear hardihood or disdain for nasty weather. We merely walked in sheltered comfort through the huge underground arcade of one of the building complexes now transforming the city (page 609).

For Montreal, Canada's biggest metropolis, booms with a vibrant reconstruction as imaginative as it is exciting. Where wrecker's ball and bulldozer level acres of slums and run-down stores, striking skyscrapers rise. Streets such as once-narrow Dorchester become multilane thoroughfares through the downtown's heart. Modern apartments sprout, universities expand, a cultural center grows, new homes and factories pop up in the suburbs.

Expo 67 Crowns a Rejuvenation

Capturing the spirit of it all sprawls Expo 67—more precisely the Universal and International Exposition of 1967—through which Montreal this spring opens welcoming arms to the world (foldout, following pages).

Pride in the new dynamism reshaping their city fills the heart of every Montrealer. A taxi driver, quoting to me the $75,000,000 cost of a building where six huge cranes labored under floodlights at night, said matter-of-factly: "If you think that's something, wait awhile. Montreal is going to be *the* city of this continent."

It has a pretty fair start. Already it ranks as the industrial, commercial, and transportation hub of Canada, the nerve center of great corporations, and a vacationlands gateway. It sits on an anvil-shaped island 32 miles long and 10 miles wide, at the junction of the Ottawa and St. Lawrence Rivers (see "The St. Lawrence, River Key to Canada," pages 622-667). But there is nothing insular in its outlook.

expo67
1 AFRICAN NATIONS C10, 11
2 AIR CANADA B6
3 AMUSEMENT AREA A10, 11
4 ARAB NATIONS C11
5 ATLANTIC PROVINCES OF CANADA D3
6 AUSTRALIA D11
7 AUSTRIA B4
8 BARBADOS AND GUYANA D10
9 BATHHOUSE B6
10 BELGIUM B3
11 BREWERS ASSOCIATION OF CANADA B4
12 BRIDGE OF THE ISLES C5
13 BURMA C11
14 CANADA E1, 2, 4
15 CANADIAN KODAK CO. D6
16 CANADIAN PACIFIC C12
17 CANADIAN PULP AND PAPER ASSOCIATION C12
18 CEYLON D10
19 CHATELAINE MAGAZINE D9
20 CHRISTIAN PAVILION D4
21 CONCORDIA BRIDGE C1
22 COSMOS WALK C9
23 CZECHOSLOVAKIA C8
24 DU PONT OF CANADA AUDITORIUM C8
25 ETHIOPIA C9
26 EUROPEAN COMMUNITIES D10
27 EXPO BANKING SERVICE D9
28 EXPO OPERATIONS CENTER C7
29 EXPO SERVICE AREAS B5, 8, C10, 11, 12, D7

- 30 FEDERAL REPUBLIC OF GERMANY — D11
- 31 FRANCE — D8
- 32 GREAT BRITAIN — D8
- 33 GREECE — D5
- 34 GYROTRON — A11
- 35 HAITI — E6
- 36 INDIA — D11
- 37 INDIANS OF CANADA — D3
- 38 INTERNATIONAL NICKEL PLAZA — C3
- 39 INTERNATIONAL SCOUT CENTER — C7
- 40 IRAN — B5
- 41 ISRAEL — D8
- 42 ITALY — C8
- 43 JACQUES CARTIER BRIDGE — A7, B11
- 44 JAMAICA — D5
- 45 JAPAN — B5
- 46 KALEIDOSCOPE — C12
- 47 KINDERGARTEN — B5
- 48 KOREA — B7
- 49 MAINE — B7
- 50 MARINA — A12
- 51 MAURITIUS — D5
- 52 MEXICO — D12
- 53 MONACO — D5
- 54 MONORAIL — E6
- 55 MOROCCO — C10
- 56 NETHERLANDS — B5
- 57 NEW YORK — B7
- 58 ONTARIO — E4
- 59 ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT — D6
- 60 PAVILION IN HONOR OF HELENE DE CHAMPLAIN — B9
- 61 PAVILION OF JUDAISM — C12
- 62 PERU AND URUGUAY — C7
- 63 PLACE DES NATIONS — C3
- 64 QUEBEC — B6
- 65 RAPID TRANSIT STOP — C3, D8
- 66 REPUBLIC OF CHINA — B5
- 67 SCANDINAVIA — C5
- 68 SERMONS FROM SCIENCE — C12
- 69 STEEL PAVILION — C12
- 70 SWIMMING POOLS — B6
- 71 SWITZERLAND — B4
- 72 TELEPHONE ASSOCIATION OF CANADA — B5
- 73 THAILAND — C11
- 74 THEME—MAN THE EXPLORER — B8, C5, 6
- 75 THEME—MAN THE PRODUCER — D8, 9
- 76 THEME—MAN THE PROVIDER — C12
- 77 TRINIDAD AND TOBAGO AND GRENADA — D7
- 78 TUNISIA — C10
- 79 U.S.S.R. — B11
- 80 UNITED NATIONS — D4
- 81 UNITED STATES — B8
- 82 VENEZUELA — C9
- 83 VERMONT — B4
- 84 WESTERN PROVINCES OF CANADA — E3
- 85 YUGOSLAVIA — D6

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

This is my city! Pride in the rejuvenation of his home town shines in the face of a construction worker atop Place Bonaventure, a multimillion-dollar trade mart rising in downtown Montreal. Behind him soars Place Victoria's 47-story tower.

Gallic expressiveness abounds in Montreal, largest French-speaking city after Paris. Here at Chez LouLou les Bacchantes, hands accent the conversation. Some of the city's French majority, intensely proud of their heritage, agitate for separation from the rest of the nation.

Montreal's dynamo, Mayor Jean Drapeau has worked an average of 18 hours a day since he took office in 1960. Drapeau has reorganized the entire administrative structure, inspired a billion-and-a-half-dollar boom in public and private investments, constructed a new subway—first proposed in 1910—and secured for Montreal its 1967 world exposition.

Two-thirds of the metropolis's 2,419,000 people count themselves of French descent, ranking Montreal after Paris as the world's second largest French-speaking city. Yet Montreal is French with a difference.

I found that out somewhat startlingly when I accepted a dinner invitation at a couple's flat in the workingmen's quarter of Montreal East. My hostess met me at the door with a cheery "*Bienvenue, déshabillez je vous en prie.*" In my high-school French that meant "Welcome, take off your clothes, I beg you." Involuntarily, my mouth dropped open.

My host, seeing my surprise, laughed and hastened to explain that many expressions in Parisian French have a different connotation in French Canada.

"This one," he said, "we use often to say 'Pray take off your hat and coat.'"

Fortunately, most Montrealers are bilingual, hence a deficiency in French poses no problems for a visitor. Signs commonly carry their messages in both French and English, but sometimes the two are captivatingly combined. On a wall of a big department store I saw the lettering "*Accessoires de* BAR accessories." And on a streetside billboard, "Consult(ez) Adrian" for the latest in hair styling.

Sidewalk signs reflect more than the 65 percent French, 18 percent Anglo-Saxon make-up of the city's population. From them you sense also the ethnic background of the remaining 17 percent. A pizzeria flashes

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

its gaudy neon nameboard a block from the gold calligraphy of a kosher delicatessen; Montreal counts 100,000 Italian residents and 73,000 Jews.

The Acropole furniture store and the Possidon fish market tell of the city's Greek element. In the Possidon, incidentally, you can buy a live eel or a whiskered barbot, a lake fish, swimming in a tank in the window.

A stroll down Boulevard St. Laurent will take you past the laundry of Hop Lee, the Bucharest Furniture and TV Corp., the Dutch Pastry Shop, the Deutsches Krauterhaus, and a barbershop called the Barbearia Portugesa. On Shannon Street you'll meet, appropriately enough, Irish stevedores who work on the docks a short walk away. In a day of cab riding your drivers may successively be a Ukrainian, a Lithuanian, and a Pole.

Majority Guards Its Mother Tongue

Postwar immigration has thoroughly internationalized Montreal. Yet still it remains primarily French, with its French-speaking majority zealously guarding its heritage. A customer will insist that the Anglo-Saxon dime-store clerk speak only in French, though the buyer himself may be letter-perfect in English. Here and there a street-corner traffic sign will have the word "Stop" painted out, leaving only "*Arrêt*"—the handiwork of fervent separatists who think predominantly French Quebec should become a totally independent nation.

French Canadians also struggle against Americanization of their tongue. They don't go downtown for "*le shopping*" as Parisians do, but "*pour faire le magasinage.*" They call a hot dog "*un chien chaud*"—the literal translation—although this seems a losing battle in the face of ubiquitous sandwich-shop signs proclaiming "*hot dogs steamés.*"

Your Montrealer is a volatile, fiercely loyal Frenchman. He's the kind who, even after the passage of 12 years, still will boo the appearance of former officials who started a momentous riot by banishing Montreal hockey idol Maurice Richard from the ice. He's a lover of art and beauty—unexcelled in the technique of appraising with lidded glance the stylish misses disgorged by Montreal's buses and commuter trains each morning. And he's steeped in Gallic gallantry and charm.

I got a sample one Saturday night when warmhearted Gérard Shanks invited me to a dance and raw-oyster feast at his Knights of

Columbus Hall in the west section of Montreal. The oysters—sweet, juicy morsels from famed Malpeque Bay on Prince Edward Island—were memorable, but so were the murmured remarks of a couple dancing near me.

"You waltz as lightly as a cloud," she complimented.

"Ah," he replied, "that is because I am dancing with an angel."

Building Boom Engulfs the City

Montrealers may take pride in Old World gallantry, but they embrace with equal fervor that contemporary phenomenon, the construction boom. Started scarcely a decade ago, the prodigious face lifting in just the past five years has seen a billion dollars' worth of building permits issued for the central area alone. That figure has been more than matched in permits for dwellings and factories and stores in the mushrooming suburbs.

"I never know any more what route to use in driving to work," insurance executive Al Wise told me. "Every day a new street gets blocked by construction."

Said another Montrealer, "It's hard to decide whether Montreal is a cluster of excavations surrounded by traffic jams or a cluster of traffic jams surrounded by excavations."

For this I vouch: I could travel a few blocks in any direction and find a yawning hole in the ground or a long string of concrete trucks pouring their loads into a building rising from raw earth.

The smell of new concrete still hung in Montreal's subway when I roamed its stations

Refuge from the weather, a miniature city lies beneath Place Ville Marie, offering pedestrians year-round shopping, dining, and entertainment in air-conditioned comfort. Skyscrapers climb above this outside entrance to the arcades. Future construction will connect other complexes in a network of six miles of climate-controlled convenience.

Swift, sleek, and silent, the blue-and-white trains of Montreal's new subway—the Métro—discharge passengers at the McGill University stop. Running on rubber tires, the trains whiz commuters through bright and decorative stations, each one with distinctive tile or mosaic walls, pillars, seats, and murals. Visitors have called the 16-mile subway system "the world's largest underground art gallery."

EKTACHROME (ABOVE) AND KODACHROME BY WINFIELD PARKS © N.G.S.

Forest of stylized trees, symbolic of one of the nation's greatest natural resources, takes shape atop the Canadian Pulp and Paper Association's pavilion. The exhibit rises from Île Notre Dame—a new island created for Expo 67. Across the river, the Canadian Imperial Bank of Commerce, left, and Royal Bank of Canada provide jobs for many of Montreal's 250,000 fashion-conscious young women.

a month after the system opened. Each of the Métro stops bears the stamp of a different architect: Basket-weave and abstract mosaics make splashes of color against ceramic walls; stairways bear ribboned railings of stainless steel. Airy blue-and-white cars run quietly on rubber tires through the 16-mile system (page 608).

But the $213,700,000 Métro has had one unexpected quirk: More pasteboard transfers are dispensed by automatic machines than actually are used for connecting rides. Montrealers take them to serve as bookmarks.

Streets disrupted for the Métro's construction wound up with new widths—and new buildings growing along them. The city's revamping spawned other thoroughfares,

KODACHROMES BY JOHN LAUNOIS, BLACK STAR, AND HORST EHRICHT (OPPOSITE) © N.G.S.

including a loop of the Trans-Canada Highway to zip traffic downtown and to broad new access roads for Expo 67 (pages 614-15).

Fifteen years ago Montreal was a somnolent, almost Old World, city. Now a vastly changed skyline reflects from the waters of the broad St. Lawrence (map, opposite).

Planners Create a Three-level City

Place Victoria thrusts 47 stories aloft as the tallest building in Montreal (page 606). Place Ville Marie, whose 70-shop arcade I wandered through in a snowstorm, rises in a complex of structures dominated by the cruciform Royal Bank of Canada building; from a plush top-floor lounge, named Altitude 737 for its height above sea level, you get a spectacular view of deepening sunsets and lights winking on to bejewel Montreal beneath you.

Nearby Place Bonaventure covers six acres of ground with a massive concrete pile second only to Chicago's Merchandise Mart in square feet of commercial floor space. A trade and exhibition center, it has—among other superlatives—a hall that will seat 17,000, pedestrian shopping malls as broad as three-lane highways, and a rooftop garden that gives taller neighbors a pleasant view. Place des Arts with its three magnificent theaters (pages 620-21); Place Radio Canada for the nationally owned broadcasting system; Place de la Justice for a new courthouse—the list of new buildings could go on and on.

Planners link such structural complexes—

Pueblo of tomorrow, Habitat 67 rises block by block on Cité du Havre, berthing place for ocean freighters. As part of Expo 67's theme "Man and His World," the housing complex develops a new concept of urban living.

Israeli-born architect Moshe Safdie designed Habitat 67 for efficient use of space, yet retained a sense of privacy and air. A giant crane lifts each prefabricated unit, complete with wiring and plumbing, and fits it into a one-to-four-bedroom apartment. Careful planning makes one apartment's roof the terrace of another.

Montreal town houses of a bygone era (left) extend typical balconies and stoops railed with wrought iron.

Montrealers like to call each a "Place"—in a master scheme that makes downtown Montreal a kind of three-level city. On one, pedestrians move; on another, vehicles; the third is office space. Projects on the books ultimately will create a six-mile network of walkways lined with shops, theaters, restaurants, and entrances to buildings and other facilities.

People will be able to go from the lower slopes of Mount Royal to the river-edge financial district without setting foot outdoors—a distinct advantage to a city whose average of eight feet of wintertime snow is greater than Moscow's, and whose summer heat and humidity rival New York's.

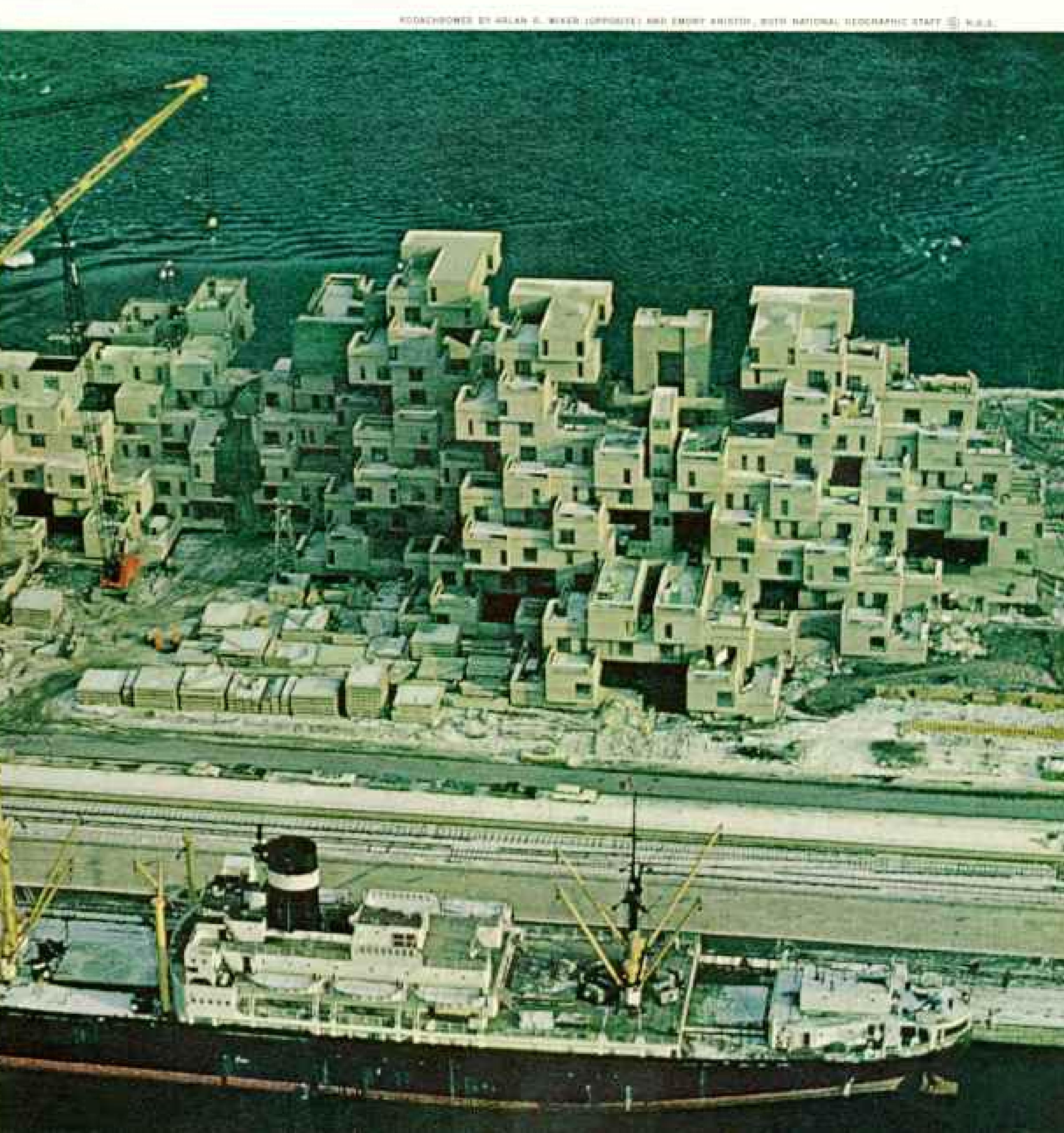
Montreal's planning aims to avoid the overwhelming skyscraper-canyon effect of other metropolises. Building codes require that the taller the structure, the more open space it must also provide. Thus downtown Montreal preserves broad plazas and airy walking areas.

Renewed Pride Transforms a "Sin City"

How can the city have accomplished so much in so little time? I put the question to Jean Drapeau, whose hard-working dynamism has made him perhaps the most popular and respected mayor in Montreal's long history (page 606).

"I think it's a matter of reawakened pride

KODACHROMES BY [illegible] (OPPOSITE) AND EMORY KRISTOF, BOTH NATIONAL GEOGRAPHIC STAFF © N.G.S.



and confidence," he said. "Montreal once had a reputation as a sin city; with it went graft and corruption. That's all changed.

"Probably the one great happening that made the rest possible was reorganization of the police department. That restored confidence in Montreal's future—for the people, the visitor, the investor."

First elected on a reform slate, Drapeau reorganized the city government to create new efficiency, revamped the administrative system, and resourcefully tackled problem after problem. His relentless drive leads even critics to say he has done more than any other one man to spark Montreal's boom.

That ferment has touched one part of the city with fascinating results: restoration of Montreal's Old Quarter. It grew near the site where explorer Jacques Cartier in 1535 discovered an Indian village, where Samuel de Champlain in 1611 established a short-lived trading post, and where the Sieur de Maisonneuve, with a band of some thirty men and three women, founded the permanent settlement of Ville-Marie de Montréal in 1642.

Cartier had named the hill dominating the island site Mont Réal—Mount Royal—supposedly because his king wanted to flatter a cardinal with a place named for the prelate's see at Monreale in Sicily, though not all authorities agree on the reason.

Old Montreal Preserves Its Past

When Montreal's rebuilding fever set in, today's old section jumbled together narrow streets, ancient buildings, dilapidated warehouses, and run-down stores. Now smart boutiques and fashionable restaurants do business in quarters renovated to preserve the charm of the past. People move back to live in refurbished places hoary with history.

Here you can see the house where John Jacob Astor stored pelts when his fur-trade empire was blossoming in the early 1800's. A block or so away stands Château de Ramezay, built in 1705; its illustrious residents included Benjamin Franklin and Gens. Benedict Arnold and Richard Montgomery. Continental troops had captured Montreal in 1775, and Revolutionary leaders tried unsuccessfully to have French Canada join the Colonies in tossing off the British yoke.

The quarter's oldest building, a Sulpician seminary dating from 1685 and still occupied by Sulpician priests, squats next to towering Notre Dame Church, with its inspiringly beautiful interior (pages 618-19). A stone's throw away, old Bonsecours Market gets new use as a City Hall annex through a $3,000,000 renovation that restored its 1845 glory.

Much of Montreal's Old Quarter has been designated a historic area. Strict rules govern preservation of its buildings—not as museum pieces but as a useful, living heritage from the past.

I felt those bygone days reawakening when I strolled a flagstoned walk past an antique shop that once had been a spice importer's office, sauntered narrow streets

Young imaginations wielding paint brushes dress up a construction site. Fittingly, the fence hides work on two new theaters at the Place des Arts, the city's new cultural center.

Asphalt sinews twist and turn in an intricate interchange that carries high-speed traffic into and out of Montreal. On the Trans-Canada Highway, motorists drive west, upper left, toward Ottawa; northwest-bound travelers, upper center, peel off to resorts in the Laurentians. Eager to provide easy access to Expo 67, Montreal has rushed to complete the largest highway-building program in its history; now expressways crisscross the city.

KODACHROMES BY WINFIELD PARKS (ABOVE) AND EMORY KRISTOF © N.G.S.

where workmen ripped up asphalt to repave with authentic cobbles, and stepped around building materials to explore the imaginative expansion of a restaurant amid the arched vaults of a century-old warehouse.

Le Vieux Montréal is rebuilding too—with taste and a flair.

Expo: the Hemisphere's Top Fair

The construction ferment seething throughout Canada's biggest city finds its leavening in Expo 67. Most projects—street-widening, the Métro, new hotels and offices—Montreal badly needed and sooner or later would have obtained. But the scheduling of Expo this April 28 through October 27 became a building stimulus and a target date for completion.

Everywhere I went I heard: "We expect the job to be finished in time for Expo."

This extravaganza is the only "first-category" exposition ever held in the Western Hemisphere. Just two before it—both in Brussels, in 1935 and 1958*—have met the rigid standards of timing, scope, and operation established for this classification by the world body regulating international exhibitions. Expo highlights a Canada-wide celebration of the 100th anniversary of Confederation—and Montreal's 325th birthday.

More than 25 million tons of earth created a new island in the St. Lawrence and enlarged an existing one as the site for Expo. There 70 nations have constructed pavilions and exhibits (pages 603-5).

I rambled the truck-cluttered site and marveled at what I saw. Workers clambered like spiders in the tent-canopy netting that tops the West German pavilion. Welders' torches flickered in the framework of the 250-foot-wide bubble of plastic and glass forming the United States exhibit. Cranes deftly lifted preformed concrete sections into cubistic Habitat 67—the Expo-built apartment house of the future, where one man's roof is another's front yard (pages 612-13).

How, I wondered aloud, could such a welter of confusion achieve completed order by the end-of-April opening day?

Expo guide Jane Pequegnat, dodging a backing lumber truck, gave me the answer: "Every job and every structure, down to the last nail or bolt, is on a computerized schedule," she said. "Any exhibitor who slips behind is given a hard-and-fast deadline by which he has to catch up. If he doesn't, his place will be bulldozed into the St. Lawrence. Everything will be ready for opening day—or it won't be here."

I believed her.

Across from Expo's site are strung the 14½ miles of wharves that make Montreal one of the world's great ports. Though a thousand miles from the Atlantic seaboard, it lies closer to English Channel harbors than does New

*See "Belgium Welcomes the World," by Howell Walker, NATIONAL GEOGRAPHIC, June, 1958.

Precision wins the game at Chez Fanny, a restaurant featuring food native to the south of France. While waiting for a table, or between courses, guests play *pétanque*, similar to English bowls. A small ball rolled onto the playing area becomes a target; the player who places his large metal ball closest to it scores.

York City. Ocean-going vessels—3,855 last year—berth in its 35-foot-deep channel, pouring South African grapes, Australian lamb, and a host of other cargoes into the transportation network radiating from the city. Sailing away, these ships carry Canadian products to the world, including grain from five mammoth elevators, which can store the harvest of a million acres of land.

But shipping isn't the kingpin of Montreal's economy. Downstream, at the island city's northeast end, reek the refineries and storage tanks of the number-one industry, petroleum. Oil from far-off Arabia and Venezuela reaches this refinery center of Canada via tanker and pipeline—including one snaking from Portland, Maine. Plants making products from petroleum chemicals sprout at Varennes and other nearby satellite communities.

Montreal's garment business, although second to the petroleum industry in product value, ranks first in giving jobs to Montrealers. With knowledgeable Al Wise guiding me, I drove through the loft district crowded with clothing manufacturers—those who haven't moved to more modern plants in the suburbs—and scouted the mill area of red-brick buildings along the Lachine Canal.

That waterway skidded into eclipse with the building of the St. Lawrence Seaway. The canal was dug to skirt the Lachine Rapids blocking river traffic; in a bit of irony early explorers named them *La Chine*—China—because here ended their search for a westward passage to the siren Orient. Part of the canal is being filled in, though barges still ply the rest to serve textile, tobacco, and metalworking plants stringing its banks.

KODACHROME BY WINFIELD PARKS AND ARLAN R. WIKER © N.G.S.

I cannot think of industrial Montreal without recalling two engaging memories—the bow to progress in suburban Saint Laurent, where a Rolls-Royce aircraft-engine plant occupies the stable that once housed a brewery's prize Percherons, and the colorful, twin parallels of workingmen's flats and shopping streets that edge the Lachine factories.

In such older sections of Montreal as these, you find the exterior wrought-iron staircases that give the city a distinctive appearance. They reach to the sidewalk from second floors of multifamily row houses, and they pattern block after block. Some descend in gentle curves; others plunge straight in a kiddie-slide slant; a few take angular routes. The handiwork of builders in the 1920's and '30's, the stairways give each family private access to the street, as well as more floor space in the interior. Building codes today outlaw their construction because of hazards they present during an icy winter.

You find the staircases in pleasing array on such streets as Messier and De Lorimier in eastern Montreal, or fresh-painted in tidy Verdun, two of the sprawling city's distinctive sections. And in summer, undershirted French Canadians lounge against their iron railings to savor the cool of evening—"going to Balconville," Montrealers call it.

Mount Royal: Green Peak Amid a Metropolis

Each part of the metropolis has its distinguishing touches. Tenements crowd around the Métro's Papineau station, where on chill nights you can watch errand-sent youngsters filling glass jugs and gallon cans with stove oil dispensed *service automatique* by bulky, quarter-in-the-slot machines at a street corner. Hampstead has its neatly kept houses—nary a store, a market, or a service establishment to mar its strictly residential, and Anglo-Saxon, primness. Exclusive Westmount clings to the slopes of Mount Royal; so fashionable is living here that the prices of the few remaining lots begin at $25,000.

This mountain that rises from a metropolitan sea of asphalt and masonry is a tree-clothed hummock 763 feet high. Once it spewed in volcanic might, ages before the coming of the glaciers. Now its upper slopes beckon as one of the city's 362 parks and playgrounds. You can ride in cars or buses partway to the top; the rest of the distance must be done on foot, or in one of the horse-drawn *calèches* that cater to tourists—and to confirmed romanticists like me.

Two structures crown Mount Royal's summit. One is a landmark cross, illuminated at night and visible for miles down the St. Lawrence. It commemorates the toil of city founder Maisonneuve, who vowed to carry a wooden cross on his back and plant it on the mountaintop if flood waters threatening Ville-Marie receded in answer to his prayers. The other structure: the steel fretwork of a TV tower.

Masterworks of the woodcarver's art glorify Notre Dame, built in 1823 to replace Montreal's first parish church. French Canadians labored 69 years to create an interior entirely of wood. Gothic splendor of vaulting, chancel, and altar gleams with gilt. Pinnacled niches enshrine saints and apostles. Artisans recently spent 12 years replacing the church's gold leaf.

KODACHROME BY JONATHAN S. BLAIR © N.G.S.

A chalet overlook on Mount Royal's brow—where you can hear open-air concerts in summer—gives you a dramatic view of Montreal. Landmarks pop up below: McGill University, where classes are held in English and where medicine's Sir William Osler and physics' Lord Rutherford taught; the sprawling French-language University of Montreal; St. Joseph's Oratory, where a votive chapel holds crutches and braces left by the faithful seeking cures through prayer; and, on a clear day, the Green Mountains of Vermont, and the Adirondacks across the New York State line, 35 miles away.

No look at Montreal, however, would be complete without a deferential bow to its restaurants. Here, truly, is one of the gourmet capitals of the world. Exquisite French cuisine, hearty *habitant* (rural French-Canadian) cooking, delectable steaks, seafood, Chinese dishes, Greek, Hungarian—you name it, Montreal has it in mouth-watering measure. I counted 14 pages of restaurants in the phone directory's classified section, 133 places beginning with the letter "A" alone; Montreal licenses some 4,000 eating spots.

The surprising thing is their general excellence. I had only one poor meal in Montreal, and that was when—needing to eat in a

VACATIONLANDS MAP REISSUED

THIS YEAR a flood of travelers will converge on Montreal and Expo 67 during holiday trips through the wonders of North America. An unsurpassed guide, the National Geographic map **Vacationlands of the United States and Southern Canada**, originally issued as a supplement to the July, 1966, GEOGRAPHIC, has been newly revised for 1967 use. It depicts more than 6,000 vacation meccas—parks, historic sites, seashores, ski resorts, cities, and wilderness regions—on both sides of the border. Copies of the 38-by-26-inch folding chart, $1.00 each on paper, $2.00 on fabric, may be obtained postpaid from Dept. 402, National Geographic Society, Washington, D. C. 20036.

hurry—I dropped in at a spot that advertised itself as an "American quick lunch."

With such a variety of establishments, eating out in Montreal can be delightful adventure. I've long subscribed to the theory that second-floor restaurants have to be good to entice patrons up a tiring flight of stairs. On Notre Dame Street in Montreal's Old Quarter, I put that idea to the test.

I climbed a narrow passageway in a none-too-attractive building where a modest sign proclaimed Au Pierrot Gourmet. The rooms that years ago had been a home glistened with thick coats of paint over papered walls; plain chairs edged tables wearing red-plaid cloths. But the food was nothing short of marvelous.

Owner Jean-Louis Larré, in spotless chef's jacket and pants, flitted from pots in the kitchen, where he presided, to patrons' elbows, where he solicitously inquired about the dishes brought out. My veal kidneys—cooked with bits of ham in a cognac-and-mushroom sauce—couldn't have been better, I assured him.

He told me he had emigrated from the Basque region of France and, 15 years ago, had opened a cafe catering to workmen of Montreal's Old Quarter. Now he serves businessmen from offices a few blocks away—and gustatory adventurers like me.

In another restaurant on another day, at the suggestion of gourmet Montrealer Lucien Bergeron, I stuffed myself with a habitant platter—heaped helpings of pigs' knuckles, meatballs, boiled potatoes, and meat pie. My dessert was *tarte au sucre*—a pastry made of maple sugar, eggs, and cream. As I downed the last rich morsel, I couldn't avoid recalling the plight of an earlier visitor to Montreal.

Iroquois Indians who welcomed Jacques Cartier to their palisaded village showered his longboats with gifts of fish and corn bread—"so much of it," he wrote, "... that it seemed to rain bread." Even today, I decided, enticing Montreal believes that the way to complete the capture of a man's heart is through his stomach.

THE END

EKTACHROME (ABOVE) BY EMORY KRISTOF; KODACHROME BY WINFIELD PARKS AND ARLAN R. WIKER © N.G.S.

Celestial beings in bronze—sculptures adorning the main lobby at Montreal's new concert hall—gaze down on mortals enjoying refreshments during intermission at a concert by the Montreal Symphony (above). Critics and performers say the hall is acoustically one of the most nearly perfect in the world. Patrons enthusiastically approve the arrangement of the hall's 2,963 seats—greater width between rows and placement so that everyone has an unobstructed view of the stage. The major component of the Place des Arts, the hall bears the name of Canadian conductor Wilfrid Pelletier.

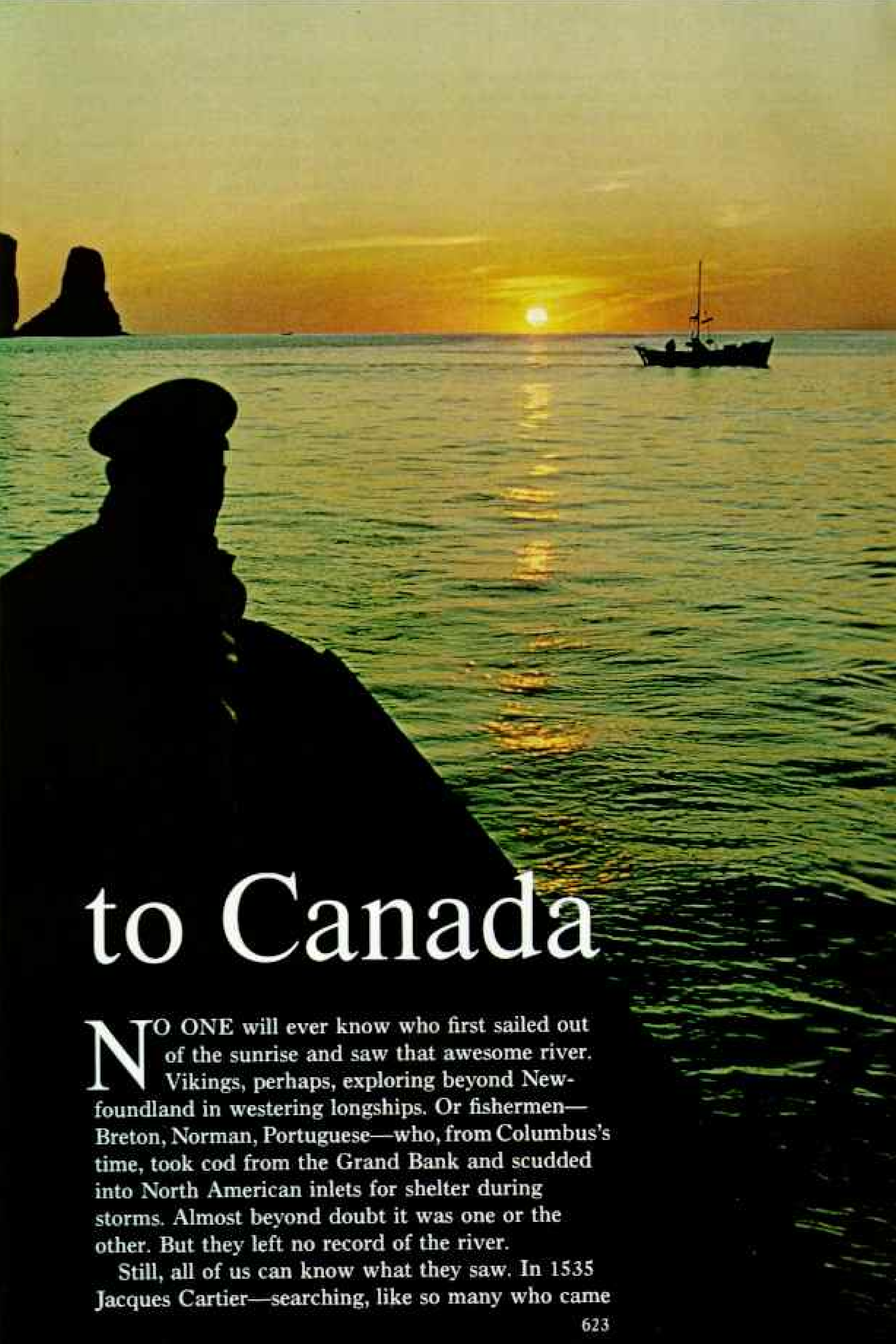
The St. Lawrence River Key

By HOWARD LA FAY, National Geographic Senior Staff

Photographs by JOHN LAUNOIS, Black Star

STREAM WITHOUT END *to early Indians, a hoped-for China passage to European explorers, the St. Lawrence today bears tides of riches to and from North America's heartland. Here, off Percé Rock, cod fishermen set out at dawn to cast their lines in the Gulf of St. Lawrence, the river's sea gate.*

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY



to Canada

NO ONE will ever know who first sailed out of the sunrise and saw that awesome river. Vikings, perhaps, exploring beyond Newfoundland in westering longships. Or fishermen—Breton, Norman, Portuguese—who, from Columbus's time, took cod from the Grand Bank and scudded into North American inlets for shelter during storms. Almost beyond doubt it was one or the other. But they left no record of the river.

Still, all of us can know what they saw. In 1535 Jacques Cartier—searching, like so many who came

after him, for fabled Cathay—sailed into the mouth of the St. Lawrence. He found whales —"none of us ever remembers having seen so many"—and walruses, animals new to him—"fish in appearance like horses which go on land at night." Farther upriver, "this region is as fine land as it is possible to see, being very fertile and covered with magnificent trees."

Samuel de Champlain, who coursed the St. Lawrence 68 years later, found it "a new world and not a kingdom, being perfectly beautiful . . . with an infinite number of beautiful islands having on them very pleasant and delightful meadows and groves in which in spring and summer one sees a great number of birds which come there in their time and season." Champlain also dined with the Indians who lived along the banks. "They feed very filthily, for when their hands are greasy they rub them on their hair, or else on the hair of their dogs."

The walruses are long gone, I found, though whales occasionally still disport in the St. Lawrence. Like all civilized rivers, this one too now has a pollution problem. The Indians eat, more hygienically and less exuberantly, in duly assigned reservations. Yet, not time nor the population explosion nor burgeoning industry can really alter that broad, deep stream.

For centuries, Canada remained a scantily settled wilderness. But in 1759 British Gen. James Wolfe sailed up the river and saw beyond the emptiness; he had the vision. Shortly before he laid down his youthful body, torn by French musket fire, to die on the Plains of Abraham, he wrote to his mother:

"This will, some time hence, be a vast empire, the seat of power and learning. Nature has refused them nothing, and there will grow a people . . . that will fill this vast space."

St. Lawrence Made Canada Possible

Canada has fulfilled the general's prophecy. Disparate settlers—the displaced Scottish Highlanders of Nova Scotia, French-speaking *habitants* of Quebec, British traditionalists of Ontario, the adventurers and immigrants who opened the West—have forged a nation.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Bagpipes skirl and drums rattle as students in the tartans of Scotland drill on Montreal's historic Île Ste. Hélène. The fort, built by the British in 1822, replaces a redoubt that sheltered early French settlers from hostile Indians. It now houses a museum that traces Canada's French, Scottish, and English military heritage.

A clenched eye, a puff of acrid smoke—crash! A volley of blanks scythes through an imaginary enemy as other students in the dress of 18th-century French marines maneuver at the fort. Like those dressed as Highlanders, these youths from high schools and colleges spend their summers performing for visitors to Ste. Hélène.

Twenty million Canadians now live in a country second only to the U.S.S.R. in land area, and enjoy a per capita income next to that of their U. S. neighbors to the south.*

In eastern Canada, life and commerce still center upon the St. Lawrence. Down the long, lovely stream, 1,800,000 gallons of water pour every second from Lake Ontario, to roll implacably toward the Gulf of St. Lawrence 750 miles to the northeast. The river unites Canada's two most populous provinces, Ontario and Quebec; the nation's largest city, Montreal, sprawls beside it; one out of three Canadians lives in its valley (see the World Atlas Map, **Eastern Canada**, distributed with this issue).

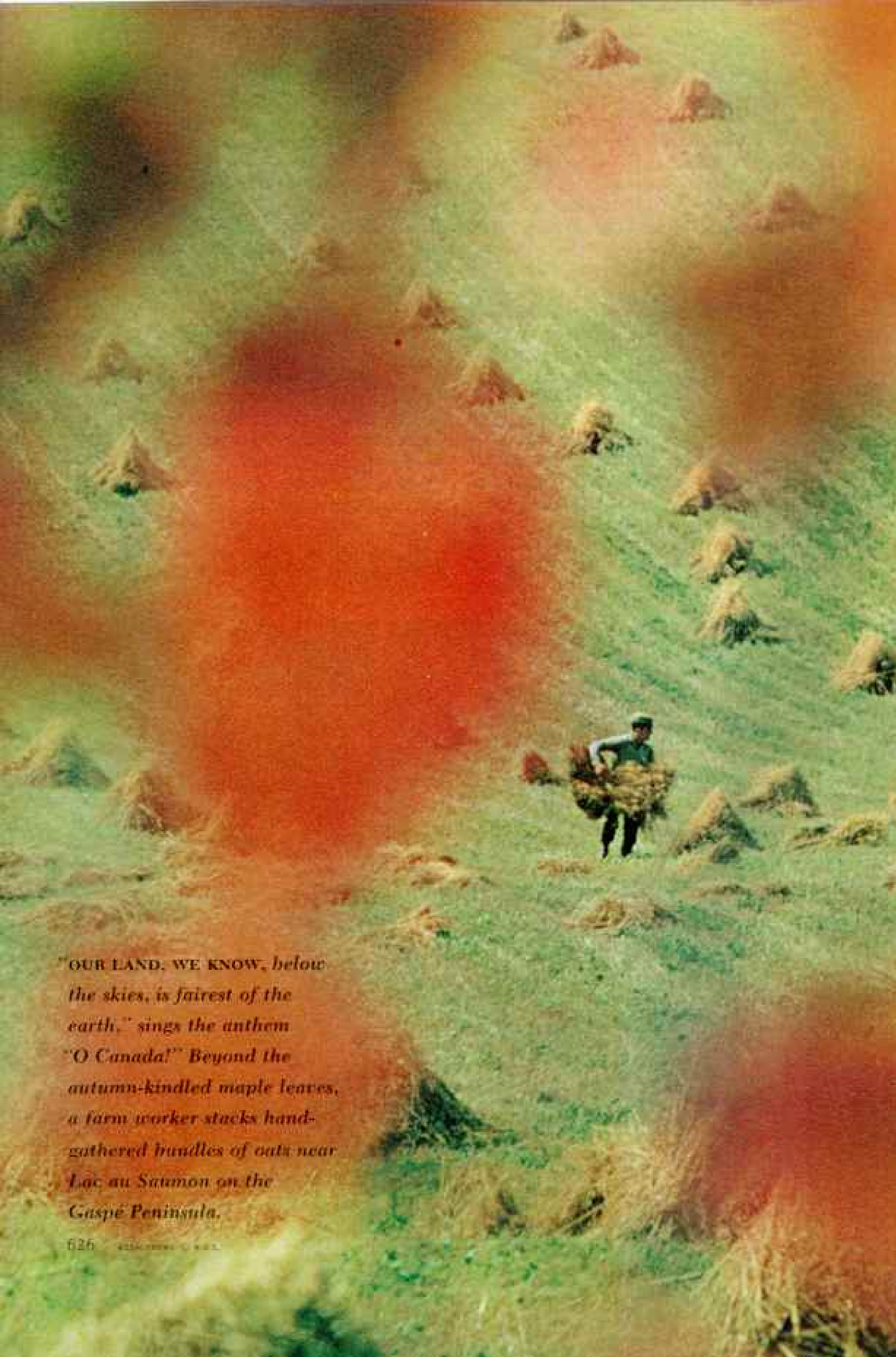
"The St. Lawrence," a Canadian friend told me, "resembles a long, thin funnel connecting the center of the continent with the Atlantic and everything that lies beyond. It offers the only easy east-west passage in North America. Our forefathers followed it when they opened up the interior; now it carries to market the bulk of what we produce. Without the St. Lawrence, I daresay, there never could have been a Canada."

I sailed up that mighty river through the golden haze of summer on M.S. *Rimouski*, a huge 730-foot laker of Canada Steamship Lines; I sailed down in the cruel white calm of midwinter aboard the Canadian Coast Guard icebreaker *Montcalm*. Overland, I traveled the length of the north shore and the length of the south. And I found that the St. Lawrence remains what it has always been—the river of ultimate romance.

My journey began on a wind-swept point of land on Cape Breton Island, where great green Atlantic breakers crashed against the harsh coastline. Here I found Canadian archeologists, historians, and engineers meticulously reconstructing the old French fortress of Louisbourg which, from the 1720's to 1760, guarded the Atlantic approach to what the early explorers called the "River of Canada."

(Continued on page 630)

*See "Canada, My Country," by Alan Phillips, NATIONAL GEOGRAPHIC, December, 1961.



"OUR LAND, WE KNOW, *below the skies, is fairest of the earth,"* sings the anthem *"O Canada!"* Beyond the *autumn-kindled maple leaves, a farm worker stacks hand-gathered bundles of oats near Lac au Saumon on the Gaspé Peninsula.*

ENGRAVING COURTESY BIBLIOTHÈQUE NATIONALE, PARIS, DÉPARTEMENT DES CARTES ET PLANS; KODACHROMES BY DAVID E.

Louisbourg regains its lost grandeur

BEGUN in the 1720's to guard a growing empire, Louisbourg—first major fortress of New France—spread over 70 acres of Cape Breton Island's lower lip. It cost so much—$10,000,000—that even spendthrift Louis XV said he expected to see its ten-foot-thick walls looming over the horizon of France. In a 1731 scene (above) by Louisbourg's chief engineer, M. Verrier, the elegant tower of the Château St. Louis, home of the governor, and the hospital's spire, left, overlook a harbor bustling with ships.

But, like the Maginot Line, Louisbourg fell: once to a band of New Englanders who attacked in 1745 across a theoretically impassable bog, again to the British in 1758. Two years later, British sappers blew the fortifications to smithereens.

Louisbourg became a national historic site in 1928; restoration began in 1961. With painstaking research, the chimneyed Château St. Louis and the King's Bastion rise again (left). Skilled masons use original stones where possible in rebuilding a bastion wall.

NATIONAL GEOGRAPHIC STAFF © N.G.S.

"At the height of its power, the fortress enclosed more than 4,000 people living in 35 city blocks," I was told by historian Blaine Adams of the Department of Indian Affairs and Northern Development, the government bureau charged with reconstructing Louisbourg (preceding pages). "A French fleet could shelter in the harbor and, by merely sailing out, could bottle up any ships audacious enough to have entered the river."

I zigzagged amid scaffolding and workmen at the mammoth Château St. Louis—370 feet long and four stories high. Specialists were hewing new beams by hand in 18th-century fashion, resetting original building stones wherever possible, and installing precise copies of iron hardware unearthed by archeologists. To assure the authenticity of this $12,000,000 project, Canadian historians spent years combing European archives.

"The place kept falling apart in the old days," Blaine said. "We have not only the original work orders but records of all the repairs, and these enable us to duplicate the materials and the workmanship. Louisbourg is unique: It's the only major fortress in North America that combined both military and civilian occupation and has exactly defined dates of birth and death."

KODACHROME BY DAVID S. BOYER © N.G.S.

Burnished brightly, 200-year-old relics unearthed at Louisbourg reveal the fortress's past. Corkscrew-tipped "worm" at right extracted a cannon's charge; the three-tined gig speared fish; a sergeant carried the halberd, lower right, as an insignia of his rank. Other finds include ice creepers, hinges, door fittings, tools, horseshoes, oxshoes, and 18th-century keys. Electrolysis, wire-brushing, and ultrasonic sound waves were used to scour the artifacts clean.

Bog No Barrier to Yankees

Standing in the entrance of the great chateau—in its time the largest habitation in North America—I could look into the chapel on one side and the jail on the other. In 1741 a Yankee visitor, his eye critical of both Catholicism and the French penal system, had stood on that very spot. "On the lift hand," he reported in a letter, "the Door opens into the Kings Chappell, on the right hand into a Dungeon, one of which has a griter resemblance of Hell than the other of heaven."

For reasons of religion, politics, and business, the energetic colonists of New England had always regarded Louisbourg with hostility. When, early in 1744, France declared war upon Great Britain, the New Englanders moved to eliminate the Cape Breton stronghold.

The Colonies raised 4,000 volunteers who sailed north and, on April 30, 1745, landed at Gabarus Bay, three miles west of Louisbourg. Like a Biblical host, self-righteous and ardent for battle, the Yankees swarmed ashore, and the names they bore—Asa, Nathan, Obadiah, Reuben—came out of the Books of Genesis and Kings and Chronicles.

Every professional soldier in North America knew that swamps and dense forests made Louisbourg

invulnerable from its landward side. Secure in this knowledge, the French hadn't trained their cannon in that direction. But nobody had told the amateurs from New England. By hand they dragged their artillery through waist-deep mud, and their sweating, straining backs bore every ounce of their supplies. Bursting out of the trees before the fortress, they set up their batteries and, after a 46-day siege, the demoralized French capitulated.

The Americans' incredible feat of overcoming European regulars defending a fortress regarded as impregnable excited little notice. Old World generals, ever bedazzled by the drill field, continued to despise the independent and intractable American soldiery. Had British statesmen properly evaluated the achievement of the Yankees at Louisbourg in 1745, they might not have underestimated their sons 31 years later, and history might have followed another course.

A treaty signed at Aix la Chapelle in 1748 restored Louisbourg to France, but ten years later—in a dress rehearsal for the fateful attack on Quebec that would decide North America's destiny—British troops conquered the ill-starred stronghold. In 1760, Royal Engineers blew up Louisbourg's one and a half miles of fortifications; the task took seven months.

Shipwreck's Gift: Irish Names

From Louisbourg, rising from its bleak grave to enjoy a second life, the jade waters of the Gulf of St. Lawrence stretched away to Gaspé Bay, where Jacques Cartier had planted a cross in 1534 and claimed all Canada for France.

In the years that followed, sturdy Breton fishermen settled on the rocky Gaspé Peninsula, which juts into the gulf like a petulant lower lip. For four centuries their descendants have taken cod from the gulf, salmon from the clear rivers, and crops from the marginal soil.

While the peninsula is overwhelmingly Roman Catholic and French-speaking, subsequent waves of immigration have left their mark. The town of Gaspé, founded by American Loyalists who fought beside the British in the Revolution, retains a Yankee flavor; at Métis Beach I found a neat and prosperous English-Scottish village clustered about its Presbyterian Church.

Just outside Cap des Rosiers, a small rose-colored marble stone commemorates "187 Irish immigrants from Sligo wrecked here on April 28th, 1847." The survivors lingered in the area, and today many a French-speaking citizen of Cap des Rosiers bears an Irish name.

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

Slashing skates, thwack of stick meeting stick, lungs scorching with cold: To Canadian boys, winter means ice hockey, a sport their nation originated. Here at Havre Aubert on Amherst Island in the Magdalens, a lad drives the hard-rubber puck before menacing defenders. Canadian youngsters choose up sides to play zestfully on frozen lakes, rivers, indoor rinks, or ponds—and dream of one day "facing off" for a top professional team.

My journey through the Gaspé revealed a savage grandeur—a dramatic blend of river and sea and mountains. The 3,500-foot peaks forming the backbone of the peninsula—actually a northern spur of the Appalachians—plunge to their death in the St. Lawrence. But they die hard, and the shoreline bristles with defiant boulders.

Skirting the ever-narrowing river mouth with the iodine smell of ocean sharpening the air, I passed racks of gutted cod drying in the sun (pages 644-5). Fleecy sheep lazed in adjoining meadows. As they graze upon salt grass, their flesh becomes permeated with a delicate tang of the sea; Montreal gourmets dream blissfully of the resulting *agneau pré-salé*.

Like most of Canada's eastern fringe, however, the Gaspé is fighting for its economic life. From Père Michel Le Moignan, young, incisive president of the Historical Society of the Gaspé, I learned the hard facts. "The commercial salmon catch from our rivers has dropped sharply, and the cod have all but disappeared from the coastal waters. Farming has never been profitable here; we have poor soil and a short growing season.

"The Gaspé possesses only one capital asset—people. And we're losing even them. The young men emigrate—some to Montreal, some beyond. Those who remain have dutifully converted the Gaspé into a kind of summer theater for the benefit of tourists. You see," he shrugged ruefully, "tourism has become our principal industry."

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Lonely as a shipwreck, Percé Rock lies beached at the tip of the Gaspé Peninsula. A water-pierced hole in its offshore end gives the great boulder its name (page 622). The beauty of the rock, the surf-brushed village, and the bird sanctuary on nearby Bonaventure Island annually attract hundreds of tourists. They largely replace fishermen who once silvered Percé's beaches with drying cod. But despite diminishing catches, a few men of the sea still laboriously "make cod" by hand.

The annual influx of summer visitors has at least fostered a lively cottage industry in traditional Gaspé crafts—woodcarvings, hooked rugs, and model boats. Shops retailing these wares crowd every highway. The English of their signs sometimes verges upon the quaint; I am still pondering one that promised an unrivaled selection of ANTICRAFT.

Iron Ore Supports "the Land of Cain"

Opposite the Gaspé Peninsula, the Côte Nord, or northern bank of the St. Lawrence, harbors few tourist attractions. Jacques Cartier termed this forbidding strand of rocks and scrub trees "the land God gave to Cain."* Although sparsely settled, the north bank boasts Canada's third busiest port—Sept Îles. Named for the islands that shelter its deep, placid bay, Sept Îles—along with neighboring Pointe Noire and Port Cartier—annually ships more than 20 million tons of iron ore to Canadian, American, and European smelters.

I watched the mechanized loading operation at the Sept Îles docks of the Iron Ore Company of Canada. Riding high and empty in the pale saline water of the bay, the big ore ships edged alongside one by one. From overhead conveyors, avalanches of iron ores—some the color of old blood, some like dirty silver sand—chuted into the holds at the rate of 8,000 tons an hour (pages 636-7).

"We have computers that custom-mix ore

*See "Quebec's Forests, Farms, and Frontiers," by Andrew H. Brown, GEOGRAPHIC, October, 1949.

Blizzard of gannets wheels and swoops over roosting grounds on Bonaventure's sanctuary. Forty thousand strong, the birds blanket the world's biggest gannet rookery. Three feet long, they spread six feet of wing; immature birds wear dark plumage. Their life-span

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

covers 20 years or more. Each year, when winter approaches, the gannets fly to warmer latitudes as far south as the Gulf of Mexico. Then in spring they return to Bonaventure, and the female lays one egg on a crude nest of seaweed and debris from the ocean.

for each customer," a supervisor told me. "It's not delicate—we do it by carloads—but it always comes out to the exact decimal point."

Night and day lose meaning at Sept Îles, for ships load around the clock. And, by night as by day, 150-car trains rumble endlessly into the terminal of the Quebec North Shore and Labrador Railway, bearing ore from mines 320 miles to the north.

Until 1950, Sept Îles was a sleepy fishing village of 1,200 people. In that year, the Iron Ore Company of Canada began building the railroad to exploit rich and all but inexhaustible iron deposits on the distant Quebec-Labrador border. No roads or usable trails penetrated the wilderness, so the company constructed 11 airstrips along the proposed right of way. Then the largest civilian airlift in history shuttled men, machines, and materials to lay a 358-mile-long railway.

The railroad exists for two purposes—to transport ore south at an average rate of 80,000 tons a day, and to supply the men and amenities that keep the mines at Schefferville, Labrador City, and Wabush operating. These towns, set like islands in the solitude of the far northern muskeg, depend upon rail and air for their only access to civilization.

Three passenger trains a week head north from Sept Îles. I joined one for the breathtaking ride alongside the Moisie River, where some of Canada's biggest, wildest salmon fight their way through rapids to spawn. Curving away from the Moisie, the train clattered past parties of Indian trappers and lonely little settlements of men who keep the right of way open through winters when the temperature plummets to 40° or more below zero.

No Way Out for Sunday Drivers

Supervising Field Engineer Bill Mann showed me around Labrador City—an unabashed eight-year-old company town that, with its 7,500 population, already ranks as Labrador's largest community.

"We're taking about 17,500,000 tons of ore

KODACHROMES BY JOHN LAUNOIS, BLACK STAR (ABOVE) AND

a year out of the mines here at Carol Lake," he said. "Since we conservatively estimate our reserves at three billion tons, I imagine we'll be working them for more than a century."

Reflecting that Labrador City stands near latitude 53° north, I wondered aloud if men would always be available to mine the ore.

"Life up here isn't as bad as you might think," Bill said. "True, only three months a year are free of frost, and we count it a warm winter day when the temperature soars to zero, but the compensations are impressive. There's a kind of purity to the air and to the countryside, and in winter the sun is often so bright that you can sun-bathe in the snow.

"The company provides the best possible schools and housing. It even gives us free grass seed if we agree to sow it. We have facilities for every sport from hockey to yachting. There's only one thing that really bothers some people—a kind of psychological itch. It's frustrating to go for a drive in your car."

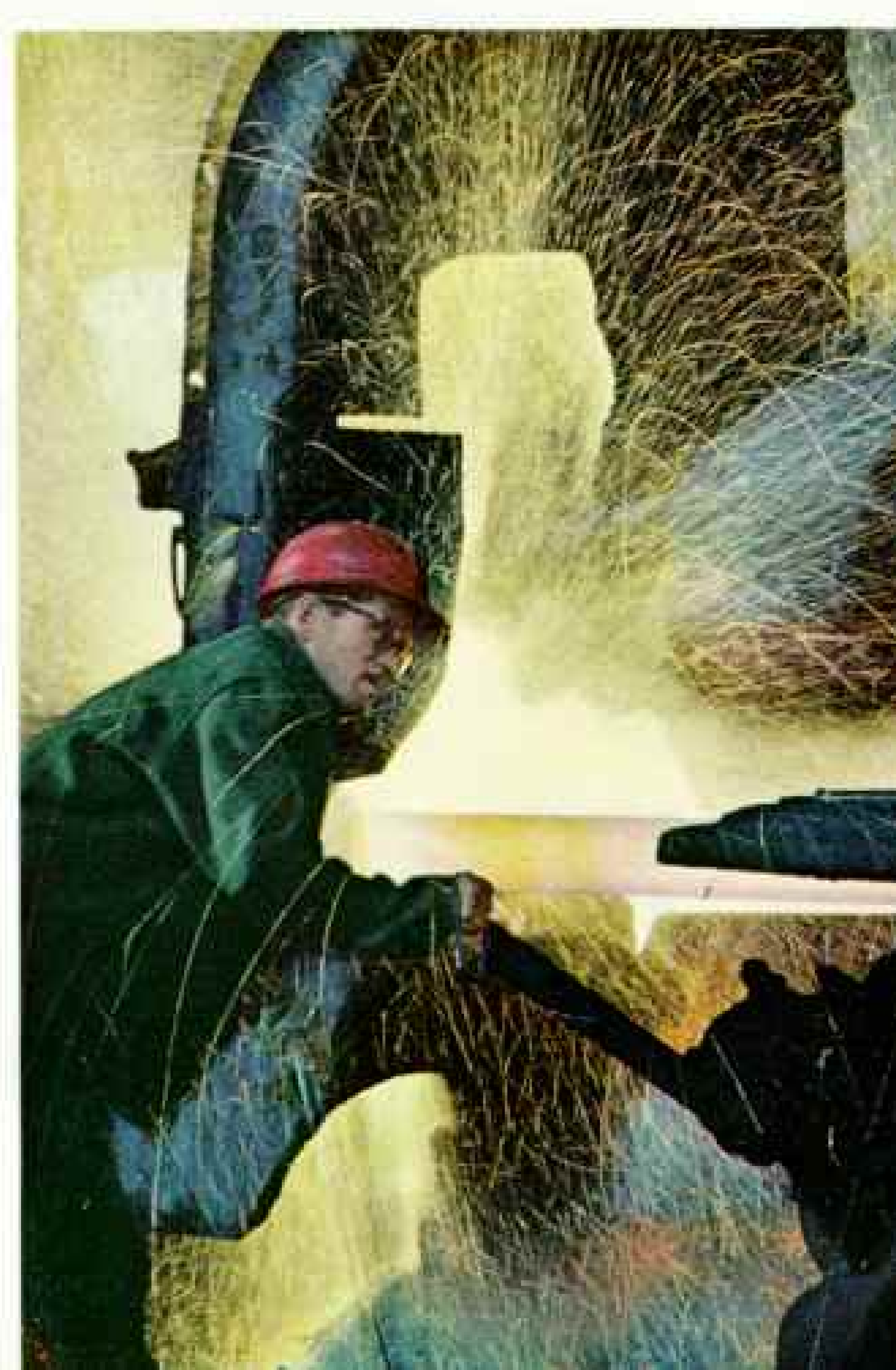
"Why?" I asked.

"Because no roads lead out of town."

The Carol Lake iron deposits, I found, actually thrust high above the ground, and the operation consists of leveling hills rather than gouging into the earth. A fully automated railroad carries the 38-percent pure ore over a six-mile track to a plant that, by eliminating silica, upgrades it to 66-percent purity. It was eerie to watch the bright-orange trains chugging smartly along—headlights glaring, whistles sounding—with not a soul aboard them. I admit that I derived a wry human satisfaction from the news that two of them had collided the previous month.

After being upgraded, most of Carol Lake's concentrated ore goes to an ultramodern pelletizing plant where it is baked into outsize marbles for ease in shipping and smelting. I followed the gray-black concentrate through the pelletizing process, watching complex mills grind it finer and ever finer before it cascaded into huge revolving drums resembling the giant barrels in fun houses.

Machines load iron ore around the clock at Sept Îles, Quebec's all-new ore port. Where 17 years ago a peaceful fishing village lay, a brick-red stream of raw ore now growls into a bulk carrier's hold. Trains from mines far inland haul the ore—most of it ground and baked into easily handled pellets like oversize marbles—to dockside on the St. Lawrence. There twin conveyors move it into ships at the rate of 8,000 tons an hour. When full, vessels like the *Naess Norseman* deliver it to ports in Canada, the United States, and Europe.



Spraying incandescence, a "hot saw" slices steel rails to exact length as a worker removes a cut section at a mill in Sydney, Nova Scotia. Trains in Canada as well as in France, South Africa, India, and the U. S. run on tracks forged by Dominion Steel and Coal Corporation, Limited, one of Canada's four biggest steel plants.

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

Upside down, right side up: It matters little to week-old harp seals, snug in mufflike coats of infant hair. Newborn pups weigh about 20 pounds. At three weeks they average 90 pounds, replace white coats with gray, and take to the water.

Today, conservation quotas limit the take by sealers, who once slaughtered 100,000 animals a year in these waters. Helicopter pilot (left) nudges a pup toward a tagger; mother seal barks defiance. Whirring above sheet ice on the Gulf of St. Lawrence, airborne naturalists study migrations of herds and make head counts.

Emerging from the drums as pellets, the ore travels 240 feet by conveyor through a 2,500° inferno for drying. This final process occurs on the plant's gloomy basement level —known to workmen as "the snakepit." The floor throbbed underfoot, scorching air blasted my face and lungs, flames glimpsed through peepholes seared my eye, random pellets sprinkled down from above like a constant hailstorm of iron. On a bulkhead, someone had chalked the single word HELP!

I agreed, but. . . . To find a mining, refining, and shipping operation so technologically sophisticated on the outskirts of a metropolis would be impressive enough. To find it beneath the grim skies of Labrador in Canada's far, frozen marches gave me a new appreciation of man's limitless capabilities.

At Sept Îles, 70 miles of open water separate the north and south shores of the St. Lawrence. But upstream of the ore port, the river gradually narrows. I passed towns whose names still ring of the frontier—Forestville, Trois Pistoles, Rivière du Loup.

Beyond Tadoussac, where the dark waters of the Saguenay swirl into the St. Lawrence, stands the town of Murray Bay—or, in its French version, La Malbaie. Here William Howard Taft, 27th President of the United States and later Chief Justice, maintained a summer home. His French-Canadian neighbors knew him affectionately as *le petit juge* —"the little judge"—a name tinged with irony, for Taft was a huge man.

On many a summer afternoon of his long life, Taft sat before his cottage watching the St. Lawrence flow past. As President, however, he had to follow hallowed usage by spending his vacations within the borders of the United States. Facing the prospect of defeat in the election of 1912, he took comfort in the anticipation "that I can go to Murray Bay in the summers thereafter."

Islands Preserve the Habitant Heritage

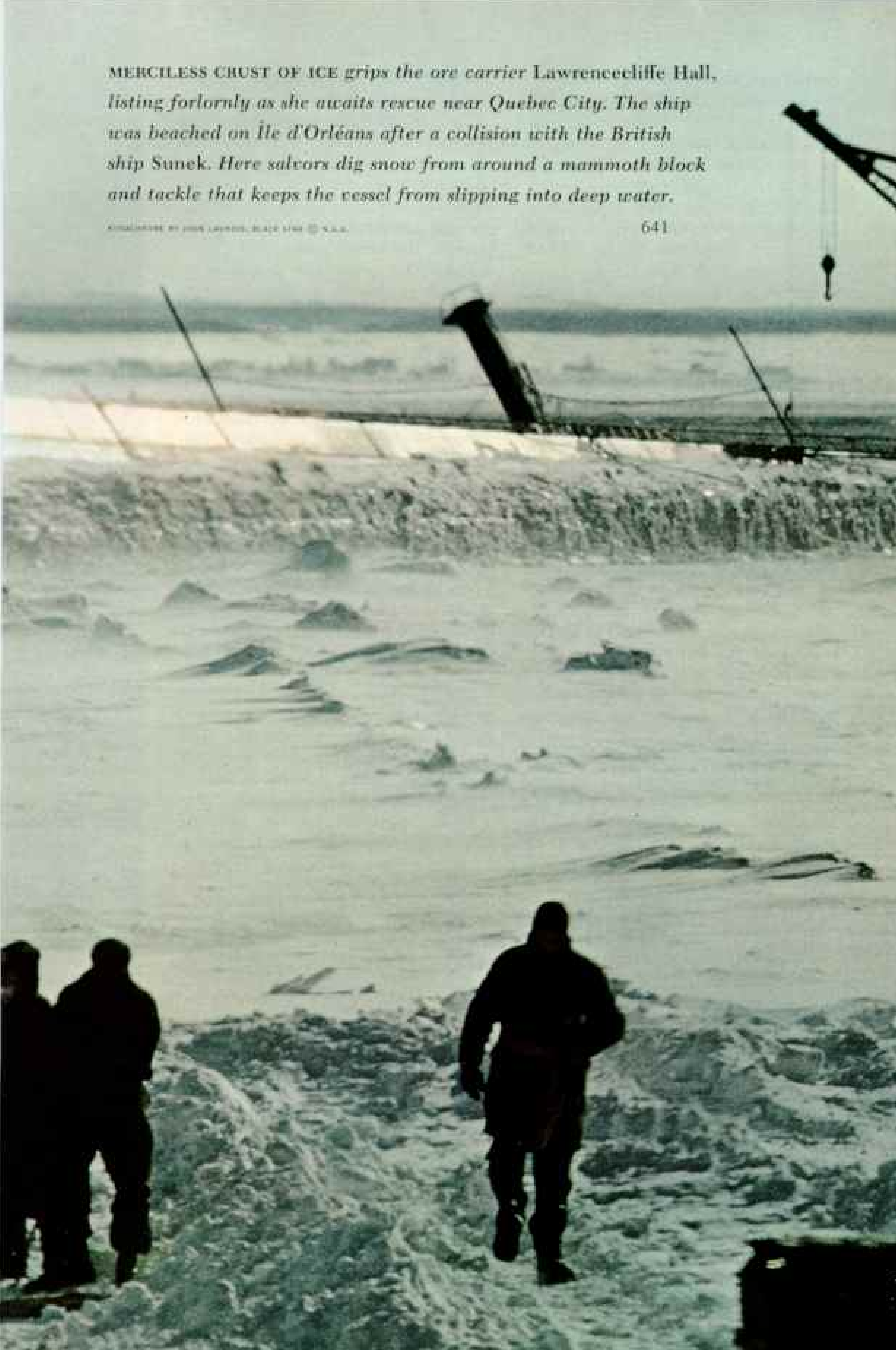
Between the mouth of the Saguenay and the city of Quebec, lovely rustic islands dot the river. The largest of them had enchanted Cartier's crewmen; because of the profusion of grapes, they named it for Bacchus, the god of wine. Their more prosaic leader christened it Île d'Orléans, and the latter name stuck.

The intervening centuries have, if anything, added to the island's enchantment. Farmsteads and villages, isolated by the surrounding waters, have preserved the atmosphere of 250 years ago, when Canada belonged to the habitants. The fenced farms, long and narrow to give every family a segment of precious river frontage, slope up from the shoreline in vivid strips of green. The houses possess the settled tranquillity of age, and all but one of the island's six churches date from the early 18th century.

On a lazy July day, with the smell of new-mown hay sweet on the air, I trudged across the Île d'Orléans. Save that most of the farmers had replaced their horses with tractors, I might have been back in New France. At a farmhouse displaying the sign PAIN DE MÉNAGE, I bought a loaf of hot, gold-crusted homemade bread, and at another a basket of raspberries picked that morning. No gourmet ever lunched more splendidly.

South of Île d'Orléans, the city of Quebec, onetime capital of New France and present

CLIFFE HALL



MERCILESS CRUST OF ICE *grips the ore carrier* Lawrencecliffe Hall, *listing forlornly as she awaits rescue near Quebec City. The ship was beached on Île d'Orléans after a collision with the British ship* Sunek. *Here salvors dig snow from around a mammoth block and tackle that keeps the vessel from slipping into deep water.*

capital of Quebec Province, overlooks the St. Lawrence from a grim, granitic bluff (pages 652-3). Samuel de Champlain founded a colony here in 1608, and its name came from the Algonquian word *kebec*, meaning "narrows." A natural fortress on the order of Gibraltar, Quebec glowered down from its height, and no ship could pass upriver without sailing beneath its guns.

European nations knew that control of Quebec spelled control of the St. Lawrence. Five times invaders besieged the city; four of the hostile armies flew the Union Jack; one, during the Revolution, was American. When Quebec fell in 1759, that fall effectively ended the French empire in Canada and delivered to Britain all of eastern North America from Florida to the Arctic.

Esprit Undimmed by Passing Years

Two centuries of separation from the mother country, however, has not diluted Quebec's quintessentially French *esprit*. French language and attitudes still prevail, and the memory of its past enfolds the city like a dream.

No matter how often I found myself in the sparkling new buildings that line the Chemin St. Louis or the handsome suburbs of Sainte Foy and Sillery, I always returned to the city's old streets, gray and brooding beside the St. Lawrence ... to the Ursuline Convent where Montcalm lies entombed ... to the sturdy house built by explorer Louis Jolliet in 1683 ... to the massive edifices of Laval University.

I would stroll the boardwalk along Dufferin Terrace, 200 feet above the river, on up the Promenade des Gouverneurs into the serenity of the Plains of Abraham. An ultimate calm envelops the old battlefield. The grass seems greener, the breeze softer, the silence deeper. The peace has a quality of eternity, as though in some way the anguish and bloodshed of the past has forever after exempted this plot of ground from violence.

I strolled across the neatly cropped turf, past children flying kites or joyously smearing their faces with ice cream, past the simple stone at the spot where "gallant, good, and great Montcalm" received his mortal wound, and another, beyond a rise of ground, where Wolfe fell.

Louis Joseph, Marquis de Montcalm had victoriously commanded the French regulars of New France—actually only a few thousand men—for three years when, in the spring of 1759, a British flotilla sailed up the St. Lawrence to Quebec, bearing 8,500 crack troops under Gen. James Wolfe.

Only 32 years old, Wolfe had served as a brigadier in the 1758 conquest of Louisbourg. Although indecisive as a strategist and bedeviled by wretched, continually failing health, he was a brilliant battlefield commander.

Wolfe spent the summer debating where and when to launch his attack.

KODACHROMES © N.G.S.

Like a finger in a glove, the refloated, good-as-new *Lawrencecliffe Hall* steams into the Eisenhower Lock on the St. Lawrence Seaway. With scant room to spare, port and starboard, fore and aft, big ships inch in and out of locks without the aid of tugs. In hot weather, crews cool their decks with water, lest the long hulls expand and droop at bow and stern, thus exceeding allowable draft in locks and Seaway channels.

From Montreal to Lake Ontario, the Seaway stretches 189 miles and climbs seven locks. Between the first lock at St. Lambert and the last control dam and lock at Iroquois, ships traveling the Seaway climb 221 feet.

LAWRENCECLIFFE HALL

Montcalm waited, knowing that time was his sole ally; only fall with its freezing temperatures could drive the British back downriver.

Then at 4 a.m. on the morning of September 13, Wolfe led his men—a Highland regiment in the van—up a steep path at the tiny cove of Anse au Foulon and onto the Plains of Abraham. Montcalm, who had been anticipating an attack on his opposite flank, hurriedly gathered his forces on the Plains.

In the formal manner of the day, the commanders deployed their troops into order of battle. The British, clad in scarlet, faced five battalions of white-uniformed French regulars, with Canadians and Indians on both flanks. The British waited stoically as colors caught the breeze, drums rolled their valiant cadence, and trumpets blared of glory. Finally, at ten o'clock on that pleasant morning, Montcalm gave the order to attack.

Decisive Battle Ends in Minutes

The French, Canadians, and Indians advanced, firing sporadically. The British—formed two deep in the thin red line that was shaping destiny from the St. Lawrence to the

Ganges—continued to wait. When the French reached point-blank range, a scant forty yards away, the redcoats fired a murderous volley. The French recoiled. Two more British volleys routed them completely. The battle ended in minutes.

Both commanders received mortal wounds. The French hurried Montcalm through the city gates, and he died the next day. As one of his last acts, he dictated a letter to the British imploring pity for his sick and wounded.

Wolfe died on the battlefield, torn by three musket balls. Some said that the young general, haunted by his failing health, had courted death. One of his officers, a Captain Knox, recounted Wolfe's last moments:

> Being asked if he would have a Surgeon? he replied, "it is needless; it is all over with me." One of them then cried out, "they run, see how they run." "Who runs?" demanded our hero, with great earnestness, like a person roused from sleep. The Officer answered, "The enemy, Sir; Egad they give way everywhere." Thereupon the General rejoined, "Go one of you, my lads, to Colonel Burton; tell him to march Webb's regiment with all speed down to Charles's River, to cut off the retreat of the fugitives from the bridge." Then, turning on his side, he added, "Now, God be praised, I will die in peace:" and thus expired.

Ironically, Wolfe's victory did not drive the French from the banks of the St. Lawrence. Quite the contrary. New France's 60,000 settlers have fathered 6,500,000 French-speaking Canadians, some 5,000,000 of whom live in present-day Quebec Province.

Maintaining their separate identity while all but engulfed by 210,000,000 English-speaking citizens of Canada and the United States has proved a vexing problem for the Québecois. English has already established some astonishing linguistic beachheads. In Quebec, I have refreshed myself at a *soda fontaine*, searched for bargains in a *seconde-main* store, munched *patates chips*, and even chalked a cue in a *salle de pool*. On one memorable occasion, I heard one young lady take leave of another on a street corner. "Okey-doke," she said. "*Je vous laisse.* Bye-bye."

Actually, I found that the preservation of Quebec's traditions has become a touchy political issue, with a small but vocal minority of Québecois agitating for their province to withdraw from the Canadian Confederation and set up as an independent nation.

"Of course I'm a separatist," one student said. "Independence for Quebec is the only alternative to being culturally swallowed up by the rest of the continent. And you Anglo-Saxons, what will you gain by assimilating

Flipping cod like flapjacks, men ensure even drying for both sides of the split fish on platforms at Cloridorme, Gaspé. When the first explorers of Canada found the seas swarming with food, eager fishermen followed and learned to preserve their catch for European tables by the "hard cure." Today most of Cloridorme's output goes to Italy.

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

Modern Paul Bunyan depends on a tractor instead of an ox to drag out logs during winter lumbering near Chicoutimi. Size of the spruce pile determines his daily wage. Trucked to a frozen lake, the wood awaits spring thaw for the voyage to downstream mills. Vast forests, covering half of Canada, feed the nation's biggest industry, paper and pulp.

EKTACHROME © N.G.S.

us? Will you be any happier on that day when only English is heard in Quebec City, and all the restaurants serve hot dogs and barbecue?"

To gain some understanding of French Canada's predicament, I sought out a NATIONAL GEOGRAPHIC author who has made his mark in Quebec politics—Jean Lesage, Premier of the province from 1960 to 1966.* M. Lesage himself speaks French and English with equal facility; I noticed books in both languages scattered across his desk. After a short chat in which we mutually deplored the impecunious lot of writers, he spoke of Quebec.

"This province is, of course, unique in North America. We have 5,700,000 people, and English is the mother tongue of less than 10 percent of them. In cities, particularly Quebec and Montreal, most are bilingual. But perhaps 1,500,000 in the rural areas speak only French.

"My own thought is that a rapprochement of French and English cultures is necessary throughout Canada. Already, happily, it seems to have begun. Last summer 1,200 students from all parts of Canada came to Quebec for French courses at Laval. The University of Western Ontario now has an extension at Trois Pistoles, where students learn French in a French environment. Here in Quebec, English is compulsory in every school. The currency is printed bilingually, the Parliament in Ottawa functions bilingually, and all federal documents appear in both English and French.

"Separatism is an illusion. But French-Canadian nationalism—meaning our determination to preserve our identity—is not. In this sense, all French Canadians are nationalists to varying degrees. If we hadn't been, we wouldn't have kept our language and traditions. If we don't continue to be, we'll lose them."

The city of Trois Rivières, 75 miles upriver from Quebec, gets its name from a kind of optical illusion. A pair of islands in the mouth of the St. Maurice River gives the false impression

*See "Alexander Graham Bell Museum: Tribute to Genius," by the Hon. Jean Lesage in the August, 1956, NATIONAL GEOGRAPHIC.

that three separate streams empty into the St. Lawrence at that point—hence the name bestowed by the early French explorers.

Although Trois Rivières entered history when Champlain erected a fort on its site in 1634, the modern city owes its prosperity to Canada's premier industry, paper and pulp making. Famed as "Newsprint Capital of the World," this one Canadian city markets almost as much newsprint as all Sweden. Ninety-five percent of it goes to the United States.

Trois Rivières' three mills turn out 100 tons of paper every hour of every day of the year. To feed them and four other mills on the St. Maurice, more than 120,000,000 logs annually float down that river. Since virtually all begin their journey near the river's source, 325 miles north of Trois Rivières, this is the world's biggest and longest logging drive.

Meals End With Pies—After Dessert

Accompanied by Larry Jorgensen of the Canadian International Paper Company, I flew north by bush aircraft to follow a typical log from forest to mill. The airplane droned up the St. Maurice Valley, and once we had passed La Tuque, northernmost town on the river, the forest seemed endless. Here and there on a hilltop a maple tree flamed scarlet—already, in August, touched by the first frost.

Then we were beyond where any maple could grow, and the spruce and fir stretched green and somber toward some Arctic infinity. Lakes beyond number and beyond naming pocked the thick nap of trees. In one I saw two moose, huge and richly brown, splashing through the crystal water. We landed for lunch at a logging camp called Jean-Pierre.

"Things have changed since I was a timber cruiser," Larry said. "Then you got pork and beans and biscuits and molasses, and not much of it. Now the company has calculated that a woodcutter needs at least 5,800 calories a day—about twice the normal requirement—to work efficiently, and even sends the cooks to school."

In the mess hall at Jean-Pierre, we dined cafeteria-style on prime steak and a leafy salad. But the thing that dazzled me was the

Largest log drive in the world annually backs up behind a dam on the St. Maurice River during the spring drive. Tugboat herds the wood toward a dam slide. Downriver at Trois Rivières, lumbermen divert branded cuttings to mills producing newsprint for United States papers. KODACHROME © N.G.S.

array of desserts—half a dozen different kinds of cakes, cookies, and puddings—spread out in an enormous caloric rainbow to tempt the gargantuan appetites of the lumberjacks. And, like a solicitous afterthought, each table held several pies for incidental nibbling.

Machine Takes Place of Bunyan's Ax

My tour of the lumber camps produced a surprise. The forest, I learned, no longer rings to the cheery thwack of the woodsman's ax, and even the whine of chain saws diminishes in the land. Automation has come to logging in the form of the Tree Harvester.

I saw this machine in all its daunting power one rainy day near Cooper Lake Camp, in a vast stand of spruce and balsam that filled the air with the scent of perpetual Christmas. A single nonchalant mechanic operated the harvester, which bore a striking resemblance to a huge yellow dinosaur.

I watched it lurch on its caterpillar treads toward a stately 90-year-old spruce. Two great metal clamps locked the lower trunk in a lethal embrace. Suddenly the clamps shot upward; their cutting edges amputated every branch. A quick scissors slice sent the crown of the tree toppling; another hydraulic shears at the bottom severed the trunk at ground level. The harvester pivoted and released its grip. With a kind of pathetic majesty, the tree—branched, topped, and felled in less than a minute—smashed to the ground.

But men must still fell trees on steep slopes where machines dare not venture. And, because of the perils and loneliness of work in the northern woods, manpower is chronically scarce. So the paper companies recruit labor wherever they can find it.

At Wolf Camp I met some 40 lumberjacks who commute to their jobs via transatlantic jet from Portugal. The Portuguese—"serious

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Spell of sparkling waters lures modern *voyageurs* along the Saguenay. According to early Indians, the mountain-cleaving river led to a legendary kingdom of "honest folk who possess great store of gold and copper." Today's habitants count their wealth in lumber and aluminum—and in the exhilaration of a cruise on tossing waters. Judge Louis René Lagacé and his wife pass St. Rose du Nord in the dory they modified with sailing rig and inboard engine and decorated with an eye on the bow for luck.

men and hard workers," according to their supervisor—arrive in the spring, earn an average wage of $25 a day until the weather turns too cold for their Iberian blood, then head home by jet for a pleasant and prosperous winter.

A fine life, they all agreed, but for one thing. "When I get home," said Alipio da Costa Simões of Coimbra, "my children cry with fear because I'm a stranger. When I leave, they cry because they'll miss me. Because of this job, my children are always crying."

Trucks carry felled trees to streams that run into the St. Maurice, where a machine slices them into uniform eight-foot lengths before launching. Seven hydroelectric dams interrupt the river, and the logs tend to jam above them. I never tired of watching the gray tugs with huge bulldozer blades that dart through the jams like swift sheepdogs, herding the logs toward the slides in each dam (page 647).

Following the drive south, Larry and I peeled off for a day's fishing at Lac Rhéaume, 45 miles northwest of La Tuque. From first light to dark we plied that lonely lake. From its shores, spruces and white birches rose abruptly like arboreal palisades. We cast our lines into the cold dark water, watching clouds mass above the green hills. A solitary, watchful osprey circled high above, and an occasional kingfisher skimmed low past our boat. Only the sudden leap of a trout in iridescent splendor broke the silence.

Finally dusk spread its quiet chill; shadows swallowed trees and water and horizon. We headed toward shore with the day's catch, 22 glistening char, or speckled trout.

With night the lake became so smooth and black that I could see the constellations reflected as in an onyx mirror. Far across the water a loon cried his wild heartbreak. Under the stars, in that pure and windless night, I understood how it must have been when the New World was really new.

At Trois Rivières, conveyors finally carried the logs—their long journey ended—into Canadian International's mill. I saw them stripped of their bark, cut into chips, stewed with appropriate chemicals, and mixed with additional wood ground into fiber. Machines compressed the resultant pulp into paper to carry tomorrow's headlines.

But even the spectacular logging drive may fall before technological progress. "The future," Larry told me, "may see the wood cut into chips in the forest and sent down to the mills through pipelines."

Torture Threatens a Hero's Life

Before leaving Trois Rivières, I paid homage as best I could to a boyhood hero—Pierre Esprit Radisson, one of the first and perhaps the greatest of the legendary traders called *coureurs de bois*—runners of the woods.

In 1651, at the age of 15, Radisson left France to settle in Trois Rivières. Soon after, an Iroquois war party captured him as he

hunted ducks on the St. Lawrence. Eventually, they put him to the torture.

His memoirs, written in English, describe it: "They bourned the soales of my feet and leggs . . . run through my foot a swoord red out of the fire, and plucked severall of my nailes. . . . For the great torments that I souffred, I knew not whether I was dead or alive."

But the capricious Iroquois spared him. In time he escaped and made his way back to New France, where he became a coureur de bois, an unlicensed trader in furs. Like his fellows, he ascended the St. Lawrence into the great green wilderness that stretched beyond the furthest imaginings of men, to the forests slashed with silver lakes, to the banks of cool rushing rivers, to the Indians, savage and innocent, to brown-eyed maidens who smiled from shadowed lodges.

Robe in Readiness for Chinese Emperor

And always, beyond the next bend of the stream, or the next rapids, or the next mountain, the coureurs might find the China of their dreams. One of them, Jean Nicolet, even carried a mandarin's robe so that he might attire himself properly to meet the emperor.

Meanwhile there were beaver pelts to make

a man wealthy, and a free adventurous life of exploration. The coureurs helped open the West, and the names they scattered across the heart of the United States linger still: Terre Haute, Boise, Coeur d'Alene, and the fanciful Grand Teton. Iron and gunpowder enabled these men to dominate a virgin continent, and Radisson caught all the wonder of it in three words: "We weare Cesars."

In 1660, he and his brother-in-law, Médard Chouart, Sieur des Groseilliers, perhaps were the first white men to reach the Mississippi. While his journal is obscure—deliberately so in order to conceal the source of his beaver skins—Radisson apparently journeyed down that river, possibly to the Gulf of Mexico.

Once, as he and Groseilliers prepared a flotilla of pelt-laden canoes to take down the St. Lawrence to Quebec, their Huron paddlers refused to set off for fear of an Iroquois ambush. At a solemn council attended by some 800 warriors, Radisson seized a beaver pelt and slapped the face of a chief: "Shall your children learne to be slaves among the Iroquoits for their Fathers' cowardnesse? ... For myne owne part, I will venter choosing to die like a man than live like a beggar."

The Hurons brought the furs to Quebec.

KODACHROMES © N.G.S.

Veiled by the warp on her loom, a young weaver demonstrates an 18th-century craft. She creates a tapestry at Brimbale House, a historical monument on Île d'Orléans, a rural island near Quebec City.

Crusty bread, steaming soup, and a blazing fire warm visitors to the Hearth, another landmark on Île d'Orléans. During summer months tourists can dine on a few simple dishes while visiting this restoration of two country houses, one built in 1680, the other in 1720.

Oft-embattled capital of New France, green-roofed Quebec clusters by the river it ruled. Hotel Château Frontenac looks across the half-mile-wide St. Lawrence to Lévis and Île d'Orléans at left.

Although more than once Radisson's beaver saved the near-bankrupt colony, the government of New France—shortsighted and greedy—rewarded his exploits with huge fines for trading without a license. So Radisson defected to the English and helped found the Hudson's Bay Company. Later he returned to the French fold; and then once again to the English. He died in obscurity, trusted by neither side. Now he lies somewhere in a grave unmarked and unremembered.

The nations that owe him so much have never built a monument to that superb woodsman. But in Trois Rivières, where once he lived, a short street bears his name. I could do nothing else to pay my respects, so I walked the length of Rue Radisson. And I thought of how it must have been for that all-too-human Caesar, having to "lye down on the bare ground, & not allwayes that hap, the breech in the watter, the feare in ye buttocks, to have the belly empty, the wearinesse in the bones and drowsinesse of ye body."

The street ended shabbily at the railroad tracks. I left it and didn't look back. Sleep well, Pierre Esprit.

Soviet Freighter Hurries the Season

Just above Trois Rivières, the St. Lawrence broadens into sluggish eight-mile-wide Lac St. Pierre. For the 20-mile length of this great, quiet pool, the current seems suspended, and ships chug complacently up and down the 800-foot-wide channel dredged through the middle. At least, they do in summer. Winter tells another story.

Standing on the bridge of the Canadian Coast Guard icebreaker *Montcalm* with Capt.

KODACHROME BY JONATHAN S. BLAIR © NATIONAL GEOGRAPHIC SOCIETY

Just upriver from the Citadel, on the right, British Gen. James Wolfe in 1759 climbed a 200-foot bluff to the Plains of Abraham to defeat Gen. Louis Joseph de Montcalm and win Canada from France.

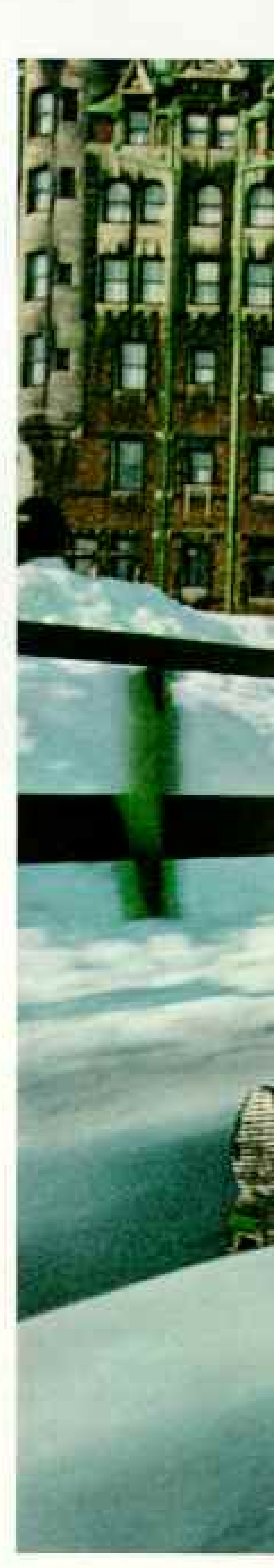
Alexandre Moreau, I learned something of the problem posed by Lac St. Pierre. It was a February morning, and a thick vapor covered the icy river. Ships loomed out of it suddenly like ghosts and as suddenly disappeared.

"The presence of ice depends upon many variables," the captain explained, "and here they all converge. The current is slack, and when the wind is easterly, the floes jam into a mass. An icebreaker must stay in action all winter to keep the channel open."

The success of icebreakers and the intrepidity of the new breed of freighter skippers may be measured by the cup awarded annually to the first ship of the year to reach Montreal. Traditionally, it was awarded sometime in early spring. Last year it went to a Soviet vessel that tied up on January 3.

The banks of the St. Lawrence between Quebec and Montreal have been thickly settled since the 17th century. In 1684, Baron de Lahontan noted that "both sides of the river are so closely inhabited that one can truthfully say they are two continuous villages sixty leagues in length." By night, lights of the parishes still gleam across the water like so many sequins strung along the shoreline—until the north bank erupts into the incandescent explosion that is Montreal.

Whereas Quebec, gray and grand on its bluff, seems to peer back into the past, Montreal—its 2,419,000 people jostling each other in a 494-square-mile urban sea that laps about the foot of Mount Royal—has its eye fixed firmly on the future. Everywhere I looked I found that a building boom of prodigious proportions had seized the city (see "Montreal Greets the World," pages 600-621).



Tobogganers scream, canoeists scramble: Québecois make the most of winter. Facing backward to heighten the thrill, four riders hurtle toward the turreted Château Frontenac near the end of a 60-mile-an-hour run down from the slopes of the Citadel (page 653). Racing at Quebec's Winter Carnival, canoeists lurch across floes that tip treacherously underfoot, alternately paddling, pulling, pushing, and carrying their craft. Steel-reinforced ice canoes originated with island farmers, who used them to fetch doctors, priests, and supplies from the city during the five months that ice clogs the St. Lawrence. Split-level Quebec took root in 1608 when Samuel de Champlain founded Lower Town on the narrow riverbank. An elevator and the Breakneck Steps lead to walled Upper Town, dominated by the Château Frontenac and a tall office building.

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

Although a thousand miles from the open Atlantic, Montreal is one of the busiest harbors in North America. Its miles of wharves have a poetry about them—a poetry composed of smells and sights and ships and sailors from faraway ports. I watched the *Hornero* out of Buenos Aires, the *Isolde* out of Stockholm, and the *Aizu Maru* out of Tokyo loading Canadian flour, chemicals, copper, and lumber. Forklift trucks darted out of warehouses, carrying commodities as varied as pickled pigs' tails and raw asbestos.

The foreign vessels in their turn disgorged glassware, textiles, fruit, and machinery. Beside the harbor's five grain elevators, a generous sprinkling of Soviet vessels out of Odessa and Archangel were loading wheat. I listened to the soothing hiss of the grain funneling into the vast holds. Seeing no evidence of off-loaded Soviet cargo on the quays, I asked a longshoreman what the U.S.S.R. exported to Canada in exchange for the wheat.

"Money," he replied contentedly.

Fur for Top Hats Built Montreal

Wandering the wharves, I couldn't help but think of the bizarre commerce that had sired this waterfront. For the port of Montreal was born of the fur trade, that strange, glittering spindrift on the tidal wave of history. The fur trade rose in the 17th century when beaver top hats suddenly became fashionable in Europe, and died in the 19th when, just as suddenly, they fell from favor.

The intervening 200 years saw the beaver driven to the brink of extinction. The "servants" of Canada's two titans of the trade—the Hudson's Bay Company and the Northwest Company—foraged farther and farther inland until, in 1793, Alexander Mackenzie reached the Pacific Ocean.*

Before the bubble burst, beaver pelts were being carried, by backpack and canoe, 2,000 miles from northwestern forests to Montreal. The risks were enormous, the profits scant. Someone once pointed out that only two peoples in the world were poor enough and fey enough to undertake the fur trade—French Canadians and Scots. And, in a curious alliance, they did. French-Canadian *voyageurs* paddled the birchbark canoes; Scottish *bourgeois* bought and sold the pelts. Some few, but very few, of the Scots grew rich; without exception the voyageurs remained poor.

A voyageur had to be short to tuck his legs inside a shallow canoe as he paddled; he had to be strong to carry the fearful loads at portages—a standard 180 pounds per man plus his share of the canoe. Nor could he stagger beneath these burdens; each voyage was a dangerous race against winter, so he had to cover the portage at a swift trot.

Fast open water came as a joy, and the voyageurs always sang as they paddled—every witness attests to that. They sang, and they died young. When Daniel Harmon first voyaged out of Montreal in 1800 as a neophyte bourgeois, he counted 30 crosses at a single bend in a single rapids.

There at Montreal, where each springtime the canoe brigades had departed upriver to the boom of cannon and the cheers of citizens, I looked out and could almost see those small, magnificent men in the *tuques* and sashes, their paddles biting the blue water and their voices keeping time with the strokes: *Youpe, youpe, sur la rivière....*

No observer ever recorded that the Scotsmen sang. But dour George Simpson, governor of the Hudson's Bay Company, would travel with a towering stovepipe hat crammed on his head and two kilted pipers skirling mightily in the stern of his long *canot du maître*. And an anonymous compatriot, overcome with Celtic melancholy in some Canadian forest, wrote perhaps the world's most nostalgic verse:

From the lone shieling of the misty island
Mountains divide us, and the waste of seas—
But still the blood is strong,
the heart is Highland,
And we in dreams behold the Hebrides.

Mohawk Pride Restored by Steel

On the south bank of the St. Lawrence, just across the boiling Lachine Rapids from Montreal, stands North America's most unusual Indian reservation—Caughnawaga. Four thousand Mohawks live in Caughnawaga, and its men have won a worldwide reputation as workers in high steel (pages 664-5).

Wherever a bridge or a skyscraper goes up in North America, you may well find the Mohawks of Caughnawaga working at the topmost point.† Structures in Europe and Asia also bear their hallmark.

I visited Caughnawaga on a Sunday. Past

*Ralph Gray told of this epic trip in "Across Canada by Mackenzie's Track," GEOGRAPHIC, August, 1955, and Sigurd F. Olson described the days of the voyageurs in "Relics From the Rapids," September, 1963.

†See "The Mohawks Scrape the Sky," by Robert Leslie Conly, GEOGRAPHIC, July, 1952.

the giant cross made of structural steel that guards the village entrance, I made my way among the unmarked streets—the Indians have stoutly resisted all efforts to label their thoroughfares—to 242-year-old Fort St. Louis. There, in the mission church, an Indian choir has been singing the Roman Catholic liturgy in Mohawk every Sunday for centuries.

During the Mass, with the haunting polyphony of the Indian chants in my ears, I looked at a life-size crucifix above the altar where a bleeding, fainting Jesus suffers without surcease. The women of Caughnawaga gave it to the church in memory of 35 of their men who died when the Quebec Bridge—which spans the St. Lawrence south of Quebec City—collapsed while under construction in 1907.

After Mass, Père J. Léandre Plante showed me through the mission. We leafed through the brittle pages of 18th-century volumes, wherein the priests of Fort St. Louis had recorded the births and deaths of their Indian parishioners. After a descent into the musty powder magazine, we walked idly atop the thick wall that had protected this bastion of God in the wilderness.

Père Plante pointed to the wall's raised convex edge—perhaps two feet wide, exceedingly rich in right angles, and with a 12-foot drop on the river side.

"The Indian boys ride their bicycles along there," he said. "It's a terrifying spectacle. They do it to prove that they're worthy to work in high steel when they grow up."

I had heard myriad explanations for the Mohawks' mastery of high-altitude construction. According to one theory, a genetic freak had removed their fear of height; another held that their ancestors' ability to slink through narrow forest trails had been inherited and applied to equally narrow girders.

I put the question to Caughnawaga's elective chief, Andrew Tanahokate Delisle.

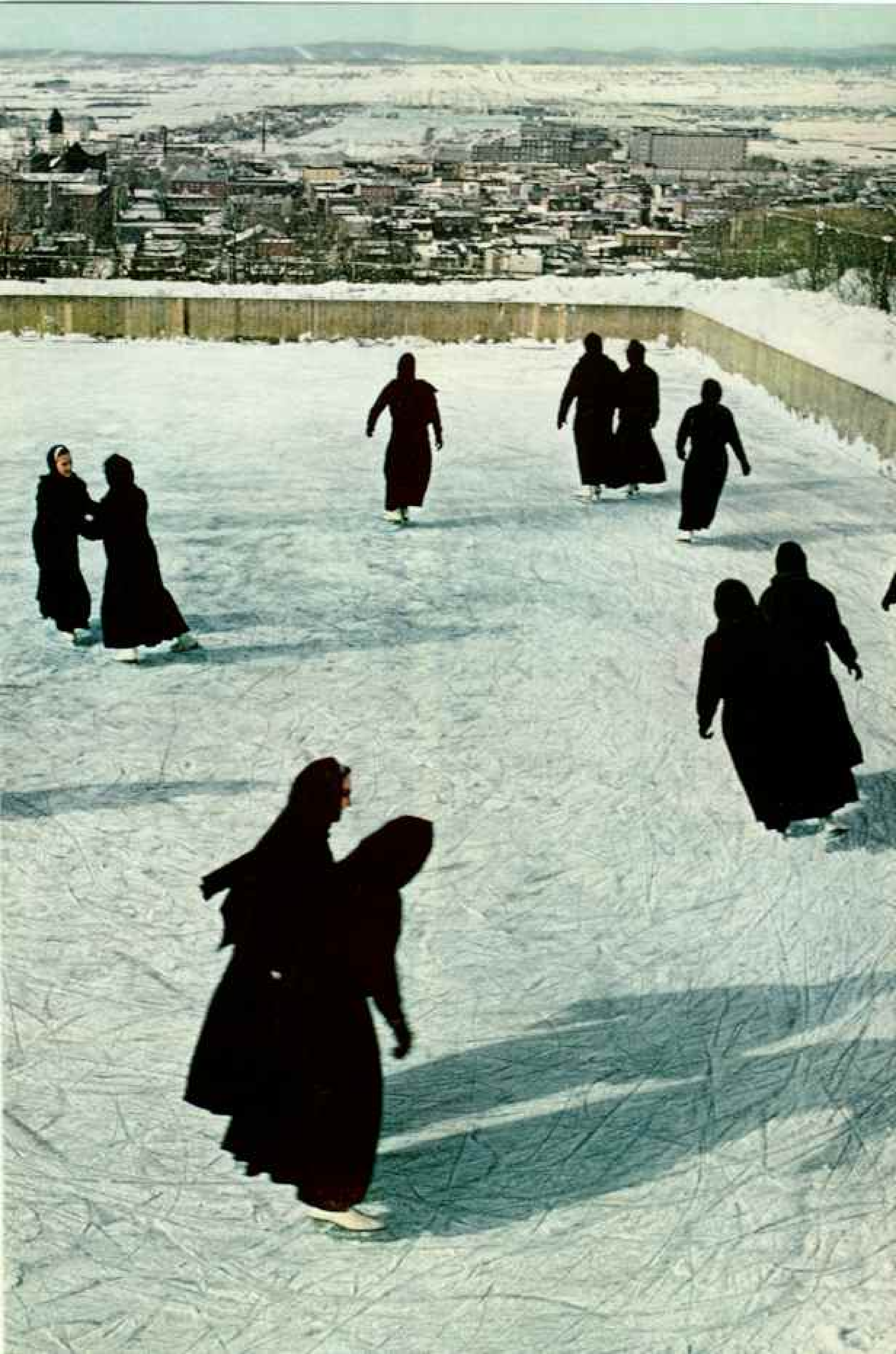
"It's simply a matter of pride," he said. "We

(Continued on page 662)

KODACHROMES © N.G.S.

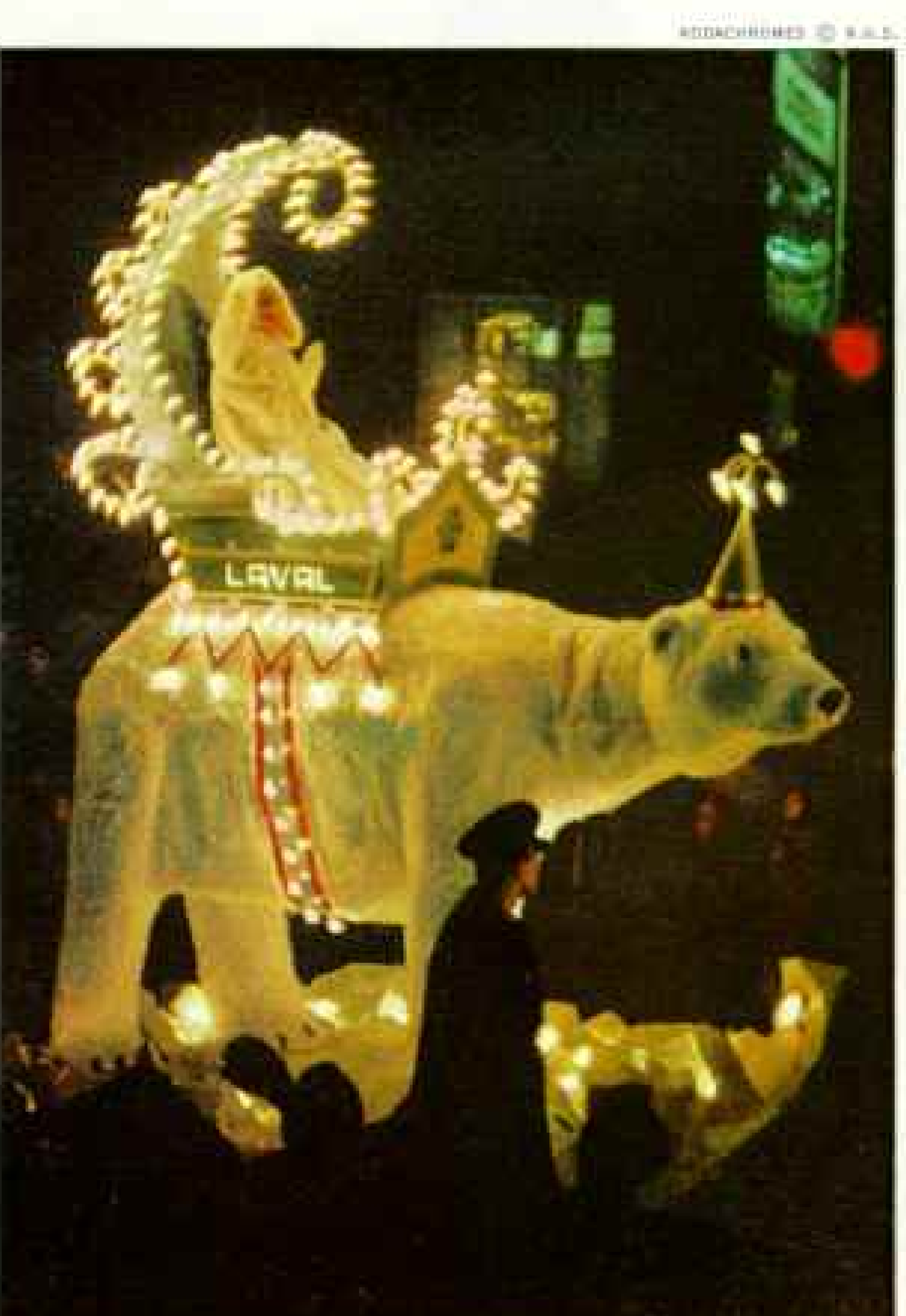
As if digging an icy grave, Danish-born Troy Friis hacks out a swimming hole by his Quebec apartment, then plunges in for an early-morning dip. Temperature: minus 5° F. Stoutly maintaining that a brief immersion promotes good health, this hardy human polar bear stays in only an instant, then scrambles out and sprints across the ice to his home. Now 56, he has done it every winter of his adult life.

BLACK SILHOUETTES ON WINTER WHITE, *nuns teaching at St. Joseph de St. Vallier girls school in Quebec glide about a rink. Just as French serves as the language of the province, so Roman Catholicism embraces 95 percent of all Québecois. Gray foothills of the Laurentian Mountains rim the north horizon.* KODACHROME © N.G.S.



Revelers besiege an ice castle during Quebec's "Mardi Gras of the North," the pre-Lent Winter Carnival. Papier-mâché polar bear parades the "Duchess of Laval," one of seven Quebec beauties competing to become carnival queen. Builders of the 60-foot-high Ice Palace lifted frozen blocks into place with derricks, then cemented them with squirts of water. Launched by winter-weary Québecois "to enliven the monotony of our dull season," the carnival nearly doubles the city's population as Quebec erupts with three weeks of street dances, costume balls, and winter sports. (See "Winter Brings Carnival Time to Quebec," by Kathleen Revis Judge, GEOGRAPHIC, January, 1958.)

KODACHROMES © N.G.S.



Dashing through the snow in one-horse and one-pony sleighs, mother and daughter defy the drifts of Île d'Orléans. Many island families keep sleighs ready for use during severe winters. Gray paving of ice covers the St. Lawrence in the background. Growing ever broader in its descent to the sea, the river meets salt water 40 miles below Quebec; it seldom freezes over completely below Île d'Orléans.

Emerald arrow of Point Frederick, guarding Kingston Harbour at left, commands the uppermost reach of the St. Lawrence where it spills from Lake Ontario. Venerable halls of the

Mohawks always held our heads higher than the other nations. When we lost our lands and our way of life, our self-respect went too. For generations the men of the band tried to restore it through hazardous jobs. When the fur trade needed canoemen, we were canoemen. When loggers were needed, we were loggers. Then we discovered high steel. Today, once again, the children of this village can look at their fathers with pride."

Atlantic Comes to Continent's Heart

Before 1959, most ocean-going ships ended their voyages at Montreal. But the completion of the St. Lawrence Seaway in that year opened Great Lakes ports to ships that ply the Atlantic.* Seven locks bypass the rapids that churn the St. Lawrence between Montreal and Lake Ontario, and last year they lifted 7,330 vessels up the Seaway.

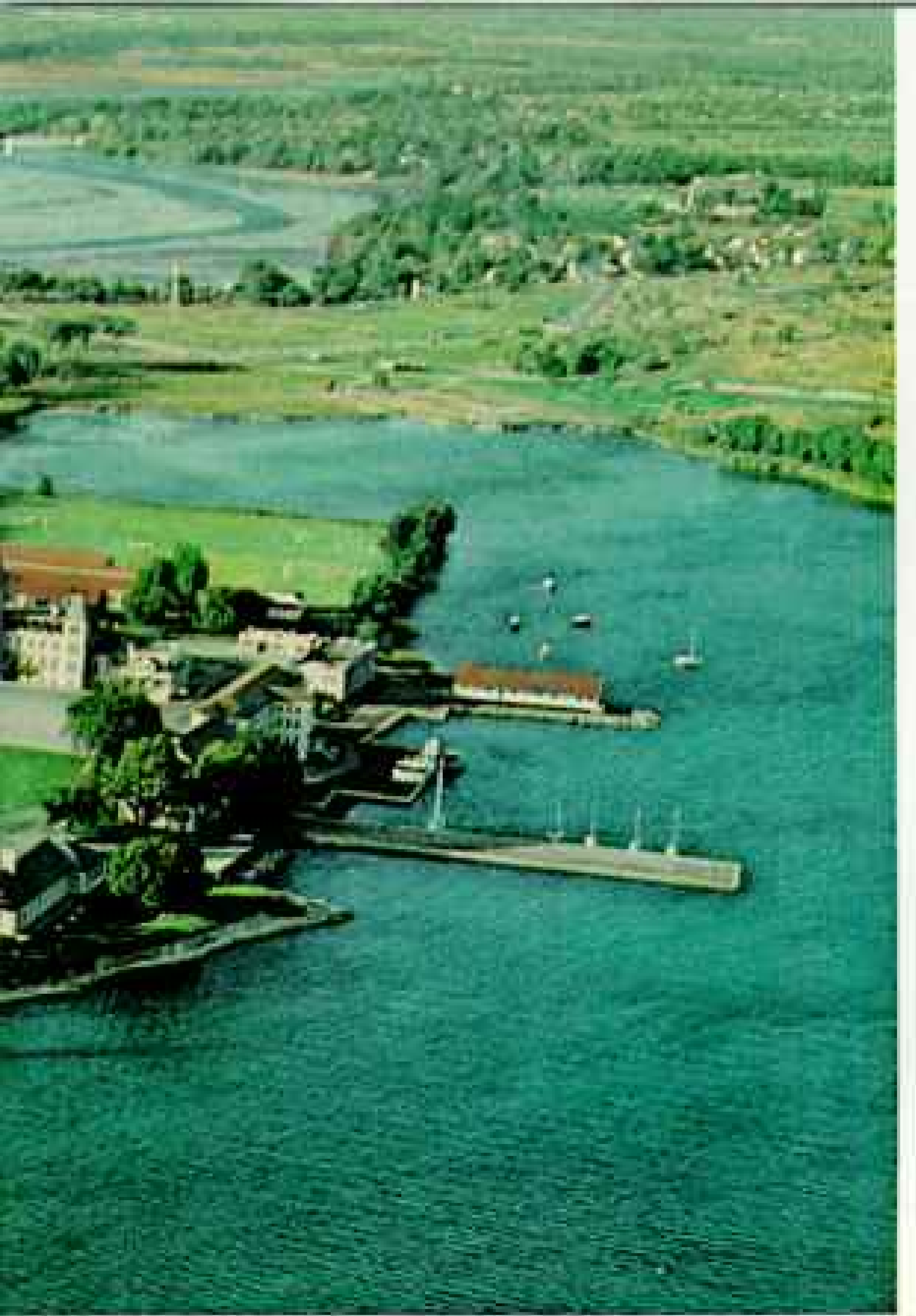
On the Seaway stretch of the upper St. Lawrence, a strange affinity seems to unite ship and shore. I remember standing one night on the deck of M.S. *Rimouski* as we glided through the channel beside the Lachine Rapids. Never more than 100 or 200 feet from the sleeping houses on the southern bank, *Rimouski* slipped past Caughnawaga. Dogs barked at our approach and gruffly ceased when we had passed. On the road skirting the channel, a car passed—two stabbing headlights, a roaring motor, two receding rubies—almost as though we shared a common freeway.

Nor is this highway analogy exaggerated. Capt. Reginald Belcher of *Rimouski* carefully cut speed the next day as we reached the narrows by Wellesley Island.

"The U. S. Coast Guard scans the river on radarscopes," he explained. "If they catch a ship exceeding the limit—nine miles an hour, in either direction—they levy a fine ranging from $50 to $300."

North of the beige-colored stream, from Cornwall to Kingston in the Province of Ontario, lies old Loyalist country, and proud of it. The monuments that dot the shore at frequent intervals celebrate neither freedom nor independence, but rather those Americans of 1776 who, scorning the radical appeals of the Continental Congress, bore arms in defense

*See, in the NATIONAL GEOGRAPHIC: "New St. Lawrence Seaway Opens the Great Lakes to the World," by Andrew H. Brown, March, 1959, and "New Era on the Great Lakes," by Nathaniel T. Kenney, April, 1959.



Kingston upperclassmen, future elite of Canada's armed forces, parade to lunch. All freshmen cadets must run from class to class.

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

Royal Military College line up behind fortifications raised in fear of U. S. attack more than a century ago.

of king and country. The Loyalists—or as some of their contemporaries called them, Tories—chose their side through conviction. History cannot label it either the right side or the wrong side, but only the losing side. And in losing, the Loyalists lost everything—nation, homes, worldly goods.

With the peace of 1783, some 35,000 of them fled to Canada. About 5,000—veterans of the Queen's Loyal Rangers, the King's Royal Regiment of New York, the American Riflemen—settled along the St. Lawrence, where the British Government granted them land. Their descendants live there still, in neat, quiet villages like Morrisburg and Cardinal.

A living museum called Upper Canada Village re-creates the times and trials of those Loyalist settlers. Houses, churches, inns, stores, and mills of the early 19th century cluster alongside the St. Lawrence, forming a typical hamlet of Ontario's pioneer past.

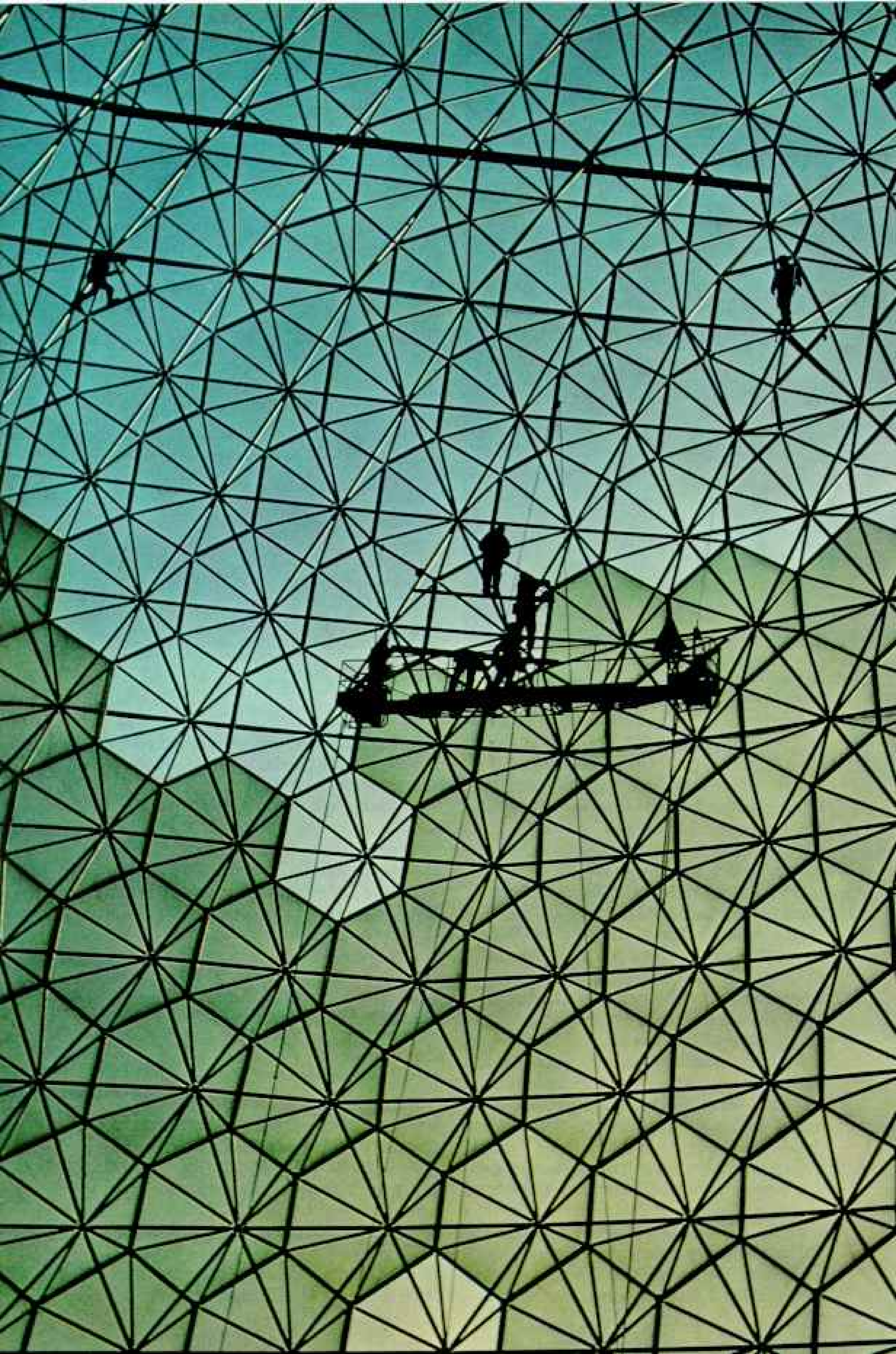
I saw a cheesemaker and a blacksmith practicing their crafts, and in the sawmill I watched a gleaming water-powered blade as tall as a man slice through a timber broad-axed from the trunk of a pine. Everything—furnishings, techniques, instruments—reflected the period between settlement by the Loyalists in 1784 and Canada's Confederation year of 1867.

William Patterson, Superintendent of Historic Sites for the St. Lawrence Parks Commission, told me that time had brought few changes to the river's north shore.

"There are no important natural resources here," he said, "and good farming land is spotty. So, few newcomers settle in this area. If you were to look at a roster of our local employees and then visit any early churchyard, you'd find that the family names are identical. Almost everyone living in this part of Ontario has a Loyalist background."

Old Letters Still Dun for Debts

Tramping the board sidewalks of Upper Canada Village, I passed the austere white clapboards of Christ Church and the neat red-brick exterior of Cook's Tavern. In the back of Crysler's Store, a bulletin board displayed a few letters posted in 1838. In one, a Mr. Hall of Montreal was dunning a Mr. Willard of Williamsburg, Upper Canada. Another letter from Toronto demanded an overdue $25 from the same Mr. Willard: "I expect to be at



Human spiders spin a web—the 187-foot-high geodesic dome of the U. S. exhibit in Montreal's Expo 67. Cat-footed Mohawk Indians such as Michael Chuck Sky (above) rig the network of steel girders—a perilous vocation that the tribesmen pursue anywhere in the world. Some 4,000 Mohawks live on Canada's Caughnawaga Indian Reserve near Montreal. In its Kateri Cemetery, a cross of I beams marks the grave of a worker in high steel—one of 35 Mohawks who died when the Quebec Bridge collapsed during construction in 1907.

"Garden of the Great Spirit," Indians called the Thousand Islands, an inland archipelago of nearly 1,800 isles that each summer lure four million United States and

Brockville in about *two weeks*, and I must beg that you will pay the above amount by that time." Reflecting upon my own mail, I immediately identified with Mr. Willard and, across a gulf of 128 years, I wished him well.

In its upper reaches, the St. Lawrence fragments into the lush Edwardian pleasureland of the Thousand Islands (above). Threading among them, I wondered if the discoverer had grown weary of counting, for almost 1,800 islands—ranging from a few square yards to 18-mile-long Wolfe Island—dot a stretch of river 50 miles long.

Neat summer cottages stud the green isles, and yachts and sailboats course the channels, leaving brief creamy wakes in the green water. Girls on water skis wave to the passing freighters, and the sailors gaze wistfully on an elegant vacationland that their lives will touch only in this swift passage.

Ashore at Kingston, I passed through a limestone arch, walked down along a curving road, and entered the great open quadrangle of the historic Royal Military College of Canada. Founded after British troops sailed for home following Confederation, the R.M.C. has been training officers for the Canadian forces for a century (pages 662-3).

No Dress Uniforms Until Christmas

In his high-ceilinged office in the Mackenzie Building, the Commandant, Air Commodore L. J. Birchall, briefed me on the history and mission of his institution.

"The R.M.C. has always been unique," he told me. "From the very beginning, our graduates went into all the services. The recent integration of Canada's armed forces didn't cause a ripple here. Every cadet takes the same courses whether he's destined for the Army, the Navy, or the Air Force. Yet—and this is important—the R.M.C. is not only a

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

Canadian vacationers. Cruise ship *South American*, bound from Montreal to Detroit, navigates the narrow road of the St. Lawrence Seaway where it threads the U. S. side.

military academy. It's also a university, and one that confers graduate degrees.

"Our aim," he continued, "is to educate a boy to his highest potential, in the belief that he'll then be a finer asset to his service and to Canada. Last year, 42 percent of our senior class graduated with honors, and 10 percent of them received scholarships to continue their studies on a graduate level."

He nodded toward the quadrangle, where early arrivals for the September term were gathering. "Unfortunately, you won't see our new cadets in dress uniform. We've learned the hard way not to issue them before Christmas. It takes us that long to slim down the pudgy and fill out the lean."

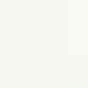
From the Mackenzie Building, where the red-and-white flag of the R.M.C.—inspiration for Canada's new national flag—whipped from the central clock tower, I strolled to the old fort at Point Frederick. It looked upstream toward the invisible line where Lake Ontario ends and the St. Lawrence begins.

The smell of open water was in my nostrils as I watched the sun sink behind the spires and domes of Kingston. From the west a wind that had blown a long, long way thrummed past my ears. Once, more than 300 years ago, some unknown, adventurous coureur de bois had paddled his canoe out of the River of Canada at this spot. How his heart must have sunk as he peered out toward the blank horizon, knowing that this fresh-water sea could never lead to China.

But I knew something that he had not known. The magnificent stream he had followed—and that I had followed so long after him—led to the heart of a continent richer by far than Cathay, a continent fated to mold the castoffs of the Old World into mighty nations, a continent that has come to symbolize man's best hope.

THE END

Big and Bountiful Eastern Canada: New Portrait of a Land on the Move



LONG TRAINS carrying iron ore clatter through the northern wilderness, while jackhammers punch out new paths of progress in cities to the south. Harbors resound to the tuba-like groans of heavy shipping, and on brawling rivers, countless logs jostle their way to paper mills. This is Canada in its centennial year, where men and machines work to put their burgeoning nation into even closer communion with its golden promise.

For its latest World Atlas Series Map, **Eastern Canada**, the National Geographic turns to the heart of this youthful giant: the St.

Lawrence country, where the great river pries open the land in its rush to offer itself to the Atlantic. Parts of eastern Canada have undergone significant changes in recent years. Brash new towns, such as Labrador City, have sprung up in the wilderness. In 17 years, the village of Sept Îles has grown from 1,200 to 14,000 inhabitants to become the third busiest port in Canada, after Montreal and Vancouver.

Much of this development springs from the discovery of almost inexhaustible quantities of iron ore in the region where Quebec joins western Labrador amid a maze of lakes and sinewy rivers. From there, ore now flows south at the rate of 80,000 tons a day.

As busy as this section of eastern Canada has become, however, it is to Montreal, deep in the funnel of the river, that the attention of the world turns in 1967. In observance of the nation's 100 years of confederation, that city of bristling activity plays host to Expo 67, the first fair in the Americas to be accorded top rating by the International Exhibitions Bureau in Paris.

A large inset at the top of the new map traces the eight-year-old St. Lawrence Seaway, which has helped make Montreal one of the busiest ports in North America, handling more than 20,000,000 tons of cargo each year.

In the long, shelving basin of the Bay of Fundy, the Canadian Government has begun new studies of an old dream—harnessing the powerful Atlantic to generate electricity. Possible sites include the Minas Basin in Nova Scotia, with tides up to 53 feet, Passamaquoddy Bay near Campobello Island, and several bays off the northern finger of Fundy.

Meanwhile, another long-time dream—to connect Prince Edward Island with the mainland—has moved out of the visionary stage. Construction has started on a $148,000,000 causeway-bridge-tunnel to span treacherous Northumberland Strait between Port Borden, on the island, and the New Brunswick mainland near Cape Tormentine.

The recent surge of nationalism in sections of eastern Canada, stemming from a French heritage, has gallicized many names. Thus, Quebec's Coldwater Lake has not vanished from the map; it's still there—as Lac-à-l'Eau-Froide. Old Fort Island, off the northeast coast of Quebec, survives as Île du Vieux Fort. And Ha Ha Lake, also in Quebec, retains its joviality as Lac Ha! Ha!

In any language, eastern Canada is a big and bountiful land, with a strong heartbeat that has set the cadence for a nation's march into its second century. THE END

Additional copies of the World Atlas Map of **Eastern Canada** can be obtained for 50 cents each, postage prepaid, by writing to Dept. 403, National Geographic Society, Washington, D. C. 20036.

EKTACHROME FROM CINEMA-PHOTO SERVICE, HYDRO-QUÉBEC © N.G.S.

Woven from concrete and steel, a scallop-skirted curtain dams the plunging Manicouagan River north of Baie Comeau, Quebec. Visitors to Expo 67 will watch the progress of Manicouagan 5, the world's biggest multiple-arch buttressed dam, on a 600-square-foot color television screen.

FIRST MASTERS OF
THE AMERICAN DESERT

The Hohokam

By EMIL W. HAURY

Photographs by HELGA TEIWES, Arizona State Museum

FROM SOMEWHERE on the mesquite-studded plain, the song of the coyote broke the primeval stillness of 2,000 years ago. This thirsty land—someday it would be known as Arizona—swept for empty miles toward brown mountains. Along bleached watercourses, saguaro cacti thrust spiny arms against a smelting sun.

Yet here, cradled in dry hills, there was also the miracle of a green valley, watered by a running stream. The Gila River, bearing distant rains from the eastern mountains to the Colorado, bathed sun-warmed banks where deer and cottontail, gray fox, muskrat, and water birds found shelter.

On this stage one of the important dramas of pre-Columbian American history was played out. Here an ancient and courageous people, known today as the Hohokam, faced and conquered the desert. With only stone and wood tools, they performed feats of canal engineering unique among the achievements of early Indians north of Mexico.

Other prehistoric tribes, it is true, survived by hunting and fishing, gathering an occasional crop of

Parading out of a long-hidden past, five-inch-high clay deer and a rattlesnake-adorned potsherd fashioned by the ancient Hohokam Indians come to light at Snaketown, Arizona. Excavations in this desert valley southeast of Phoenix have revealed a remarkable farming culture lasting from several centuries before Christ to A.D. 1400-1500.

wild fruits, berries, and roots. But the Hohokam made this hard land bloom with corn, beans, and squash. They became the first irrigationists within the present-day United States, and we now know that they did it several centuries before the time of Christ.

Hohokam (pronounced ho-ho-*kam*) is a modern Pima word meaning "that which has vanished." And indeed the ancient Hohokam have long been the forgotten Americans of pre-Columbian times. It sometimes seems to me that they must have planned it that way. I have probed Hohokam ruins for more than thirty years of my professional life—and the search quickly taught me to live with frustration and disappointment.

Unlike any other early people of the Southwest, most of the Hohokam cremated their dead, preventing us from forming a clear picture of their physical appearance. The most beautiful of their artifacts—stone vessels, clay figurines, jars in human form—are almost invariably found willfully smashed. We do not know why. They left few examples of monumental architecture to attract the eyes and spades of archeologists. And the restless wind of the Arizona desert swept in soil to seal their remarkable irrigation systems, leaving only provocative traces.

But gradually, important clues came to light: caches of cult objects pieced together by meticulous technicians (pages 692-3) and ancient watercourses revealed by aerial photographs. Finally, the brush and trowel of the archeologist, aided by a massive earth-moving machine, cleared away the uncertainties.

Extensive excavations in 1964-65, which I directed, have opened one of the earliest and most important chapters in the prehistory of our country. The shadowy Hohokam have emerged as the first masters of the southwestern desert, and the makers of a culture that represents a major stride toward civilization.

History Slept On in Humble Mounds

My students at the University of Arizona sometimes ask me how the Hohokam remained hidden for so long. It was, in part, the result of historical accident.

The early excavators in the Southwest, at the end of the last century, were naturally drawn first to the Four Corners Country, where Arizona, New Mexico, Colorado, and Utah come together. There, in the land of the Anasazi cliff dwellers, spectacular ruins on mesas and in high-arched caves of canyon walls attest to a high level of civilization.*

Few scientists of that time were tempted to

grub in the less promising sites of the scorching desert to the south. But those who did invariably found clues to the presence of a numerous, gifted, and ancient people.

In 1887-88 a colorful explorer, Frank Hamilton Cushing, led the first organized archeological expedition into southern Arizona. He and his diggers collected more than 5,000 Hohokam specimens from the Salt River Valley near Phoenix. From the ruins he examined, Cushing concluded that the desert had been the home of a "greater if not further advanced ancient population" than the Pueblo people to the north.

But American archeology was then a young science, and few diggers realized that a trash dump may be a greater treasure than a temple. The Hohokam's story remained buried in their house pits and their humble mounds.

Years passed, and to most people southwestern archeology still meant only one thing: cliff dwellers. Finally, in 1934, Harold S. Gladwin, Director of the Gila Pueblo Archaeological Foundation, organized a landmark

*The emerging story of the Anasazi has been told in NATIONAL GEOGRAPHIC in "Ancient Cliff Dwellers of Mesa Verde," by Don Watson, September, 1948; "Searching for Cliff Dwellers' Secrets," by Carroll A. Burroughs, November, 1959; and "Solving the Riddles of Wetherill Mesa," by Douglas Osborne, February, 1964.

First irrigationists of the Southwest, the Hohokam flood a field with water brought three miles from the Gila River. One man wades in to dam the main canal with a mat of woven fiber; his companion lifts out a similar barrier, diverting water to a side canal. Others lead off the precious flow to irrigate their staple crop, corn.

Modern Indian (below), a Pima living near Snaketown, uses the same methods, sometimes following a watercourse laid down by the vanished Hohokam.

excavation at a Hohokam site in the Gila Valley. I had the privilege of serving as field director of that excavation; thus began a lifelong interest in this forgotten culture.

The site, then as now, was a wide expanse of undulating mounds and slopes in the open desert southeast of Phoenix (maps, opposite and page 699). It lay within the Gila River Indian Reservation, home of the gentle Pima. The Pima called it Skoaquik, Place of the Snakes—to us, Snaketown. And indeed snakes still inhabit the area, feeding on rodents that tunnel into the ancient trash mounds.

The village itself had long ago vanished under the earth. Only the strangely brittle surface of the hillocks, paved with literally thousands of potsherds, remained to prove that a settled people had once lived here.

The Pima who helped us dig the site were irrigation farmers. Their forebears lived in round houses constructed very much in the manner of the Hohokam dwellings we soon encountered (page 686). The Pima way of life bore the immemorial stamp of the Southwest, a perfect adaptation to a difficult environment.

Ancient Ball Court Poses a Question

I asked myself: Is it possible that the Hohokam were the first to put that stamp there? If so, when? And what happened to them?

We found only partial answers during that first dig. But we also uncovered some surprises.

A curious depression flanked by ridges lay not far from the largest of Snaketown's

KODACHROMES BY HELGA TEIWES © NATIONAL GEOGRAPHIC SOCIETY

Biting windstorm buffets members of the Arizona State Museum expedition to Snaketown as they lash down a storage shelter. Led by Dr. Emil Haury, the museum's retired director (far left), a team of archeologists and Pima Indian helpers spent seven months in 1964-65 studying the ancient Hohokam village. The National Science Foundation and the University of Arizona aided the project, and the Gila River Indian Community Council gave it their blessing. Mosaic of house floors at left spans more than 1,000 years and seven cultural phases. Dr. Haury's team has pieced together the history of an agricultural people who wandered into Arizona from the south and stayed in their irrigated valley for more than 1,500 years. Craftsmanship of surpassing quality and the absence of any sign of warfare suggest that the Hohokam led a peaceful and prosperous life.

mounds. As we peeled back the centuries of earth, it began to look familiar. When the bright desert sun finally shone on it again, we saw that we had cleared a ball court reminiscent of those found in ruined cities far to the south in Mexico (pages 678-9).

There were other surprises. The highest of the mounds, No. 29, yielded seven distinct cultural phases stretching further back into time than anyone had a right to expect. On the floor of a burned house, amid refuse from the beginning of Snaketown's fifth phase, we unearthed pottery imported from the pueblos to the north. That pottery carried, almost as clearly as a maker's mark, an unquestionable date of A.D. 500. It derives from the Douglass tree-ring calendar, in which the varying annual growth rings of certain trees have given a year-by-year record of variations in weather over the centuries. Compiled by a series of National Geographic Society expeditions, this remarkable yardstick can tell archeologists the precise year when a beam or post in one of Arizona's prehistoric ruins was cut from a living tree. Thus pottery and other artifacts found in the ruins can also be dated.

From other imported shards we were able to estimate that the last three phases of Hohokam history at Snaketown—beginning about A.D. 500—had lasted around 200 years each. Yet there were four earlier phases here! Even a conservative estimate pushed the beginnings of the settlement toward the opening of the Christian Era.

There were strong affinities with Mexico in addition to the ball court. Aptly enough, one of the enduring favorites of the Hohokam craftsman was the snake. We found him writhing around the sides of pots, forming the circlet of a shell bracelet, coiling at the rim of a stone incense burner. Quite often a bird is attacking the snake, a very old motif south

With an artist's care, the author and team member Al Lancaster at left brush away the desert soil covering charred remnants of a Hohokam house. Dr. Haury says, "If it were not for the National Geographic Society, I might never have become an archeologist." He began his distinguished career as a member of a Society-sponsored expedition to Cuicuilco, Mexico, reported in NATIONAL GEOGRAPHIC of August, 1923.

Dirt-moving behemoth, a combination backhoe and front-end loader, was tamed by Dr. Haury to do the work of an army of hand shovelers. Once thought too ponderous for archeological excavations, such power tools have come to the aid of scientists rushing their work ahead of new highways, dams, and urban development. "It saved the day at Snaketown," Dr. Haury claims. "By cutting a series of trenches, it led to the discovery of a primitive canal that proved the Hohokam's primacy as irrigationists."

of the Rio Grande—and one that survives to this day on Mexico's flag.

Among the many thousands of artifacts gathered, we found countless stone tools and arrowheads, but it was a small number of decorated marine shells, dated to about A.D. 1000, that intrigued us most. We were baffled by the incredible fineness of the working of horned toads, snakes, and geometric forms that adorned them.

Hohokam Discovered Etching Process

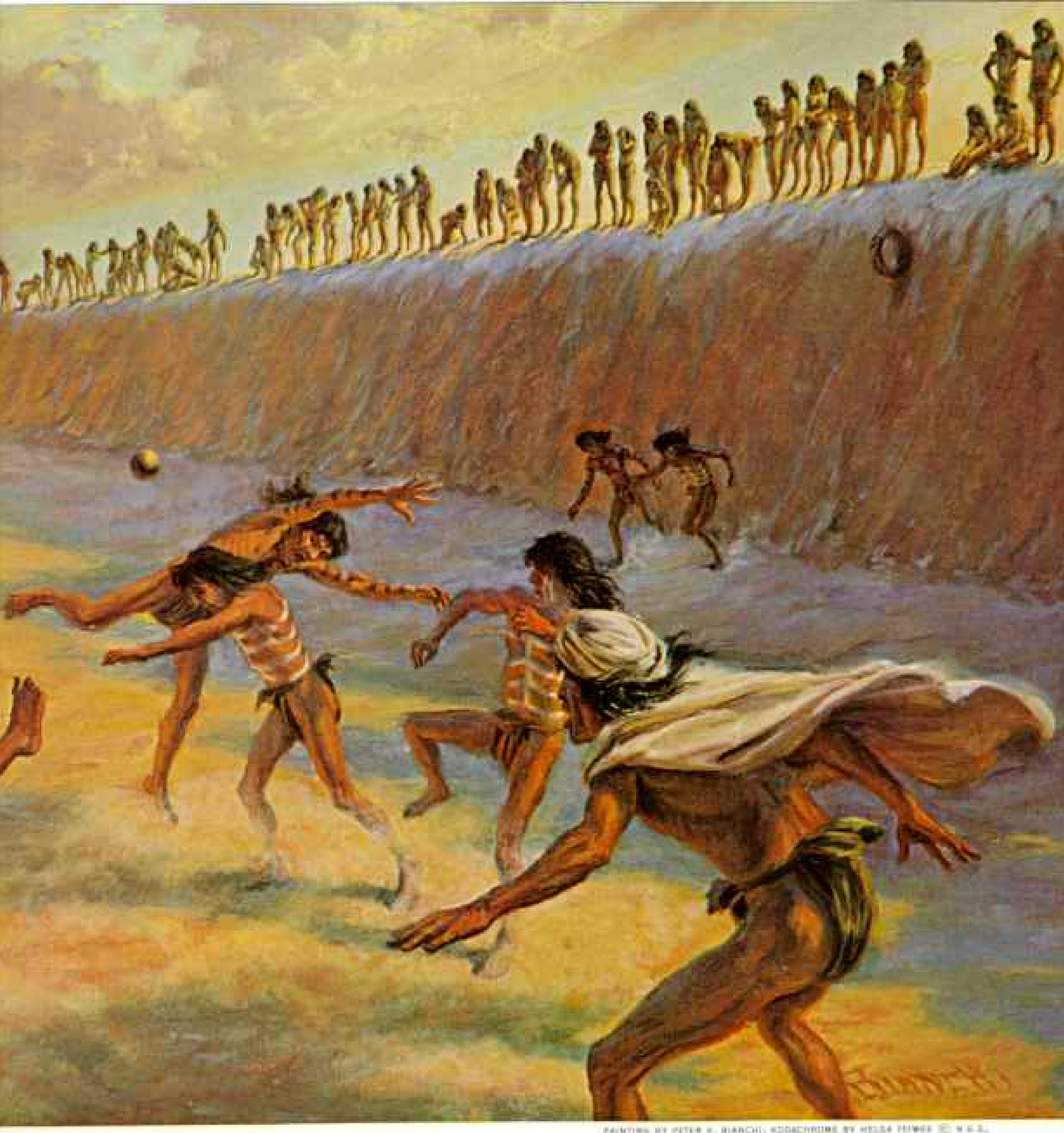
Our study pointed to only one plausible hypothesis: The shells were etched. We knew full well that this meant crediting the Hohokam with the first etched artifacts in history —hundreds of years before Renaissance armorers in Europe came upon the technique.

We speculated that an Indian artisan accidentally discovered the corrosive power of fermented cactus juice, which produces a weak acetic acid. Shells soaked in the vinegar would be eaten away unless protected by a resistant substance, such as pitch. Hence the procedure, by simple reasoning: Form a design of pitch on a shell, soak it in acid, scrape off the pitch, and the result is an etched design.

Recently I was able to prove this theory with the finding of a shell prepared for an acid treatment never completed (page 680). The invention of etching enabled the Hohokam to create some remarkable works of art.

A final major surprise of that first dig into the Hohokam past was the excavation of a canal system that implied a long period of technological growth. The canals stretched for miles along the upper terrace of the river valley, safe from sudden floods yet near at hand for maintenance and water control and for directing water to the fields.

A cross section of the prehistoric canals showed one imposed upon another as changes



PAINTING BY PETER V. BIANCHI; KODACHROME BY HELGA TEIWES © N.G.S.

More battle than sport, a Snaketown ball game may have resembled ancient Mexican contests described by the Spanish. Forbidden to throw or kick the rubbery ball—probably made from guayule, a desert bush—players tried to knock it through rings on the walls with hips, knees, or elbows. So rarely did a goal occur that the scorer could claim the clothing and jewelry of the spectators. Thus when a goal was scored, the contest ended; viewers took to their heels, pursued by friends of the victor. The ball court, first excavated in 1934, shows later erosion (left).

were made over a long period of time. The earliest we had found thus far, dated to A.D. 800, seemed every bit as well planned and executed as the latest, dug about 1200.

Today's Pima Indian also irrigates his fields with ditches (page 673), some of which follow the tracks of the ancient Hohokam. Likewise, 19th-century Mormon farmers used some of these prehistoric canals.

Vanished Ones First Tamed the Desert

When that first dig ended, we had pieced together part of a remarkable story—how settlers from the south moved into a desert land and built a canal system that led to centuries of peace and prosperity.

The presence of plain brown pottery in the earliest levels meant that the once-scorned Hohokam of the

EKTACHROME (ABOVE) BY CHARLES W. HERBERT, WESTERN WAYS; KODACHROMES BY HELGA TEIWES © N.G.S.

Hohokam triumph— the world's first etchings

MOST STARTLING artistic achievement of the Hohokam was their invention of etching with acid. Centuries before European armorers developed a similar process in the middle 1400's, Hohokam craftsmen learned to fashion delicate designs on sea shells obtained in trade with tribes on the Gulf of California.

Coating a shell with pitch in the shape of an animal, they soaked it in a weak acid solution—probably the fermented juice of the saguaro-cactus fruit (upper right). The acid slowly gnawed away the unprotected surface of the shell, leaving a raised design like the horned toad (lower right). Shells found in earlier excavations had led archeologists to surmise that the Hohokam had discovered etching; the theory found dramatic proof with the discovery of an artifact still wearing a coat of pitch (above, left). The shell had never reached the acid bath.

Sevenfold enlargement of another shell shows fine detail of a stylized snake design etched along its outer rim.

KODACHROME FROM ARIZONA STATE MUSEUM © N.G.S.

southern desert were producing ceramics centuries before the northern Pueblo Indians.

We concluded that Snaketown was a flourishing neolithic community, with a highly developed art, a stable domestic architecture, and a successful farming economy, long before the first pueblo had been built. We were convinced that we had found the first irrigation farmers of the Southwest.

New Expedition Seeks Final Proof

These results threw sand into the face of accepted archeological theory, and it was clear that further proof was needed to establish our thesis. The Hohokam threatened to fade again into anonymity, the trail lost once more in the trample of scholarly footprints.

The opportunity, though, finally came in 1964, when the Arizona State Museum, with National Science Foundation and University of Arizona support, sponsored a major dig to clarify the questions of Hohokam origin.

It was a clear and hot autumn afternoon when I returned to Snaketown. Far to the west, the Sierra Estrella stood silhouetted in a blue haze like postcard mountains pasted to the sky. Before us stretched the 300 acres of the once-thriving town.

I chose an area south of old Mound 29 as a likely place to start the dig, and I further decided to counter any stratagems of the elusive Hohokam by a piece of magic. A seminar class at the University of Arizona had given me a "good-digging" token, a silver trowel

EKTACHROME (ABOVE) AND KODACHROMES BY HELGA TEIWES © N.G.S.

Ancient lifelines in the desert, hand-dug canals made Snaketown's long existence possible. Such relics of primitive engineering extend for miles through Arizona's Salt River and Gila River Valleys. The earliest canal, broad and curving (above, left), dates from three centuries or more before Christ; later ditches went deeper and narrower to reduce evaporation (above). Previous excavations had unearthed a canal dug around A.D. 800, leading scholars to suggest that the Hohokam were late-comers to the Southwest. The 1964-65 expedition, however, uncovered traces of far earlier canals, clinching the Hohokam claim to antiquity.

Grooves in the wall of a pit indicate how the Hohokam gouged their canals with sharp sticks; modern hands show the method.

Prized possessions of the ancients, carved stone palettes held pigments with which the Hohokam painted their bodies for games and religious ceremonies. Example at center, measuring just over 6 inches, shows a favorite motif: the horned toad. The author believes that Snaketown artisans devel-

bearing an inscription from Shakespeare's *Julius Caesar:* "You are not wood, you are not stones, but men." A better epigram for the archeologist's work has never been written.

Standing in the old village, I hurled the shining trowel into the air. Jones Williams, a 72-year-old Pima who had been with me on Hohokam adventures before, turned the first spade of earth at the place where it landed.

And sure enough—that proved to be the least productive spot in the whole village! I gave up the business of magic and went back to the hardheaded work of excavation.

Our crew included an assistant director, three archeologists, a cartographer, a photographer, two laboratory assistants, 30 Pima with shovels and screens, and a mechanical monster usually found digging ditches—a combination front-end loader and backhoe (pages 676-7). That excavating machine symbolizes a change that has come to archeology.

In my early years in the field, the use of such a tool would have been unthinkable. But the archeologist today often finds himself in a desperate race against the highway and dam builder. Salvage archeology fights fire with fire by adopting the tools of the construction engineer.

Mechanical Shovel Saves the Day

At Snaketown we had to sink numerous trenches with limited personnel, in a limited time, on a limited budget. We stood to gain more than we could lose by employing the big machine; it ended up by saving the day.

We worked through the entire winter and

KODACHROMES © N.G.S.

oped the palettes—here stacked on glass shelves—from the metate, a slab of stone used to grind corn.

Country cousins to similar effigies found in Mexico, these Hohokam figurines—shown nearly twice actual size—date from the first few centuries of the Christian Era. Indians probably used the slit-eyed statues in fertility rites.

spring. Once again, our digging evoked memories of ancient Mexico.

Among our finds were two examples of monumental architecture. The first was a platform mound, a low structure filled with dirt and trash and capped with a thick pad of clay. It dated to about A.D. 500, the time when mounds were rising out of the Mexican jungles to serve as stages for ceremonial dances and religious rituals. At Snaketown the footsteps of the dancers, if any, long ago vanished, and the sounds of the bells, flutes, and drums were gone with the desert wind.

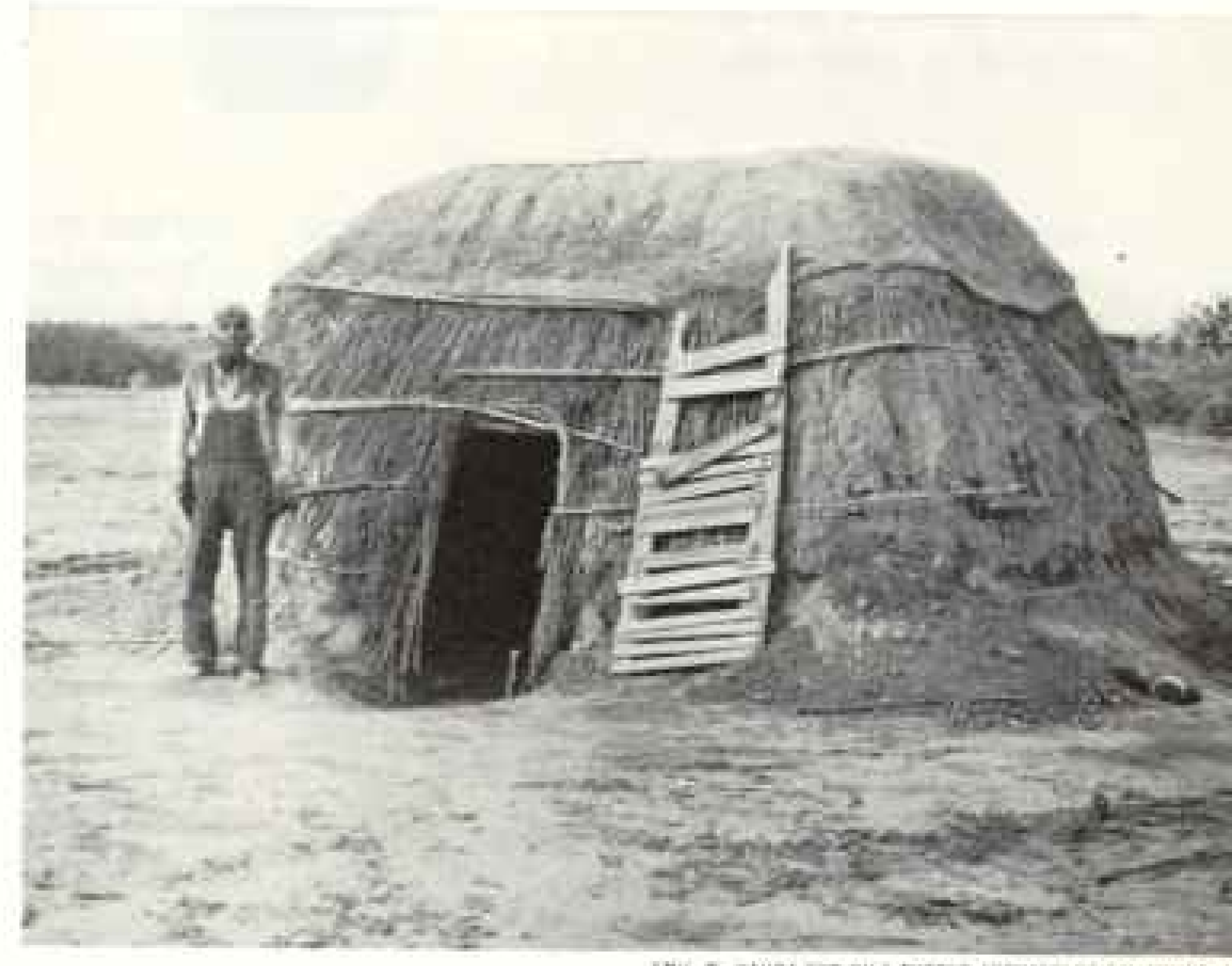
Not far from the platform mound, archeologist Jim Sciscenti was removing a thin veneer of earth from another structure that gave me a deep sense of nostalgia. At the very beginning of my career as an archeologist, I had worked at Cuicuilco, near Mexico City. One of the major remains there had been a 90-foot-high conical mound, preserved by a lava flow that partially covered it.*

At Snaketown, on what I vowed would be my last dig, Sciscenti uncovered a strikingly similar truncated cone, though much smaller. This one was made of clean desert soil. Perhaps by now the Hohokam had come to realize that the gods merited something better than a refuse heap!

In Mexico, such dirt structures gave rise to the famous temple pyramids. At Snaketown, we found a single step going up to a surface 50 feet across and only 3 feet high.

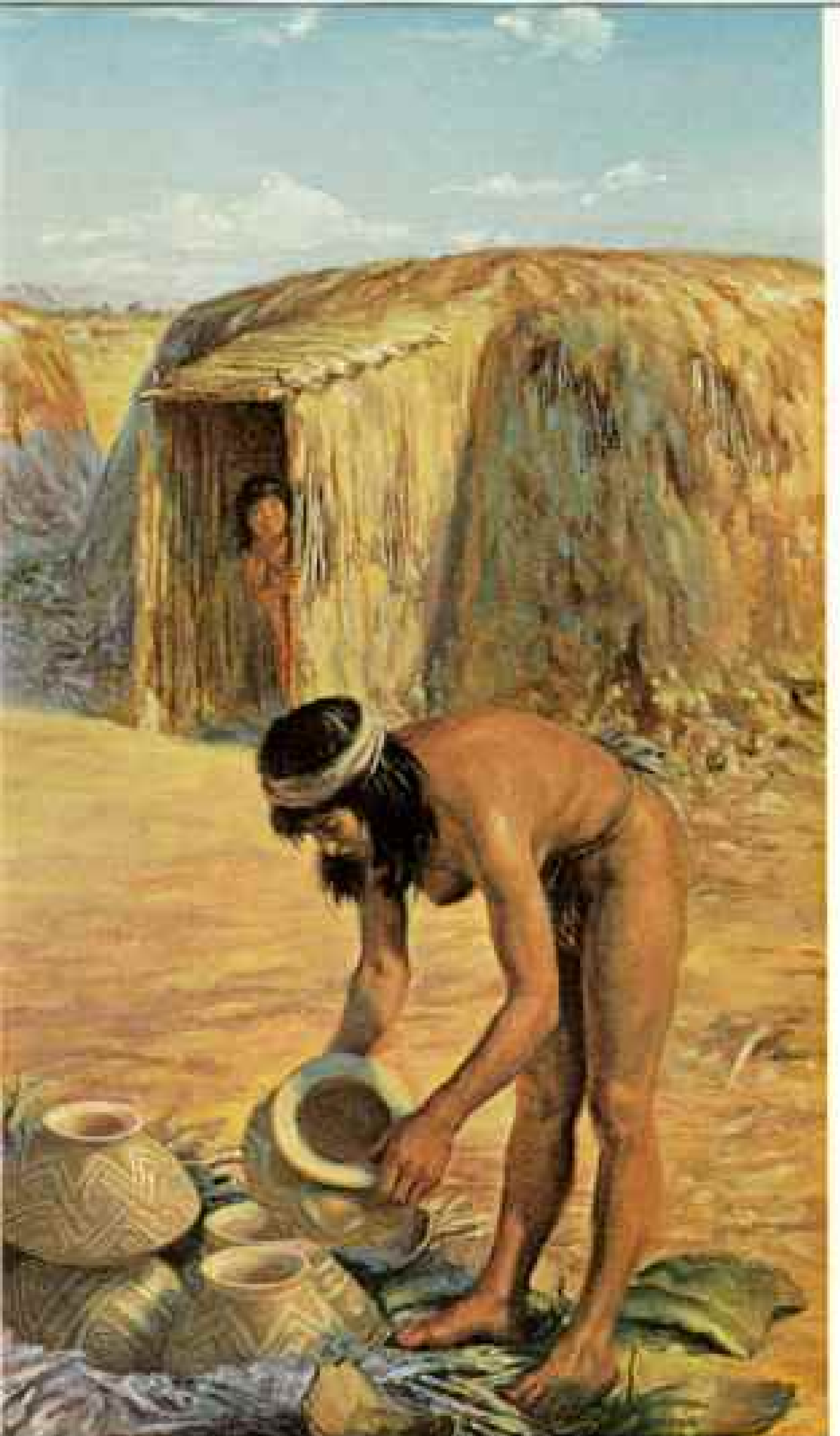
*See "Ruins of Cuicuilco May Revolutionize Our History of Ancient America," by Byron Cummings, NATIONAL GEOGRAPHIC, August, 1923.

Men gone hunting or farming, Snaketown resounds with the cries of children and the gossip of women. Mother at center kneads clay before shaping it into pots like that being molded by hands and paddle at left. Beyond, a son helps tend a kiln of sticks atop raw pottery. Woman at right covered her vessels with pieces of broken pottery to protect colors during firing. In the distance a villager adds to a trash mound, which archeologists will someday sift to reconstruct scenes like this.



Last Pima round house, photographed in 1935, shows its descent from Hohokam houses of two thousand years ago.

EMIL W. HAURY FOR GILA PUEBLO ARCHAEOLOGICAL FOUNDAT



PAINTING BY PETER V. BIANCHI © NATIONAL GEOGRAPHIC SOCIETY

Meanwhile we were building a little mountain of our own with broken pottery. Snaketown's mounds are packed with the shards of pots once used to cook a family's dinner, store water and food, and gather a harvest.

Happily for the archeologist, there are few things more fragile than a pot, and few things more durable than its broken pieces. And because styles change, these pieces can serve as a kind of time clock to date other features, such as the houses in which they are found.

To make our pottery time clock at Snaketown, we examined more than 1,500,000 fragments. Tens of thousands were mechanically screened from the rest and carried to a field laboratory set up at an unused school building 12 miles from Snaketown. There a staff of five women cleaned, sorted, mended, and catalogued each day's take—a load of "washing" of monumental proportions. Yet these pieces represent only 1/500 of those available on the site.

Over the centuries, we found, Hohokam pottery became more and more elaborate. The original settlers of Snaketown made a plain, thin-walled ware carefully built up from damp coils of clay and pounded into shape with a flat paddle. A thousand years later, using the same technique, the potters were turning out a dazzling array of jars, bowls, and scoops painted with vivid geometrical elements repeated many times.

One type of design in particular attracted our attention. One staff member whimsically suggested that the Hohokam liked alphabet soup, for the pottery of this period carries painted characters strikingly like our own A B C's. In others mammals, birds, reptiles, and humans scramble about in cartoon fashion, over and over in endless circles.

I have the notion—and I admit I fetched it from afar—that these elements, found nowhere else in the Southwest, derive from the calendrical symbols common in Mexico. If so, their original significance was lost in transmission, and they were picked up by the Hohokam to the north only as art forms.

Snaketown's flourishing art showed itself also in a remarkable series of stone palettes—collectors' items among a varied and complex assortment of stone tools and utensils.

The early Hohokam brought with them a basic kit of tools that included hammering stones, stone knives, small projectile points, mortars, pestles, and troughed stones called metates, for making corn meal.

From this lowly kitchen utensil came the beautiful palettes of later ages (pages 684-5). Remnants of paint told us their use. The Hohokam probably painted themselves for dances and games; they lavished great care upon the palettes used for grinding and mixing the pigments. They often gave them the stylized shapes of men or desert creatures—horned toads, lizards, snakes, and birds.

Postholes Betrayed by Telltale Sound

Through the warm winter, ancient Snaketown emerged from its long sleep under the earth. After the backhoe, in the hands of its skilled Pima operator, Fred Marrietta, had taken test bites of designated areas, the staff archeologists went to work.

Uncovering the remains of dwellings was difficult. The Hohokam sank their houses in shallow pits about a foot below the desert surface. Vertical posts set into the bottom of the pit supported flimsy brush roofs and sides of slanting poles covered with clay. When the house eventually collapsed or burned, the pit filled with debris, and if another house

Banded gecko found in Snaketown poses beside a Hohokam potsherd bearing the likeness of an ancestor. Today the little lizards still skitter nervously across the southern Arizona desert at night.

Saw-toothed icicles of stone, some 3,000 beautifully chipped arrowheads came to light in one ceremonial area. Hohokam archers used the handsome points to bring down rabbit, deer, fox, and muskrat when the Gila River's water greened this now-arid valley. The notches, like the serrations of a steak knife, may have given the points greater penetrating power; they also aided in holding the arrowheads' lashings to the shafts.

KODACHROMES BY HELGA TEIWES © N.G.S.

was not erected over the spot—as was often the case—desert winds swept the place smooth. We sometimes unearthed a succession of floors stacked like a platter of pancakes.

All that remains for the archeologist is the hard-packed house floor and the cavities where the posts stood. These postholes, we soon discovered, could be traced by the ear better than by the eye—by listening to the singing of the trowel as it was drawn over packed soil. A change in pitch indicated that a different surface, the soft scab of a posthole, was in contact with the blade.

In clearing these house floors, we would infrequently find treasure. James ("Al") Lancaster, one of the three staff archeologists, is a veteran of the campaigns at Wetherill Mesa in southwestern Colorado. Digging in a desert was a new experience for

him, yet this stranger to Hohokam archeology made one large strike after another. First he found a collection of 18 thick-walled clay vessels probably used to burn incense. I knew he had something else unusual when he called me over one morning and asked, "What do you make of this?"

With deft sweeps of the trowel he was loosening the soil from the figure of a clay animal. More troweling and brushing opened a two-foot-deep pit crammed with a herd of 19 animals (pages 670-71), three human-effigy vessels, 40 pieces of pottery, shell bracelets, and a fragment of a charred basket and remnants of other things that had been burned. The material in the pit was dated by the pottery time clock to within a few decades of a thousand years ago.

Al's good-luck streak—it seemed almost second sight, as if he had kinship with this ancient tribe—continued when he uncovered 50 sculptured stone vessels, Hohokam art at its best. Unfortunately, not one of them was intact (page 693).

We silently cursed whatever custom required the smashing of these cultural treasures. We could only speculate that the objects may have belonged to a religious cult or magician and were "killed" when the cult line ended or the man died.

Funeral offering, a clay incense burner seven inches high and resembling a mountain sheep, survives intact from a cremation of A.D. 1000. Unlike other Southwest Indians, the Hohokam burned their dead and, inexplicably, usually smashed the objects placed in their graves.

KODACHROME © N.G.S.

5,000 Houses Buried by the Desert

By season's end, we had rolled the centuries back from a wide area of dwellings. From a helicopter, we could look down on more than 12 centuries of occupation.

Two things became clear in that hovering look. The first was that Snaketown was a populous place. We estimated that a hundred houses might have stood in the village at any one time, each with a life-span of about 25 years. That would mean some 400 homes every century for more than 1,200 years—or almost 5,000 architectural units buried under the reddish soil beneath us! By dint of hard labor, we had managed to clear 167.

The second fact that seemed clear was the security of the Hohokam way of life. In the desert, choices are limited. One lives with nature or not at all. We found that the very first houses were every bit as good as the latest, and not very different from them in style. In a word, that kind of architecture worked in the desert, and the Hohokam kept it, with few changes, for more than 12 centuries.

These house floors told us many other things. From one of the earliest we recovered burned corn, confirming our belief that the founders of Snaketown were settled farmers. Finding this corn was like finding a nugget of gold—for corn must be cultivated by man and will not grow in the wild. It is absolute proof of agriculture.

That led us directly to the chief challenge of the project. If the earliest Hohokam grew crops in that parched land, they would have had to irrigate them with water brought from the Gila River. Traces of those very first canals should still be there, buried deep, their original beds marked perhaps by a layer of sand only a fraction of an inch in depth. To find that fraction, we resorted again to the power of the mechanical backhoe.

We were gambling that the first canals had not been located on the lower terrace near the river. Floods would long ago have washed those old scars clean. We were also gambling that the first Hohokam were capable of

ditching the upper terrace, a vast work that required the organization of a multitude of people and a degree of engineering skill unknown among other American Indians north of Mexico at that very early date.

The backhoe sliced 20 narrow trenches along a four-mile stretch of the later canal known from the first excavation. We found a place where four canals had been superimposed one upon another, indicating a long period of use—but not as long as we had optimistically hoped.

One of the trenches exposed a place where a lateral canal branched off from the main waterway. Here there were traces of a head gate, enabling us to reconstruct the method of Hohokam irrigation (painting, pages 672-3).

It was at this head gate that the Hohokam met with a disaster. At the height of Arizona's midsummer heat, cumulus clouds build up into dark towers. Sweeping in over the desert, they cause intense local downpours. One of these hit the upper terrace sometime before A.D. 900. The canal, filling in minutes, burst its banks, and the water gouged out a deep gully near the head gate as it raced toward the lower terrace.

Traces of this event pointed up more clearly than any theory how hard the Hohokam had to labor to keep their canals flowing. They conquered the desert only through continuous effort.

Painted and potbellied, a pottery vessel in grotesque human form—carefully assembled from fragments—spent more than 950 years under the desert soil. KODACHROME 3/4 ACTUAL SIZE © N.G.S.

Our own dig's time and funds were running out. We probed deeper into the terrace, examining the trench walls inch by inch. At last we came upon a thin crusted layer with a slim covering of sand. Was this the bottom of a waterway? Its shape, broad and shallow, was different from the deeper and narrower canals built afterward. Pottery shards and stone implements found on its surface were consistently of the oldest kinds found at Snaketown. I began to feel that this was what we had been looking for.

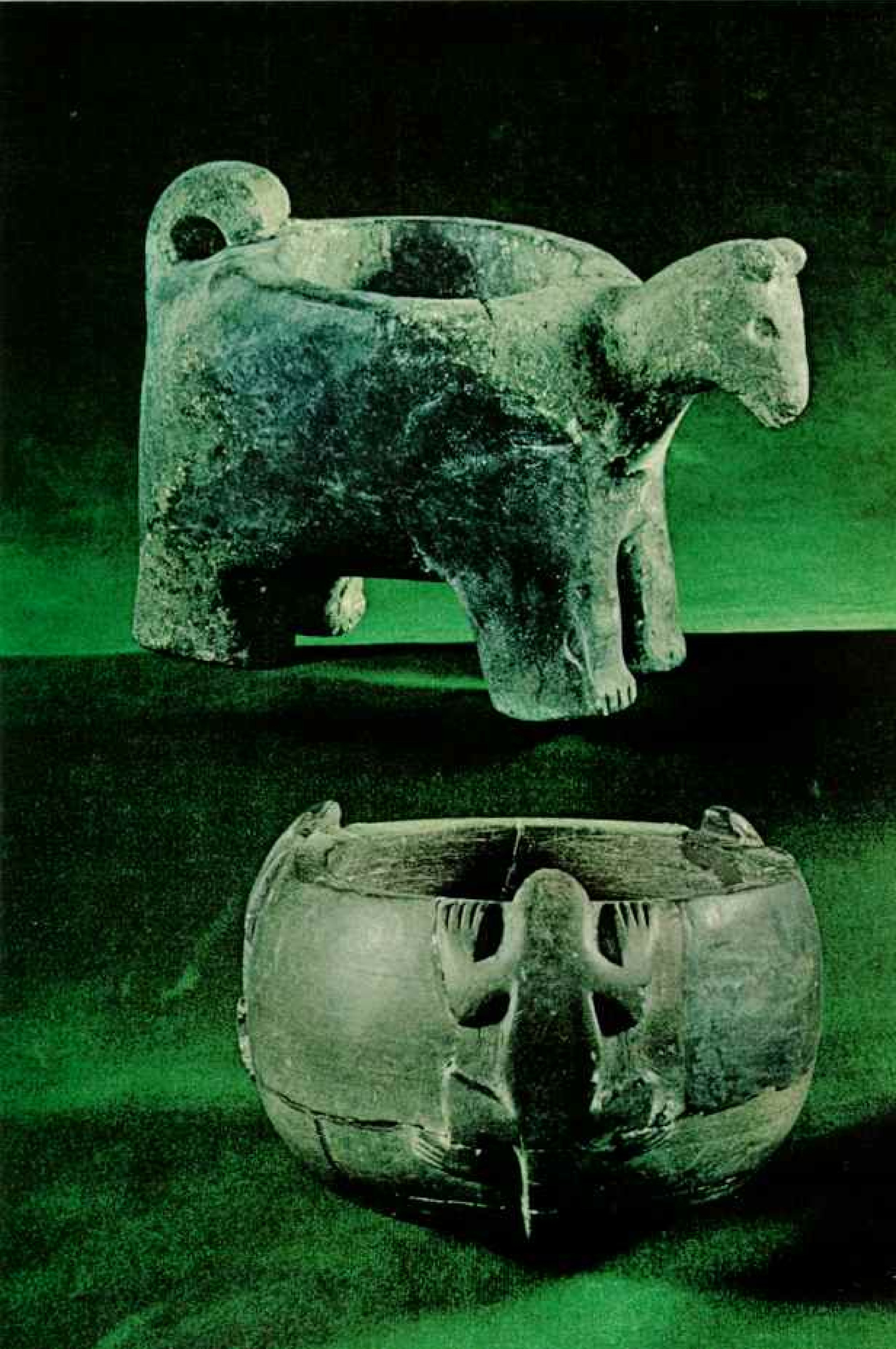
The entire staff was enlisted in "Operation Big Ditch." We set to work clearing a 225-foot-long section along the axis of the canal we had found (page 682). Then we hit the jackpot. At the west end of what we were now certain was the oldest canal yet unearthed at Snaketown, we found a tangle of later ones; these confirmed a long growth upward from that earliest canal.

The claim for antiquity was clinched. The Hohokam had indeed reached full dependence upon irrigated agriculture well ahead of all other known people in the Southwest.

New Dating Technique Confirms Snaketown's Age

As we studied the topography of the area, we were even more impressed by the Hohokam's achievement. The intake point for the gravity-fed canal could not have been less than three miles up the Gila River from the village. Three miles of hand-dug ditch to support a developed agriculture, in Arizona, in 300 B.C. or before!

How do we know it was that long ago?



BROKEN TREASURES *restored by the Arizona State Museum: Stone incense burners or medicine cups bear stylized images of a dog, toads, lizards, and a man, perhaps with magical or religious significance. One Snaketown cache (right) held 50 such shattered vessels, superbly carved from desert rock.*

Snaketown goes underground again in a matter of hours, as archeologists seal the 300-acre site; bulldozer riding a protective pad of soft dirt fills the house floors to protect them from weather. Should the site be designated a national monument, the historic landmark will be re-excavated, stabilized, and opened to the public.

"A lot of cracked crockery," Dr. Haury jokingly calls the million and a half potsherds he and his associates uncovered at Snaketown. Tens of thousands of pieces were washed, sorted, and catalogued. At the Arizona State Museum in Tucson, the author works out a chronology from the changing designs and discovery positions.

KODACHROMES © N.G.S.

Fortunately for the modern archeologist, his field opinions and deductions from pottery clocks and stratigraphy can now be tested against other measures of dating. The most famous of these is the carbon-14 method.* A charcoal sample from early Hohokam refuse has yielded a date of 425 B.C., give or take about 100 years.

The evidence at Snaketown has been supported by another ingenious method of dating—archeomagnetism. This technique is still in its formative stages; as yet, only a few scientists in the world are experimenting with it. One of them is Prof. Robert L. DuBois at the University of Arizona (see "Magnetic Clues Help Date the Past," beginning on the following page). Dr. DuBois has fixed a date of 300 B.C. for an early Hohokam fireplace.

Drama Ends in a Peaceful Invasion

We are gaining new certainty about the beginning of Hohokam culture. But what about its end? Snaketown died as a village sometime between A.D. 1100 and 1200, but its people continued to live in scattered, smaller settlements up and down the valley, still thriving on irrigation.

In the 14th century the first major social change in the long Hohokam history occurred. Pueblo builders, a mixed breed of Anasazi and Mogollon cultures we call the Salado people, spilled out of the eastern mountains and moved in large numbers into the Hohokam's ancient domain. We find no suggestion of a violent invasion, but rather a peaceful melding of cultures.

The four-story pueblo at Casa Grande National Monument, with its mixed Salado and Hohokam remains, dates from this period. Because the Pueblo Indians were comparatively well known, and the Hohokam known almost not at all, it was once erroneously suggested that the simple pit houses of the Hohokam were servants' quarters, while the masters occupied the big pueblo houses.

What happened to the Hohokam?

My own view is that they are still there, in the form of the modern Pima Indians. Strong similarities exist between early Pima and late Hohokam house types, pottery, agriculture, and way of life. Throughout the long months of excavation, our Pima workmen became convinced of this themselves.

The constant interest and good humor of these men proved major factors in our success. As April approached and the desert began to stir with new life, the Pima gathered to discuss a way in which their appreciation for this archeological experience might be shown. The result was one of the most moving ceremonies I have ever witnessed.

On April 17, after weeks of planning, the Pima gave a party. No detail was overlooked. The "traffic committee" had even arranged for a highway patrolman to direct traffic at the crossing of the dirt road with State Highway 93 when our party from Snaketown drove to the celebration. He stood in the center of the silent little road, which vanished in heat mirages toward the horizon, and held up his arms while our caravan of six dusty cars scooted across the asphalt. Nothing else was moving for miles.

The party itself was an occasion I shall never forget. A six-voice choir of old folk sang Christian hymns in the Pima language. A dance group from Gila Crossing performed. Then our staff members were given gifts—beautifully wrought baskets—and the Pima master of ceremonies expressed the thanks of his people for our efforts.

Snaketown: Moral for the Modern World

The Secretary of the Interior has already designated Snaketown as a registered national historic landmark. And, encouragingly, the National Park Service is considering a Pima request to make it a national monument. Someday, perhaps, the increasing number of tourists to the Southwest will find along the Gila Valley a reconstructed ball court, village, and canal system as Snaketown rises, like the desert phoenix, from the ashes of its ancient cremations.

After so many years of association with the vanished Hohokam, I am convinced that their achievement is instructive for our own time. Their secret of success was profoundly simple: They came to grips with, but did not abuse, nature. They became a part of the ecological balance instead of destroying it. They accepted the terms of their existence in a difficult environment, and they continued for well over 1,000 years.

For our own generation, with its soiled streams and fouled air, its massive and abrupt changes in environment, its shortages of water, its rampant misuse of shrinking open space, the achievement of Snaketown holds a profound meaning. * * *

*See: "How Old Is It?" by Lyman J. Briggs and Kenneth F. Weaver, NATIONAL GEOGRAPHIC, August, 1958.

Magnetic Clues Help Date the Past

By KENNETH F. WEAVER, Assistant Editor

And the touch'd Needle trembles to the Pole. . . .
ALEXANDER POPE, "THE TEMPLE OF FAME"

THE COMPASS NEEDLE, contrary to popular notion, does not point true north. Moreover, its aim today differs from that of a century ago, or of Columbus's day. And, if the compass had existed in the time of Christ, its direction would have been still different then.

In fact, what geologists call the "virtual," or apparent, geomagnetic north pole, toward which the navigator's compass points, wanders about the Arctic like a lost child. It may move as much as 700 miles in a century.

This curious and little-understood drifting offers an ingenious key to riddles of the past. Today's archeologist, when he uncovers the kilns, hearths, or fire pits of ancient man, may search for faint traces of magnetism. These traces serve as a "fossil compass." From them the scientist can determine the age of the remains, using a new dating technique called archeomagnetism. In the past several years it has dated Roman pottery kilns in Britain and France and ancient hearths in Japan.

Archeomagnetism Verifies Diggers' Theory

In the pre-Columbian Snaketown ruins in the Arizona desert, described by Dr. Emil W. Haury on pages 670-95, archeomagnetism has helped clarify a long-standing controversy about the Hohokam Indians.

"When we first excavated Snaketown 30 years ago," says Dr. Haury, "we became convinced that the Hohokam had developed a high degree of culture long before the cliff dwellers farther north. But this idea did not fit the archeological theories of the time.

"Today, our new magnetic dates tell us we were right. These dates confirm our chronology of Hohokam life worked out by other means, based on pottery fragments and radioactive carbon 14. Now we can be reasonably sure that the Hohokam were the first full-fledged irrigationists in what is now the United States. And we have good evidence that they practiced their advanced arts and agriculture several centuries before Christ."

Fortunately for Dr. Haury, the University of Arizona has on its geology faculty Dr. Robert L. DuBois, one of the very few specialists in archeomagnetism in the United States—indeed, in all the world. By measuring magnetism in clay fire pits at Snaketown, Dr. DuBois

PAINTING © N.G.S.

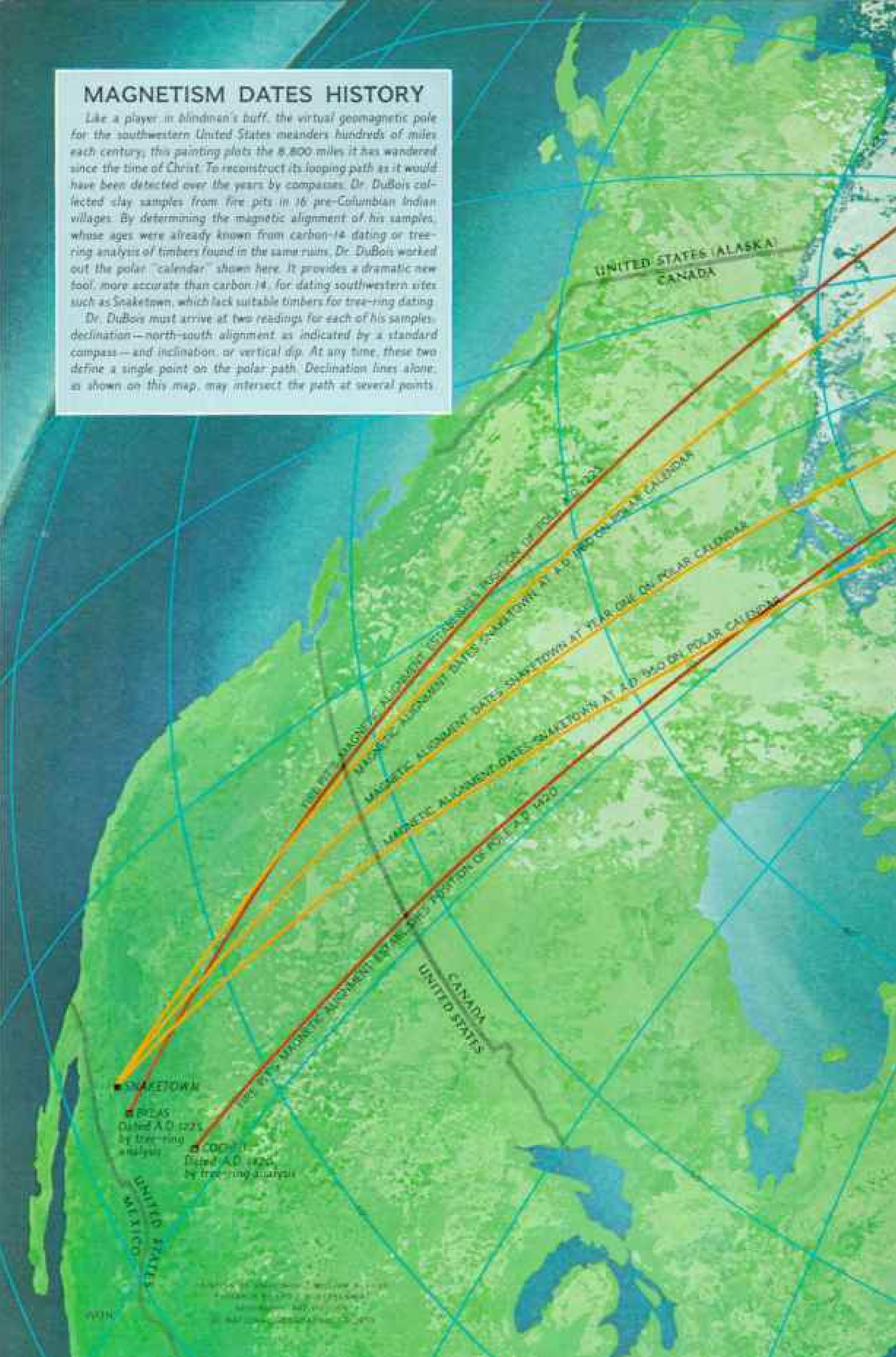
Mirrored shaft of light in a University of Arizona magnetometer illuminates the ancient past: By recording the magnetism in a bit of clay, it gives geologist Robert L. DuBois information that helps him date the 2,000-year-old fire pit from which the clay was taken.

The sample, shrouded in a cube of white plaster and positioned on a plastic

KODACHROME BY W. LEON LOPEZ AND HELGA TEIWES © NATIONAL GEOGRAPHIC SOCIETY

pedestal, contains bits of naturally magnetic iron minerals. Above it, suspended by a ribbon of phosphor bronze finer than a human hair, hang three small magnets spaced on a slender rod. A protective cylinder keeps out any disturbing air currents.

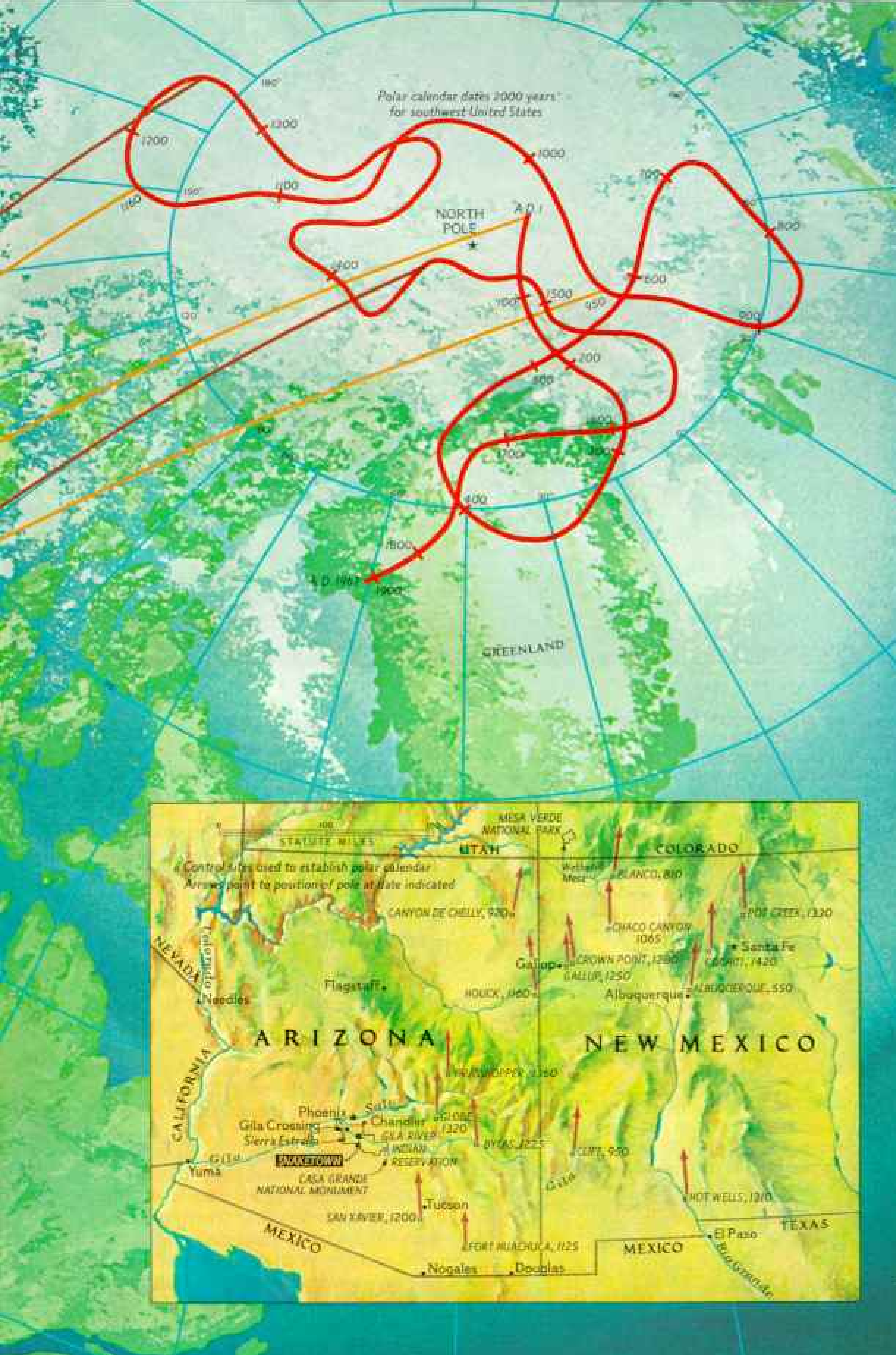
The light beam, reflecting from a tiny mirror above the middle magnet, serves as a pointer on a numbered scale. Magnetism in the clay sample rotates the delicately suspended assembly as if it were a compass needle. The beam of light shifts accordingly, giving a figure on the scale that can be used to determine direction of the magnetism. Meters at left control electric coils that cancel out extraneous magnetism.



MAGNETISM DATES HISTORY

Like a player in blindman's buff, the virtual geomagnetic pole for the southwestern United States meanders hundreds of miles each century; this painting plots the 8,800 miles it has wandered since the time of Christ. To reconstruct its looping path as it would have been detected over the years by compasses, Dr. DuBois collected clay samples from fire pits in 16 pre-Columbian Indian villages. By determining the magnetic alignment of his samples, whose ages were already known from carbon-14 dating or tree-ring analysis of timbers found in the same ruins, Dr. DuBois worked out the polar "calendar" shown here. It provides a dramatic new tool, more accurate than carbon 14, for dating southwestern sites such as Snaketown, which lack suitable timbers for tree-ring dating.

Dr. DuBois must arrive at two readings for each of his samples: declination—north-south alignment as indicated by a standard compass—and inclination, or vertical dip. At any time, these two define a single point on the polar path. Declination lines alone, as shown on this map, may intersect the path at several points.


Polar calendar dates 2000 years for southwest United States
NORTH POLE
A.D. 1
1000
1200
1300
1100
1400
1500
600
800
900
950
200
A.D. 1967
1900
GREENLAND
MESA VERDE NATIONAL PARK
STATUTE MILES
UTAH
COLORADO
Control sites used to establish polar calendar
Arrows point to position of pole at date indicated
CANYON DE CHELLY, 920
BLANCO, 810
CHACO CANYON 1065
CROWN POINT, 1280
GALLUP, 1250
Gallup
Santa Fe
ALBUQUERQUE, 550
Albuquerque
HOUCK, 1160
Flagstaff
Needles
NEVADA
ARIZONA
NEW MEXICO
CALIFORNIA
Phoenix
Chandler
Gila Crossing
Sierra Estrella
SNAKETOWN
GILA RIVER INDIAN RESERVATION
CASA GRANDE NATIONAL MONUMENT
Yuma
Tucson
SAN XAVIER, 1200
FORT HUACHUCA, 1125
CLIFF, 950
HOT WELLS, 1310
El Paso
TEXAS
MEXICO
Nogales
Douglas

Ancient Hohokam fire pit yields its evidence to Dr. DuBois, one of the world's few specialists in archeomagnetism. He chisels into the fire-hardened clay to isolate a round core, then pours plaster around the sample to protect it, using a brass mold that has been leveled with a spirit level (right) and oriented with a compass to the present magnetic north. Once the plaster has hardened, the cube can be cut free.

© N.G.S.

Archeomagnetic dating depends on the fact that the magnetism of minerals in clay, when heated to about 1,100° F., takes on the direction of earth's magnetic field. Unless reheated, the particles hold that magnetic bearing through the centuries. As the upper diagram shows, magnetic direction in unfired clay is helter-skelter before heating. After firing, the magnetism lines up uniformly in all the particles.

derived the magnetic dates that Dr. Haury finds so useful in his chronology.

I had heard of paleomagnetism, the magnetic dating of ancient rocks. But archeomagnetism—magnetic dating of archeological remains—was something new. I visited Dr. DuBois in Tucson to find out how it works.

He drove me out to the University of Arizona farm, where his magnetism laboratory stands isolated in a cow pasture, far from the interference of electrical machinery and power lines. We parked a hundred yards away to avoid vibration and magnetic interference.

The laboratory itself—a simple concrete-block rectangle—contains no steel; even the nails are aluminum. Its two rooms are crowded with magnetometers and storage cabinets, each surrounded by skeletal wooden frames ringed with coils of wire to cancel out extraneous magnetism.

"You are aware, I'm sure," said Dr. DuBois, a lanky, crew-cut Westerner, "that the earth acts like a giant magnet, with lines of force sweeping from Antarctic to Arctic. It is this magnetic field with which the compass aligns.

"Now, as every navigator knows, the compass does not point true north. What's more, it does not home in on a single point from all

over the world, contrary to what many people think. Rather, the compass needle parallels lines of force that may be greatly distorted in local areas. So the apparent pole position depends on where you are, and corrections must be made for navigation. Every locality has its own virtual geomagnetic north pole."

Dr. DuBois explained further that as the years pass, earth's magnetic field constantly shifts in direction and intensity. Why, nobody knows for sure. With the shifting of the field, what appears to be the magnetic north pole for any given locality shifts also.

Scientists have been able to plot the shifting of the pole in relation to Tucson for some 2,000 years past (diagram, pages 698-9). They do this by finding magnetic clays that can be dated by reference to such organic matter as tree rings or radioactive carbon 14.

Fire Pits Preserve Magnetic Bearings

"The Hohokam," Dr. DuBois continued, "unwittingly left magnetic records for us by the way they did their cooking. Because leaping flames would consume the brush roofs of their houses, they built fires outdoors, then carried live coals inside to clay-lined pits, where they roasted meat and parched corn.

"Clay, as it happens, contains particles of magnetic minerals, usually forms of iron oxide. When it is baked under sufficient heat—say 1,100° Fahrenheit—the magnetism in the clay orients itself with the earth's field, like the compass needle. And, until it is heated again, the clay retains a weak but very stable 'thermo-remanent' magnetism as a faithful record of earth's magnetic field at that time."

One must not jump to the conclusion, Dr. DuBois cautioned, that the particles or the molecules actually line up. They are not free to move in the way the compass needle is. What does happen is that the spinning electrons that produce the magnetism in the particles begin to move in identical patterns instead of helter-skelter.

And so it is that the incandescent coals in those fire pits baked the thick clay hot enough to alter its magnetism. The magnetic clay recorded the calendar of Hohokam life as surely as a magnetic tape records a Bach chorale.

To take a sample from such a fire pit, Dr. DuBois chips at the brick-hard clay with tools like ice picks until he isolates a small knob. Around this he places a two-inch-square mold, which he carefully levels, orients to today's magnetic north, and fills with plaster to protect the sample (opposite). Once the plaster has hardened, he cuts the whole block free.

I saw hundreds of such samples in Dr. DuBois' laboratory. There, too, I saw the magnetometer with which he checks the magnetic bearing of the samples.

Essentially the magnetometer consists of three tiny magnets, spaced on a slender rod suspended from a very fine wire in a plastic tube. A thin beam of light shines on a mirror glued to the rod, then reflects, like a pointer, to a numbered scale (page 697).

Electric currents flowing through large coils of wire on the wooden skeleton around the magnetometer cancel earth's magnetic field. When no sample is in the device, its beam of light points to zero.

But when Dr. DuBois put one of the Snaketown samples on a platform directly beneath the suspended magnets, the entire assembly above it rotated slightly. The reflected beam of light moved across the scale, exactly like a compass needle, indicating just how far the clay sample had caused the magnets to turn.

The geologist upended the block and read the deflection of the magnets again; he repeated for each face of the block. From these readings, with the aid of a computer, he calculated where the virtual geomagnetic pole was when the clay was fired. Then, with his map of the polar wanderings, he assigned an age to the sample. His results—accurate to within less than 50 years—are more precise than carbon-14 dating would be for charcoal from the same pit.

Unfailing Records Left for the Future

The two methods complement each other nicely. Archeomagnetism enjoys the advantages of precision and the ability to date lifeless minerals, for which carbon dating cannot be used. However, archeomagnetism will not work with such nonmagnetic materials as charcoal, bone, shell, or wood, for which the carbon-14 method is especially suited.

Tree-ring dating, most accurate of all techniques, can pinpoint the actual year a tree was cut, but it can be used only with stumps or timbers from a few kinds of trees.

Meanwhile, as scientists date peoples of the past, it excites the imagination to realize that when we build a campfire on a clay riverbank, we may be automatically recording unseen lines of force, and thus dating this mundane event in our own lives for archeologists of the future.

THE END

Micronesia: The Americanization of Eden

By DAVID S. BOYER

National Geographic Foreign Staff

I HAD NO MORE THAN set foot on the little island, lost in a corner of the western Pacific, when I met a small boy named Cigarette. And another named Maybe. A third was called Careful. Then, inevitably, came a young girl with the captivating counterpoint, Careless. Two others responded to KissMe and LoveMe. There was also a child, bearing both her name and her soul in her large round eyes, called Kindly—a soft symbol of her Micronesian people.

Half a dozen such barefoot youngsters took me hiking one day, up a rain-soaked volcanic mountain covered with coconut palm and breadfruit trees. Wearing rubber sneakers, I kept slipping and falling in the mud. I suppose I looked ridiculous, wildly trying to save three cameras each time I lost my feet. The Micronesian kids, at any rate, were hysterical over my embarrassment.

One of them, named Radio, gave me a name, too—"Mr. Accident."

Then he delivered the coup de grace. When I slipped again and landed on my back, Radio got into the act before I'd even stopped sliding. Flinging his arms and palms outward and downward like a baseball umpire, he screamed, "Safe!"

Radio and Cigarette and LoveMe and their realm of little islands, Micronesia, are gravitating toward the United States of America, as the names given them by their parents indicate. Considering that Micronesia is flung across a stretch of blue water broader than the United States mainland and 5,000 miles distant, this is a curious movement. It began, slowly at first, when U. S. forces captured the islands from Japan in World War II.* Today, the Americanization of Micronesia gathers momentum almost by the hour.

One Stadium Could Seat All Micronesia

Although Micronesians are an ocean away from the United States—south of Japan, north of Australia (maps, pages 714-15)—their drift toward the U. S. A. shows everywhere: in their births and baptisms, their language, their thinking, and their habits, good and bad.

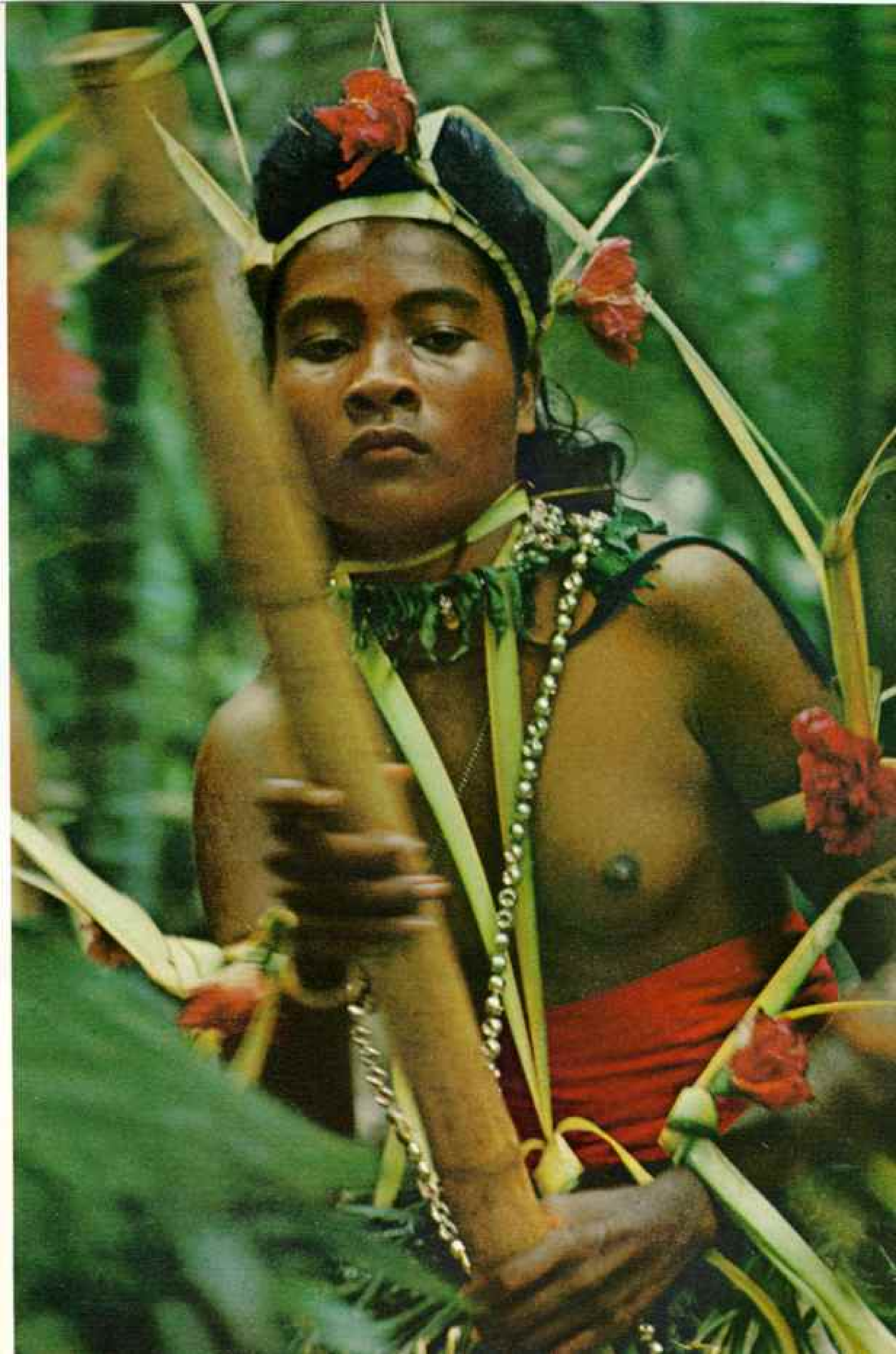
What makes this eastward orientation most startling is that some Micronesian islands are barely surfacing from the Stone Age, or, more precisely, from the shell-and-coral age, for the tools of the islanders have been coral and shell. Not even the most advanced island has truly caught up with the 20th century.

If all the Micronesians in all this wide blue world were to come together, they wouldn't fill the stands of the Rose Bowl in Pasadena.

*An earlier account of our Micronesian stewardship, by W. Robert Moore, appeared in the July, 1948, GEOGRAPHIC: "Pacific Wards of Uncle Sam."

Swirling, swaying girl of Yap joins her high-school troupe in a spirited stick dance. Jeweled with hibiscus blossoms and a gleaming necklace, the grass-skirted coed keeps alive her heritage while studying for the future. Currents of anticipation sweep the scattered Pacific islands of Micronesia as its seafaring people—bruised by World War II and jarred by nuclear testing at Bikini and Eniwetok—look for a place in the modern world.

REDACHROME (ABOVE) AND EKTACHROME BY DAVID S. BOYER © NATIONAL GEOGRAPHIC SOCIETY



Even with the population explosion, there are only about 93,000 of them.

In land area, Micronesia—known also as the United States Trust Territory of the Pacific Islands—adds up to very little. Lumped together, its 700 square miles would cover barely two-thirds of Rhode Island. Only 96 of the 2,100 islands and atolls, all but lost in three million square miles of ocean just north of the Equator, are inhabited.

By ship and by plane and by hook and by crook, I managed to find 47 of them in four months. Each lonely island, as I sighted it, rose like a mirage out of a salt-water Sahara.

I flew into Micronesia via the U. S. island of Guam, physically part of the island group but politically distinct. It has been under our flag since Spain ceded it to us in 1898.

After a quick briefing at the nearby Trust Territory headquarters on Saipan in the Mariana Islands, I flew to Truk—famed Japanese naval base during World War II—in the Caroline Islands. It was there that I met Radio and his colleagues. Then I flew on to Yap, to catch an island-hopping boat to the outer Carolines, home of the most isolated and primitive of the Micronesians.

These Re Mathau, meaning People of the

KODACHROME BY DAVID S. BOYER © NATIONAL GEOGRAPHIC SOCIETY

Deep Sea, are inhabitants of flat coral atolls that stretch across a broad sweep of the Carolines. They acquired this condescending name from the more civilized people of the "high island" of Yap.

Atolls, a geologist had explained to me, occur after the death of high islands. They were originally volcanic mountains spewed up from the sea. Then they subsided and, sinking, left memorial records of their one-time shorelines in the form of coral reefs that grew upward even as the land sank. These irregularly shaped atolls—rings of living coral—may be a mile across, or fifty (page 722).

Sails set high at sunrise, Re Mathau, or People of the Deep Sea, leave Satawal Island for tuna-fishing grounds beyond the horizon. These residents of small atolls between Yap and Truk (map, pages 714-15) voyage hundreds of miles in outriggers made from breadfruit planks. Such craft brought the ancestors of today's 93,000 Micronesians, who inhabit 96 of 2,100 islands and atolls flecking three million square miles of ocean. American forces wrested this vast region from the Japanese; in 1947, it became the United States Trust Territory of the Pacific Islands under an agreement with the United Nations Trusteeship Council.

Micronesian ingenuity adapts old ways to new uses. The foreman of a construction project finds his earlobe a handy place to keep a pencil. Today, young men seldom pierce ears for ornaments, but the older generation still adorns itself with heavy metal rings.

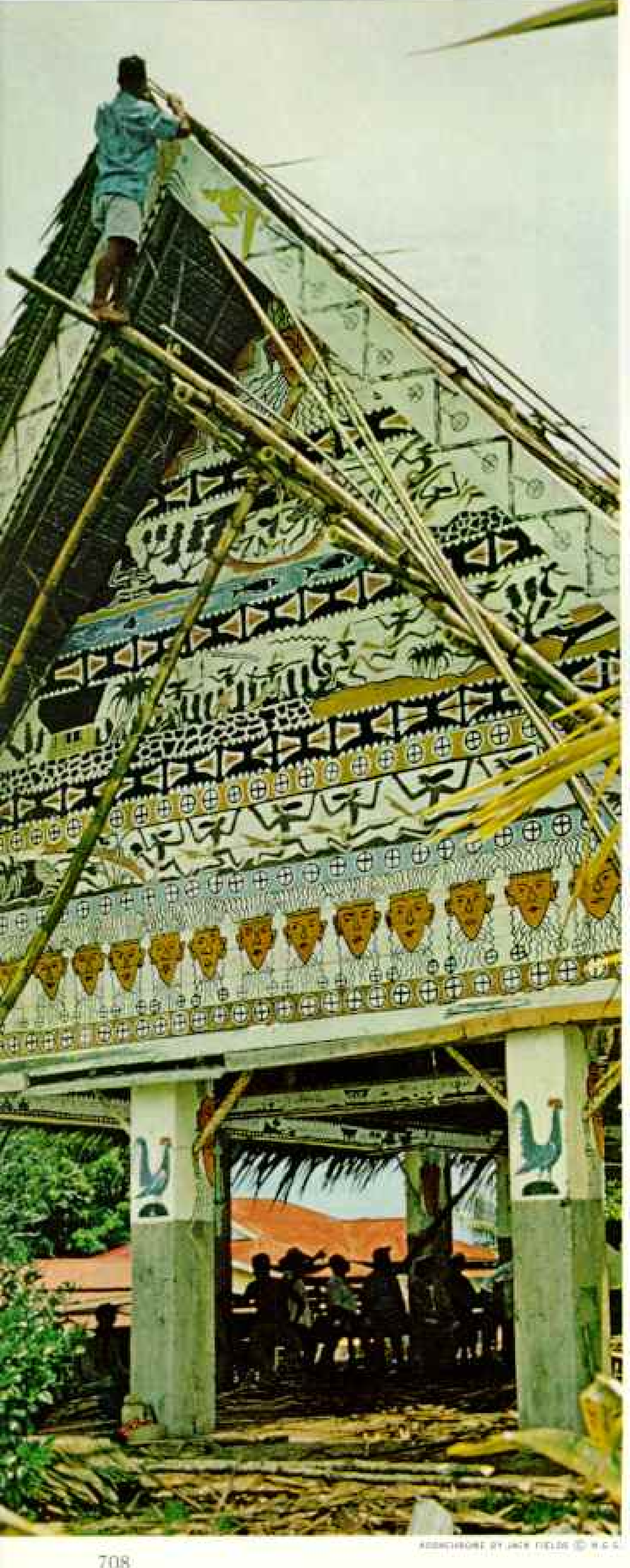
With need for keys but no pockets, another man clips a holder to his *thū*, the loincloth worn by men in the Carolines. Cotton goods, introduced by missionaries and trading companies, slowly replace the scratchy hibiscus homespun used for thūs and lava-lavas.

Innocence of Eden still sets Yapese styles

AT THE THRESHOLD OF CHANGE, a woman from Ulithi ponders a purchase in a Yap department store. Old customs still prevail on Yap and its outer islands, where a strict tradition of modesty accepts bare breasts but prohibits uncovered thighs. This shopper's boldly striped lava-lava, woven of shredded hibiscus bark, marks her as a visitor from a distant atoll. Yapese women prefer ankle-length grass skirts; an abbreviated version hugs the hips of the shy toddler at right.

Both women and men tote personal belongings in woven palm-leaf bags. Micronesians learned to use *zori*, thonged Japanese footwear, during 30 years of occupation.

KODACHROME (ABOVE) BY WALTER MEAYERS EDWARDS; EKTACHROME (OPPOSITE) AND KODACHROMES BY JACK FIELDS © N.G.S.



The green of my first outer island rose no higher above the ocean than a pancake of coral sand could thrust a thick spread of tropical foliage. I landed, by chance, during a burial ceremony in a tiny cemetery darkened by a jungle of coconut palms.

The People of the Deep Sea stepped forward across the coral sand, some of the brown-skinned women clutching naked babies to their breasts. In turn, they tossed tropical wildflowers soundlessly onto the lid of a coffin. Only days before, the coffin had been a canoe. It had sailed the blue island seas until its owner had died. Now it was going with him into the grave.

Male mourners at the funeral were dressed only in brilliant red *thüs*, loincloths that waved like flags fore and aft. Women wore lava-lavas, waist-to-knee sarongs woven from the inner bark of hibiscus; in Micronesian tradition, a woman's thighs must be modestly covered, but her breasts may go bare.

Small girls sported little ponytail switches of shredded hibiscus bark belted around their waists in pairs, front and back. Toddlers were completely naked.

Dead Were Formerly Set Adrift

These bereaved islanders might simply have pushed the burdened canoe away from shore. Consigned to the currents, the departed one would drift westward. His Micronesian ancestors had come from there long ago, sailing similar canoes, from Indonesia and Southeast Asia.

He might have been cast adrift westward, except that his survivors were—culturally—moving eastward, toward the United States.

"I would be happier if they'd put their dead out to sea as they used to, but they've heard that Americans bury their dead in the ground. You notice that we've got the cemetery a long way from any houses or wells. The only drinking water is from the rain.

Old look on a new idea: Row of trophies from head-hunting days and, above it, misadventures of a prodigal son decorate Koror's community center, here being re-thatched. Communal projects help Palauans overcome local rivalries.

KODACHROME BY JACK FIELDS © N.G.S.

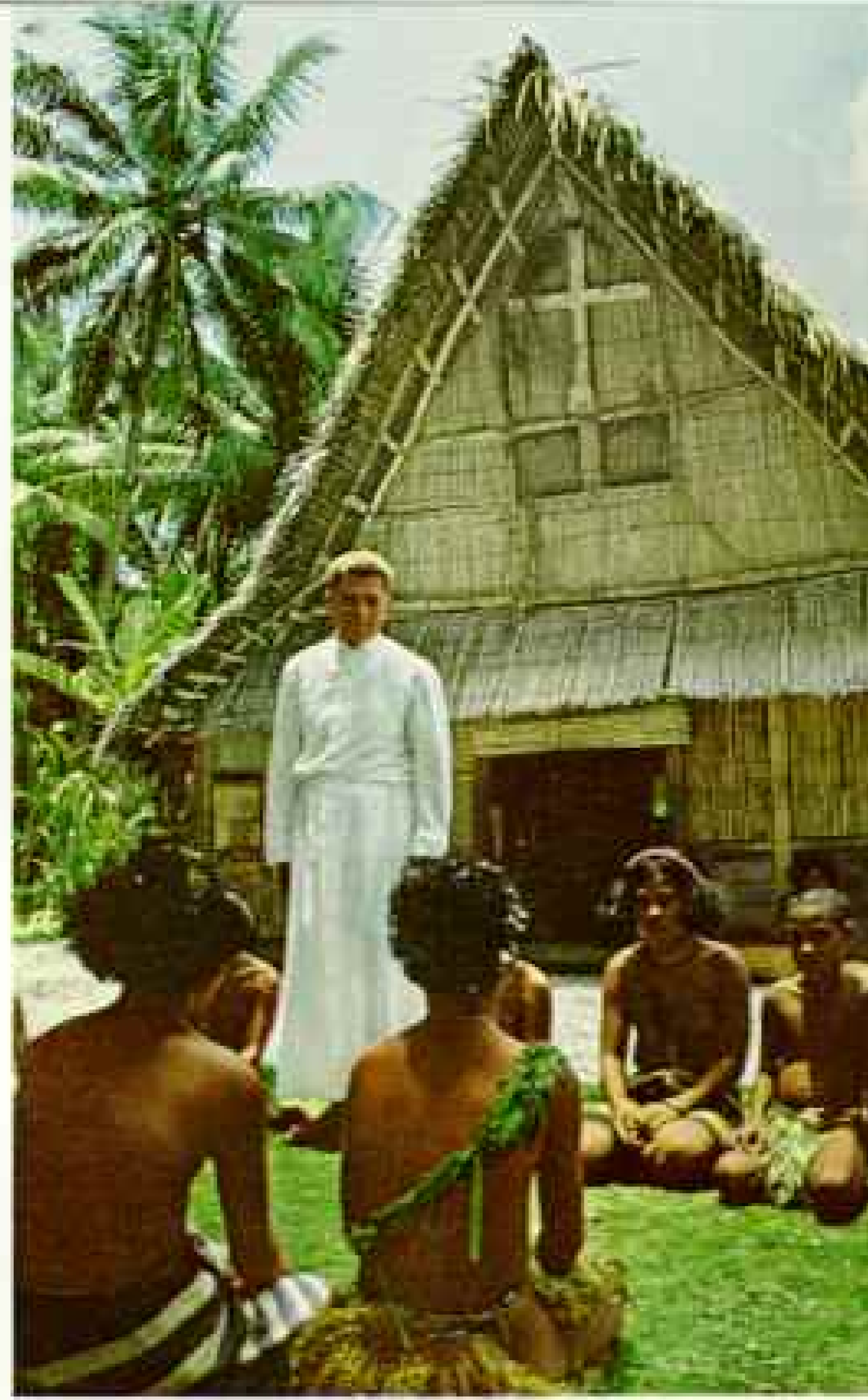
It lies underground, close to the surface, floating in pools on the denser sea water that saturates the coral underneath."

The words were whispered to me during the service by Jesuit missionary William J. Walter of Buffalo, New York (right). Now he moved forward to pronounce phrases that would dedicate this Christian grave.

No other American has lived so long among the Re Mathau. For 18 years Father Walter has toured these atolls. He logs 2,500 rolling, queasy miles a month aboard *Yap Islander* (page 714), a Trust Territory ship operated by a Yapese cooperative group, which carries food and supplies, doctors, officials, and ordinary travelers. Father Walter calls on some 2,400 Roman Catholic parishioners, most of whom he baptized himself. I had come with him on his rigorous monthly circuit.

His congregations are scattered on 21 islands; reaching them all requires three weeks of steaming. Visits ashore, by small boat or outrigger canoe, average only a few hours, scarcely long enough for burials, marriages, baptisms, confessions, and Mass.

A sailor only by necessity and devotion, this thin,

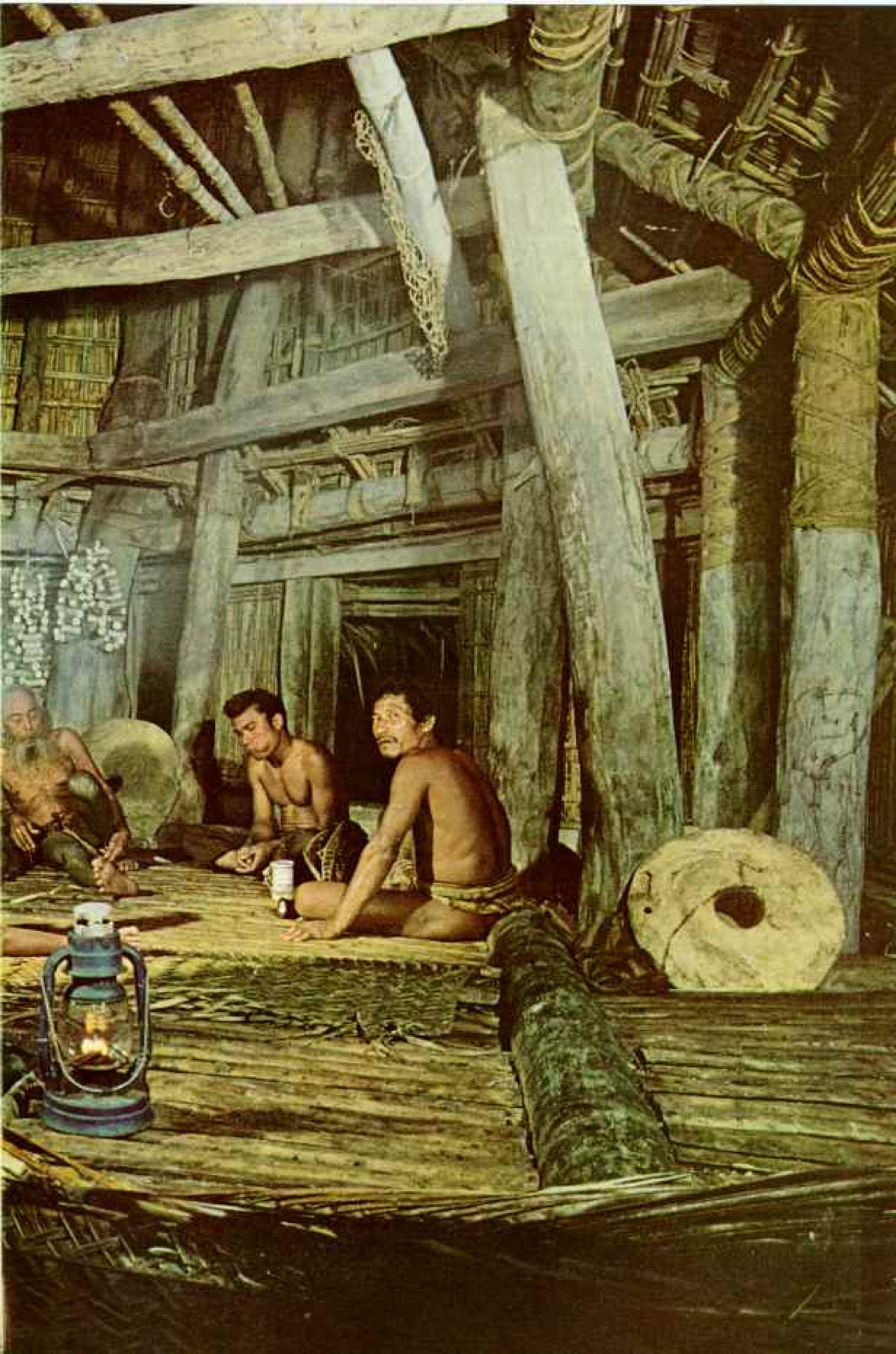


Priest to a far-flung flock, Father William J. Walter visits his chapel on Ifalik Atoll, one of a score of stops on his 2,500-mile monthly round. Some 125 Catholic and Protestant missionaries serve Micronesia —most as teachers in mission schools.

KODACHROMES BY WALTER MEAYERS EDWARDS (BELOW AND NEXT PAGES) AND DAVID S. BOYER © N.G.S.

Street lined with "money" proclaims village prestige. About 10,000 highly prized stone disks dot the islands of Yap. In times past, men sailed to the Palaus to quarry the calcite cart wheels. The more perilous the expedition, the greater the value attached to the treasure. Yapese bestow the heavy stones to honor individuals or villages, but seldom take the trouble to move them to new locations.

Day's work done, males of Atelu, Yap, relax in the village "all-men" house. Once a place of residence and instruction for bachelors, it now serves largely as a clubhouse and storage place. The village chief lights a cigarette with a glowing ember. Bearded elder with tattoo-blackened legs spins yarns for his friends, who affectionately call him "Moses." A betel-nut quid fills the cheek of a listener to his left. When the kerosene lantern is turned down, men curl up on the corrugated floor and gossip quietly into the night.



grizzled American priest rides *Yap Islander's* rail, shunning the close, claustrophobic confines below decks. The little island supply ship is not much bigger than its own cockroaches and too small, almost, to be let out to sea alone. Unable to abide the odors of the galley, Father Walter eats meagerly from cans of cold corned beef or tuna.

Ashore, smiling Micronesians welcome him to their palm-thatched huts and regale him with finer fare—roasted breadfruit, boiled taro root, fried reef fish—all washed down with water from green coconuts slashed open by machete. His Stone Age islanders shyly adorn him and themselves with *maramars*, coronets of fresh wildflowers. The maramar is Micronesia's trademark, a symbol that stands half for happiness, half for love.

Father Walter, their best-loved visitor, carries their letters and serves as go-between with mainland mail-order firms. To a few uncommonly thrifty parishioners he sometimes delivers transistor radios, but generally his suitcases are loaded with metal pots and knives as replacements for the sea-shell tools his communicants now consider non-American. On this trip, he was also filling orders for colored cotton yarn for the making of lava-lavas.

"Yarn is much easier to work than hibiscus bark," the women had told him, "and it's not so scratchy to sit on."

"No Money for Soap"

Father Walter also brings his people religious comfort. But he urges them to hold fast to their ancient ways and does not try to change them.

"These calm, patient islanders have more to teach us, I sometimes believe, than we have to teach them," Father Walter said as we watched the closing of the grave.

"You really can't try to halt change, though," he went on. "The globe today is too small for even its most inaccessible corners to escape civilization. But I'll fight the wrong kind of change, like the bringing in of beer and liquor. These people simply can't drink. Liquor is legal already on many islands, and it has ruined a lot of people.

"I'll hate the day, too, when they start wearing clothes. You've seen them, on Yap and other islands, like tramps in dirty, giveaway clothes. It'll happen out here, too.

"In a couple of years we'll have outer-island boys going off to college in the States," Father Walter continued. "They'll come home wearing trousers, and they'll want blouses and brassieres on their girls. Trouble is, they still won't have soap to wash the clothes. No money for soap. All they have in this world is a few coconuts to sell. In a year, they earn only about $12 per

KODACHROME BY JACK FIELDS © N.G.S.

Itinerant medic, armed with a first-aid kit, examines a boy's inflamed throat. Dedicated health aides of the outer islands make their rounds by outrigger, bicycle, and on foot. They also maintain makeshift dispensaries. Now paid and given refresher training by the territorial government, the aides once worked without regular salaries.

person! Happily, they don't need much cash."

We watched the bronzed gravediggers as they neatly covered over their work with coral gravel, and Father Walter sighed again.

"They'll lose their beauty and dignity, in clothes. And have outbreaks of skin infections as well.

"But it's inevitable," he said, practically. "We've got to get them enough money to buy soap, and education to use it, on bodies *and* clothes. And to build toilets and wear shoes. They *must* do that. What with bare feet and poor sanitation, they're nearly all plagued by internal parasites."

The mourners pounded a hand-carved wooden cross into the sand and made the sign of the cross. In the throng dispersing homeward along the jungle paths, I became separated from Father Walter, but I thought about him. Conservative. Enchanted by idyllic characteristics in his Micronesians' way of life. Anxious not to destroy their calm, their happy contentment. Yet himself a commitment to change.

Many Americans and Micronesians are committed to change on a much more rapid scale. Disembarking from *Yap Islander* at Ulithi Atoll, I stared across an empty lagoon, once a roadstead for hundreds of U. S. warships. Now a lone American walked down the silent beach to greet me—James D. Boykin of Riverside, California. Virtually singlehanded, Jim had created Outer Islands High School (pages 716-17), housing it in quonset huts abandoned by a U. S. Coast Guard loran station. He arranged for the youth of the Re Mathau to come by boat to Ulithi. In the old barracks, they sleep and work, study English and science, read assiduously about the American way of life, and eat free cafeteria meals made from U. S. surplus powdered milk, grain, and meat.

The school's 42 coeds, bare-breasted under the palm trees, daily knead the milk and flour into dough, then bake it outdoors in the heat of flaming coconut husks. The boys, wearing their flowing loincloths even for skin diving, spear fish to supplement the menu. Boys and girls attend classes side by side, dignified and handsome in their simple costumes.

Under a pandanus tree during lunch hour, a high-school sophomore and her boy friend leaned dreamily together. Propped between their respective ears, I noted as I walked by, was a tiny transistor radio whispering rock 'n' roll. An American-style disc jockey, 100 miles away on Yap, was responsible.

"We like American music," the coed told me later, "because it has a lot to do with love."

My next question embarrassed her.

"These purple marks on our arms? Our old island chiefs have all those magnificent

EKTACHROME BY DAVID S. BOYER © N.G.S.

Skilled Palauan medical team removes a gall bladder at Koror's hospital. Yuji Mesubed, left, administers the anesthetic, as Minoru Ueki, Ulai T. Otobed—Micronesia's only woman physician—and Masao Kumangai operate. All received medical training in Suva, British Fiji. In time, islanders hope to earn degrees at American universities.

TRUST TERRITORY *of the* PACIFIC ISLANDS

The Trust Territory possesses only two-thirds the land area of Rhode Island, yet lies scattered over an expanse of ocean comparable to the contiguous United States. It embraces the Marianas, Carolines, and Marshalls—some 2,100 islands with 93,000 inhabitants. Major exports are copra, World War II scrap metal, and fish.

MARIANA ISLANDS (LADRONES ISLANDS)

Farallon de Pajaros
Maug Is.
Asuncion
Agrihan
Pagan
Alamagan
Guguan
Sarigan
Anatahan
Farallon de Medinilla
Trust Territory Headquarters
Saipan
Tinian
Aguijan
Rota
Agana
Guam
U.S.

MARIANA ISLANDS DISTRICT
Land Area: 184 Sq. Miles
Population: 10,800

MANILA GALLEONS
Between 1565 and 1815, Spanish galleons laden with silks, ... and spices voyaged each year from the Philippines to Mexico. Returning to Manila with heavy cargoes of silver, the vessels put into Guam for supplies.

Tinian-based B-29's hastened the end of World War II by dropping A-bombs on Hiroshima and Nagasaki, August 6 and 9, 1945.

Magellan, sailing westward around the world, passed through Micronesia without sighting a single island until he discovered Guam on March 6, 1521.

Greatest known ocean depth

M I C R O N E S I A

Perforated stone "coins," from 18 inches to 12 feet in diameter, are still treasured in Yap as ceremonial money. For centuries such disks, some weighing many tons, were brought across 300 miles of open sea from the Palaus, where they had been quarried and shaped.

Ulithi Atoll
Fais
Yap Islands
Yap
YAP TRENCH

YAP DISTRICT
Land Area: 46 Sq. Miles
Population: 6,700

Gaferut
Namonuito Atoll
Nomwin Atoll
Murilo Atoll
Hall Is.
Farallep Atoll
Pigailoe Atoll
Ulul
Pikelot
Pulap Atoll
Truk Is.
Moen
Olimarao Atoll
Elato Atoll
Ifalik Atoll
Lamotrek Atoll
Satawal
Puluwat Atoll
Pulusuk
Woleai Atoll
Sorol Atoll
Eauripik Atoll
Ngulu Atoll
Losap Atoll
Namoluk Atoll
Etal Atoll
Mortlock Is.
Satawan Atoll

C A R O L I N E   I S L

Kayangel Is.
Palau Islands
Babelthuap
Koror
Peleliu
Angaur
PALAU TRENCH

PALAU DISTRICT
Land Area: 180 Sq. Miles
Population: 11,300

Before its destruction by U.S. forces toward the end of World War II, Koror was a thriving city of 20,000, the chief administrative center for the Japanese mandate in the Pacific.

Sonsorol Is.
Pulo Anna
Merir
Tobi
Helen Island

Truk's protective coral reef encircles a lagoon 30 miles in diameter—large enough to hold all the islands in the Trust Territory.

TRUK DISTRICT
Land Area: 46 Sq. Miles
Population: 26,800

Dotted lines represent areas of jurisdiction and are not to be interpreted as boundaries.

INDONESIA
Kepulauan Asia
Kepulauan Mapia
EQUATOR
Waigeo
Salawati
Supiori
Kepulauan Biak
NEW GUINEA
Ninigo Group
Pelleluhu Is.
Ninigo Is.
Heina Is.
Sae Is.
Kaniet Is.
Hermit Is.
Mussau
TRUST TERRITORY OF NEW GUINEA
Australia
130°
140°
150°
10° N
0°

KODACHROME BY JACK FIELDS © N.G.S.

Floating trading post, *Yap Islander* delivers manufactured goods and takes on copra and handicrafts at Elato Atoll. Once a month the 100-foot ship calls at every inhabited island group of the Yap District. Such "field-trip" vessels serve each of Micronesia's administrative areas, bringing doctors, magistrates, and school officials as well as wares.

Shaving dangerously on board *Yap Islander*, passenger Carlos Momo (opposite) uses a bare razor blade as his grandfather might have used a sharpened shell.

160° 170° 20°

0 100 200 300 400
STATUTE MILES: NORTH OR SOUTH LATITUDE

Places with Scheduled Air Service
Elevations in Feet. Soundings in Fathoms
District Headquarters

CARTOGRAPHIC DIVISION
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Wake I.
U.S.

WORLD WAR II IN MICRONESIA
Japan's World War II empire began to crumble as Allied Forces launched their Micronesian offensive in November, 1943. From the Gilbert Islands the Allies pushed west and north in a succession of costly battles, occupying the Marshalls, Marianas, and western Carolines. By the end of 1944, U. S. B-29's were on Tinian and Saipan, within range of the Japanese homeland.

MARSHALL ISLANDS DISTRICT

Land Area: 70 Sq. Miles
Population: 18,400

United States nuclear tests took place on Eniwetok and Bikini Atolls from 1946 to 1958. The first H-bomb was exploded in 1952 on Eniwetok, now the site of a U. S. Air Force station.

For centuries, Marshall Islanders navigated open seas using "stick charts." Made of interwoven strips of pandanus studded with cowrie shells representing islands, these charts (page 744) delineated wave patterns along a given course.

Taongi Atoll · Bikar Atoll · Eniwetok Atoll · Bikini Atoll · Eniwetok I. · Rongelap Atoll · Rongerik Atoll · Ailinginae Atoll · Utirik Atoll · Taka Atoll · Ailuk Atoll · Mejit · Wotho Atoll · Likiep Atoll · Wotje Atoll · Erikub Atoll · Ujelang Atoll · Kwajalein Atoll · Ujae Atoll · Lae Atoll · Ebeye · Kwajalein I. · Maloelap Atoll · Aur Atoll · Lib · Namu Atoll · Jabwot · Majuro Atoll · Arno Atoll · Ailinglapalap Atoll · Jaluit Atoll · Mili Atoll · Knox Atoll · Namorik Atoll · Kili · Ebon Atoll

MARSHALL ISLANDS

Ralik Chain · Ratak Chain

Here the United States develops and tests the Nike-X antimissile missiles against ICBM's fired from California.

10° N

C A R O L I N E S

Senyavin Is. · Oroluk Atoll · Pakin Atoll · Ponape · Mokil Atoll · Nanmatol · Ant Atoll · Pingelap Atoll · Ngatik Atoll · Kusaie

PONAPE DISTRICT

Land Area: 176 Sq. Miles
Population: 19,100

Colossal blocks of basalt, ruins of a ritual center where chiefs ruled Ponape in ancient times, mark Micronesia's most notable archeological site.

Nukuoro Atoll

Kapingamarangi Atoll

Though grouped with islands of Micronesia in the Trust Territory, Kapingamarangi and Nukuoro are Polynesian in culture.

Makin Atoll · Marakei Atoll · Abaiang Atoll · Tarawa Atoll · Maiana Atoll · Abemama Atoll · Kuria · Aranuka Atoll · Nonouti Atoll · Kingsmill Group · Beru · Tabiteuea Atoll

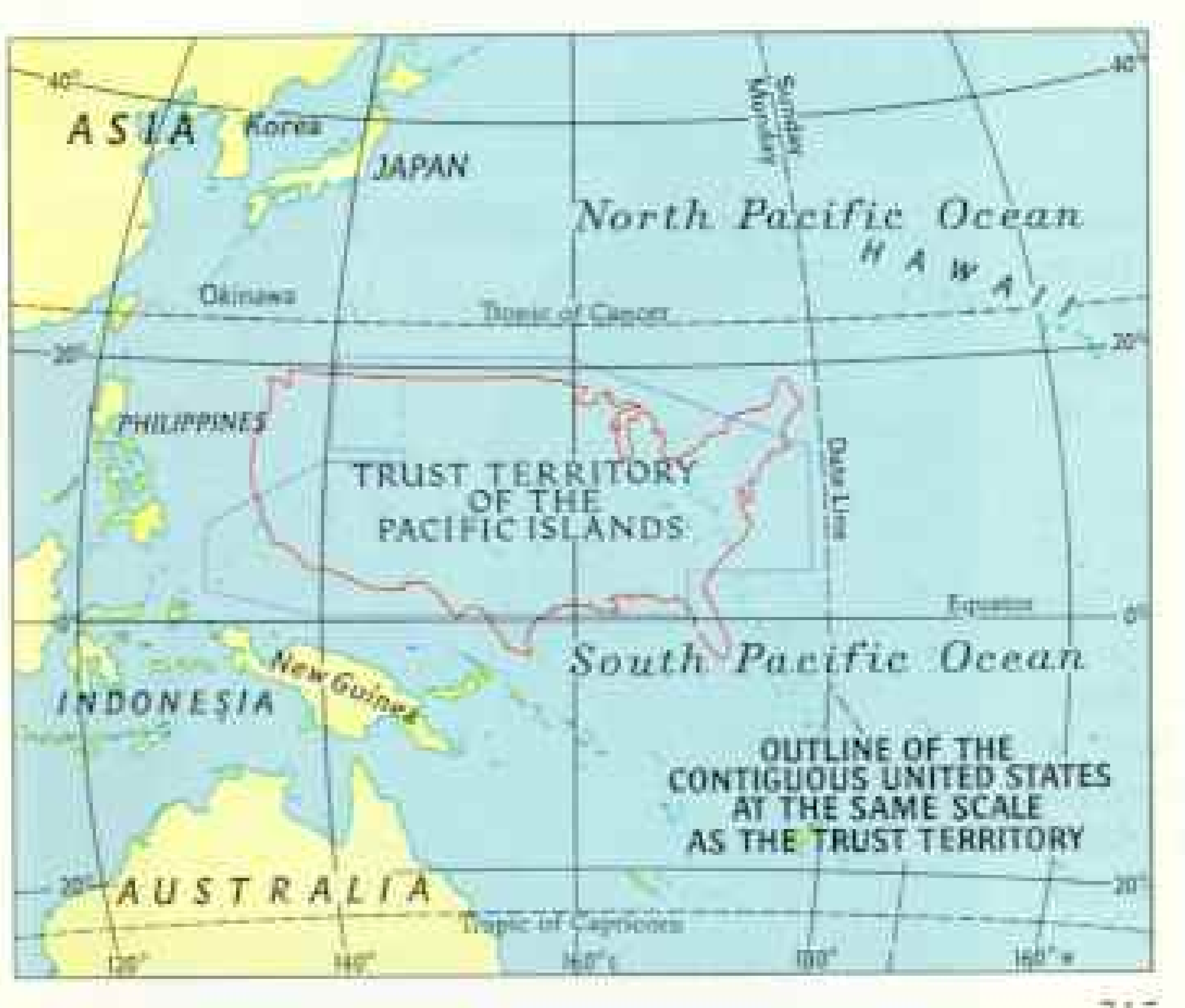
GILBERT ISLANDS
United Kingdom

EQUATOR 0°

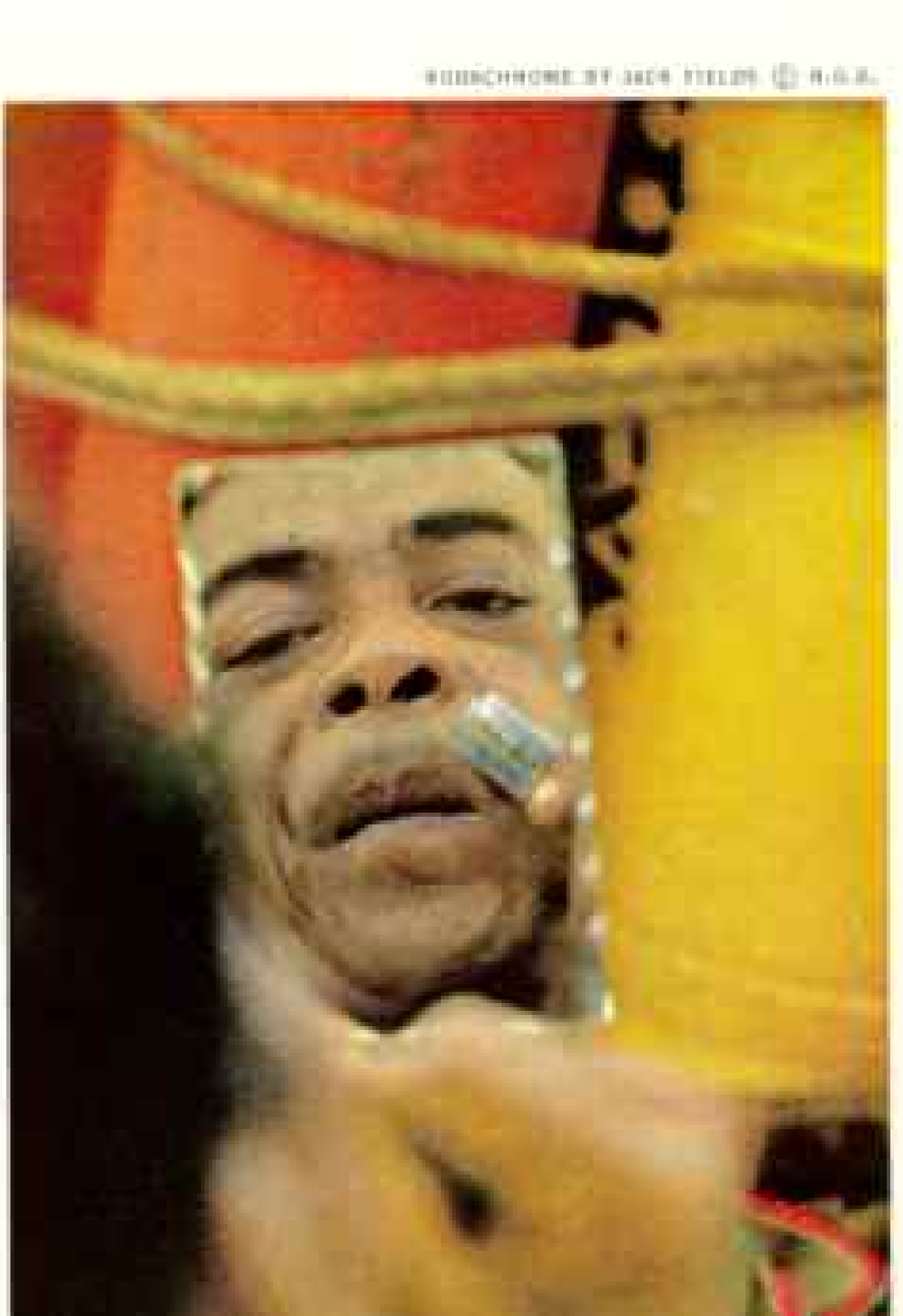
Nauru I.
Trust Territory
Australia

Ocean I.

160° 170° E



KODACHROME BY JACK FIELDS © N.G.S.



In Eden's simple garb, teen-agers tackle the complexities of science at Outer Islands High School on Falalop, Ulithi Atoll. Sophomore coeds study biology (left), while junior boys perform a chemistry experiment in a class instructed by James D. Boykin. With Trust Territory support, Mr. Boykin founded this public school in 1965 at an abandoned U. S. Coast Guard station. He and one other American taught every subject offered while they trained Micronesian teachers.

Three hundred students from 21 scattered islands live in former barracks during the school year—for most new students, their first venture beyond isolated home isles. They prepare their own cafeteria meals from American surplus food plus fish the boys spear in the nearby lagoon.

Until four years ago, one public high school, at Ponape, served all Micronesia. Now the Trust Territory operates eight and plans several more.

Living masterpiece of a dying art, an ornately tattooed chieftain watches the departure of his link to the outside world. Only men of great rank among Micronesia's elders merit such elaborate decoration. He and two village lads rest on a drum of fuel oil delivered to Ulithi by *Yap Islander*.

KODACHROME (BELOW) AND EKTACHROME BY JACK FIELDS © N.G.S.

tattoos. Ours we make with U. S. felt-tip pens. Maybe we're still savages in some ways!"

For five years, Jim Boykin has taught his "savage" students every academic subject he knows. In his new school's chemistry lab he proudly presented 11 caramel-colored young Adonises, his first graduating class. Girls will graduate beginning in 1968.

New Era Dawns for Island Wards

"The trouble is," Jim said, "we're wrenching their primitive culture away from them. Substituting science for magic. Medicine for witch doctors. Breaking down their whole society. But we haven't replaced their old system with any solid future yet.

"Micronesia has never had, until now, an economic or political plan. The Japanese, the Germans, and the Spaniards, when they ran the islands, didn't worry much about the inhabitants. We ourselves have had a leave-them-alone, go-slow policy for the past 20 years, but that's partly because Americans have disagreed among themselves about bringing Western civilization to these people. Thank heavens we're committed at last!"

EKTACHROME BY DAVID S. BOYER © NATIONAL GEOGRAPHIC SOCIETY

Jim was referring to a flood of new developments emanating from Washington, D. C., and Trust Territory headquarters on Saipan. They seemed to him to signal a long-overdue new era in United States policy.

"Through most of Micronesia's colonial history," Jim told me, "lack of education and of economic enterprise have left the islands in a state of suspended animation. And under the United States, until recently, we've had little more than a showing of the flag—a few administrators and experts, a handful of teachers, a scattering of doctors."

I would hear the same cry and see more reasons for it elsewhere. On Babelthuap, the Territory's largest island, a gangling young American named Dan Cheatham squinted sadly at me from under the brim of a forest ranger's hat and said:

"You are right now looking at the entire U. S. expeditionary force for forestry and conservation for 2,100 Pacific islands."

On Ponape, plant pathologist Jim Zaiger told me that a disease is killing breadfruit trees on many islands: "Breadfruit means the good life to lots of Micronesians. If the cause of the malady isn't found soon, the crop will be doomed. Our appeals have brought some pathologists, but large-scale research is urgently needed to solve the problem."

On Majuro, a crescent-shaped sliver of an island where 4,500 Micronesians live in tin shacks, an agricultural agent named David Ivra grimaced at the sight of a sick dog and told its owner and me:

"We've been trying to get a veterinarian for Micronesia for years. One is finally coming. But not in time for this dog."

Betel Nut Yields to Chewing Gum

Outer-islanders forsake the clean, uncluttered beauty of their islands for the crowds and squalor of Majuro and five other district centers. They hover like moths around the attractions of the settlements—government jobs, schools, hospitals, movies, high-priced canned food, and higher-priced beer.

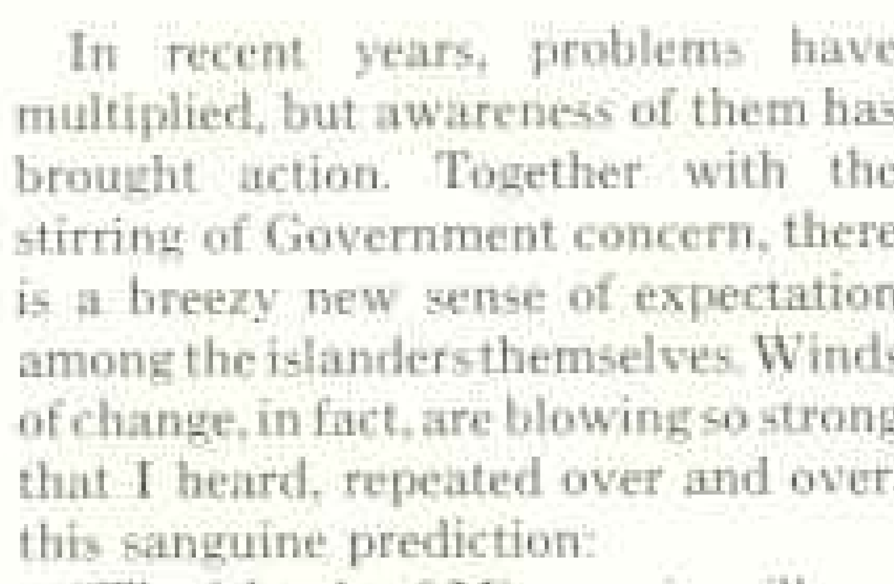
If some of the older generation would rather fight than give up chewing betel nut, the youth have switched to chewing gum. In the movies, you can hardly hear the sound track over the gum popping.

Adrift between two ways of life, a family peers from its one-room shack as a tropical downpour drums on the metal roof. Yearning for jobs, schools, movie theaters, and American food and clothing, Micronesians move into such homes to be near district centers and military bases.

Accelerated construction program adds a neat row of classrooms at Melekeiok, Palau. Before 1963, villages boasting elementary schools provided their own buildings—sometimes only thatched houses.

Stabbing home a point, Trust Territory High Commissioner William R. Norwood reports to the Trusteeship Council of the United Nations on efforts to bring better housing, education, and economic and political development to the islands. Flanking him are Ambassador Eugenie Anderson, U. S. Representative on the Trusteeship Council, and Senator Francis Nuuan of the Congress of Micronesia—appearing in behalf of the Territory's people.

EKTACHROME (ABOVE) AND KODACHROME (LEFT, LOWER) BY DAVID S. BOYER; KODACHROME BY CLAYTON L. PRICE © N.G.S.



In recent years, problems have multiplied, but awareness of them has brought action. Together with the stirring of Government concern, there is a breezy new sense of expectation among the islanders themselves. Winds of change, in fact, are blowing so strong that I heard, repeated over and over, this sanguine prediction:

"The islands of Micronesia will one day become a state, or part of a state, of the U. S. A.!"

Where have they been all this time, these eastward-tending islands of the western Pacific?

Their recorded history is scant enough: Between 1885 and 1914 they passed from colonial Spain to imperial Germany and on to Japan. International concern over these transfers abated after World War I, though they proved bewildering and difficult for the islanders.

Then, in one fateful moment, the islands reappeared on the international stage, to play a major role in a drama that shook the world. They provided secret bases for Japan's 1941 attacks on Pearl Harbor and Guam and Wake; they became bastions of Japanese military power and bloodstained battlegrounds of World War II.* They saw the launching of the atom bombs against Hiroshima and Nagasaki, and then trembled to the testing of the hydrogen bomb as a defense against a threatening, uncertain future.

*See, in NATIONAL GEOGRAPHIC: "Hidden Key to the Pacific," June, 1942, and "Mysterious Micronesia," April, 1936, both by Willard Price.

Kwajalein . . . Eniwetok . . . Bikini . . . Peleliu . . . Angaur . . . Saipan . . . Tinian . . . Truk . . . Ulithi. . . . The islands' names echo, in heads old enough to remember, like the tolling of terrible bells.

Then, abruptly, it was ended. No longer did their names make news. The islands seemed curiously to have slipped back into the depths that gave them birth.

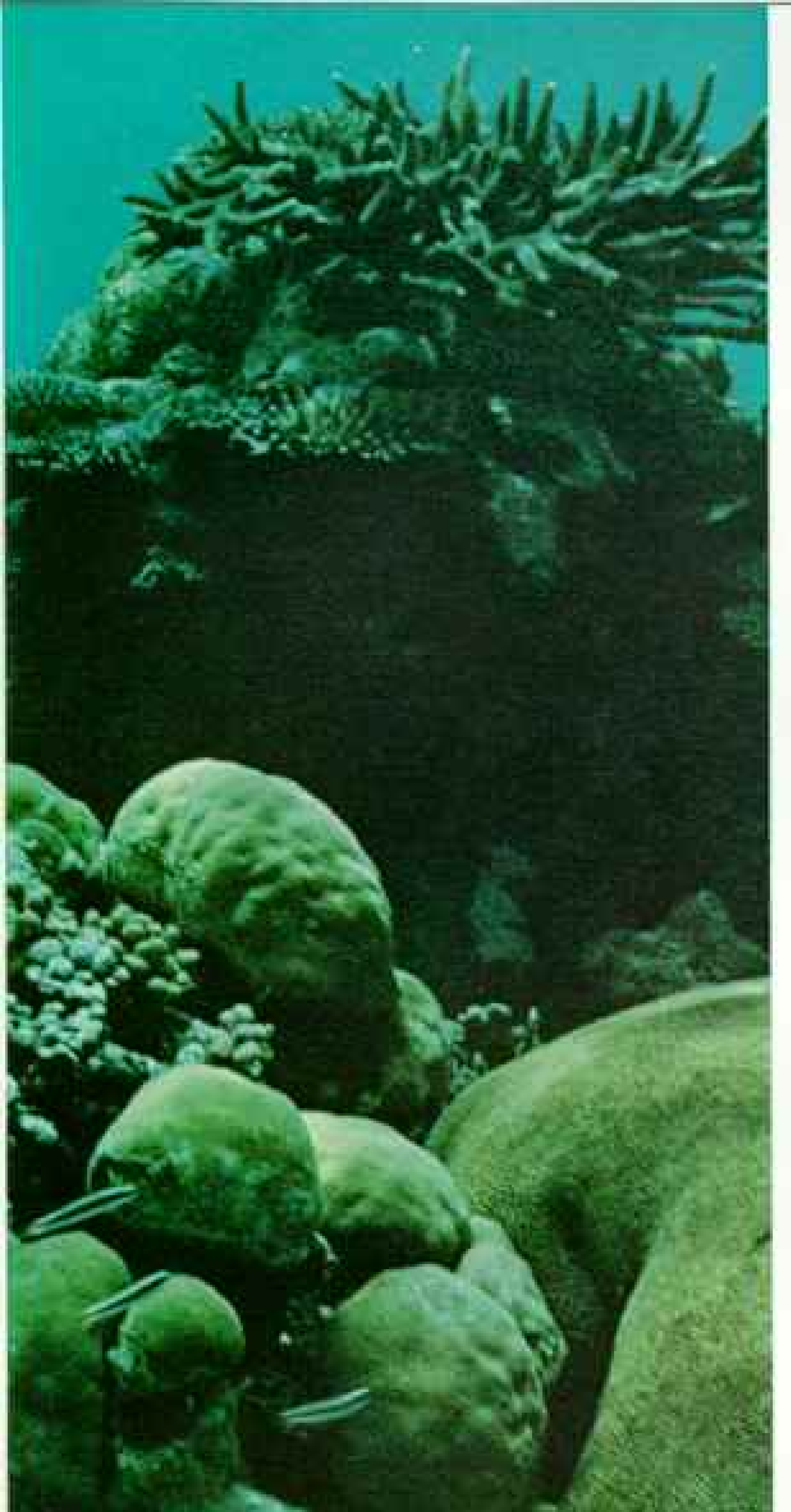
Goals Set by United Nations

Captured at tremendous cost, they had acquired tremendous value in a Pacific Ocean suddenly vital to U. S. security. The military resolved to hold these strategic prizes as a restricted reservation.

Japanese troops and colonists, many from islands bypassed in the fighting, were shipped home. Micronesians were repatriated to islands they had been forced to leave in the upheaval of war. They were brought food and medicine and doctors, and specially trained American naval officers became their guides and administrators.

Movements of foreigners were rigidly controlled in the new U. S. area. Even American nationals required security clearance; tourists, reporters, businessmen—all were discouraged from even trying to come. A reason often cited was Micronesia's lack of modern accommodations. The islands were, in effect, under wraps.

Much has changed since that beginning. First of all, a second guardian entered the lives of these orphans of World War II; in 1947, the Trusteeship Council of the United Nations became involved. The islands,



entrusted to Japan after World War I as a League of Nations mandate, now came under the United Nations Trusteeship Council as the U. S. Trust Territory of the Pacific Islands.

Our Navy continued to administer them, however. The negotiated "strategic" trusteeship arrangement between the United States and the United Nations was unique. It provided for the United States to use the islands for military purposes and authorized it to deny entry to outsiders.

In return for these privileges, the United States subscribed to United Nations goals—to further modern education, sanitation, and economic advancement, and to "promote the development of the inhabitants... toward self-government or independence...."

To bring all this to Micronesia would have cost hundreds of millions of dollars. Money aside, not everyone subscribed to the idealistic U. N. goals. The ruling philosophy of the postwar era was: The Micronesians live in paradise. Please don't disturb.

With snorkel, mask, and flippers, a diver invades the magical realm of a Palauan coral reef. His prize: a parrotfish, speared with a sharpened concrete-reinforcing rod. Accomplished spearfishermen, islanders normally use homemade goggles and swim barefooted. Wrasses hover at lower right.

Fleet of giant clamshells at their command, youngsters battle in a Koror storage yard. The Western Carolines Trading Company exports the armor of *Tridacna gigas* for sale to shell and curio collectors.

EKTACHROME (ABOVE) BY DAVID S. BOYER; KODACHROME BY WALTER MEAYERS EDWARDS © N.G.S.

RUBY NECKLACE ON A SAPPHIRE SEA: *Green foliage of Pakin Atoll appears red on infrared film used for aerial reconnaissance. Murmuring waterfall on a volcanic slope (opposite) turns a Palauan maiden's morning bath into a living idyll.*

 EKTACHROMES BY DAVID S. BOYER © N.G.S.

That philosophy, far from dead, has powerful adherents today. Besides many in the military, there are missionaries and civilian administrators—and Micronesians too—who are not sure that these people should be educated, given jobs, provided with gadgetized houses, and otherwise snatched into the materialistic modern world.

In 1951, the islands—except for military bases and nuclear-bomb test sites—were transferred from the Navy to the Department of the Interior. Though the Navy retained security control and authority to restrict entry, the principle of civil government had triumphed.

Even so, it was not until three or four years ago, under the Interior Department's High Commissioner M. Wilfred Goding, that a new concept began to gain the upper hand. Today, interest in advancement is keen. The military has removed most of its restrictions. Travelers get in. News gets out. The Trust Territory budget—millions of United States tax dollars—has doubled, will probably redouble. Congress is considering substantial new appropriations for roads, airports and harbors, hospitals and schools, water systems and electricity, agriculture and industry.

Peace Corps Enters the Battle

A dynamic new high commissioner has taken office. William R. Norwood of Hawaii (page 719), an islander himself and a man of ardent ideas for the Trust Territory, has a natural warmth toward the Micronesians.

Even before Norwood, a major goal had been to provide a liberal education, in English, for people who speak nine distinct island languages. After Norwood came, 350 Peace Corpsmen joined the battle. Some 700 will be there by the end of this year. Many teach in thatched-hut schools on isolated outer islands. Others join the Trust Territory's own contract teachers in new typhoon-proof, concrete-block schools on 36 islands (page 718). Still others carry on health and construction projects.

Economic development, almost ignored before, has been accepted as vital. Six elected legislative bodies are learning to govern district affairs. Most significant of all, a Territory-wide Congress of Micronesia, with a senate and house, has begun to function. Its paramount concern: self-determination. A plebiscite is on the horizon. Within a few years, Micronesian voters will face the question of whether to become an independent country or to become part of the United States.

Before then, the American Congress must determine what status it could offer Micronesia, should the islanders vote for permanent union with the United States.

Complicating the whole Micronesian problem is the islands' future relationship with Japan. On Saipan I talked with Dr. Elbert V. Bowden, economic analyst of Robert R. Nathan Associates of Washington, D. C. He was heading a team, hired by the Trust Territory government, to design and support plans to spur Micronesia's economy.

"The Japanese might be able to re-establish some of the industries they started during the years when they occupied these islands," Dr. Bowden said. "Micronesia will never have a viable economy without heavy injections of capital, management, and labor. Healthy Japanese participation could speed this development."

His belief has much to support it.

Under the rule of Japan, colonists came by

KODACHROMES BY WALTER MEAYERS EDWARDS (ABOVE) AND DAVID S. BOYER © N.G.S.

On velvety grounds of the Ponape Agricultural Development Station, superior-quality coconuts take root to serve as replanting stock. The station's experiments with pepper and cacao introduced islanders to new crops. A cooperative group markets Micronesian pepper as a gourmet item.

Chest-deep in muck, a Palauan woman gathers taro, starchy staple of Pacific islands. After breaking off the bulbous rootstock, she replants the top. Men of Palau disdain such tasks, but in the Truk Islands males work the boggy patches.

the thousands to build roads, towns with water and electric systems, and hotels for Japanese tourists. Others mined for phosphate, started fisheries, cleared farms, and raised sugar, manioc, pineapples, and rice, all for export.

Japan harbors a continuing interest in her onetime possession. She purchases almost all of today's skimpy exports, including copra—now worth $2,500,000 a year—and scrap metal left from World War II. She sells, to Micronesians and Americans alike, ships, boats, automobiles, motorcycles, bicycles, radios, clothing, and canned vegetables. Plus canned fish—caught in Micronesia's waters!

Most Micronesians, however, are skeptical of a Japanese return. If they remember money under the Japanese, they also recall menial jobs, a paucity of education, and repression.

Relations among Micronesians, Americans, and Japanese today are cordial but fragile. I witnessed the problem at close range while traveling with a group of Japanese who had been given special permission to return.

The occasion was a voyage on *Yap Islander* to remote Lamotrek Atoll. En route, at Woleai Atoll, we had dropped off the Japanese. They were army veterans come to visit a scene of island warfare that still evokes heartbreak in many Japanese; here they suffered one of the grimmest tragedies of World War II.

Capt. Willie Poznanski, an islander whose name recalls the visit of a whaling schooner's crew a century ago, dropped a stern anchor and secured his bow to a Lamotrek palm tree. The islanders paddled us ashore in outriggers, and moments later we sat cross-legged on the grass beneath the palms, drinking from sweet young coconuts and wearing maramars of welcome on our heads.

Garlanded to receive us was Veronica Lefaioup, stately paramount chief of her atoll. Women can be chiefs on some islands of Micronesia.

"A Japanese fishing boat has been here for three days," she complained. "They fished inside our lagoon, then loaded up with coconuts and bananas. When we asked for cigarettes or canned food in payment, they were very rude. They sailed away just before you arrived."

Captain Willie immediately returned to his ship and radio.

"Japanese pirate ship marauding vicinity Lamotrek Atoll," he flashed. The message went out to Saipan headquarters, then to the Navy on Guam. Fishing boats of any foreign nation are forbidden to come within three miles of any island, except for medical or mechanical emergencies, and most Japanese skippers respect the rule.

The violator on Lamotrek made his getaway. When our ship returned to Woleai, however, to collect ex-Army Capt. Nobuaki Koseki and his party of Japanese war veterans, Willie captured a second marauding boat anchored in Woleai lagoon.

After arresting her Japanese crew, the skipper radioed a report. By law, the boat could have been confiscated. Over the years many poachers have been seized and their crews air-shipped home, fares paid by Japan. But Willie received orders to issue a stern warning and let this one go.

Bombs Fail, but Starvation Conquers

Willie and I exchanged relieved smiles with Captain Koseki, who had come aboard and shared the embarrassment. Koseki had almost completed his pilgrimage. Here on Woleai, 21 years earlier, he had survived one of the most chilling sagas of the Pacific war.

As one of 7,000 Japanese, he had landed here in April, 1944, to reinforce the threatened defenses of Woleai and its airfield.

"Each day, American Air Force arrive," Captain Koseki recalled. "We set our watch, ten o'clock, crawl down in bunker. Twenty-four aircraft, B-24. Two, what you call, tail fin? Make big circle, drop bomb single file, island so small. Each day, almost never fail, 15 month. I remember saying, 'Must be many, many bomb in U. S. A.!'

Batons clash, grass skirts swish, as boys of Truk High School vigorously thrust and weave through the precise motions of a stick dance. Anthropologists believe this popular entertainment of the Carolines originated as military and athletic training, perhaps a ritual prelude to warfare. Both sexes perform the rhythmic exercises, but only young children dance in mixed groups.

"But U.S.A. bomb kill very few. Most Japanese die because no food, no supply ship can come.

"Japanese Navy sometime send submarine at nighttime. But submarine not carry much supply, sometime not arrive, maybe sunk by Yankee bomb. So we on Woleai have fever, disease, die from hunger. No chance to fight for Japanese emperor.

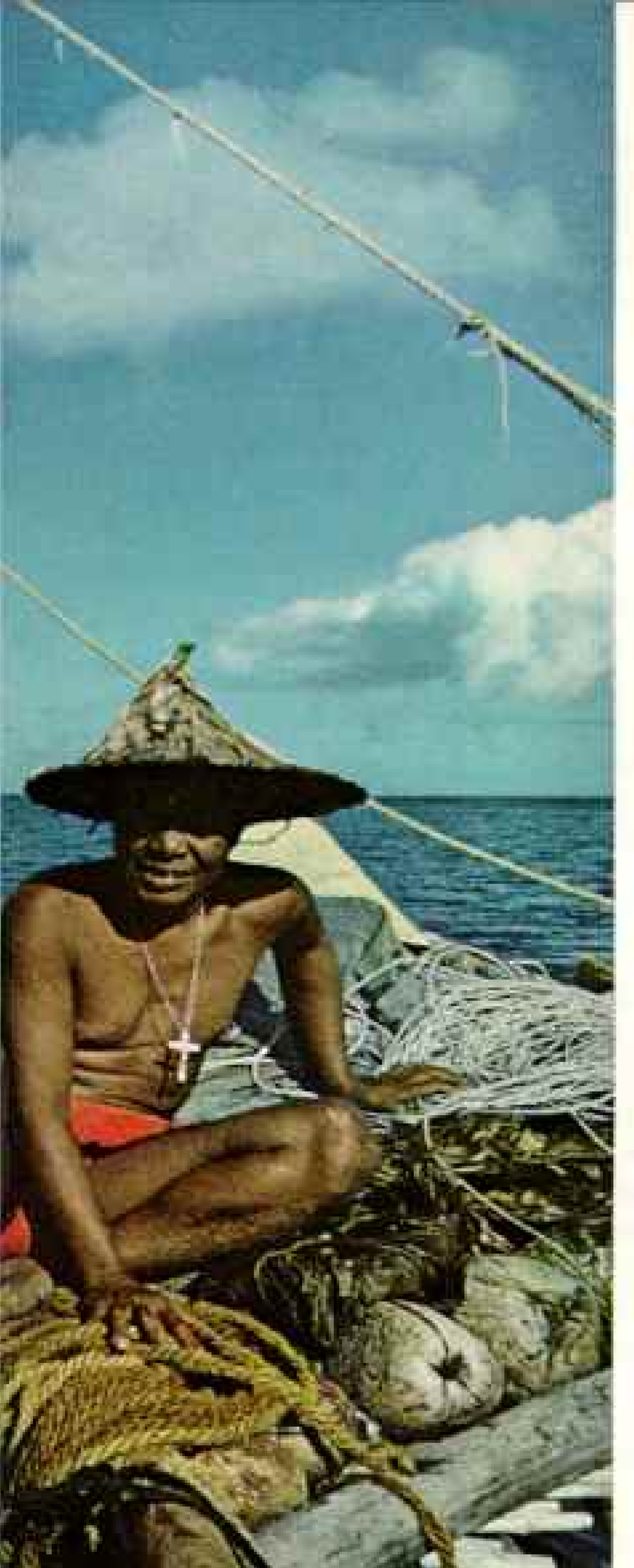
"Only 1,500 Japanese ever see Japan again. Very sorry. Now we return, make ceremony in honor 5,500 soldier who die."

Ashore, I watched Captain Koseki and former Sergeants Keiji Okinaka and Haruei Hirano pay their final respects. Hundreds of Japanese had sent letters, prayers, photographs, candles, incense, food, and cigarettes appropriately called "Peace." The three veterans laid out these offerings, one by one, at the base of a simple wooden shrine. The two-hour dedication ceremony, beautiful, tasteful, brimming with emotion, culminated in the burning of a funeral pyre draped with a Japanese flag (page 739).

Through the smoke, the three old soldiers chanted "Umi-Yukaba," a military funeral march sacred in Japanese tradition for 1,200 years. Their voices were very low, for their heads were bowed.

An Old Soldier Says *Sayonara*

That gripping scene had its intimate aftermath, on which I was the only trespasser; I could not avoid it. At midnight Captain Willie sent a small boat ashore to pick us up. As I leaned against the port gunwale, the bearded visage of Sergeant Okinaka was only a yard away. His glazed eyes were obviously



Homeward bound from a shopping spree, men of Puluwat sail through Truk lagoon, their outrigger nudged along by a light quartering breeze. They will voyage across 185 miles of open ocean to reach their atoll. Shelter of mats hangs outboard; coconuts supply food and drink.

Highlight of a day in town: Puluwat seafarers buy cartons of cigarettes and bright cotton material for new thús at the Truk Trading Company—a Micronesian-owned business with headquarters on the principal Truk island of Moen.

KODACHROMES BY WALTER MEAYERS EDWARDS, NATIONAL GEOGRAPHIC STAFF © N.G.S.

watching in review those grim events of many years ago.

Staring into the darkness, Sergeant Okinaka removed his military hat. Slowly, in benediction, he extended it out over the water, dropped it into the wake of the boat, then folded his hands beneath his chin. A single great tear slid down his nose, hung there, then splattered across his knuckles.

His lips moved soundlessly, but I read them: *"Sayonara!"*

Japan's economic influence—and its possible effect on Micronesia's future—was apparent when I visited the Palau Islands.

Here, before World War II, the Japanese brought Okinawan-Japanese tuna fishermen as colonists. Today, an American company has brought some of them back under contract to train Micronesians.

I sailed one sunset aboard the tuna boat *Peleliu*. Her skipper was a boyish Okinawan named Shunsuki Uehara.

We anchored for the night inside the reef that makes Palau a sheltered paradise for such few fortunate swimmers, waterskiers, skin divers, and shell collectors as ever reach this Pacific playground (pages 720-21).

Shunsuki and his crew turned to luring bait fish into a net with an electric light. I turned to one of nature's most extravagant excursions into symmetry, for *Peleliu's* bow, as she rode at anchor, pointed into a regiment of low, rounded silhouettes, dark against the embers of a burned-out sun. They were like loaves of bread against a hot brick-oven wall; as darkness descended, a sliver of moon hung above the scene. I was watching night overtake the unique Rock Islands of Palau.

The Rock Islands may one day become one of the tourist wonders of the world. Geologically, they are the remains of lime-secreting animals and algae. Erosion over millenniums has resulted in myriad humpbacked islands—some not much bigger than haystacks. They look, in the curious rows many seem to assume, like ranks of soldiers' helmets.

Seen at low tide, they acquire the aspect of seagoing mushrooms, for they are deeply undercut on all sides. Wave action, one surmises. But that would not be the whole story. Calcareous rubble, scouring the islands' "stems," probably contributes. Limestone dissolves easily, so that heavy tropical rains play an important part.

No doubt by the time the Rock Islands are discovered by the world's tourists, they will also have attracted more of the world's geologists, drawn by the still unsolved puzzle of their strange shapes.

Hard Life Faces Apprentice Fishermen

With *Peleliu's* bait tanks deep and silver with sardines, we raised anchor at dawn. A squadron of sea birds pursued us outward through a passage in the reef, breakfasting on the bait that escaped through the openings that keep sea water circulating in the tanks. The crew and I chopsticked our way through rice and *sashimi,* bits of raw fish drowned in soy sauce.

As we ate, huddled on our haunches on *Peleliu's* afterdeck, I listened to a teen-age Micronesian from Ponape Island, which hopes one day to have a tuna fishery, too.

"I'm here to become a fisherman," he declared. "Not to fool around. No luscious Palauan girls for me. But it's a hard life. If we catch 40 tons of tuna a month, we make about $40; if less than five tons, nothing at all; it takes that much to cover the boat's expenses. Worst part is eating this Okinawan sashimi and rice, rice and sashimi. If I ever get a night off, I go out and get some nice Micronesian taro root, or pounded breadfruit, or coconut pudding."

We had a fair day, caught a ton of tuna. I was unloaded with the fish at sunset. My friends waved as *Peleliu's* wake curved and then straightened out toward the Rock Islands and another 24-hour quest for tuna.

In the district center of Koror that night, at the Royal Palauan Hotel (not quite royal enough to boast rooms with bath, but one of the Trust Territory's best, nevertheless), I talked to Fisheries Management Biologist Peter T. Wilson. Pete admitted that the training program was going poorly.

"Most of our Palauan trainees have quit," he said. "Only boys from Ponape and Truk are left. They might quit, too, if they weren't so far from home. Micronesians don't like hard work with little pay. Most of them have never had to do anything harder in their lives than walk out in their front yards to collect coconuts for dinner."

With an imported Hawaiian-Japanese master boat builder and Palauan labor, Pete was building a prototype tuna-fishing boat, the *Emeraech,* or Morning Star.

Screened by a leafy lattice, women bathe and wash clothes below one of the falls that lace the slopes of Ponape. Rainfall here averages 190 inches a year at sea level; perhaps twice as much drenches the 2,595-foot heights of this volcanic island, highest in the Carolines. Dense forest mats the rarely penetrated uplands. Ponapeans live beside coastal bays and coves.

EKTACHROME BY DAVID S. BOYER © NATIONAL GEOGRAPHIC SOCIETY

"*Emeraech* will get by with half the crew of an Okinawan boat," Pete said. "She'll have greater speed, more capacity. If she proves out, our boys can make better money. And we'll have a shipbuilding industry, too."

Next morning, under bright new operating-room lights in the district-center hospital, I photographed five Palauan men and women at work, practitioners in one of Micronesia's few real professions (page 713). Chattering a tossed salad of English and Palauan, they removed a woman's gall bladder as neatly as American surgeons might have done.

Most Micronesian doctors got their training at Suva's Central Medical School in British Fiji. Their degrees are not recognized by American medical authorities, so officially they are mere "medical officers."

"They're doctors in my book, though!" Pete Wilson's

Champion fishermen of Ponape, villagers of Porakiet reap a bounty from the sea. Boatmen cast a net over shallows for tiny fish. Their catch will bait hooks on hand lines lowered into deep water beyond the island's barrier reef. Hand-carved wooden goggles pushed up on his forehead, a diver heaves a parrotfish into a canoe. Another spearman kills a small fish with a bite behind its head. Both participate in a huge sweep across the reef. Village men form a circle about a mile in circumference and drive fish toward a V-shaped net, skewering those that try to escape.

KODACHROMES BY WALTER MEAYERS EDWARDS (ABOVE) AND CLAYTON J. PRICE © N.G.S.

cover-girl American wife Ann had told me. "They delivered my three sons. And if I had 13 more to go, I'd want every one born into the hands of a Palauan doctor."

Medical Aides Make Do With Little

I talked with Dr. Minoru Ueki (one of thousands of Micronesians bearing Japanese names) as he and I changed out of operating-room garb together after the final stitches closed the gall-bladder incision.

"We do our best," Dr. Ueki smiled. "We'd like to boost our medicine up to at least U. S. minimum standards. But the obstacles! None of us were trained in the States."

The Trust Territory, Dr. Ueki told me, had too long tried to manage on a subsistence budget. "But there seems to be a revolution in U. S. thinking," he said, "especially since the critical report by the U. N. health organization in 1966. We may soon be able to send Micronesian doctors and nurses to the U. S. for training. Until then, we'll happily take on Peace Corps assistants to tide us over."

By chance, I headed unknowingly to a second medical rendezvous. Hawaiian Airlines invited me to join their survey trip from Palau to Majuro in the Marshall Islands, a 2,600-mile flight from one end of the Trust Territory to the other (maps, pages 714-15). Hawaiian was hoping to give Micronesia its first tourist and commercial air routes. Pan American, which already operates a contract air schedule for the territorial government, hoped to beat Hawaiian to it.

From the DC-6, I looked down on oval atolls I had visited by ship and sailing canoe—jade necklaces displayed on Pacific blue velvet. A tiny figure waved from beside the sail of a solitary outrigger canoe—probably

Haunting ruins of Nanmatol pose a riddle for archeologists. Built on Ponape of rock "logs" —huge crystals of basalt found on the island—such enclosures spread over a hundred islets that fill a swampy lagoon. Local legend hints that the structures' owners were tyrants who

a Micronesian health aide, shuttling from island to island, his equipment a first-aid kit, his qualifications a spoonful of medical knowledge and a heartful of fraternity.

On Majuro, I met a counterpart of Dr. Ueki: Dr. Tregar Ishoda. We toured the Marshall Islands hospital together. Next door stood the Trust Territory's rehabilitation center for polio victims (page 744), housed in salvaged metal barracks from atom-bomb testing days on Bikini Atoll. The center came into being, Dr. Ishoda told me, after a tragic polio epidemic; an American family had brought the disease in 1963.

Dr. Ishoda drove me back to my quarters. En route, he gestured toward a cluster of rust-rotted World War II quonset huts in sundry stages of collapse.

"Until last week, my family and I shared one of those with another doctor's family." He pointed again. "But now we have that new metal hut to ourselves. It's a step up."

He stopped to let me off before the handsome three-bedroom house to which I had been assigned. Equipped with an electric stove, refrigerator, and shower, it awaited an American doctor or administrator.

Threat of Disease Stalks Outer Islands

"But better things are coming for us, we hope," Dr. Ishoda said. "Meanwhile, our hospital service improves all the time. We haven't done much for our outer islands yet, though. Even immunization is not completed. These people are vulnerable to almost any epidemic."

Beyond the hospital, the rest of Majuro was a depressing Micronesian slum. Its future epidemics could be such urban problems as unemployment and juvenile delinquency.

For two nights, Majuro wined and dined the Hawaiian Airlines officials. Talk about Micronesia's future became almost giddy.

KODACHROME BY JACK FIELDS © N.G.S.

exacted tribute from the islanders. But no one knows for certain who erected the complexes, or when. An expedition of the Smithsonian Institution explored Nanmatol in 1963. It recovered charcoal that proved to be about 700 years old when dated by the carbon-14 technique.

"Wait until the tourists discover paradise!"

As I started to leave, our host Dwight Heine, whose German grandfather had been a Protestant missionary here, proposed a parting drink.

"How about one for the reef? I can't offer you one for the road. That mile of pavement you saw in Palau and a bit of worn-out asphalt here are the only paved roads the Trust Territory ever built!"

Heine has the distinction of being the only Micronesian yet to rise to high Trust Territory rank. Working under Commissioner Norwood, he governs the Marshalls as district administrator; a Marshall Islander himself, he truly represents his people.

It turned out that Dwight wasn't so bitter about the past as he was worried about the future. "We've been saved, you know, by the fact the U. S. hasn't developed us yet," he said.

Half a dozen prospective promoters of Micronesia's future sat upright on the edges of their chairs.

"We're going to be developed now, for sure," Dwight went on. "And invaded by tourists. The question is, have we had enough time to prepare for the coming storm?"

Islanders Lack Technical Know-how

I had heard lamentation by scores of Americans and Micronesians about the glacial pace of the region's development. Now here was Dwight Heine sounding strangely happy about it.

"Lots of Micronesians now speak English," he continued. "Some have a smattering of history, literature, or economics. We even have a few professionals. But we've virtually no artisans, mechanics, or tradesmen.

"What will happen to us in an economic explosion? Will we be replaced by Americans who know how to do things? What about our

culture? Steam-rollered? Our natural resources? Exploited and exhausted?

"We can keep from being swallowed, maybe. Vocational education first, for those who want to compete. Then set aside some islands as reservations for those who don't—no tourists, no hotels, no industry, no commercial fishing, nothing. Let them be a refuge for those who don't want to enter the 20th century. There are quite a few, you know.

"The only thing an outer-island refuge needs is a good doctor. And a school—a passport to the modern world—for those kids who want one.

"You'll see a worse slum than Majuro at Ebeye. You'll understand why we want some Micronesian havens left intact."

Tight Little Islands Shun Publicity

Ebeye is an island in Kwajalein Atoll, and Kwajalein is one of two major U. S. military areas in the Trust Territory. The other is Eniwetok. Both were prominent on the world's front pages during postwar years as bases for the nuclear-bomb tests that made a desert of a third famous atoll, Bikini.*

Eniwetok is now an Air Force station, its lagoon a target for intercontinental ballistic missiles test-launched from California. Kwajalein is an Army base for the development of Nike-X antimissile missiles (pages 740-41). The Defense Department tries to keep both bases out of the news as much as possible. No journalist may visit Kwajalein Island.

But I did get to Ebeye Island—part of the giant Kwajalein Atoll. Ebeye is inhabited by a swarm of Micronesians and comes under Trust Territory government, rather than military. I sailed from Majuro to Ebeye on a regular field trip, and so landed a mere mile from the secrets of the missile base.

For two days, I watched the lives of 4,000 souls from all regions of Micronesia who, before the floodgates were shut for reasons of health and sanitation, had funneled into Ebeye. Some 400 of them hold down precious high-paying jobs on the Army's tight little island. Leaving Ebeye for Kwajalein Island by army ferry at 7 a.m., they return at 4:30 p.m., to lightless, plumbingless shanties.

Here nine relatives, on an average, share the wealth of every jobholder. It is the Micronesian way. What is mine is also my brother's. Or uncle's. Or cousin's. One breadwinner in a clan is usually considered sufficient.

Army authorities, when I was there, had completed several one-level apartment houses, replacing some of the disease-ridden shacks of Ebeye. I inspected a few of these. Though built to house an entire family in each room,

*See, in NATIONAL GEOGRAPHIC: "Farewell to Bikini," by Carl Markwith, July, 1946, and photographs of "Operation Crossroads," in April, 1947.

Feast of slithery moray eels in the making. Men of Porakiet skin and clean the vicious reef predators before roasting them slowly over glowing coals. Their women will add yams, rice, and a pudding of pounded taro and shredded coconut to the banquet. A Polynesian colony on Ponape, Porakiet villagers emigrated from overpopulated Kapingamarangi, southernmost atoll of the Trust Territory.

they did have running water and toilets.

I flew to another historic island that once datelined the most staggering headlines of World War II: Tinian, in the Marianas. Here, on August 6, 1945, the B-29 *Enola Gay* shuddered down a runway bearing an atom bomb for Hiroshima.

Jungle Conquers Historic Airfield

To land where the *Enola Gay* took off, I chartered a twin-engine Beechcraft owned by Micronesian Airlines and piloted by its president, Emmet Kay.

We had to park the Beechcraft and walk a quarter of a mile to the bomb-loading area; encroaching jungle had made its taxi strip impassable (page 739). The bomb pits themselves were tangles of wild growth, too, for no one ever came or cared. Two small bronze plaques forlornly marked the spots where the bombs had been loaded, one for Hiroshima, one for Nagasaki.

We didn't talk much, just made photographs, then followed the *Enola Gay* on her historic Tinian take-off. We banked out over the deep, clean blue of the Mariana Trench.

Emmet turned the nose of the plane toward the Trust Territory's airstrip on the neighboring headquarters island of Saipan.

He didn't ask me what I'd write about the place. He knew as well as I why he had never had any customers for the trip in the past. History might never forget Tinian, but people want to.

Saipan has war memorials that do draw tourists. One is an American tank, only its

KODACHROME BY WALTER MEAYERS EDWARDS © NATIONAL GEOGRAPHIC SOCIETY

Moldering skeleton of war, a wrecked Japanese plane on a palm-fringed isle recalls the nightmare of World War II. So much debris litters Micronesia that scrap metal provides the Territory's second most valuable export, after copra. Though it is illegal, islanders also kill fish with explosives gleaned from live ammunition they find lying about.

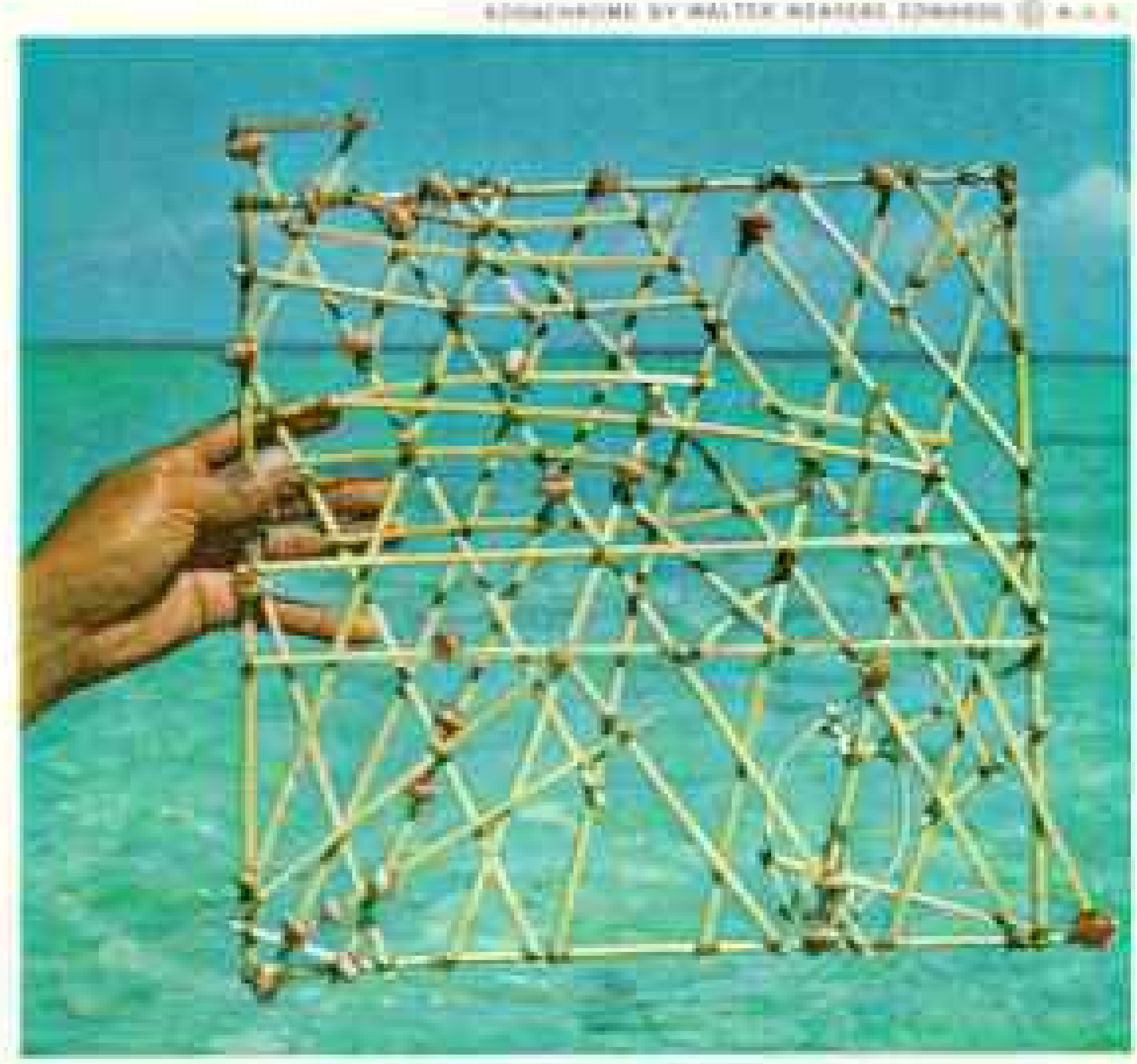
From secret Micronesian bases, Japan supported her attacks on Pearl Harbor, Wake, and Guam that opened the Pacific war. In 1944, American forces sealed Japan's doom by winning the islands in costly, grinding assaults. Even as troops fought for the Marianas, engineers began improving Japanese-built runways on Tinian (right) that launched fateful atom-bomb raids on Hiroshima and Nagasaki. On Saipan, visible across a strait, Japanese defenders mounted a suicidal *banzai* charge rather than surrender. Earlier, U. S. naval elements protecting the invasion destroyed 330 Japanese planes and two aircraft carriers in the "Great Marianas Turkey Shoot," the war's most decisive carrier battle.

Today, the Trust Territory government maintains headquarters on Saipan.

Revisiting a scene of sadness (below right), Japanese veterans pay tribute to 5,500 comrades who perished on the Caroline atoll of Woleai. Three of 1,500 who survived, they end an emotion-choked ceremony by singing an ancient military dirge before a symbolic funeral pyre.

EKTACHROME (ABOVE) BY DAVID S. BOYER, KODACHROMES BY WALTER MEAYERS EDWARDS (TOP) AND JACK FIELDS © N.G.S.

KODACHROME BY WALTER MEAYERS EDWARDS © N.G.S.



Trail of fire sears Marshall Islands skies as a Nike-Zeus roars up to intercept another missile fired from California, 5,000 miles away. The first of two exposures caught the scene as dusk silhouetted a flapping U. S. flag and a tracking vessel in Kwajalein lagoon; the launching came after dark. Technician (below) plots the path of an incoming missile on a map that shows Bikini Atoll, former atomic testing site, at the upper left corner.

No strangers to long-distance navigation, Marshallese once voyaged by "stick-chart" (above). They fixed positions between atolls—the shells—by interpreting wave patterns indicated by sticks.

KODACHROME (OPPOSITE) AND EKTACHROME (BELOW) BY CLAYTON J. PRICE © N.G.S.

turret gun breaching the water at high tide, still aiming at the Japanese shore defenses that knocked out the tank when U. S. forces landed on Saipan, June 15, 1944.

Another is a pair of cliffs, each known for its Japanese suicides—3,000 in all, I was told. Beneath one of these cliffs, in a thicket of trees, lie the bones of 1,000 civilians and soldiers who jumped rather than be taken prisoner by American troops.

I toured Saipan's battlegrounds—still so littered with live ammunition that it is unsafe to visit them alone—with the best guide on the island. Antonio M. Benavente, now a Trust Territory deputy sheriff, had been a guerrilla fighter and helped U. S. marines ferret Japanese holdouts out of hidden caves.

We walked to the lip of the second suicide cliff, then stepped back from its vertiginous 80-foot drop to the pounding sea.

"Your Navy men stood off there in ships," Tony said, "pleading with the Japanese over loudspeakers, begging them not to jump. They did, though. Some even tied stones around their children's necks first so they couldn't swim. The Navy boys came in, in small boats, to save as many as they could."

Ailing Child Survives With Love

No Micronesians committed suicide here, or sacrificed children. First, they didn't believe Japanese propaganda: After all, they had known American and European missionaries before Japanese times. More importantly, the Micronesians' love of children exceeds almost all other values.

On one field trip, I had watched a sick child being cared for during the long days aboard ship before we reached the hospital. Three people—his mother, his father, and his uncle—guarded him. The mother gave him food and such medicine as an island health aide had made available. The father and uncle took turns holding him in their arms, 24 hours a day. He survived—almost certainly because of pure love.

A child in Micronesia is someone to love and care for, however distant the relationship. In a sense, a child is not orphaned by the death of his parents. Even before such a tragedy, he is an integral part of the larger family, and afterward, he is immediately adopted by relatives.

Children play their part in family economy from the day they are able to climb trees for coconuts, help paddle a canoe, or bait a fish hook.

From infancy, too, many now are part of the pervading Christian faith. One Sunday,

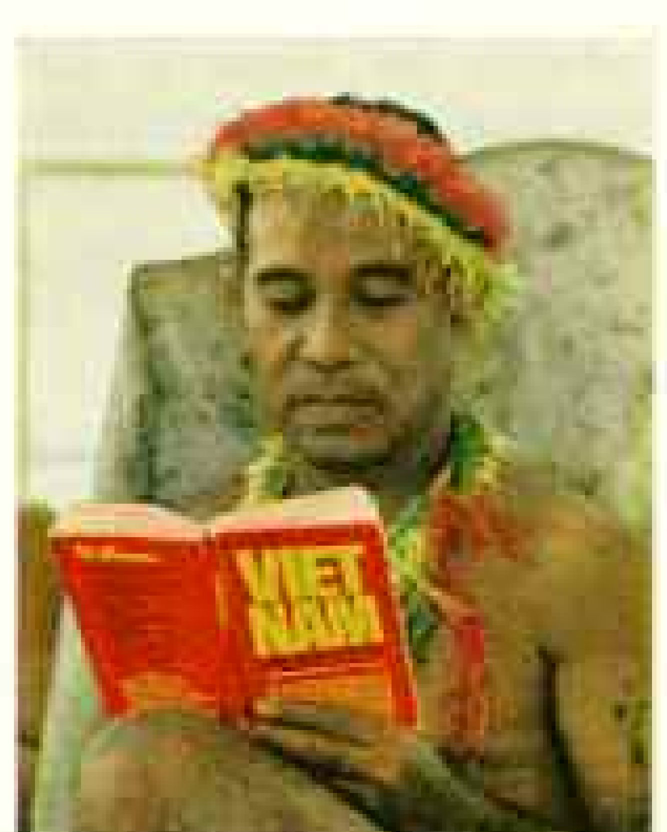
Islanders reach for new horizons

CHOOSING from two worlds, Micronesians build their own. Garlanded with wild-flower *maramars*, Outer Islands High School students pose proudly with a new motorcycle. A friend takes a snapshot for the folks at home.

Born and raised in Palau, Francesca Gillham (right) works as secretary to James E. Hawkins, Assistant Commissioner for Community Services.

Islanders tune transistor radios to disc jockeys like barebacked Andrew Ruecho, who spins popular American records four hours a day on WSZA, Yap. Stations in each administrative district help teach English and beam news, public affairs, and educational programs to remote atolls.

Mind attuned to the globe despite his choice of island dress, elementary teacher Robert Gatelmar bones up on an international crisis.



KODACHROME (ABOVE) BY DAVID S. BOYER; EKTACHROME (UPPER LEFT) AND KODACHROMES

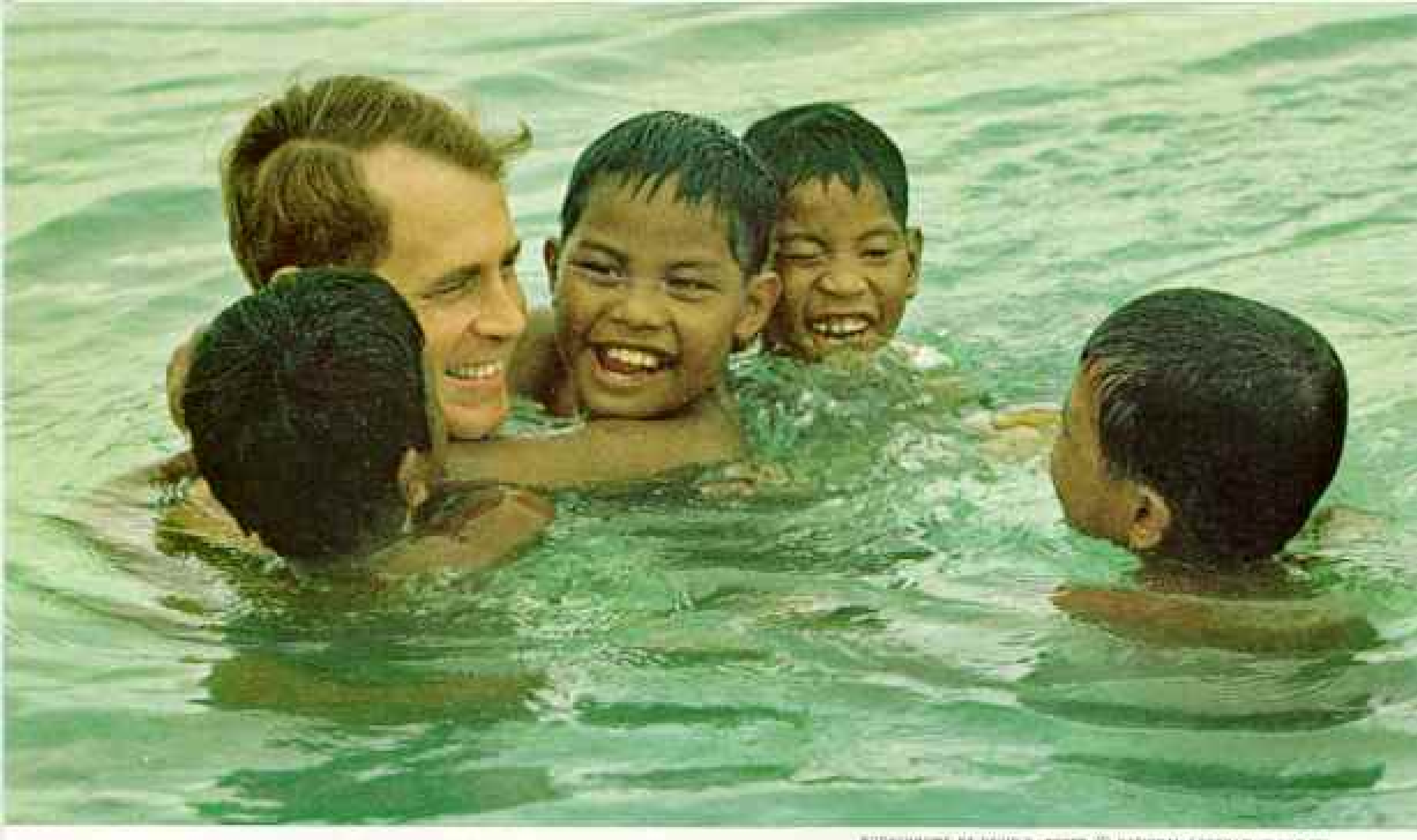
on the far island of Pata, in the 30-mile-wide lagoon of Truk, I proposed to two boys that they let me make an underwater photograph of them wrestling with an octopus, the local seafood delicacy. They declined. Fishing was forbidden on the Christian day of rest.

American missionary influence, strong throughout all of Micronesia, dates from the 1850's on the island of Kusaie. New England whalers also used to come here for food and water. Reminders of their welcome survive in today's Caucasian faces.

Kusaie faded, however, from the American ken. Then, a few years ago, a staff of Trust Territory teachers and an administrator, Fred Muhleman, returned to create a school system and other social services.

Fred and his Kusaiean friends led me back a few centuries when they took me fishing for flying fish. At midnight, in moonless dark, low whistles signaled us down to the shore. Cautioned not to speak a word, for fear of alerting ghosts who would warn the fish of our coming, we stumbled into the outrigger canoes and were paddled off silently toward the open sea.

JACK FIELDS © N.G.S.



KODACHROME BY DAVID S. BOYER © NATIONAL GEOGRAPHIC SOCIETY

Learning to swim, polio victims splash with Duncan S. Catling. A former Peace Corpsman in Malaysia, the teacher spends after-school hours with young patients at a rehabilitation center in the Marshalls. The first Peace Corpsmen actually assigned to the Trust Territory began arriving late last year. By next fall, 700 eager mainland volunteers will be helping Micronesians catch up to a century that almost passed them by.

When we stopped, we seemed lost and alone. Then someone struck a match and lighted a palm-frond flare. In seconds a dozen flares came alive in half a dozen canoes around us. Immediately the flying fish began to glide out of the sea, activated like moths by the lights. As they came whistling over the gunwales, they were snatched from the air with long-poled butterfly nets.

Pingelap Enjoys a Building Boom

"They catch flying fish on Pingelap and Mokil Atolls, too," Fred told me. "You'll stop there en route to Ponape. I think I'll go with you. There's no radio communication, and I get worried between trips. Who knows what might be happening?"

What was happening on Pingelap was the finishing of a new homemade Trust Territory school. The people were building concrete-block houses for themselves, too, at $1.50 per square foot of living space. Masterminding both projects was Father Hugh Costigan, a Jesuit priest from the Bronx. The good works of this "building priest" are pillars of the entire Ponape District.

On Mokil, former Peace Corpsman David Porter, now a Trust Territory teacher, had two dozen school children in his house on a Sunday afternoon, all reading U.S. magazines, listening to U.S. music on a tape recorder, drinking Cokes, and speaking English.

"The U.S. is no longer the edge of the world, somewhere out there, for them," Dave said. "It is places and people. And someday soon, they believe, they will really belong to it."

We landed at last beneath the lush rain-forested mountains of Ponape. This highest of the Caroline Islands is considered by many the most beautiful of all Micronesia (pages 730-31 and 734-5). In the few final quiet days before a plane would come, I wandered among Ponapean villages, visiting the people.

These prospective new citizens of the United States would soon have things and opportunities that many of them long for.

But I was glad I had come before the change.

Everywhere I went, in those days, I heard the Ponapean word of greeting. Interchangeable for either hello or goodbye, it is one of the world's loveliest words:

Kasalëhlia!

When you hear it pronounced liltingly on the tongue—cassa-LAY-leeah—by a Ponapean maiden with a flower in her flowing hair, as you pass her thatched house under the palm trees beside the deep sea, you feel you have heard the sound of paradise.

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◀ **COVER:** Micronesian maiden, crowned and garlanded with wildflowers, dances to changing times (page 702).

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She belongs to a rare breed of women. Original and captivating. She loves the challenge and the chance to win. For her, Hamilton has created the American Classic.
A combination of elegance and excitement. Beauty that compliments beauty. A slender ellipse of 14K gold with co-ordinated Jacquard textured bracelet.
Delicate but dependable. Durability she understands and expects. Shock-resistant, anti-magnetic, with a 17-jewel movement and an unbreakable Dynavar® mainspring.
Who says a fine watch can't be exciting? Not the woman who knows what perfect form is. She'll understand why you chose to give her a Hamilton.
If you want to give more than time, give
HAMILTON
Is there any excitement left to give a girl who trains and rides her own Champion Hunter?
Does she own a Hamilton?

Got kids who like action? Got a wife who likes comfort? Got a yen to go fishing?

...GET A SPORTSMAN!

Some boats are soft riding. Some have stability. Some have style. Some are designed for fishing. Some for cruising. Some for skiing.

There's never been one boat that does all these things exceptionally well — until now.

If you like to fish, but don't like to abandon the wife and kids, the Sportsman is your kind of boat. It has more usable space than conventional boats 2 or 3 feet longer. It has comfortable bucket seats that unfold into sun lounges (if the fish aren't biting, just relax).

The floor is flat. There's a casting platform forward where the pointed bow would be if it had one. The split windshield folds to provide easy access to the foredeck. You can beach the boat and step off without getting your feet wet. And you can button it up with its tonneau cover to make it look like a runabout.

The Sportsman has all the sea-going characteristics that distinguish Evinrude's wide-track Gull Wing hull. You ride on a cushion of spray. It's soft, stable, dry.

It's the kind of boat that'll get you to where the fishing action is in a hurry — and in solid comfort. It does it quietly, smoothly, economically — with a choice of 90 hp V-4, 120 hp inline-4, or 155 hp V-6.

The more you know about boats, the more you'll appreciate what the Sportsman does for a fisherman — and his family.

See the Sportsman at your Evinrude dealer, listed in the Yellow Pages under "Outboard Motors." Catalog free. Write Evinrude Motors, 4066 N. 27th St., Milwaukee, Wis. 53216.

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On top of the bottom of the world

FIRST EVER ON ANTARCTICA'S ROOFTREE, American mountaineers conquer the 16,860-foot summit of Vinson Massif, December 18, 1966. They carried with them flags of the 12 nations that signed the Antarctic Treaty for peaceful research on the continent. Here Richard Wahlstrom, Samuel Silverstein (standing), and Nicholas Clinch unfurl the Society's banner. The National Geographic Society, National Science Foundation, and American Alpine Club sponsored the ten-man expedition, which received invaluable logistic support from the U. S. Navy. In next month's GEOGRAPHIC, expedition leader Clinch tells how, despite storms and sub-zero temperatures, the party scaled six mountains in six weeks, collecting rock specimens to aid the continuing investigation of the frozen land.

As a member, you helped make possible this ascent of the last unconquered continental crest. Your friends can also support such explorations—and read about them in NATIONAL GEOGRAPHIC. Simply fill in the form above.

"Movie cameras are too big and bulky."

"Sure, I'd like one, but the prices are a little steep."

"...and loading them is a nuisance."

"I'm not sure movies are worth the trouble."

Kodak has changed all that.

New palm-size Kodak Instamatic® M12 movie camera, less than $30.

The Kodak super 8 movie cameras are so easy to use, you'll take terrific color movies right from the start. And so easy to travel with, you'll take yours wherever you go.

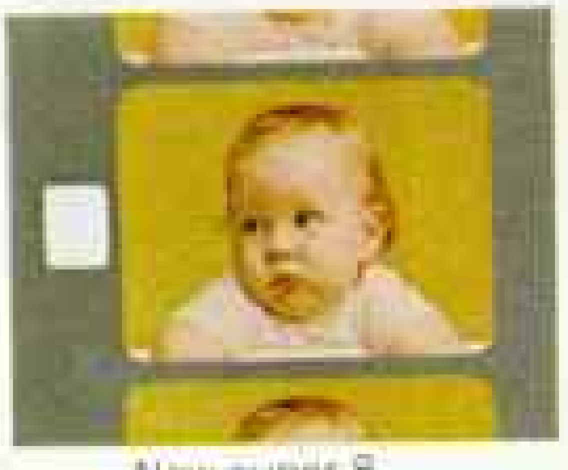
Loads instantly.

Just drop in the film cartridge and shoot a full 50 feet of movies.

No threading. No midpoint flip-over. No double exposure or edge fogging. And no winding—Kodak Instamatic movie cameras have battery drive.

Super 8 pictures are 50% bigger.

The pictures you take with your Kodak Instamatic movie camera are 50% larger in area on the film than on regular 8mm film. This means sharper, brighter movies.



New super 8

Regular 8mm

New super 8 movies call for a super 8 projector. Kodak offers a complete line, from less than $63, all with fully automatic threading. Some models project both new super 8 and regular 8mm movies.

In addition to the Kodak Instamatic M12 movie camera with its f/2.7 lens, there are three other palm-size models, all with wrist strap. Model M14 has a CdS electric eye for automatic exposure settings and f/2.7 lens, less than $50. Model M16, with faster f/1.8 lens, less than $60. Model M18 (left) features a zoom lens for wide-angle to telephoto shots and CdS electric eye that sets lens opening automatically. With pistol grip, less than $80.

Prices subject to change without notice.

Kodak
TRADEMARK

Found it! Caring for the grounds around the house that Jack built is no longer as tedious as making the mortgage payments. Not since Jack dealt himself a Simplicity Broadmoor 707. For little more than the price of a single-purpose riding mower, he has a real tractor going for him — with Simplicity's job-mated attachments giving him all-season utility . . . from lawn-mowing to snow-throwing (and even "vacuum-cleaning" leaves and clippings). Quality values include soft-action clutch and all-gear transmission (2 speeds forward, 1 reverse) . . . Floating Traction tires that won't mar tender turf . . . the benefit of doing business with one of the Dealers of Simplicity, all men you can depend on for the Good Deal that's right for you.

Found him! The size and the look of J. B.'s country place tell you he's a success. A self-made guy, and very shrewd, J. B. seldom makes the same mistake twice. Like buying on price alone . . . or being burned by a "no-service" retailer. That's why a Simplicity Good Dealer keyed his purchase of a new Landlord 2012 riding tractor. He wanted *(and found)* a garden machinery specialist whose recommendations and service he could trust. What else? A Good Deal, of course! Simplicity's most powerful, most versatile rider. All-new engine, with synchronized balancer, delivers the horses with uncanny smoothness. Three power take-offs and quick-hitching, job-mated attachments underscore Landlord's promise to handle over 25 jobs with ease.

For your Good Deal. See your Good Dealer. *Choose your "Simplicity way of life" from the long labor-saving line of Simplicity riding tractors and mowers, rotary tillers, snow throwers and job-matched attachments.*

Simplicity Manufacturing Co., Inc., 6721 Spring Street, Port Washington, Wis. 53074

We'll help you find the most beautiful detour in California, rent a bicycle in Yosemite, and buy a can of genuine San Francisco fog.

California is a lot bigger than most people realize.

(The whole state of New Jersey, for instance, easily fits in between Los Angeles and San Francisco.)

And it takes a lot of planning ahead to get the most out of a vacation there.

To help you, American Airlines has put together a special kit.

We'll tell you what you get for your money at the different hotels and restaurants.

You'll find out how to sample your way through California's wine country, where to have a 6-course dinner for 87¢, what to do when a bear in Yosemite wants to share your lunch.

And how to find the detour (between Monterey and Carmel) that takes you 17 miles out of your way and you'll love every mile.

Plus such tidbits as where to find a jumping contest for frogs (Calaveras County), a ski slope in the desert (Palm Springs) and a hot mineral bath in a cave overlooking the Pacific (Big Sur).

Our whole kit is yours for $1, and any Travel Agent will tell you it's worth it. (It also includes $40 in discount coupons for Marineland, a San Francisco Bay cruise and so on.)

All we need to get started is your name and address. And your dollar.

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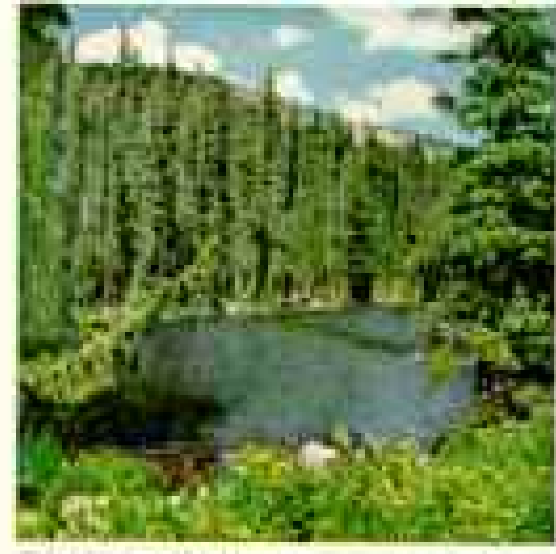
BRAVO! Thrill to gay Spanish dances— there's a new world of excitement awaiting you in New Mexico . . . Old World Atmosphere . . . New World Charm . . . there's added spice to life here . . . blending the best of three cultures . . . Indian, Spanish and Anglo . . . we call it the Land of Enchantment . . . You will, too . . . Ole!*

* Bravo!

LIVELY, COMPELLING Spanish rhythms pace the sparkling performance of gay senoritas.

NEW MEXICO

FREE: For colorful literature about New Mexico, write Department of Development, Box NG-27, Santa Fe, New Mexico. Be sure to include Zip Code in your return address.



RELAX AMONG blue mountain lakes in cool, scenic beauty.

YOU'LL ENJOY fine horse racing against majestic Western mountain backdrops.

STRINGS OF RED chiles dry against adobe walls.

NEW MEXICO OFFERS a wide variety of delightful accommodations for every taste.

What would happen if you lifted this luggage 25,000 times?

Nothing. That's why Samsonite guarantees the handle for a lifetime.

You'll never give the handle of your Samsonite Silhouette as much punishment as *we* dream up. In our own factory tests, we lift and drop it through thousands of cycles. We pull it up and lower it (fully packed) through thousands more. And we twist it in a full circle more than two thousand times. No wonder we guarantee our steel-core, cushion-comfort Silhouette handle for a lifetime. (If at any time it should break or come loose through normal use, simply return the luggage to your dealer or direct to Samsonite and we'll replace the handle free of charge.)

Every part of Silhouette luggage is as travel-worthy as it is handsome. The strong, lightweight magnesium frame. The sleekly hidden locks that can't snag or break off. Exteriors of scuff and stain-resistant Samsonite Absolite® that *stay* beautiful. And room for everything. Pack it up. Pick it up and go through a lifetime of bon voyages.

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THE LUGGAGE THAT KNOWS ITS WAY AROUND THE WORLD

Silhouette luggage available in Venetian Red, Willow Green, Biscayne Blue, Dover White, Marine Blue and Oxford Grey for women. Deep Olive and Oxford Grey for men. Shown in Oxford Grey from left to right: Ladies' West End Tote $29.50, Ladies' 26" Pullman $45.00, Beauty Case $29.50, Men's 2-Suiter $45.00, 21" Companion Case $32.50. Available at all fine department and specialty stores. Samsonite Corporation, Denver, Colorado 80217. Available in Canada. In Mexico thru Altro S. A. Also makers of Samsonite Furniture.

HEART

An inside look at the world's toughest, most efficient stern drive.

Rugged MerCruiser power speaks softly: rubber-mounted engine, neoprene coupling between crank-shaft and drive unit plus Jet-Prop exhaust make this the quietest stern drive ever built. And MerCruiser carries a big stick: performance-proved engines geared to take bigger props for tremendous low-speed thrust and high-speed efficiency. MerCruiser is built to last, with lower unit housing die-cast of one piece of high-impact aluminum—no nuts, bolts, screws or gaskets. Rugged shearproof drive eliminates vulnerable shear or drive pins. And MerCruisers with Jet-Prop exhaust require only one hole through the transom: it's a stronger, neater, leak-free installation. MerCruiser is tough, but responds instantly to the lightest touch on its single-lever throttle and shift control. And new Power Trim hydraulic system (optional on 120, 160, 225-HP models) lets you trim your boat while under way with the flick of a dash switch. MerCruiser '67: *engineered to stay ahead:* 60, 80, 110, 120, 150, 160, 225, 325, 475 HP—plus 60-HP diesel. See your MerCruiser dealer, or write for '67 catalog to Dept. NG-5A, Kiekhaefer Corporation, Fond du Lac, Wisconsin.

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You will always take special pride in giving Krementz Jewelry – for Mother's Day . . . Graduation . . . Birthdays . . . Weddings – or to yourself.

Top left: Rose Necklace $35 Earrings $50 (14Kt. gold with diamond)
Forget-me-not: Brooch $16.50 Necklace $15 Earrings (14Kt. gold) $13
Cameo: Brooch $18.50 Earrings $15 Earrings (14Kt. gold) $17.50
Bottom center: Sunburst Brooch with cultured pearl $26.50

Center: Ivory Rose Brooch $22.50 Necklace $9 Earrings (14Kt. gold) $13.50
Right: Leaf Brooch with cultured pearl $14.50
Jade and cultured pearls: Bracelet $40 Earrings $15
Grape motif: Jade and cultured pearls: Brooch $47 Earrings $31.50

14Kt. gold earrings are for pierced ears

Jewelry not called 14Kt. gold is 14Kt. GOLD OVERLAY

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Available wherever fine jewelry is sold.

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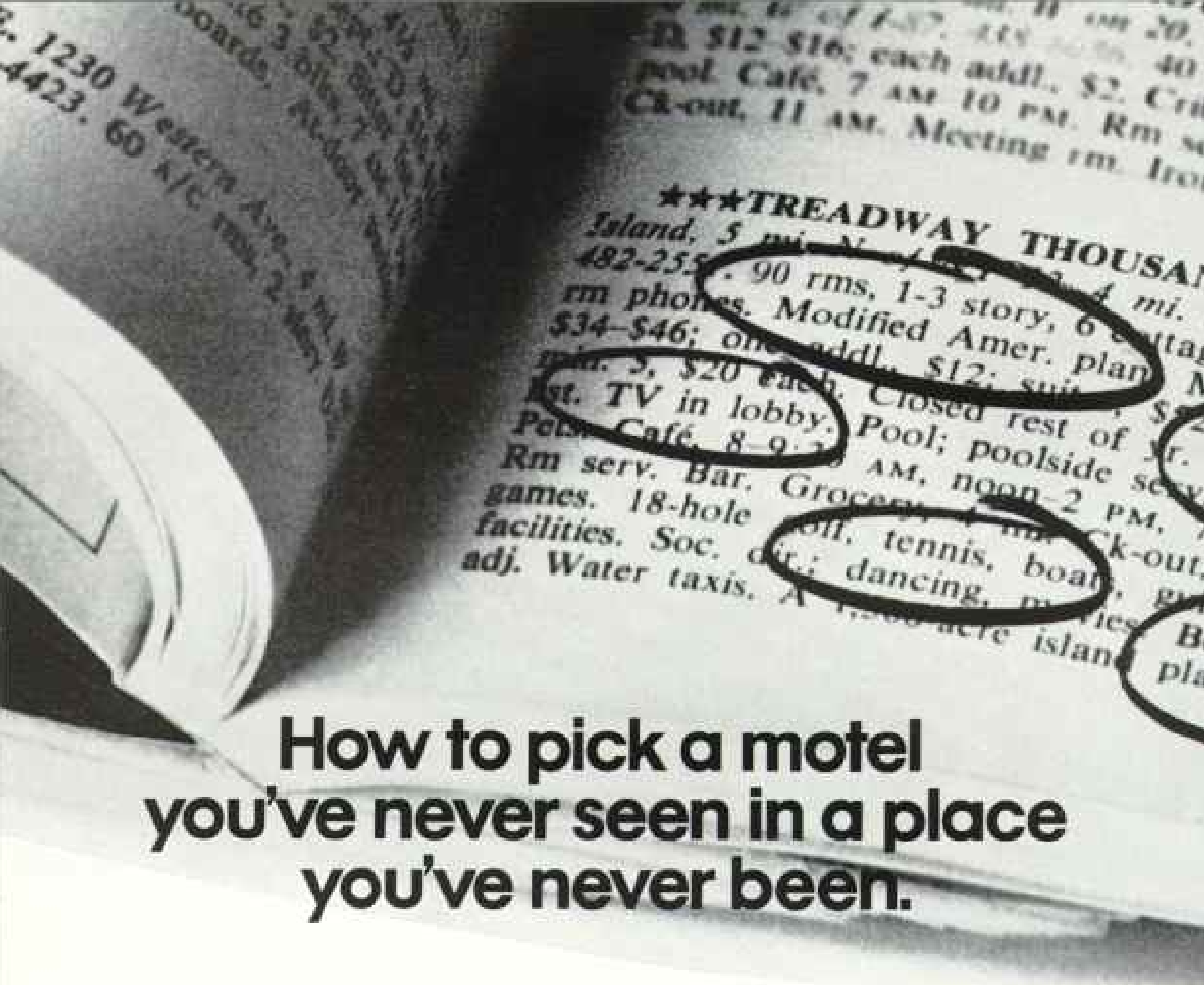

You've been on the road all day.

You're tired.

You'd like a shower.

And it's time to start looking for a place to stop for the night.

You can ask somebody, "Where's a good motel?" (But what's good for somebody else isn't necessarily good for you. Or your family. Or your *budget*.)

Or you can drive from motel to motel, until you find the right one, at the right price. (If you can stay awake that long.)

Or you can look the easy way, in the Mobil Travel Guide.

The Mobil Travel Guide describes and rates 22,000 motels, hotels, resorts and restaurants all over the country.

You just look up the town you're in, and look under "Motels."

Unless the town is very small, you'll find a big list.

You'll find the rates for each.

You'll find a description of what the rooms are like.

You'll find out which motels have a pool, restaurant, baby-sitter list, or whatever else you happen to need.

And you'll find a 1, 2, 3, 4 or 5-star rating for each motel. Based on an inspection by a very picky Mobil Travel Guide inspector.

And in addition to the ratings, you'll find maps, things to see and do along your way, and Guest Certificates that save you money on sightseeing tours, museums, etc.

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*Suggested retail price

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Mobil Travel Guide

1967 ratings: food, lodging: sightseeing

General Motors is people making better products for people.

Don Trites's dummies lead a rough life. For your sake.

To Don Trites, these dummies are very special people.

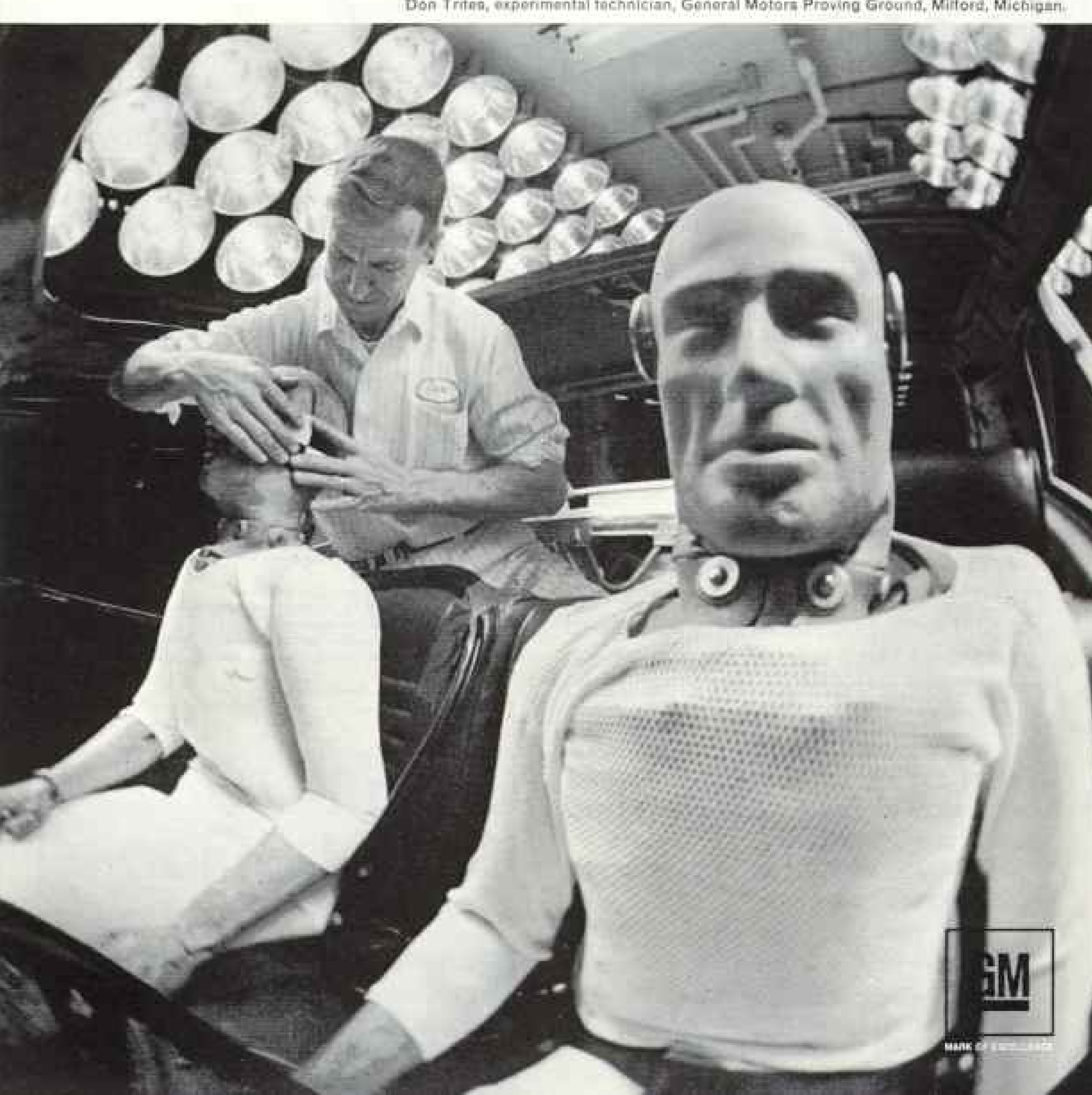
True. Their expressions never change, but they do have feelings. Mechanical feelings that can be measured by Don in moving simulated impact tests. These tests have helped GM safety engineers find and develop automotive designs that are safer for real people.

The tests go on day after day, year after year, ever increasing in sophistication and value.

Safety is an important part of every General Motors car. Maybe that's why Don thinks his dummies are something special.

They're silent heroes.

Don Trites, experimental technician, General Motors Proving Ground, Milford, Michigan.



Now. Precise movie exposures automatically... our solid-state electric eye is behind the zoom lens.

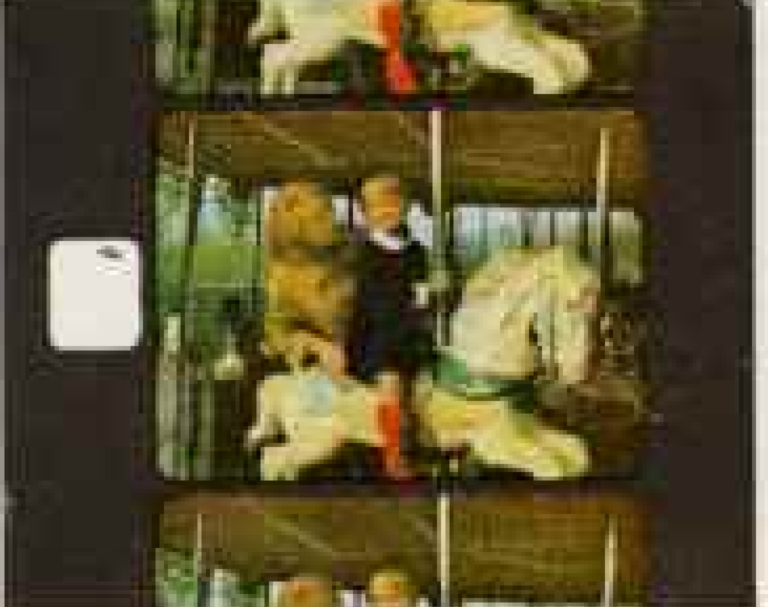
The BELL & HOWELL touch: we did more than just give our new Super 8 camera an automatic exposure system. We gave it our precise solid-state Optronic Eye®, developed through years of intensive research. And we placed it where it belongs—behind the zoom lens—to measure only the exact light that exposes the film.

Indoors or out, the Optronic Eye gives you perfect exposures every time; whether you power zoom from wide angle to extreme closeup, or from brightest light to dimmest shade. All you do is concentrate on the action.

And what action! With exclusive Power Focus, this superb 5-to-1 zoom camera gives you razor-sharp shots every time. (You get the same basic lens system we designed for the Surveyor Moon Shot Program.) And you can go into dramatic slow motion instantly—right in the middle of a shot.

The Bell & Howell touch? More than a promise. It's a commitment to extra precision and care that makes all our cameras fine photographic instruments. Isn't it time you gave your movies the Bell & Howell touch?

You'll need a new projector to show Super 8 movies. We have a brand-new one that shows both Super 8 and regular 8mm.



Start at wide angle. The Optronic Eye gives you perfect exposure automatically. Now . . .

zoom in. You still get exact exposure as the Optronic Eye sees only what the film sees.

Probably. And it's a good thing, too.

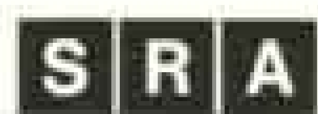
Because an educational revolution is taking place in our nation's schools. A revolution in methods of teaching. In materials for the classroom.

Never before have there been greater opportunities for improving the quality of education. Never again will there be room for complacency about learning. For outmoded ideas. Or for teaching methods that can't recognize individual student needs. Science Research Associates is helping our schools make a difference in education. With assistance to teachers. And with innovative products that help create a one student/one teacher relationship.

A revolutionary idea? Yes. But, then again, so was the wheel, the book and the rocket.

Is she being taught by a revolutionary?

Science Research Associates, Inc. 259 East Erie Street, Chicago, Illinois 60611 A Subsidiary of IBM



Publishers for Innovative Education

Upper Canada Village is a gentle reminder of days gone by—
you just can't miss it on your way from Toronto to fabulous Expo 67 at Montreal, Québec.
Canada
Any minute now, the stagecoach will thunder by. And the kids will desert the blacksmith for the man who drives the stage. Just like kids did over 100 years ago. Or they might vote for the General Store. The old kind, with sawdust on the floor. And big glass jars full of penny candy and momentous decisions. This is Canada remembered. Kind of sentimental, but lots of fun. So, as long as you're on the highway between our two biggest cities . . . why not steal a day . . . just to feel like a kid again.
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Meet the new Charge Ahead 6-speed by Wheel Horse

GET A HORSE! Wheel Horse, of course!

1967

NEW TRANSPOWER* DIFFERENTIAL FOR AUTOMATIC TRACTION · NEW SLOW-SPEED VERSATILITY · NEW WIDE ANGLE HEADLIGHTS · NEW COMFORT-CONTOURED SEAT

COMPLETE RANGE OF TRACTORS · 6-SPEED · 3-SPEED · AUTOMATIC

Wheel Horse is the only tractor manufacturer that offers owners a choice in power, in models and transmissions. Now the newest of the new — the Wheel Horse 6-speed which features the exclusive Transpower Differential. It automatically transfers full power to the wheel getting the traction. No slip — no slide. The new 6-speed offers slow-speed power that's totally effective in moving the big snow out of the way. New dig-deep tiller operates at maximum efficiency. Newly designed headlights provide more than enough light for those after dark, or before daylight jobs. Wheel Horse is the total Homechore Tractor for the total year. See your Wheel Horse dealer, today. He's listed in the Yellow Pages. Write for Free full color brochure.

**Trademark Wheel Horse Products, Inc.*

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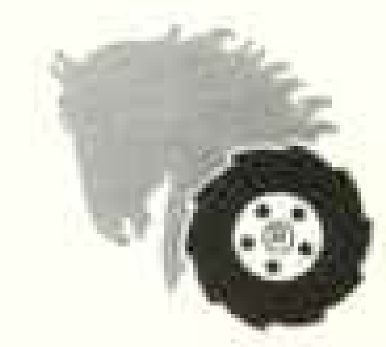
529 West Ireland Road, South Bend, Indiana

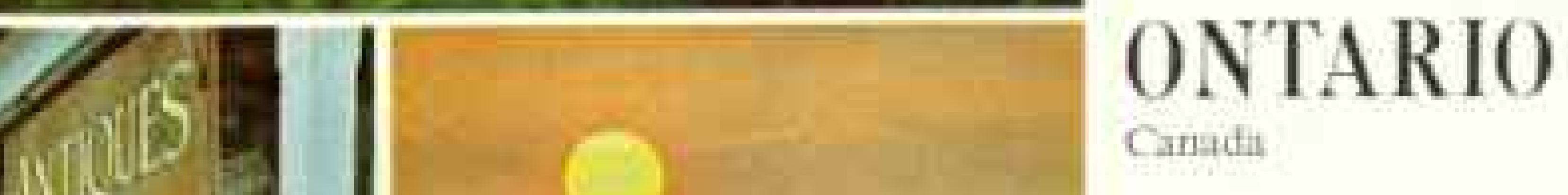


Need a power mower? See all new Reo-by-Wheel Horse. The new Challenger, the Custom, Regal and Royale — plus America's most popular riders. In rotaries, riders or reel type, there's a Reo that's right for you.

Quality is Standard Equipment in Every Wheel Horse Product

Friendly, Familiar, Foreign and Near

Living drama stirs the blood at Stratford's world-famed annual Festival. It's just one of the ways Ontario is so excitingly different. A less-crowded land. Steeped in British traditions. Naturally blessed, yet with bright lively cities. And, this year, all agog with Canada's Centennial celebrations. Join us, won't you? We're within easy reach. But first, let us send you our beautiful book. 52 pages of full-colour pictures and detailed text reveal the vibrant spirit of Ontario . . . Land of Great Adventure Vacations. Just write: Department of Tourism & Information, Room 28, Parliament Buildings, Toronto.



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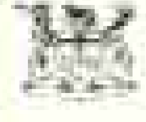

PHOTO COURTESY OF WISCONSIN CONSERVATION DEPARTMENT

How the Battle of the Dam saved a wildlife paradise

For centuries, Horicon Marsh has been a favorite stopping place for huge flocks of migrating mallards and Canada geese. Hundreds of species of fish and game make it a paradise for sportsmen and nature lovers.

But Horicon Marsh is a paradise we almost lost.

Louis "Curley" Radke. "When he talked about the marsh, you could hear him from Wisconsin to the White House."

In 1869, the area was drained to uncover more tillable land for farming. It turned the once beautiful, living marsh into an arid wasteland where crops failed, natural plants shriveled and died, and wildlife disappeared in droves.

A basic fact was also revealed: The marsh had played a vital role in Nature's master plan, providing irrigation, as needed, to surrounding forests and plains. When Nature's balance was disturbed, floods and droughts plagued the land—a typical result of man's misunderstanding of Nature's ways.

To mend the damage, a dam was built. But due to conflicting interests, the marsh was later drained again...then dammed again—a seesaw battle that lasted some thirty years.

The tireless efforts of private citizens finally won public support for restoration of the marsh *as the best use of the land for the community.*

A leader among them was Louis "Curley" Radke, a local resident, who fought the battle through 16 sessions of the Wisconsin Legislature. Helped by the Izaak Walton League, the Milwaukee Federation of Women's Clubs and many others, Radke succeeded in getting a petition signed by 115,000 interested supporters.

Planting aquatic plants to help Nature feed and shelter wildlife on the marsh.

Countless newcomers are hatched on the marsh year after year.

As a result, Horicon Marsh is today a 30,000-acre Wildlife Refuge, protected, nurtured, and controlled by the State of Wisconsin and the Federal Government.

You and your neighbors are needed to help decide the best use of the land around you.

As a company long dedicated to conserving America's natural resources, Sinclair would like to send you a folder describing other cases where private citizens have achieved results that will benefit Americans for generations. Write Sinclair Oil Corporation, Room 2210, 600 Fifth Avenue, New York, New York, 10020.

Drive with care and buy Sinclair

Discover America by car—it's worth seeing and saving

Built tough like the big ones!

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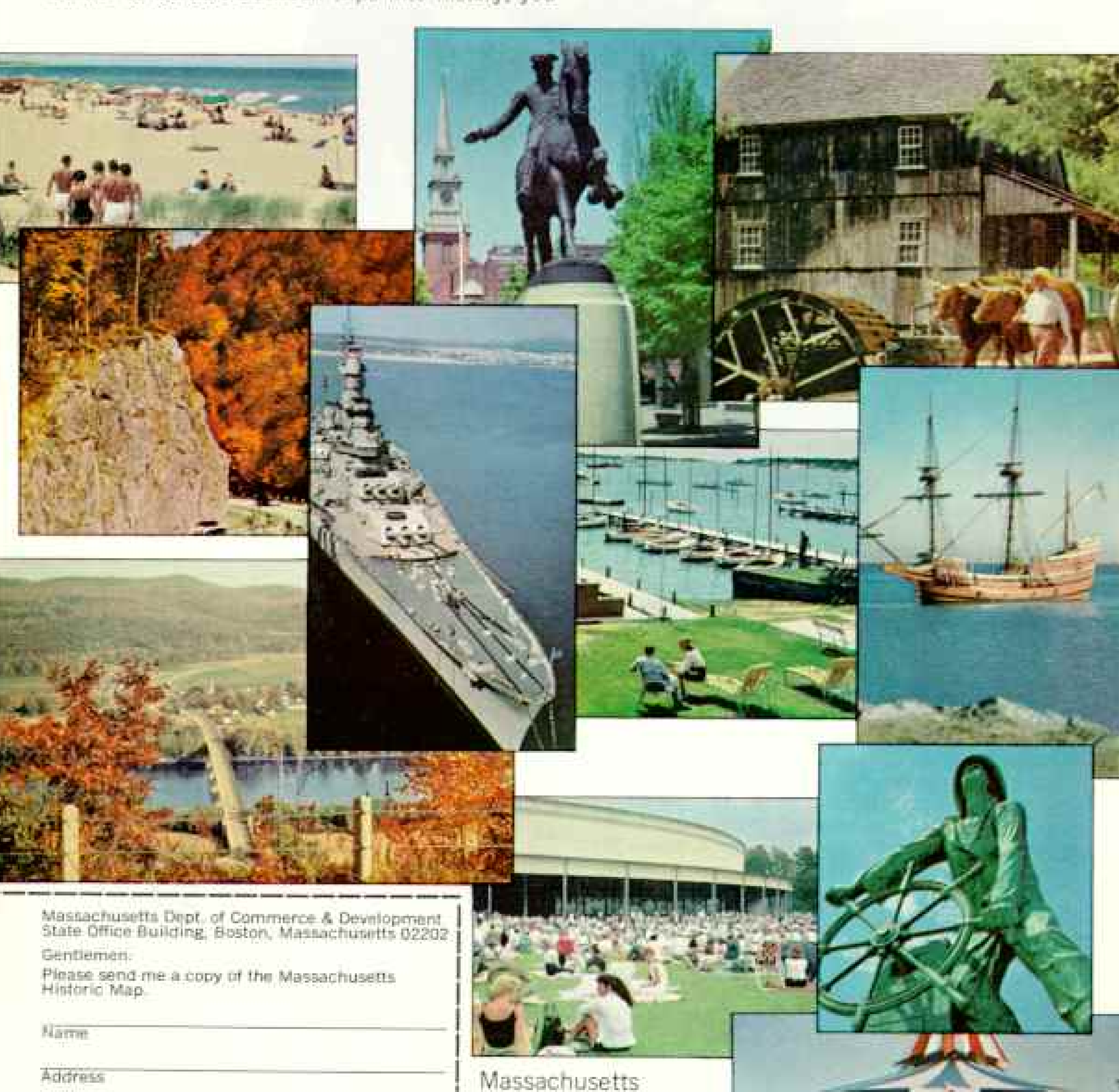

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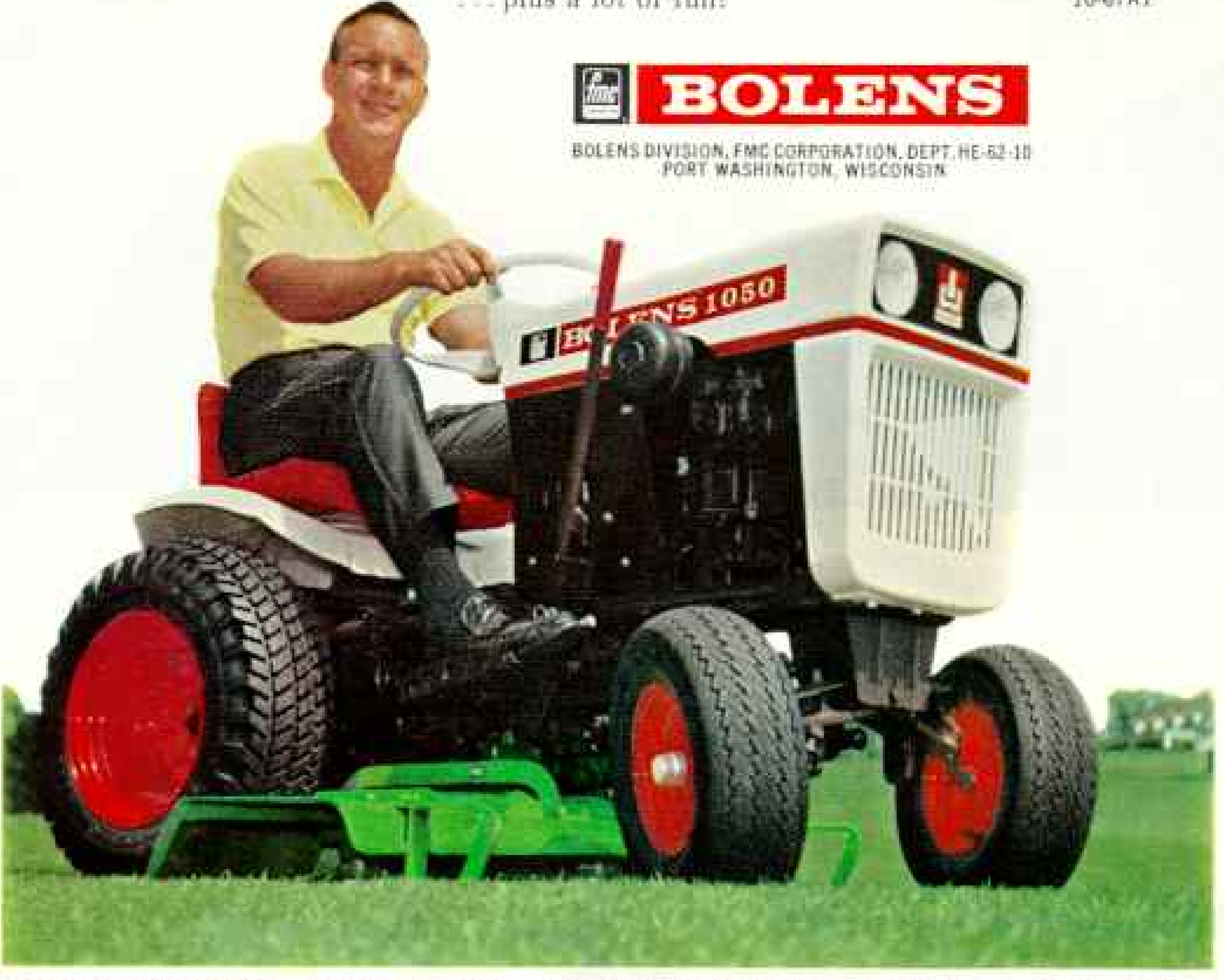

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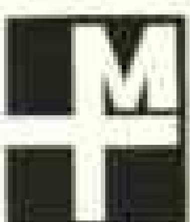

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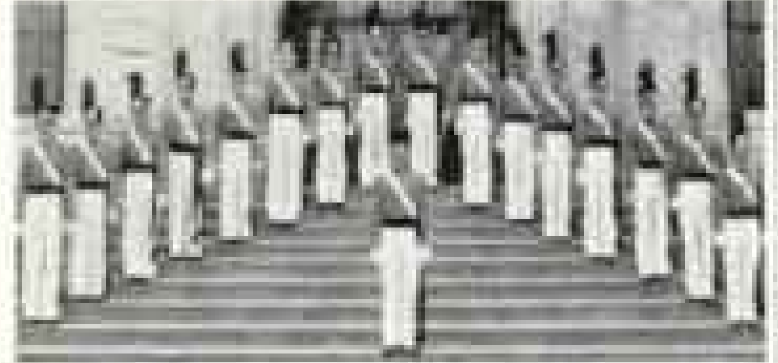

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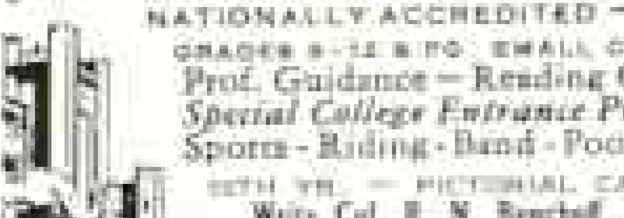

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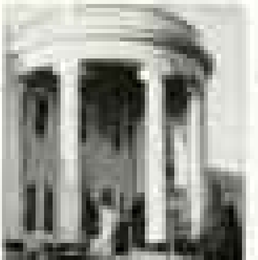

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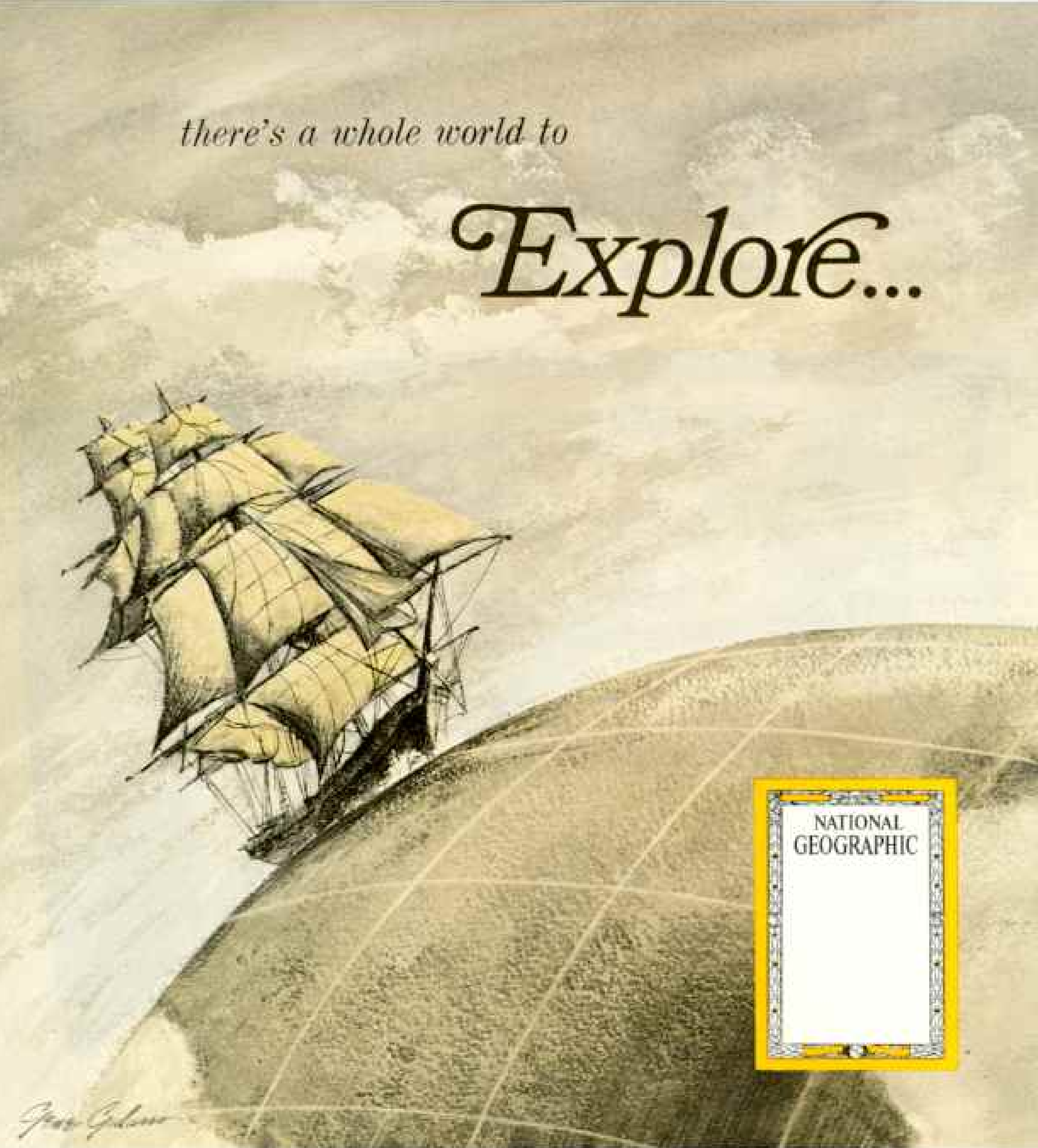

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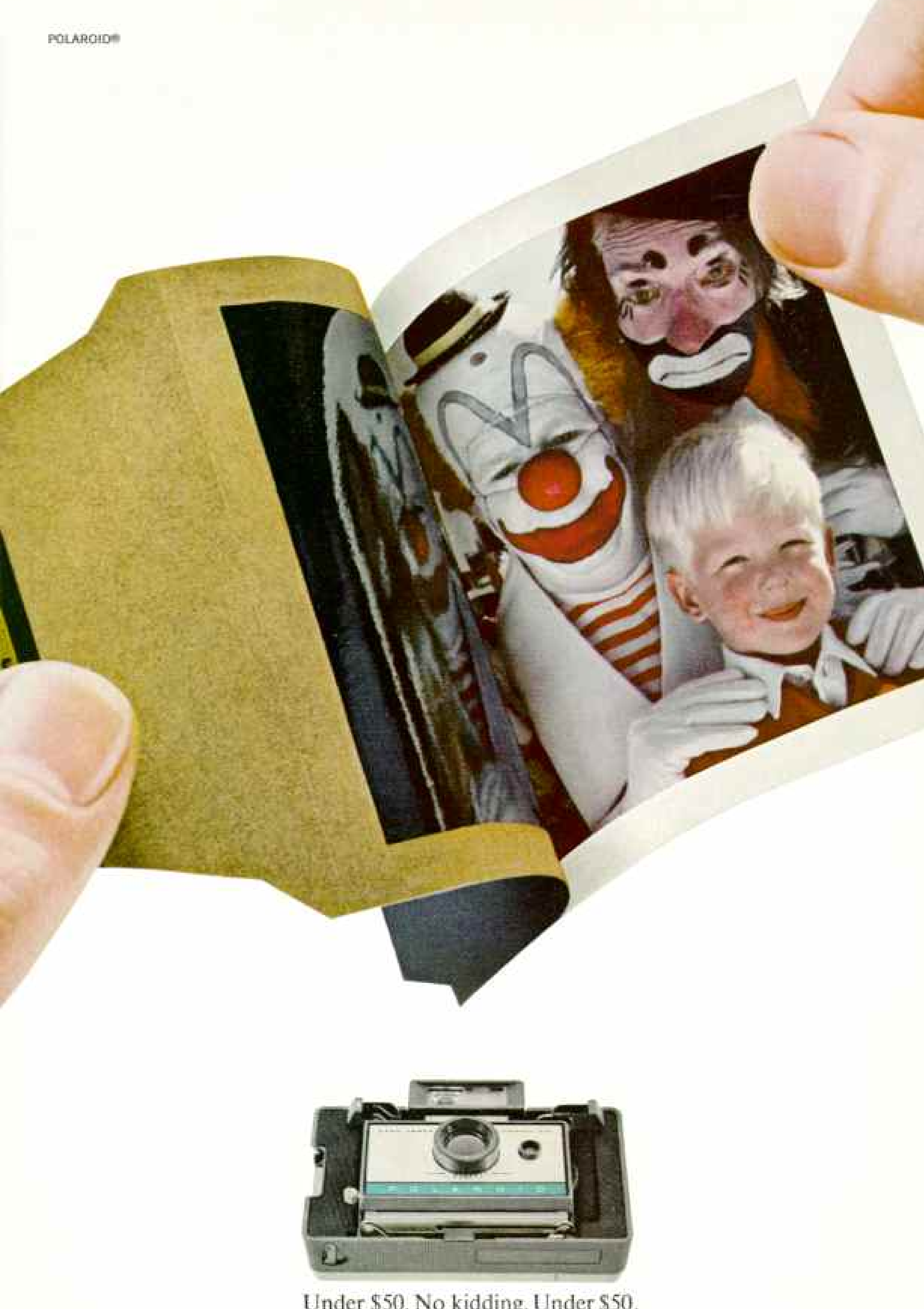

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