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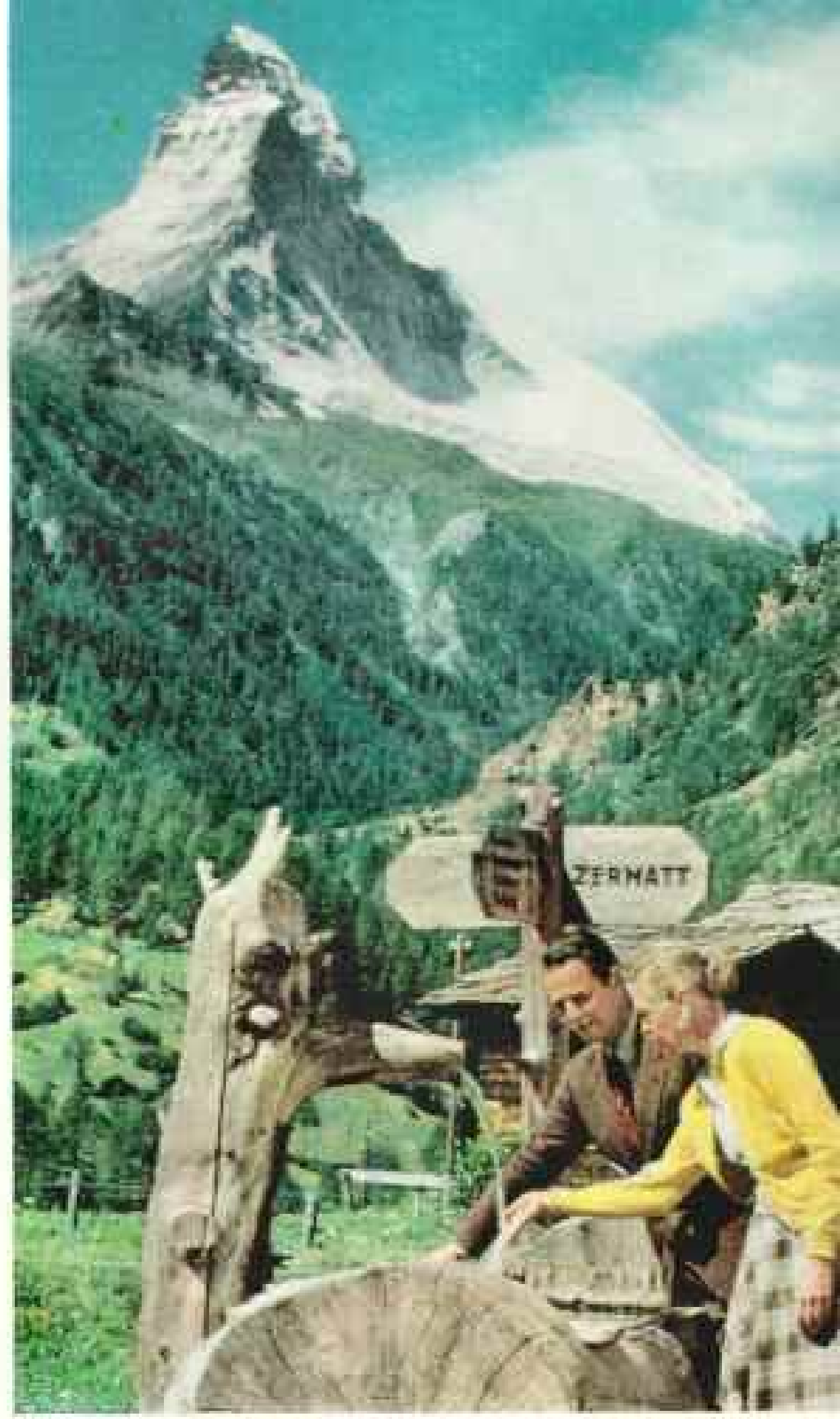
JEAN AND FRANC SHOR TAKE YOU GLOBE-TROTTING IN THE GEOGRAPHIC

"The most widely traveled young American couple"—that's what Supreme Court Justice William O. Douglas calls Jean and Franc Shor. Here they sample the water supply of Winkelmatten, a Swiss village at the foot of the Matterhorn.

Franc Shor, the National Geographic's Senior Assistant Editor, was born in Philadelphia but calls himself a Kansan—he grew up in Dodge City. Jean, of the Foreign Editorial Staff, is from Amarillo, Texas. They married in Shanghai, honeymooned in the Gobi Desert, and went on to adventure from above the Arctic Circle to the southern tip of Tierra del Fuego. They retraced a famous journey from Venice through Central Asia to produce their best-selling book, *After You, Marco Polo,* translated into five languages.

Wherever the Shors travel they make friends, helped by Franc's linguistic skills, including fluent Chinese, and Jean's knack for enjoying the ups and downs of the unbeaten path. Captured by Chinese Communists in 1947, she cheerfully lived for weeks on fried goldfish: "The taste? Not bad. Like French fried potatoes."

In this issue, the Shors' 18th and 19th articles take you to Iraq (page 443) and Switzerland (page 562).



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Sundecks and pool are designed for outdoor living at its best.

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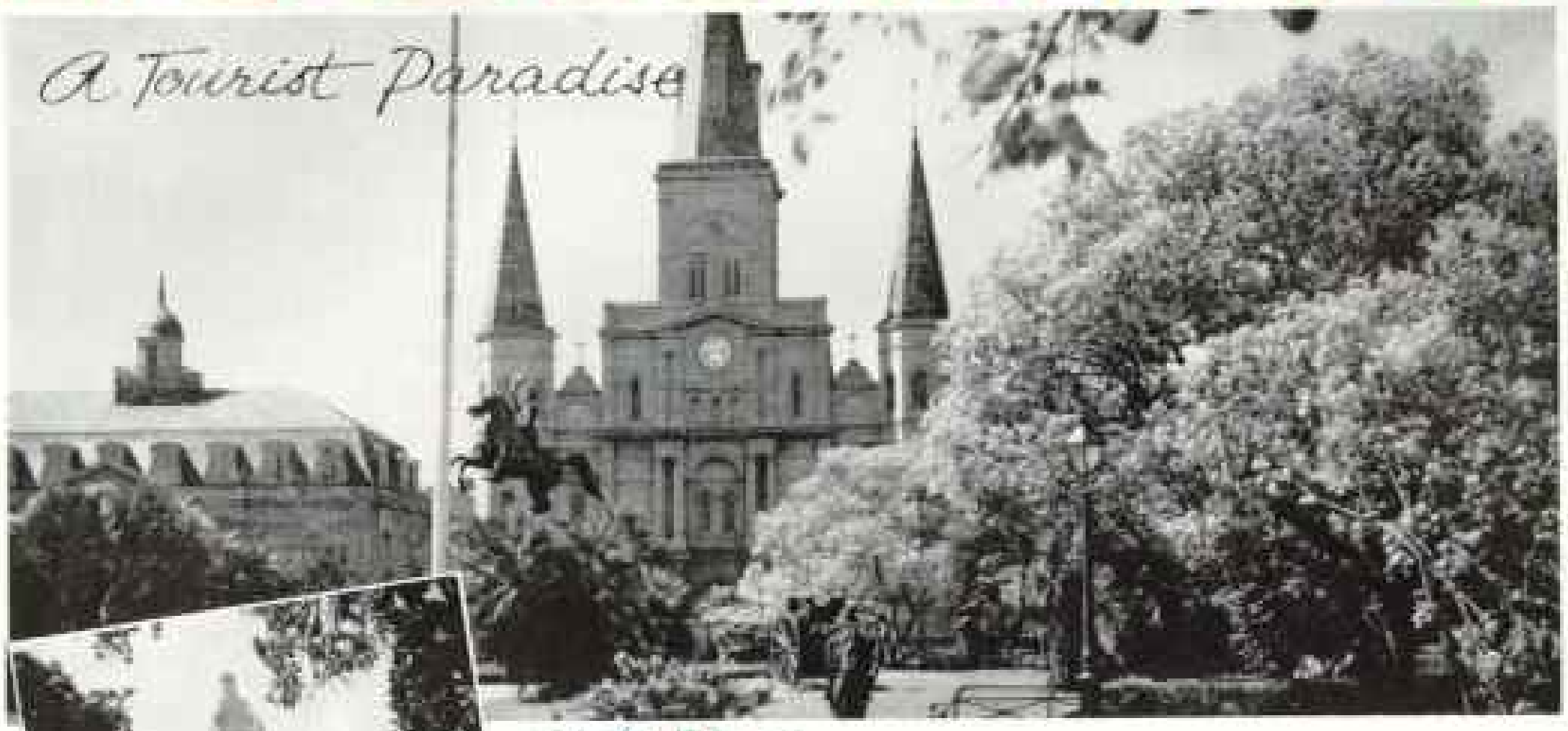

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Discover old world charm combined with modern day living in beautiful LOUISIANA. The variety state, from the white sand beaches of Grand Isle pounded by the warm restless surf of the Gulf of Mexico, to the white cotton fields of the Ouachita sharing vast expanses with giant industrial plants, will enthrall your curiosity. History and tradition abound in many sites of cultural interest. Elegant plantation mansions, monuments of yesterday, extend a cordial welcome of respite from the frantic rocket age. However, present utilitarianism is in constant contrast with antiquity in this fabulous land.

Bright stainless steel skyscrapers soar beyond dainty iron lace balconies, bustling commerce on Louisiana's great rivers orchestrates quiet oak shaded bayous, ocean liners crowd the docks of LOUISIANA'S seaports while picturesque steamers ply the Mississippi. VISIT LOUISIANA; the climate is ALWAYS MILD. All outdoors, sports, boating, hunting, and fishing have abundant arenas. The state is a year around tourists' paradise. COME TO LOUISIANA, the Azaleas and Camellias are in bloom!

*LOUISIANA IDEAL CONVENTION STATE
write Chamber of Commerce, New Orleans, Shreveport, Baton Rouge, Lake Charles, Monroe, Alexandria, or Lafayette, for details.

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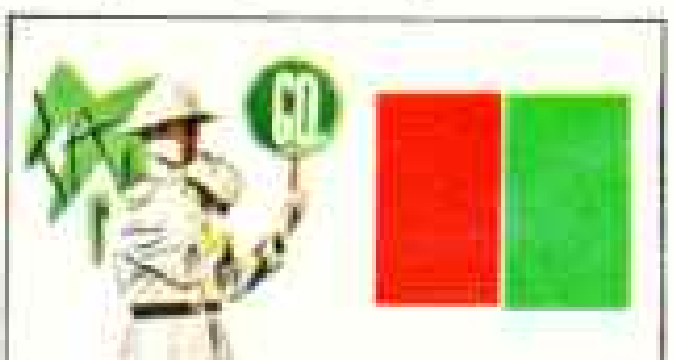

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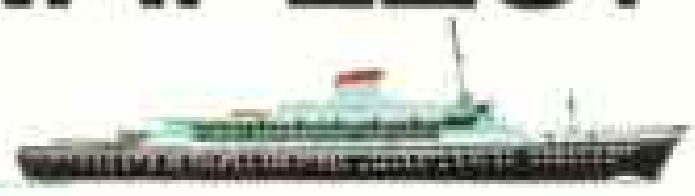

So *much* to look forward to . . . so much to *remember!* A divine trip! I've been outrageously spoiled . . . superb service . . . delicious food . . . wonderful atmosphere . . . heavenly nights. I feel I already know Italy and *adore* it!

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We might have lost everything

(Based on Company files #TC53-34 & 75)

We all got out of the house safely. Frightened, but unhurt. Our house was a shambles, but we had a feeling things would turn out all right. We had insurance.

The Nixons next door put us up for the rest of the night. Early next morning, before we even had a chance to think very much about what we'd do, our Hartford Group Agent appeared.

He told us to try not to worry about what we'd lost. Insisted on taking care of all the details. Said that was all part of his job as our local Hartford Group Agent.

And he really followed through. The week hadn't ended before he handed me two checks. One for damage to the house. The other for damage to our furniture and other belongings.

"We're not always able to pay a claim this fast," he said, "but I can tell you that the Hartford always does its best to make prompt settlements and fair ones."

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People who've taken popular "host" tours will tell you that your time goes further as well as your money when a Travel Agent handles essential arrangements in advance.

Day by day itinerary of a 3-week tour shows you how much you can see in the continent of contrasts. All packed and ready? Let's go!

Leave New York after lunch on a DC-7B. Fly non-stop to a Caracas dinner. You'll be met by an English-speaking "host" who will take you to the luxurious Hotel Tamanaco. Your room with bath will await you.

Next morning, your host will call for you to drive you to see the city's finest sights. You'll have the afternoon beside the hotel pool. At nightfall, you'll take the famous 20-minute drive over the 6-million-dollars-a-mile superspeedway to the airport and board a DC-7B for Rio.

3rd day! You'll arrive in Rio de Janeiro in daylight to get the priceless view of the harbor. You'll be escorted to your hotel on Copacabana Beach and have the day to explore, bathe, shop.

In the next three days, you'll see Rio from Sugar Loaf after a sightseeing drive to museums, markets, and public buildings, and view Rio from Corcovado after a drive through suburbs and Tijuca Forest. Standing at the foot of the impressive statue of Christ, you'll look down on Sugar Loaf and the harbor . . . one of the great experiences unique to South America. You'll have time to explore on your own, or take a side trip to Petropolis and Terezopolis.

On the 7th day, you'll fly in an hour to São Paulo, city of modernistic skyscrapers. Your host will drive you to the Jaragua Hotel. And after lunch he will show you the city sights. Next day, you'll have time to visit local churches or drive to Santos, world's largest coffee port.

On to Montevideo on the 9th day. You'll arrive in Uruguay in the early evening and stay at the splendid Victoria Plaza Hotel. In the next two days, your host will drive you around Montevideo —to the top of the hill that named it—to beaches, and out into the country to see gauchos. You're sure to want to shop because nutria coats that would cost $1,000 or more here are less than $400 there. At nightfall, you'll take an hour's flight across the river to Buenos Aires, and the famous Plaza Hotel.

Buenos Aires, one of the most beloved cities in the world! You'll be there three days—drive to government buildings, race tracks, adjacent parks, art galleries, and to the world's largest opera house. You can feast on 50¢ filet mignon. Your host will name the best eating places. And your hotel is just around the corner from Avenida Florida where alligator articles sell for a song.

The morning of the 15th day, leave "B.A." and live another experience that only South America can offer—the 30-minute flight over snow-covered Andes to Santiago, Chile. You'll never tire of telling about it. You'll probably talk of nothing else on your drive to the comfortable Carrera Hotel.

Next morning, if you're not up already, band music will waken you as the Changing of the Guards takes place in the plaza in front of your hotel. Then you'll be driven to see government buildings and palatial homes. Next day, you can see more of Santiago, or Valparaiso and Viña del Mar, "Riviera of the Pacific."

On to Lima, on the 18th day, after a stop at La Paz, Bolivia, highest airport in the world. You'll see many moods of the Andes . . . ranging from snow-covered volcanos to sun-baked plateaus which Indians used as gigantic drawing boards to chart the sun. Then, in early evening, the Grand Hotel Bolivar!

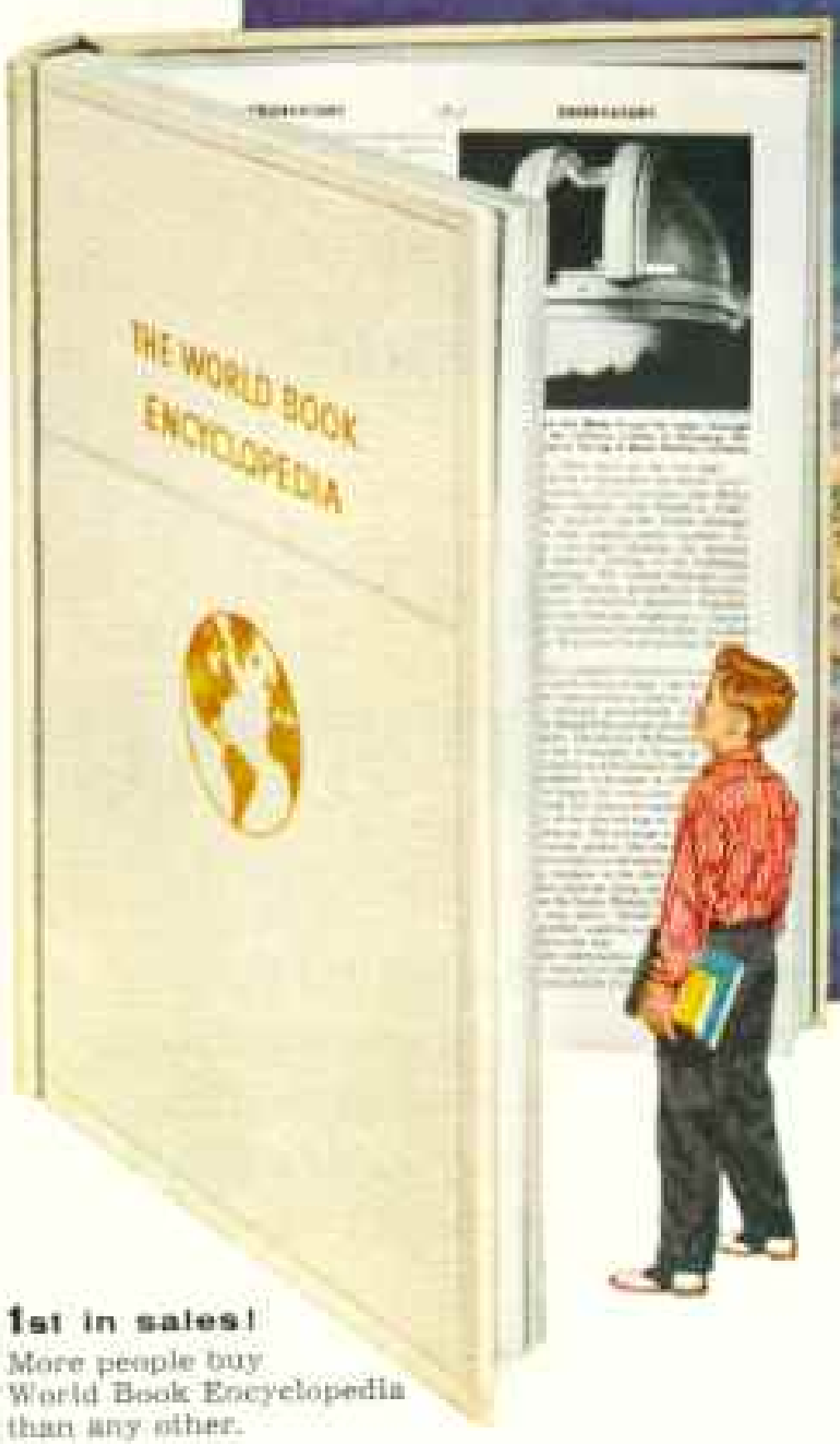
3 days in the City of Kings! You'll drive narrow streets overhung with wooden balconies . . . wide, beautiful plazas framed in 400-year-old architecture; and through suburbs where palatial homes are set in tropical gardens. You'll drive to museums and along the Pan American Highway to Pachacamac on the Pacific where civilization flourished 2000 to 4000 years ago.

On the 21st day, you'll have time in Lima to shop for silver before the evening plane for home over the routes of Panagra, Pan Am and National. Your plane stops at Panama where you can shop for bargains in tax-free perfume, liquor and watches. You arrive in Miami in early morning, in New York before noon of the 22nd day.

From New York, your 3-week trip costs $1002; Miami, $937; Chicago, $1013; Los Angeles, $1056. It includes round trip by air, drives to and from airports, excellent rooms with baths, guided sightseeing. For only $181 more, you can include an extra week and visit the "hidden city" of Machu Picchu, the ancient Inca capital at Cuzco, and Quito, Ecuador.

All flights by DC-7Bs and DC-6Bs all with radar! You're with Pan American World Airways on the East Coast and Pan American-Grace Airways (Panagra) on the West.

The stops and length of this trip are examples of what a Travel Agent can offer with the special 30% off excursion fare to Buenos Aires and back. Tours vary from 11 to 55 days, guided or on your own. For free folders and helpful suggestions, see your Travel Agent or Pan Am. Or write Mr. Don Wilson, **Panagra**, Room 4448, Chrysler Building, New York 17, New York.



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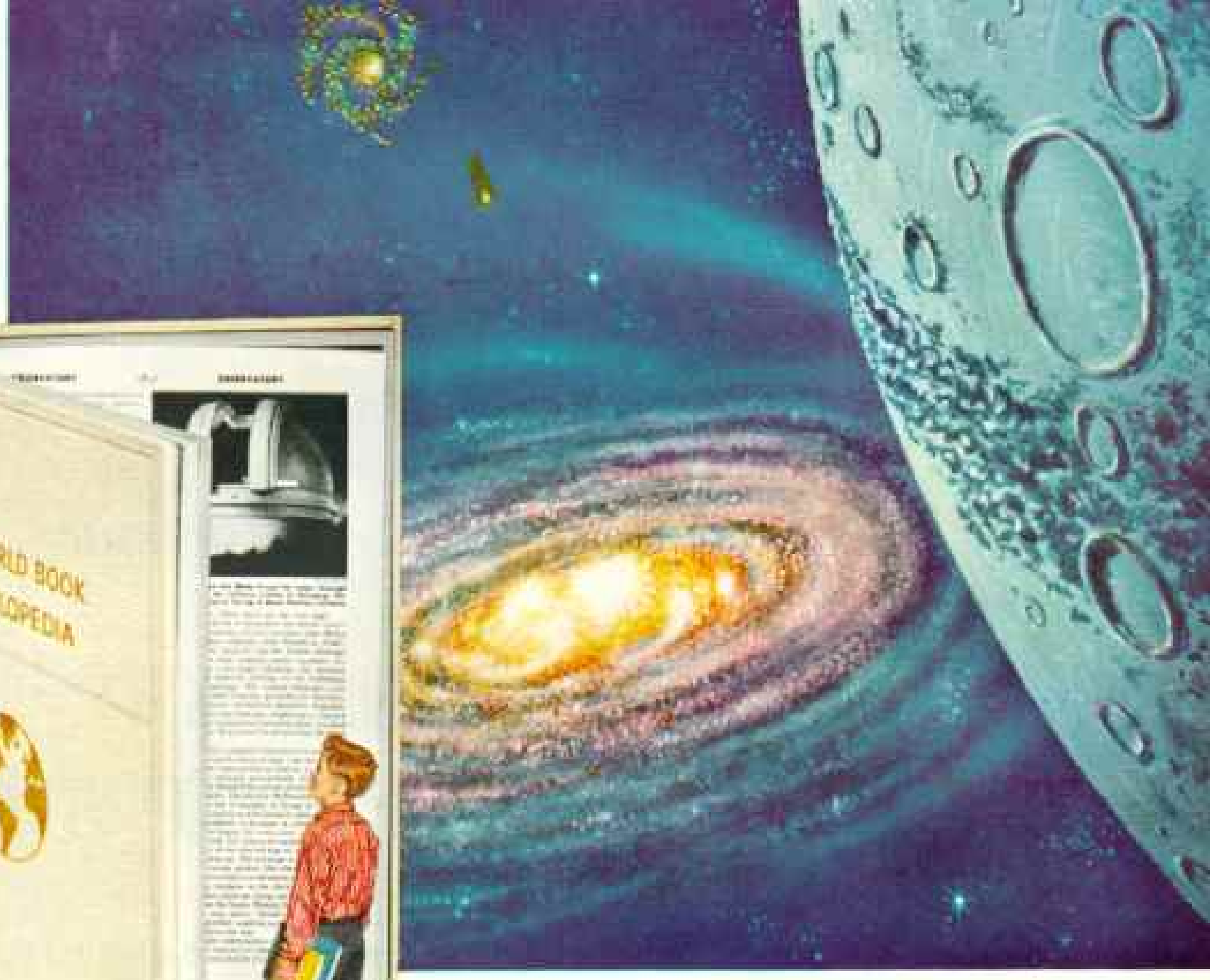

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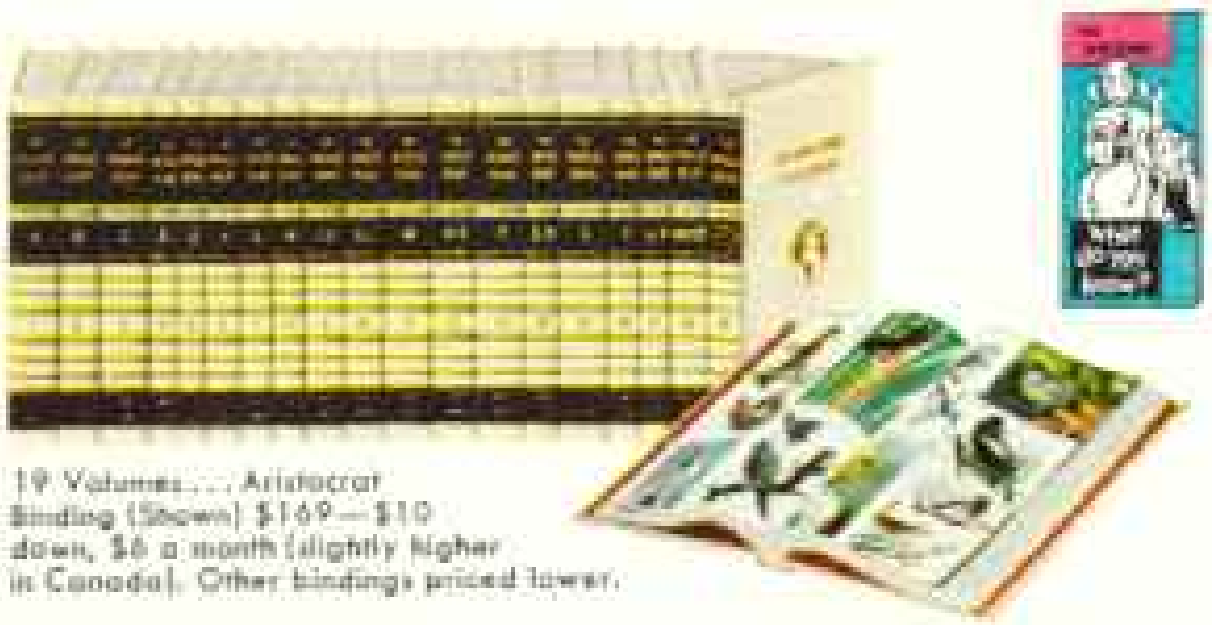

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National Geographic 10-58

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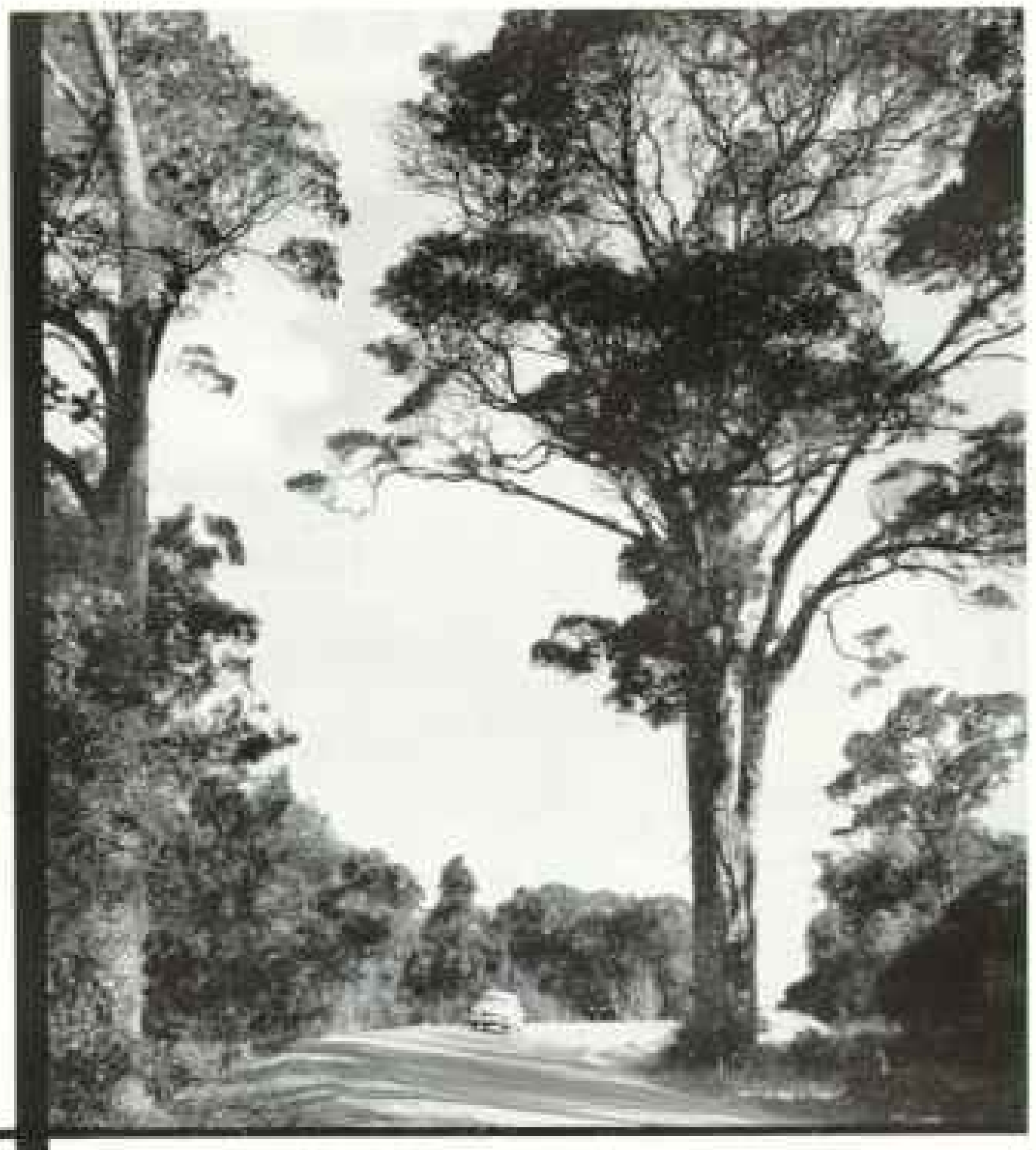

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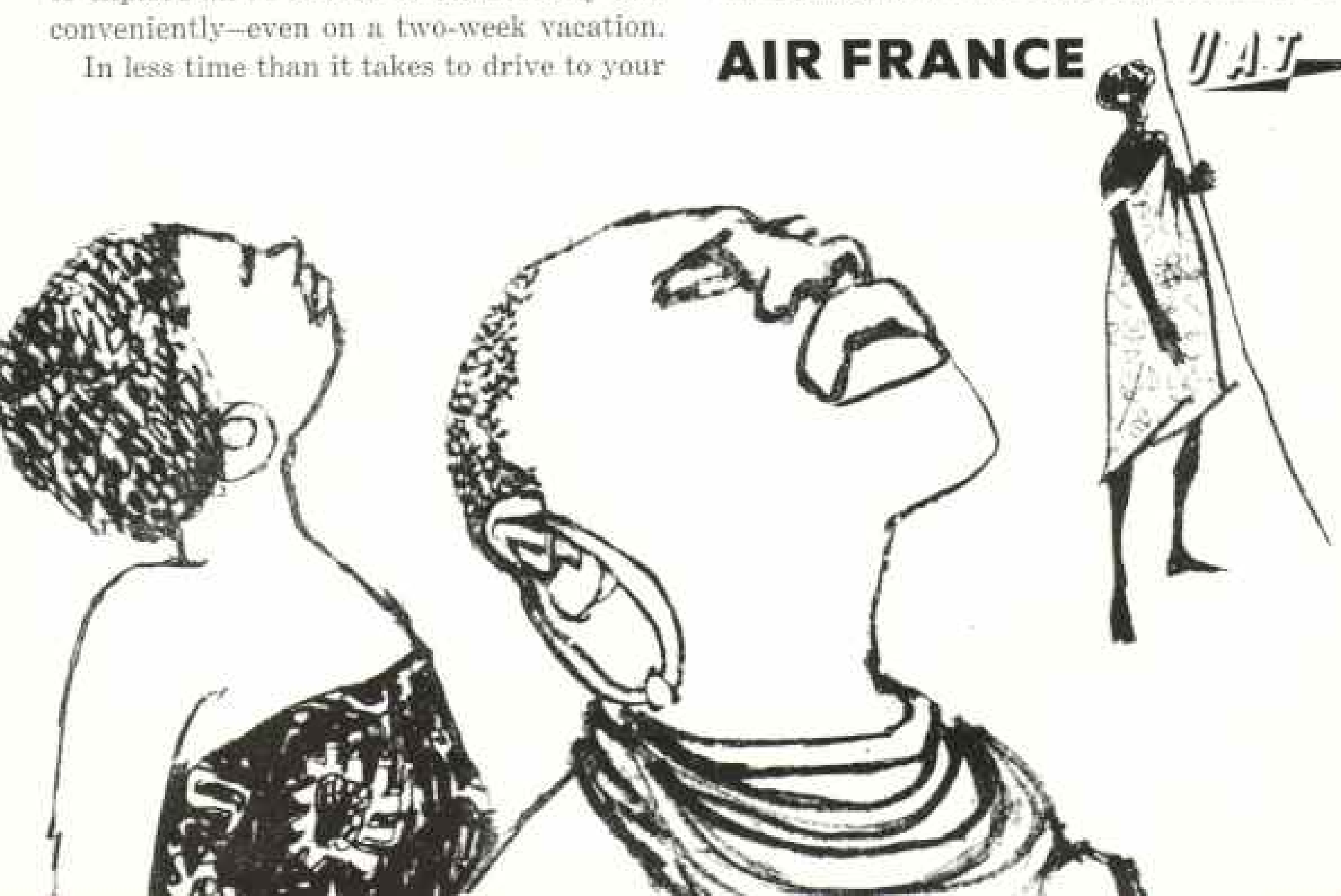

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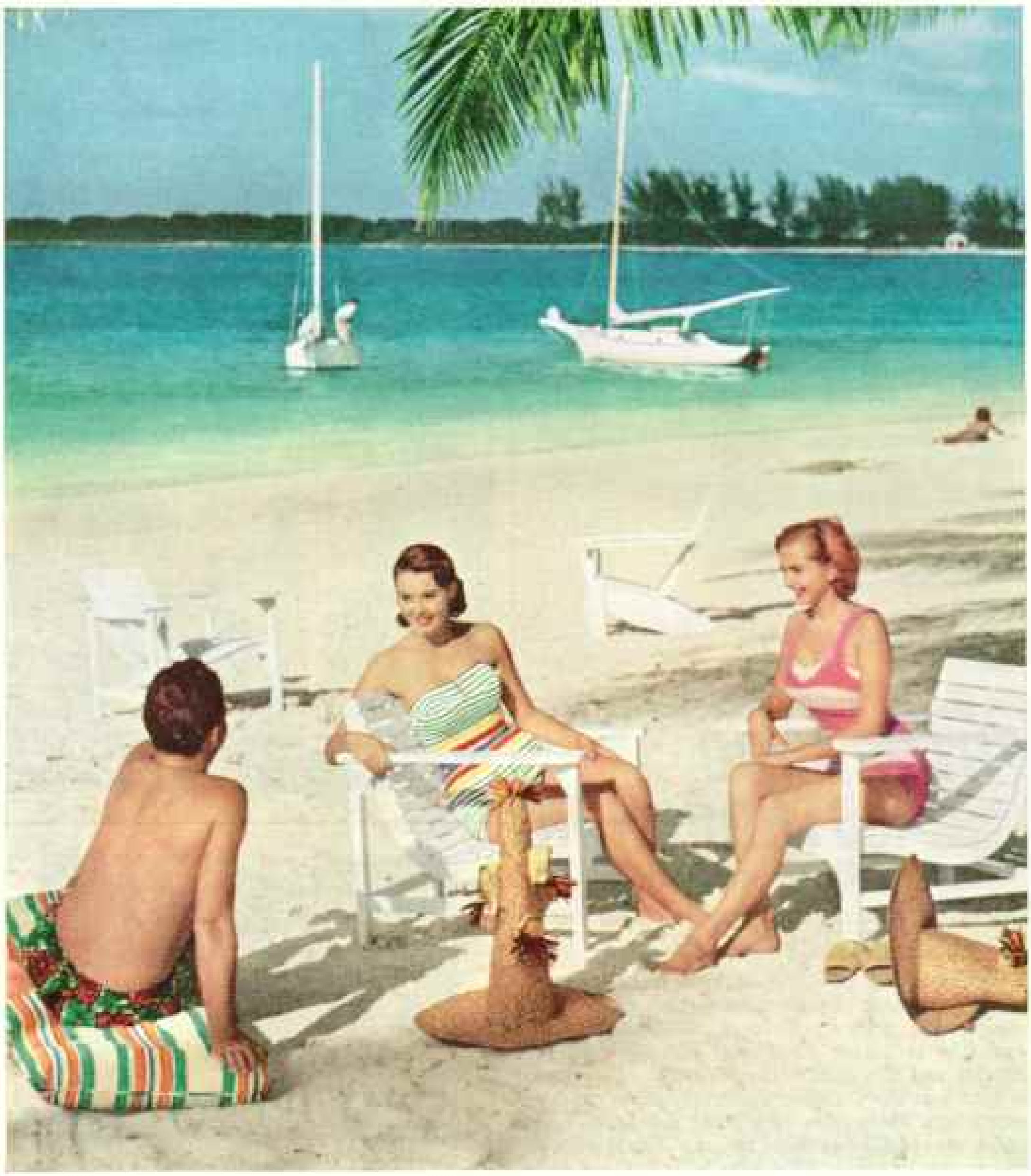

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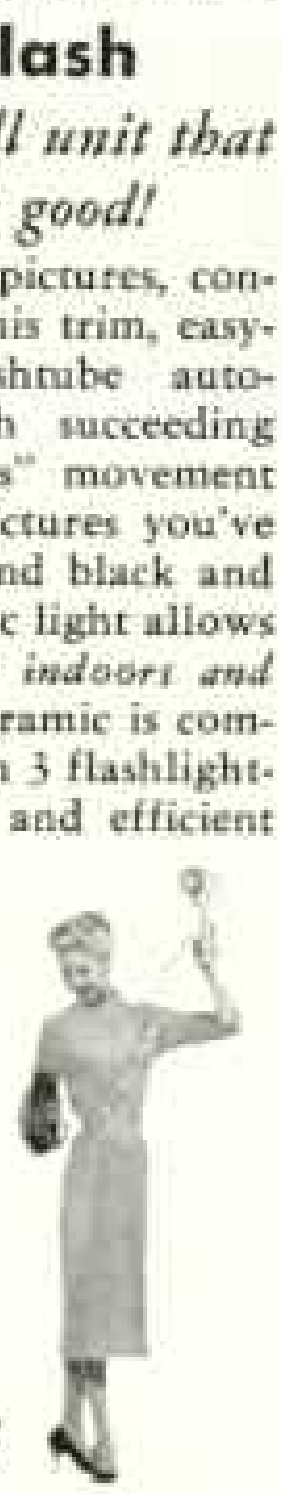

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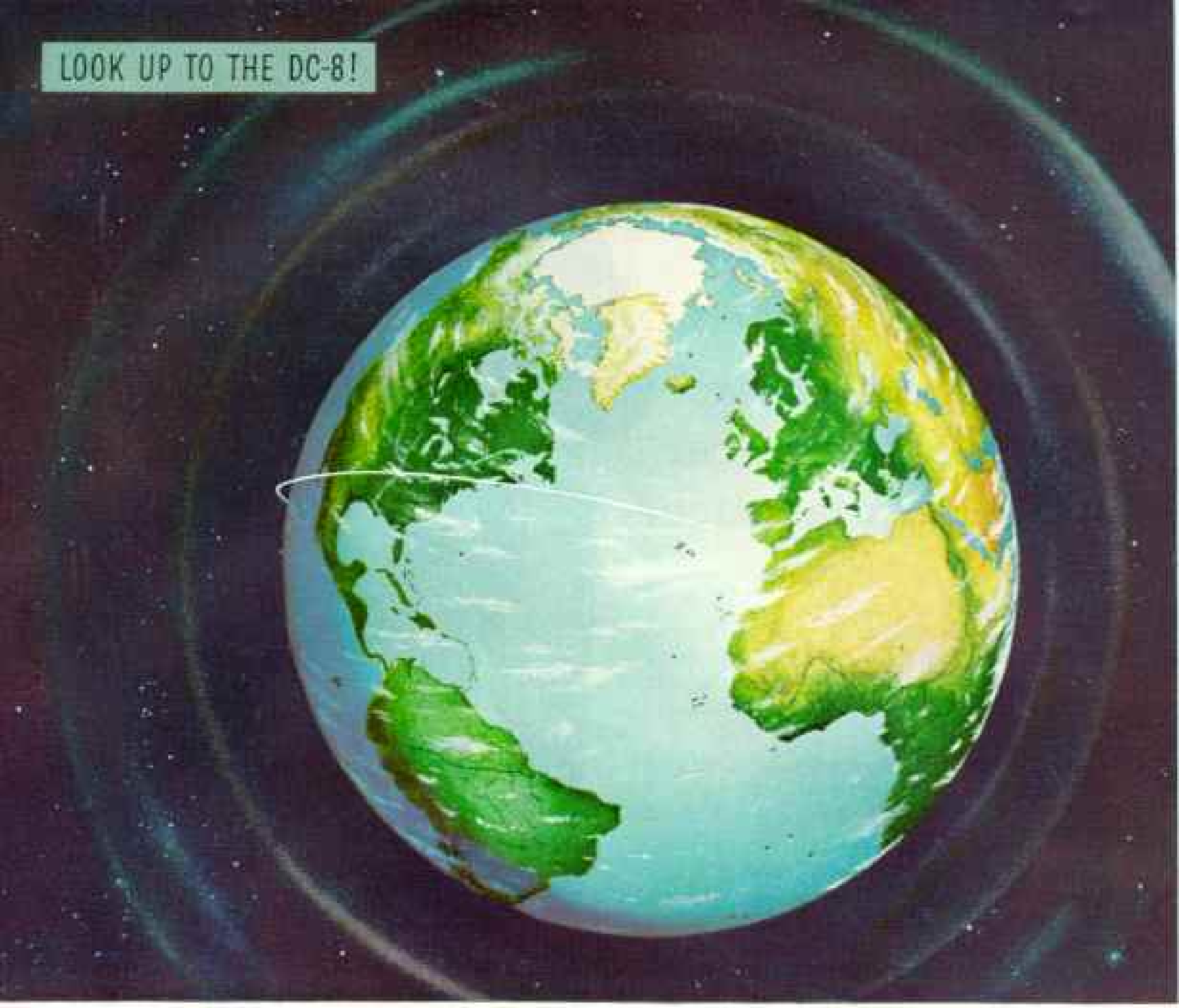

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VOL. CXIV, No. 4 WASHINGTON OCTOBER, 1958

THE NATIONAL GEOGRAPHIC MAGAZINE

An Arabian Nights land, spotlighted in a world crisis, draws on its vast resources to build for the future

Iraq—WHERE OIL AND WATER MIX

By JEAN AND FRANC SHOR, National Geographic Magazine Staff

With Photographs by Staff Photographer J. Baylor Roberts and the Authors

THERE is an ominous air about a country on the eve of revolution. My wife Jean and I spent three months in Iraq early this year, and we felt it everywhere.

Working in the Near East was nothing new to us; we have spent a great deal of time there. But this time it was different.

In country villages the radios in public squares were almost always tuned to Radio Cairo and its litany of hate for the West. In Baghdad crowds complained when we tried to take pictures anywhere but in the most modern sections of the city. And too many people with whom we talked echoed the pat phrases of anti-Western propaganda.

We had to discharge one interpreter because he began each day with a recital of that morning's tirade from Gamal Abdel Nasser's transmitter. He tried to turn every interview into a discussion of politics. We could never make him understand that our interest was in the physical, historical, and cultural aspects of his country, rather than in its temporal problems.

Iraq is, of course, undergoing a tremendous political upheaval. But the problems of any particular period, even our own, seem somehow less important when one remembers that this Land of the Two Rivers has seen 5,000 years of recorded history and that some of the world's greatest civilizations here rose, flourished, and decayed.

In the north stood Nineveh, royal residence of Sennacherib when that Biblical monarch ruled the Assyrian Empire during its golden age. South of Baghdad was storied Babylon, where Nebuchadnezzar built the Hanging Gardens, one of the Seven Wonders of the World. According to ancient Greek accounts, he built them to ease the sorrow of his homesick queen (pages 468-9).

It was in Babylon that Daniel translated the handwriting on the wall and foretold the fall of Belshazzar's kingdom. And it was not far away, in a land called Sumer, that scribes of 5,000 years ago incised their records on clay tablets, giving us the first known writing.

Hammurabi's Code Ruled Here

The most famous of the early codes of law, Hammurabi's "eye for an eye and a tooth for a tooth," once ruled this country. And there is as much to interest the romantic as the scholar. Baghdad, the burgeoning capital, was the seat of Caliph Harun al-Rashid, and its main street still bears his name—synonymous with the tales of *The Arabian Nights*.

Basra, the great southern port, teems with trade and impressive statistics—but how much more fascinating is the legend that Sindbad the Sailor set sail from there.

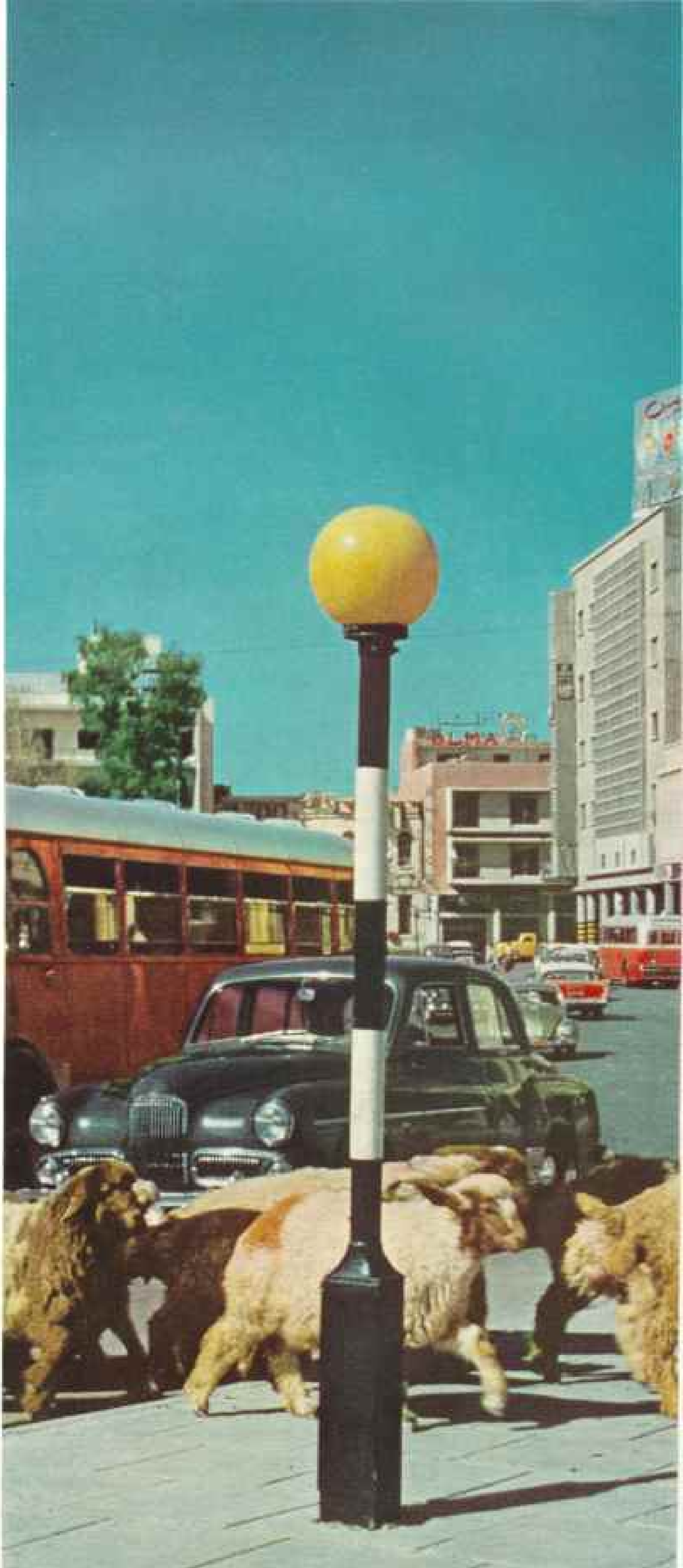
This is a stimulating country, where Biblical associations arise on every side, and the

Sheep and Sedans Cross Trails in Modern Baghdad

Under a law passed in 1950, Iraq allocated 70 percent of its immense oil income to development of the nation's resources. Hundreds of millions of dollars poured into flood control, irrigation projects, roads, schools, hospitals, and industries.

Prosperity came to the nation on the magic carpet of black gold; Baghdad sailed into a new age of modern buildings and wide boulevards. In the city of *The Arabian Nights*, Chevrolets outnumbered camels, and stores retailing imported electrical appliances outsold *suqs* displaying homemade copperware (pages 470-1).

Here, last April, market-bound sheep alone echoed the past. Three months later the capital stood engulfed in a world-shaking coup d'état. One of the new regime's first acts was to announce the continuation of Iraq's development program.



Kodachrome by National Geographic Photographer J. Baylor Roberts
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physical stuff of history lies in crumbled ruins awaiting the turn of a shovel.

Iraq's basic problem has little to do with politics; it is as old as the story of man's struggle against nature. It is the problem of water: how to put it to the best possible use. And now, in the 20th century, another fluid has seeped into the equation.

Oil Pays the Water Bill

Oil, which has brought the Near East vividly into the spotlight of world affairs, is making it possible for Iraq to take giant strides in its age-old struggle with water. This is one place where oil and water mix. As our plane swept northward from Basra toward Baghdad, my Iraqi seatmate pointed through the window.

"Look down there," he suggested, "and you'll see our greatest national resource."

I expected to see a forest of oil derricks. Instead I was looking down at Al Qurnah, storied site of the Garden of Eden, where the Tigris and the Euphrates join to form the Shatt al Arab and empty into the Persian Gulf (map, pages 452-3).

"Oil is a fine thing," my companion explained, "but you can't plant it. Water is far more important. Most natural resources are replaceable. Grain, timber, fruit, cotton—all yield seeds, and all reproduce year after year. But once you take the oil out of the ground, it is gone forever.

"It brings in a lot of money, it is true. But the nation that bases its economy on such revenues is headed for trouble. When the oil is gone, the income stops. And nothing is left to take its place."

What, I asked, was Iraq doing to avoid such a disaster?

"We're using the revenue from our petroleum to create replaceable resources," he told me proudly. "Seventy percent of our oil revenue—and that may amount to $200,000,000 this year—is turned over to a government organization called the Development Board. The board invests it in long-term projects which will keep our economy sound long after the last drop of oil has been drained from the earth."

During our stay in the Land of the Two Rivers, Jean and I visited many of the projects, some completed, many in the ground-breaking stage. We talked with government officials and foreign technicians, with land-owning sheiks and Arab farmers, with date growers and Kurdish herdsmen. Everyone seemed to approve the principle of the board, though there was concern over the time it took to get its projects into production.

"Every spring the government celebrates Development Week," a United States Point 4 technician told us. "Completed projects are officially opened during that period, and new ones are inaugurated. The trouble so far is that Development Weeks have seen a lot more cornerstone laying than ribbon cutting.

"From the long-range technical point of view, that's probably the way it should be. But politically it may be dangerous. There's a good deal of unrest in this country. If people could see immediate results from all the money they're spending, it might ease the situation. Unfortunately, they can't."

That unrest flared in July into the revolution which cost young King Faisal and Prime Minister Nuri al Said their lives, and resulted in the establishment of a provisional republic. The new government quickly indicated that it would continue the work of the Development Board.

Human Side to Be Stressed

Hashim Jawad, appointed by the new government as Iraq's representative on the Security Council of the United Nations, assured me shortly after his arrival in New York that the board would retain its importance.

"We will continue our development program," he said, "but with a new emphasis on the human side. We will stress improved living conditions and social amenities.

"All the major projects now under way will be completed. There is no thought of cutting down on this work."

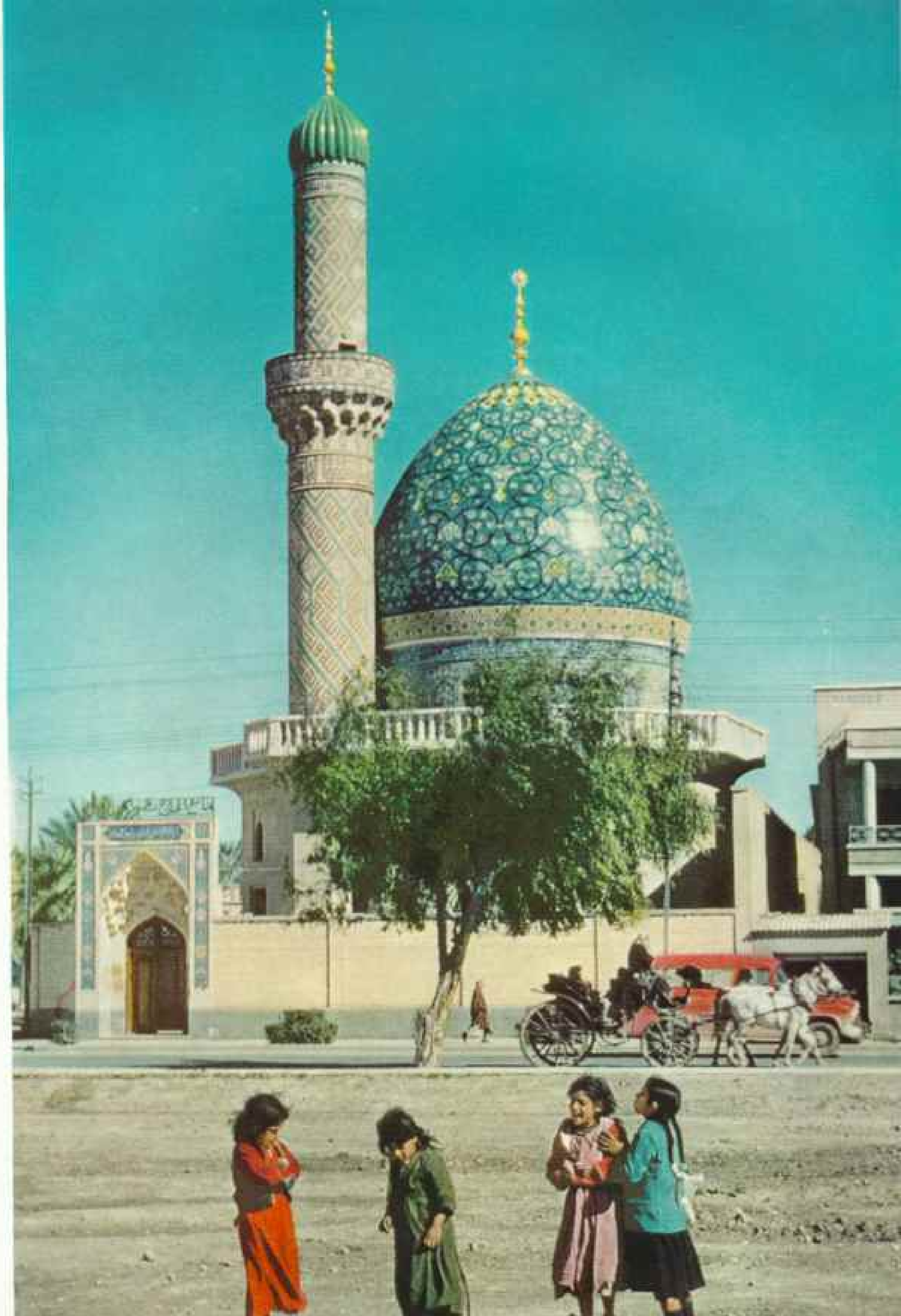
I asked if American and other foreign experts now in Iraq would be retained.

"I cannot speak for any individual," Mr. Jawad said, "but our need for technical advice will certainly not diminish; as a mat-

Jewel-bright Dome and Minaret of a New Mosque Adorn Baghdad's Skyline

Neon sign over the entrance names the citizen who built the Mosque of al Haj Mazhar al Shawi, one of more than 100 in the capital. The horse-drawn carriage, banned in the modern business district, plies the west bank of the Tigris. A few blocks away, revolutionaries ransacked and burned the British Embassy in July.

Kodachrome by Jean and Franc Shor, National Geographic Staff © N.G.S.



ter of fact, now that we are broadening the field of our development work, we will need even more experts."

Jean and I had our own experiences with the deep dissatisfaction the Arab population of Iraq feels with its economic lot. Nearly everyone, we found, was enormously self-conscious about the country's backward aspects and determined that Iraq should be presented to the world in its most modern light.

On a main street in Baghdad we found a pottery shop, where great water jars in brilliant colors made a vivid and charming display. We asked the proprietor if we could photograph him and his wares for the NATIONAL GEOGRAPHIC MAGAZINE. He would, he replied, be honored.

Students Object to Picture

But while we were setting up our equipment, a crowd gathered. Two students demanded, in Arabic, to know why we wanted the picture. We explained through our interpreter.

"Don't let him do it," one shouted to the shop owner. "He just wants to show Americans how backward our country is."

The shopkeeper protested that he didn't see anything backward about his water jars, that he was, in fact, rather proud of them.

But the younger element in the growing crowd sided with the students. Water jars indicated a lack of plumbing, they said. If we wanted to take a picture, why not take one of some of Baghdad's new buildings?

I had already done that, I explained. I wanted to show all sides of Iraqi life. But the crowd's shouts took on a menacing tone, the proprietor obviously was becoming ill at ease, someone kicked my camera tripod, and one of the students spat at Jean. We gathered up our equipment and went away from there.

Even our college-trained interpreter showed similar reactions. In the countryside, when I asked him to help me take a picture of a water buffalo pulling a plow, he demurred, "Why don't you take a picture of a tractor?"

Again I explained. Draft animals outnumber tractors by the thousands to one in Iraq. National Geographic readers want to see the country as it is, not as it hopes to be. But I never got that point across.

This intense nationalism does not center upon devotion to Iraq as a country, but upon the Arab heritage of its citizens. Almost without exception, the people we talked with considered themselves Arabs, and regarded their Iraqi citizenship as incidental. We never encountered actual anti-American emotions; rather there seemed to be a distrust of the Western World's approach to the Arab people.

Such political shadings, however, were not our interest. We wanted to know how Iraq looked, what its people did, and how they lived. To find out, we traveled thousands of miles over rough roads, stayed in desert villages and mountain resorts, and walked for hours through the streets of the great cities of Baghdad, Mosul, and Basra. We bought our necessities in crowded suqs, or bazaars, and drank innumerable cups of tea on the rough wooden benches of village coffee shops.

Outside of Baghdad, with few exceptions, our welcome was heart warming. Hospitality, a deeply ingrained aspect of Arab culture, was seldom wanting. A request that we be allowed to take a picture might be declined, but almost always with the greatest of courtesy. If we asked a question of one man in a crowd, half a dozen volunteered additional information.

Our first surprise was the discovery that Iraq, which we had pictured as a desert country, has never suffered from a shortage of water, although some of its people have. The problem is rather one of control and distribution. The two great rivers, the Tigris

(Continued on page 455)

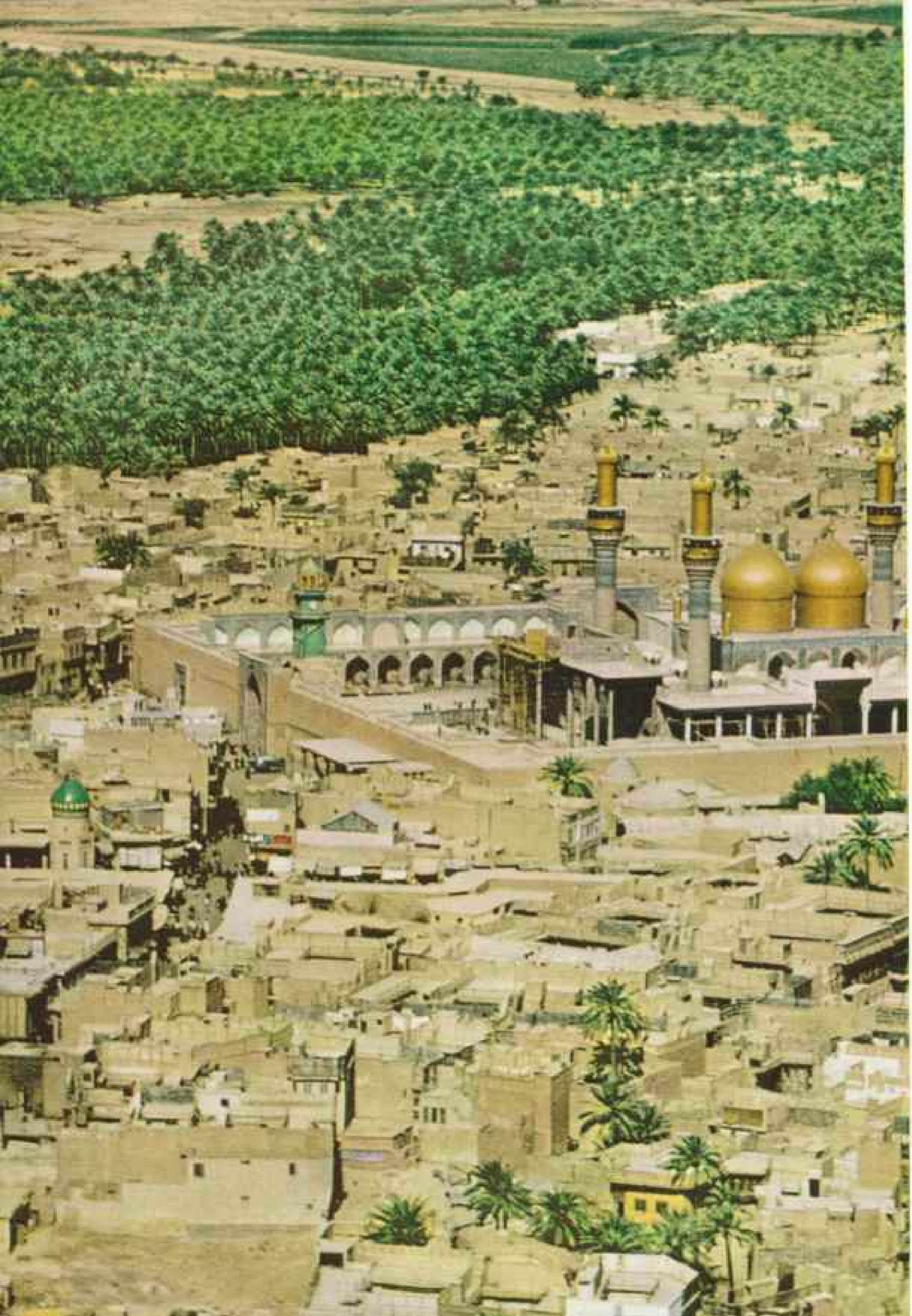
Remaking the Face of Baghdad, Men Rear Walls of Reinforced Concrete

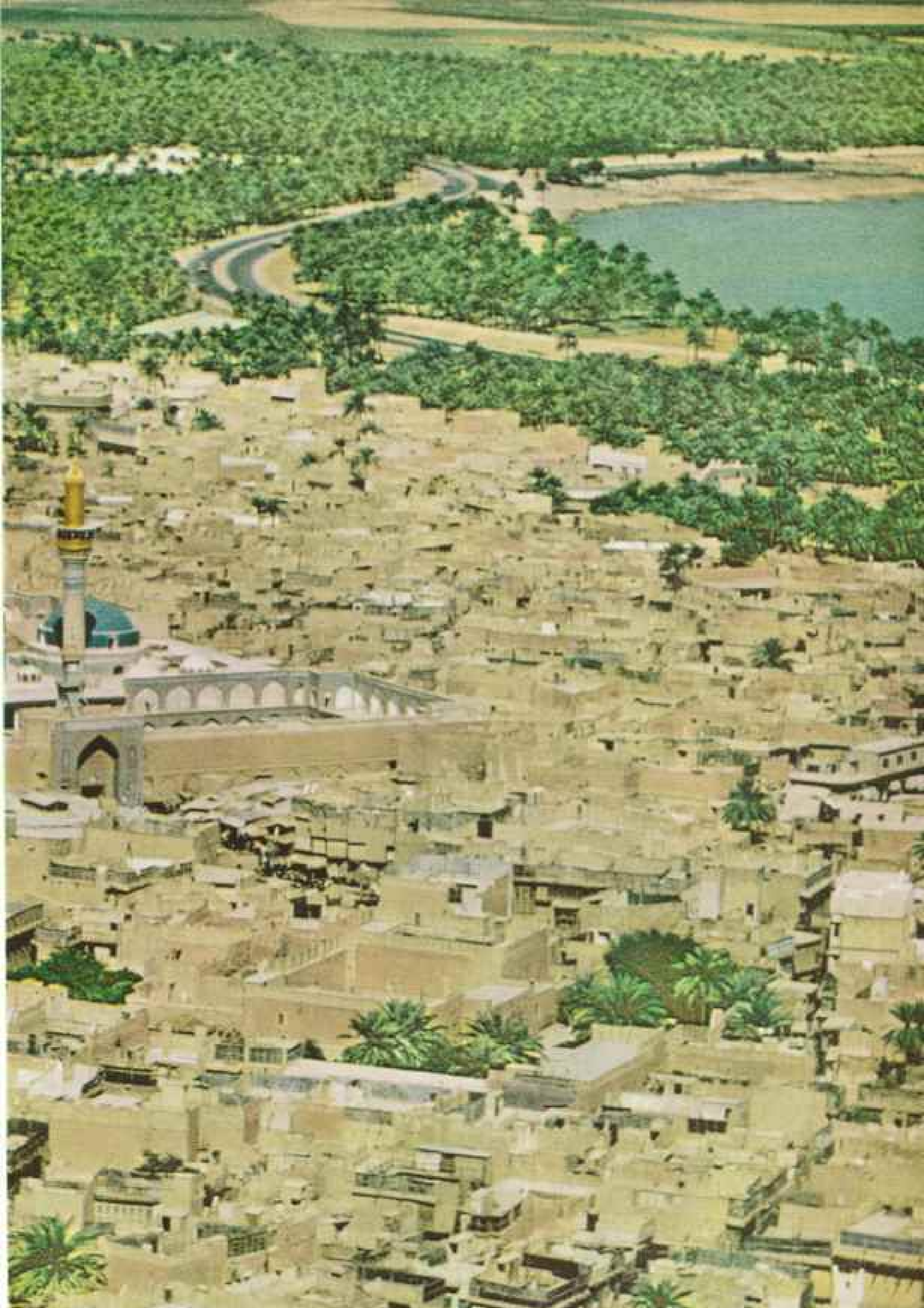
"A country of this kind . . . is all beginnings," wrote Gertrude Bell, the Englishwoman who worked to establish Iraq. Her words still rang true in the spring of 1958, when Baghdad looked like a boom town. Al-Rashid Street looks on two new bank buildings.

A Golden Shrine Draws Pilgrims to the Holy City of Kadhimain (Page 450)

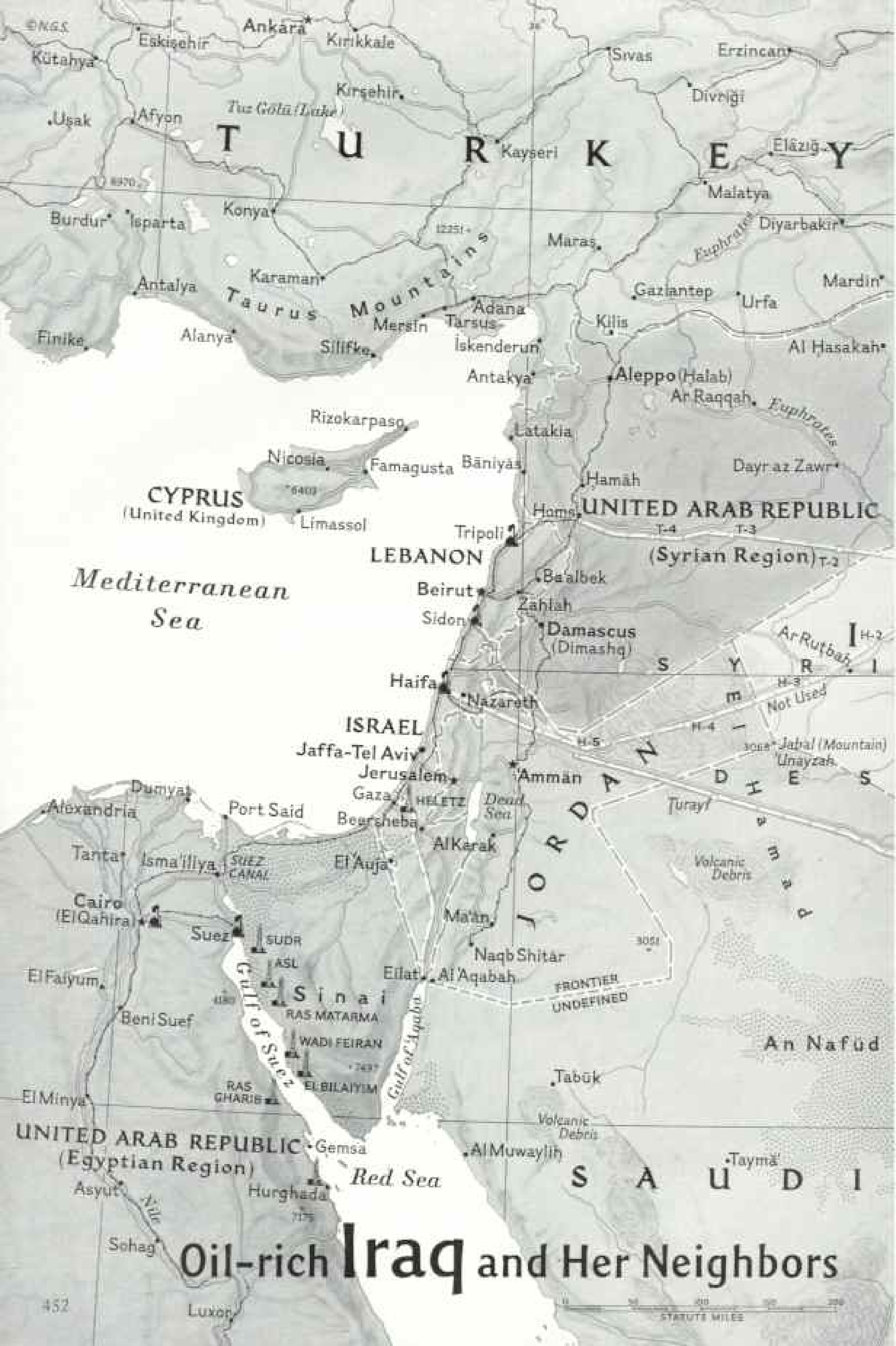
Shias, who form a major branch of the Moslem faith, revere the 16th-century mosque as the tomb of two of their chief leaders. Courtyards beneath gilded domes and minarets form an island in the tangled sea of rooming houses, food stands, and souvenir shops. A superhighway skirting the Tigris (upper right) was designed to link this Baghdad suburb with distant Mosul; now it ends a few miles beyond the date groves.

Kodachrome by National Geographic Photographer J. Baylor Roberts © N.G.S.





Oil-rich Iraq and Her Neighbors



U. S. S. R.

Caspian Sea

Erzurum
Mt. Ararat 16946
Murat
Muş
Bitlis
Van Gölü
Van
Batman
Kurtalan
Siirt
RAMAN DAĞ
Tigris
Mākū
Nakhichevan'
Dzhulfa
Sal'yany
BUZ DAG
Lenkoran'
Astara
Khvoy
Ahar
Ardabil
Tabriz 1237
Lake Urmia
Rezaʾiyeh
Marāgheh
Mīāneh
Pahlavi
Rasht
Chālūs
Al Qāmishlī
MUSHORAH
ZĀKHŪ
AIN ZALAH
BUTMAH
Al ʿAmādiyah
Tall Kayf
Nineveh
Mosul
Rawāndūz
Ṣalāḥ ad Dīn
Little Zab
SASSAN
QASAR
JAWAN
NAJMAH
Irbil
Dokan Dam
BASA GURGUR
Kirkuk
As Sulaymānīyah
Sanandaj
QAIYARA
BAI HASSAN K-1
JAMBUR
K-2
Thartha
Tigris
Zanjan
Kazvin
Elburz Mts.
Tehran
Hamadan
Qom
Al Hadithah
K-3
T-1
H-1
Tharthār Depression
Ar Ramādi Barrage
Samarra' Barrage
Halabjah
Khānaqīn
NAFT-KHANEH
Sāmarrāʾ
Tharthar Channel
Diyala Weir
Kermanshah
NAFT-I-SHAH
Nahāvand
Malāyer
Arāk
Kashān
Borūjerd
Golpāyegān
I R A N
(P E R S I A)
R A Q
Baghdad
Ad Dawrah
Khān al Mahāwīl
Karbalāʾ
Babylon
Al Ḥillah
Al Kūt
Al Kūt Barrage
An Najaf
Ad Dīwānīyah
Euphrates
Al ʿAmārah
E R T
Dezful
LALI
Shūshtar
Masjed Soleymān
NAFT SAFID
HAFT KEL
Ahvāz
Shatt al ʿArab
An Nāṣirīyah
Al Qurnah
Ur
Isfahān
Shīrāz
AGHA JARI
Bandar-e Shahpūr
GACH SARAN
Basra
Az Zubayr
ZUBAYR
Abadan
The world's largest petroleum refinery
Al Faw
Ganāveh
Bushire
Hawr (Lake) al Ḥammār
As Salmān
Rafḥā
KUWAIT
Al Kuwayt
MAGWA
Al Aḥmadī
BURGAN
NEUTRAL TERRITORY
WAFRA
SAFANIYA
Hafar al Bāṭin
Al Qayṣūmah
Persian Gulf
Al Nuʿayrīyah
ABU HADRIYA
KHARSANIYA
FADHILI
QATIF
DAMMAM
Dhahran
Ras Tannūrah
Al Manāmah
BAHRAIN
ABQAIQ
GHAWAR
QATAR
DUKHAN
Ḥāʾil
A R A B I A

Oil Field
Refinery
Basra Town with Refinery
Oil Pipe Line and Pumping Station
Intermittent Lake
Dry Salt Lake

California-size Iraq forms the heartland of the troubled Near East, often miscalled the Middle East. Oil-derrick, refinery, and pipeline symbols emphasize the major reason for the importance of this region today: Iraq and neighboring Iran, Kuwait, Saudi Arabia, and Qatar together supply a fourth of the world's oil.

Baghdad Carpenter Pauses for Water

World-famous architects lent their talents to the renaissance of Baghdad.

Italy's Gio Ponti designed a headquarters for the Iraq Development Board. America's Frank Lloyd Wright created plans for an opera house on an island in the Tigris. France's Le Corbusier set to work on a sports stadium, and Finland's Alvar Aalto, a civic center. As they turned out blueprints, thousands of Iraqis, largely substituting manpower for machinery, erected other buildings.

Adz hooked over shoulder, this worker drinks from an earthenware jug while balancing on a seven-story scaffold.

Kodachromes by National Geographic Photographer J. Baylor Roberts © N.G.S.

Traditional ways are still convenient. A Baghdad housewife sets up her portable kitchen on a tiled balcony for the summer. Lamb stew simmers over a kerosene burner.

and the Euphrates, run the length of the California-size country, and even in dry years they carry billions of tons of water from the mountainous north to the Persian Gulf.

Clifford Willson, a jovial American who was then serving as one of the two foreign members of the Development Board, briefed us on the over-all program. Willson is a veteran of 23 years service with the U. S. Department of Agriculture and foreign aid projects. Jean and I had seen him in action in places as widespread as China, New Mexico, and India.

At that time the board was theoretically outside politics and included Willson and a Britisher. In August, however, the new government replaced all the members, turning over their functions to a group of cabinet members and the Deputy Premier.

"We've gone at this job on a long-range basis," Willson told us. "A lot has been accomplished in the last five years.

Lives Depend on River Control

"Under a law passed in 1950, 70 percent of all oil revenue goes to the board. It's our job to see that the money is devoted to irrigation and flood-control projects, more efficient land use, improved public health and education, strengthened communications, and development of industry. In 1956 our revenue was more than $135,000,000. It was less in 1957 because of the Suez trouble, but this year it should be even greater."

Flood control and irrigation, Willson pointed out, get the lion's share of the budget.

"That's as it should be," he went on. "Either man is going to control the rivers, and live a life of abundance, or the water will run wild and he'll starve—if he doesn't drown."

Some of the most impressive projects that have been completed, members of Willson's staff told us, have already paid for themselves. Most ambitious of these was the Tharthār Project to control the Tigris, which used to break its banks almost annually with devastating effect.

The Tharthār Depression is a remarkable natural basin lying just below sea level and covering some 790 square miles, an area considerably larger than the Dead Sea. A barrage was thrown across the Tigris at Sāmarrā', 70 miles northwest of Baghdad.

Now when the spring floods sweep down the great river, steel sluice gates clang shut, turning the waters into a huge artificial cut which runs 40 miles through the desert into the depression (page 464). The $44,800,000 project involved the moving of nearly two-thirds as much earth as was moved in digging the Suez Canal.

"Iraq got its money back on that job in 1957," a Point 4 technician told us in Baghdad. "There was a terrible flood in 1954 which did more than $50,000,000 damage, most of it right in this city. In 1957 the amount of water in the Tigris was even greater than in 1954. But the Tharthār construction was completed in 1956, and it took care of the surplus without spilling a drop."

The Tharthār Project may become more than just a protection against floods. The barrage itself includes facilities for a power station, if one is needed at a later date, and engineers are making studies to see if the stored floodwaters can be used for irrigation.

Irrigation itself is, of course, one of the principal aspects of the board's work. The present population of Iraq is about 6½ million; experts believe that with proper utilization of land and water the country could support more than 20 million people. And history records that Mesopotamia, present-day Iraq, was once the granary of the ancient world.*

It is possible that the wheel of history may have come full circle with the engagement of European and American irrigation experts to assist the Iraqis in their reclamation projects. Some historians believe that irrigation was introduced into Europe by the Arabs in their 8th-century occupation of the Spanish peninsula. Now those techniques are being returned to the land of their origin.

Scientists Seek Ancient Secrets

But even the most modern methods seem to fall short of the skills lost a thousand years ago in the land that supported the glories of Babylon, Nineveh, and Ur. And Development Board experts have turned to archeologists in an effort to rediscover those lost techniques.

"When you travel in this country, you see constant evidences of ancient canal systems," observed Kenneth Vernon, introduced to us as chief of the board's irrigation, drainage, and flood control section.

* Life in Mesopotamia thousands of years ago, as well as in ancient Egypt, Greece, and Rome, is portrayed with the aid of 215 illustrations, including 170 dramatic paintings, in *Everyday Life in Ancient Times*, available at $6 postpaid from the National Geographic Society, Washington 6, D. C.

A Doomed Young King and His Advisers Pose for a Historic Portrait Beneath the Vivid Designs of a Royal Canopy

Last April 26, at the opening of Iraq's Development Week, National Geographic photographer Roberts took this picture—one of the last ever made of ill-fated Faisal II (center) together with Iraqi leaders. Three months later rebellious army units seized power and declared a republic. Once

© National Geographic Society

in control, the new regime announced that 23-year-old Faisal and his uncle, Crown Prince Abdul Illah (seated at right), had been killed during early hours of the revolt. Later it was reported that long-time Premier Nuri al Said (third from left) had lost his life while trying to escape in the guise of a woman. Sayid Ibrahim Hashem (fourth from left), Deputy Premier of the Arab Union of Jordan and Iraq and former Premier of Jordan, was also slain. Here Iraqis, Jordanians, and Kuwait delegates (in white kaffiyehs) meet with the King to dedicate a Baghdad woolen mill.

"One of our biggest problems today is to find out how the ancients were able to keep land irrigated and under production for century after century before it became too saline, or toxic."

When modern irrigation methods have been applied to some of Iraq's less well-drained areas, the capillary action of the water on the saline subsoil has caused the surface to salt so badly it has had to be abandoned within five years.

"Before we recommend an area for reclamation and irrigation, we test the soil for potential productivity," said Mr. Vernon. "We want to know if it would be arable in its present state, and if not, whether we could make it usable with modern methods.

"Frequently," he continued, "the tests show that the soil is useless for agricultural purposes. Even with irrigation, drainage, and fertilizers, the examinations indicate, a satisfactory crop could not be produced.

"Then we find the tax records of a thousand years ago," he went on, shaking his head, "and learn that that very soil was in production for hundreds of years without a break.

"Why is that?" Vernon asked. "Why is it that those old boys could keep their land usable for five hundred or a thousand years? Why, there's one area east of Baghdad that remained in production for at least fifteen hundred years. How did they do it? What is it we've forgotten?"

Ancient Tax Records Show Crop Pattern

The archeologists are tackling the problem from two directions, Mr. Vernon explained. By direct excavation, they are seeking the methods by which earlier inhabitants improved the natural drainage. And by the translation of ancient tax records found on clay tablets, they study the use made of the soil.

"Those tax records give an excellent picture of the farming practices of the day," Mr. Vernon went on. "They not only tell us the yield—in some cases better than our present-day harvest—but they reveal the type of crop. That tells us a lot about soil conditions.

"Where wheat was grown, the soil was practically pure. A crop of barley may indicate that it was more toxic—barley will tolerate more salt than wheat. Sometimes, in the gradual change from wheat to barley, we can map the advancing salinity."

Natural drainage is poor in much of Iraq, said Mr. Vernon, and provision of artificial facilities is expensive.

"What we need," he explained, "is a crop program which will substitute for natural drainage facilities. Between the best that modern science has to offer and what we can learn from the ancients, we hope to find one."

U. S. Envoy Tells of Progress

Our Ambassador to Iraq, Mr. Waldemar J. Gallman, told us about the strides taken by Iraqis in recent years. Sitting in our Embassy in Baghdad a few months before the July coup, he spoke of his admiration for the determination with which Iraqis have followed out their original plan.

"It's impressive to find a nation setting aside 70 percent of its oil revenue for construction and development," he said. "It's not only unusual in this area; it would be an astonishing thing anywhere in the world.

"The important thing is that they not only passed the law; they followed through with the establishment of a competent agency to implement it. We're proud that, through our technical assistance program, we've been able to provide some of the personnel."

Nearly 100 Americans, Ambassador Gallman told us, were working with government ministries at the beginning of this year. Their fields range from rural redevelopment to public health. The Ambassador is pleased with the record they have made in Iraq.

"These have been among the most stimulating of my years in the Foreign Service," Ambassador Gallman said. "It's inspiring to see what these people are doing for their own country."

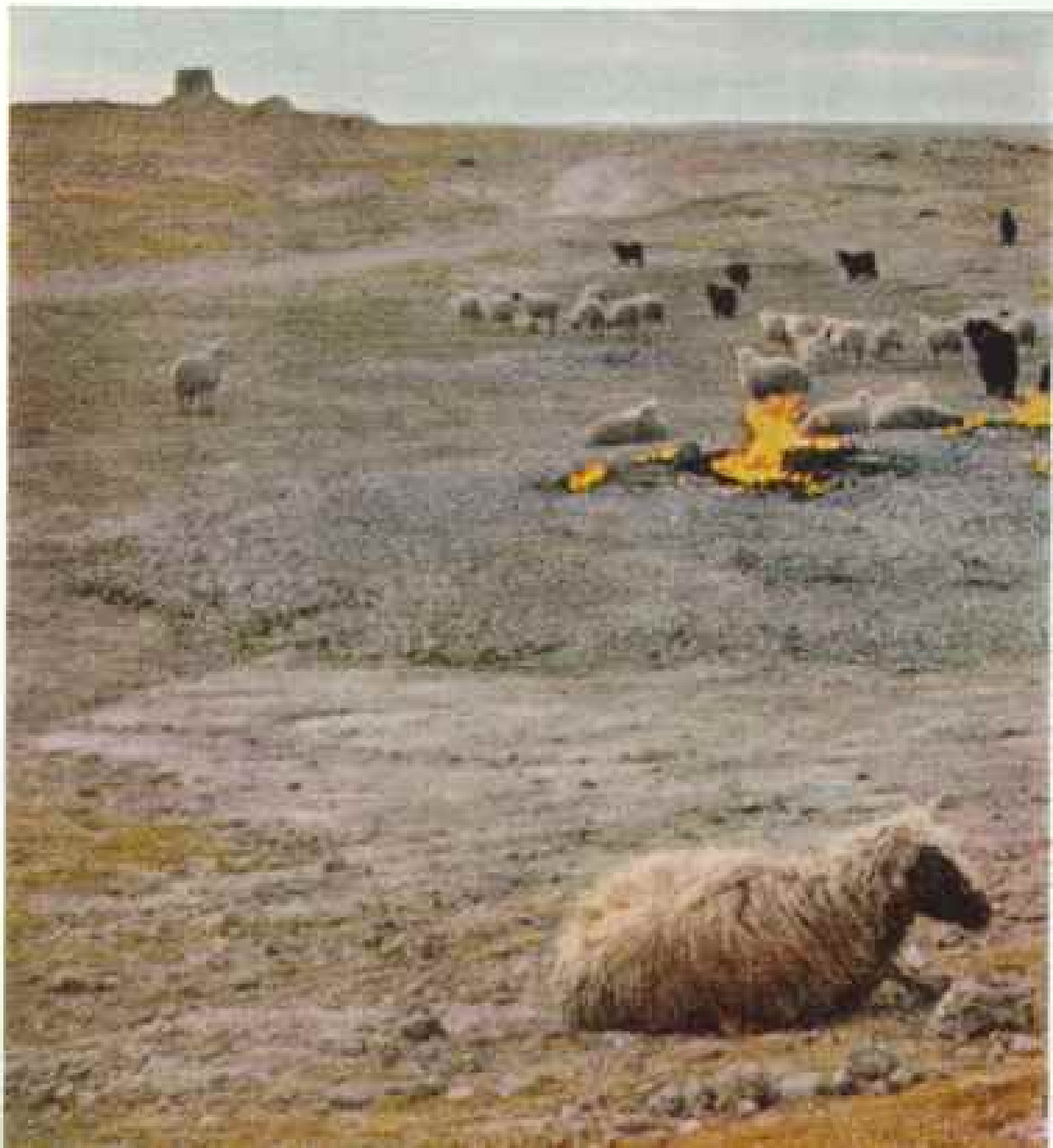
Just how much they have done, and in what a short time, we learned from Dr. Kevin G. Fenelon, an ebullient Englishman who was

(*Continued on page 463*)

Stacked Like Layer Cakes, Bowls of Yoghurt Ride to Market

Some Iraqi women adopt Western dress and manner, but many still cling to the veil. The Ma'dan of southern Iraq's marshlands do neither. These women, who migrated to Baghdad with their water buffaloes, wear the black shroud, or aba, but leave their faces bare. Rising before dawn, photographer Roberts caught the wraithlike figures as they padded silently into Baghdad to sell products from their herds.

Super Ansochrome by National Geographic Photographer J. Baylor Roberts © N.G.S.



Ghostly Ground Fires Dance Eternally at Baba Gurgur

Gases seeping through cracks in the earth's crust have fueled the flames for ages. Traditionally, the fires served as the Bible's "fiery furnace," into which Shadrach, Meshach, and Abednego were cast on the order of King Nebuchadnezzar some 2,500 years ago. Here a shepherd and his flock gather about the warming glow as twilight descends across the bleak plain.

During World War II the fires were smothered to keep Axis planes from targeting the oil fields at near-by Kirkūk.

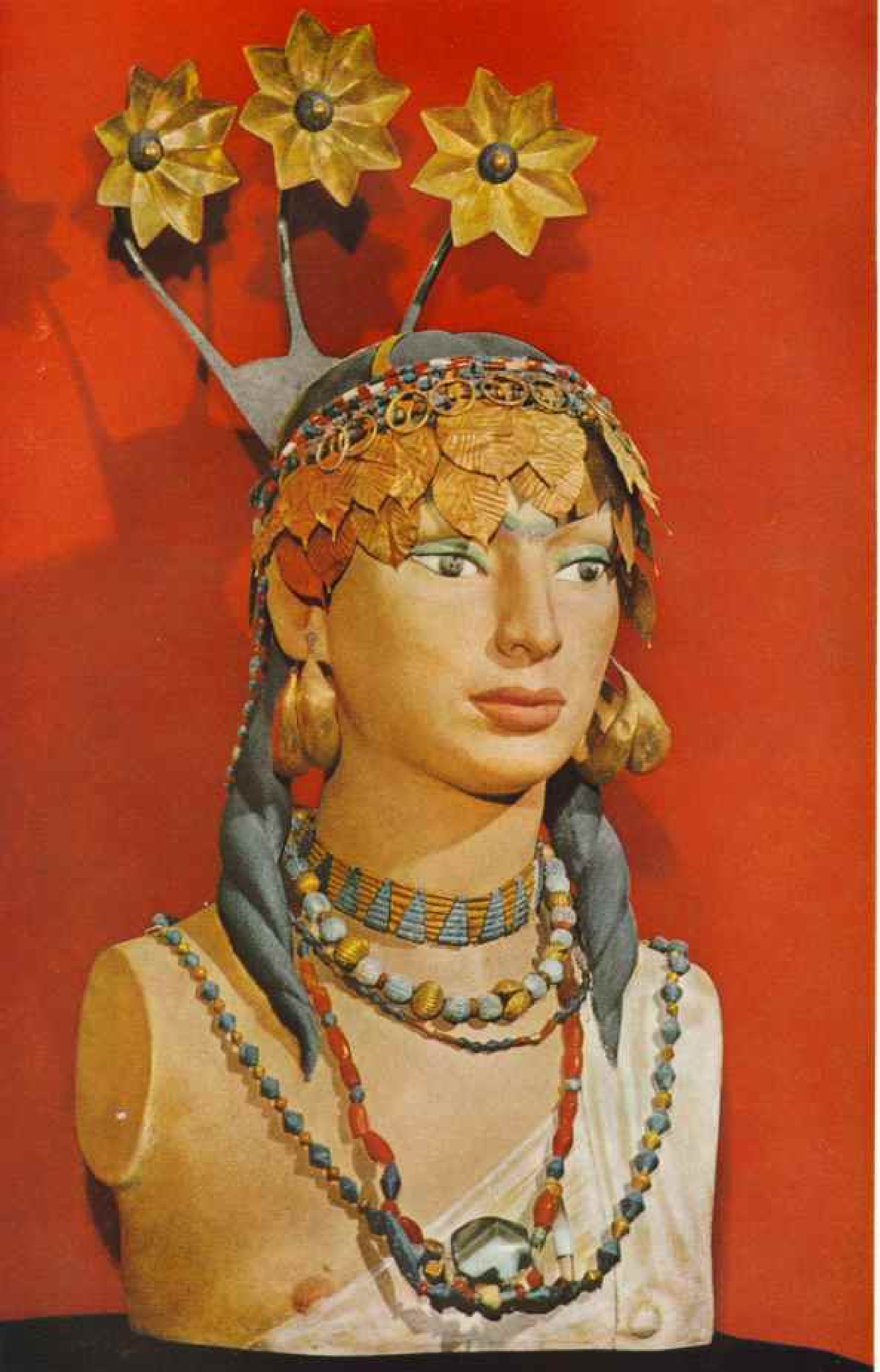
Paper Association by National Geographic Photographer J. Baylor Roberts

A Blazing Cloud Marks the Nation's Treasury: Kirkūk's Oil Field

For thousands of years men have known that oil existed at Kirkūk, but 1927 ushered in the first well—an 80,000-barrel-a-day gusher.

In 1958, with only 75 active wells, Iraq ranked as the world's eighth biggest oil producer. Its known reserves, 25 billion barrels, constitute a tenth of the earth's inventoried store. Some Arab nationalists insist that Iraqi oil belongs to the whole Arab world.

This stabilization plant prepares crude oil for shipment through pipelines to Mediterranean ports in Syria and Lebanon. Flare points, burning waste gas, light the landscape so brilliantly that one can read a newspaper by night.



then serving as an adviser to the Ministry of Economics. Dr. Fenelon is a statistician, and under his direction Iraq has established a system of record keeping far ahead of anything else we have seen in the area.

"Our policy is not only to produce statistics," he smiled, "but to get people to use them. Some of them make fine advertisements for the job the Development Board is doing. Look at these figures on national income."

The growth is indeed phenomenal: From $442,400,000 in 1950 to $725,200,000 in 1953 and a thumping $848,400,000 in 1956.

Iraqis Stay Home on Census Day

A statistician in the Near East, Dr. Fenelon told us, has some unusual problems—but also some unique opportunities.

"When we took our housing census in 1956," he recalled with a smile, "the government simply ordered everyone to stay home on counting day. With a very few necessary exceptions, everyone did. Made the job quite simple. Baghdad, which I estimate now has nearly 900,000 people, looked deserted."

It certainly doesn't look deserted under ordinary conditions. The city of the Arabian Nights has growing pains which have turned into Arabian nightmares. A fascinating hodgepodge of modern buildings, landscaped parkways, and winding, muddy alleys, it typifies the marriage of East and West.

Native bellboys sleep in the hallways of air-conditioned hotels. Shops vending television sets and Geiger counters stand beside dealers in gold-laced brocades and finely woven carpets. Horse-drawn carriages are barred from the main streets, but an occasional countryman and his laden donkey stroll along the crowded sidewalks, scattering window shoppers.

Once off the main avenues, you find yourself in the city of Caliph Harun al-Rashid. Not 50 yards from the city's biggest department store is a street where bearded artisans work gold and silver into delicate filigree. A hundred muddy paces beyond, the tap-tap-tap of hammers fashions great copper vessels for water storage (page 470). Garishly painted wedding chests, made from old crates and bits of broken mirrors, stand beside dressers of varnished veneer in the best Grand Rapids tradition.

But everywhere in Baghdad we found evidences of prosperity. New houses are going up by the hundreds, and whole new subdivisions are extending the city's perimeter. New automobiles crowd the avenues. The first full-fledged television station in the Near East—a government operation—is on the air every night, and the demand for sets is brisk.

In a western suburb Jean and I came upon a row of two-score neat brick-and-concrete houses in modern style, painted in a variety of colors. The street was still a sea of mud, and construction debris was piled in every courtyard, but a number of families had already moved in. We stopped to photograph a pink structure on the corner, and a tall, slender Arab emerged from the door to watch.

"It is a beautiful house," Jean said through our interpreter. "You must be very proud of it."

"I am," he replied. "If you wish to come inside, you are welcome."

Wife Too Shy to Face Guests

We entered a three-room dwelling whose concrete slab floor was covered with worn Oriental rugs. Our host introduced himself as Shakir Abbas, and proudly presented his sturdy five-year-old son Hamoud. His wife, he said, was in the kitchen; as he started to call her, there was a scurry of feet and the back door slammed.

"Forgive us," he laughed. "She is very shy. I am afraid she has run to a neighbor's house."

Mr. Abbas invited us to sit down and apologized for not offering coffee, explaining that the family had moved in only the day before and had not yet got the kitchen into operation. The house, he told us, was part of a government project, built under the supervision of a Greek consultant, to provide for Baghdad's low- and middle-income families.

"I'm a foreman in a tannery," he ex-

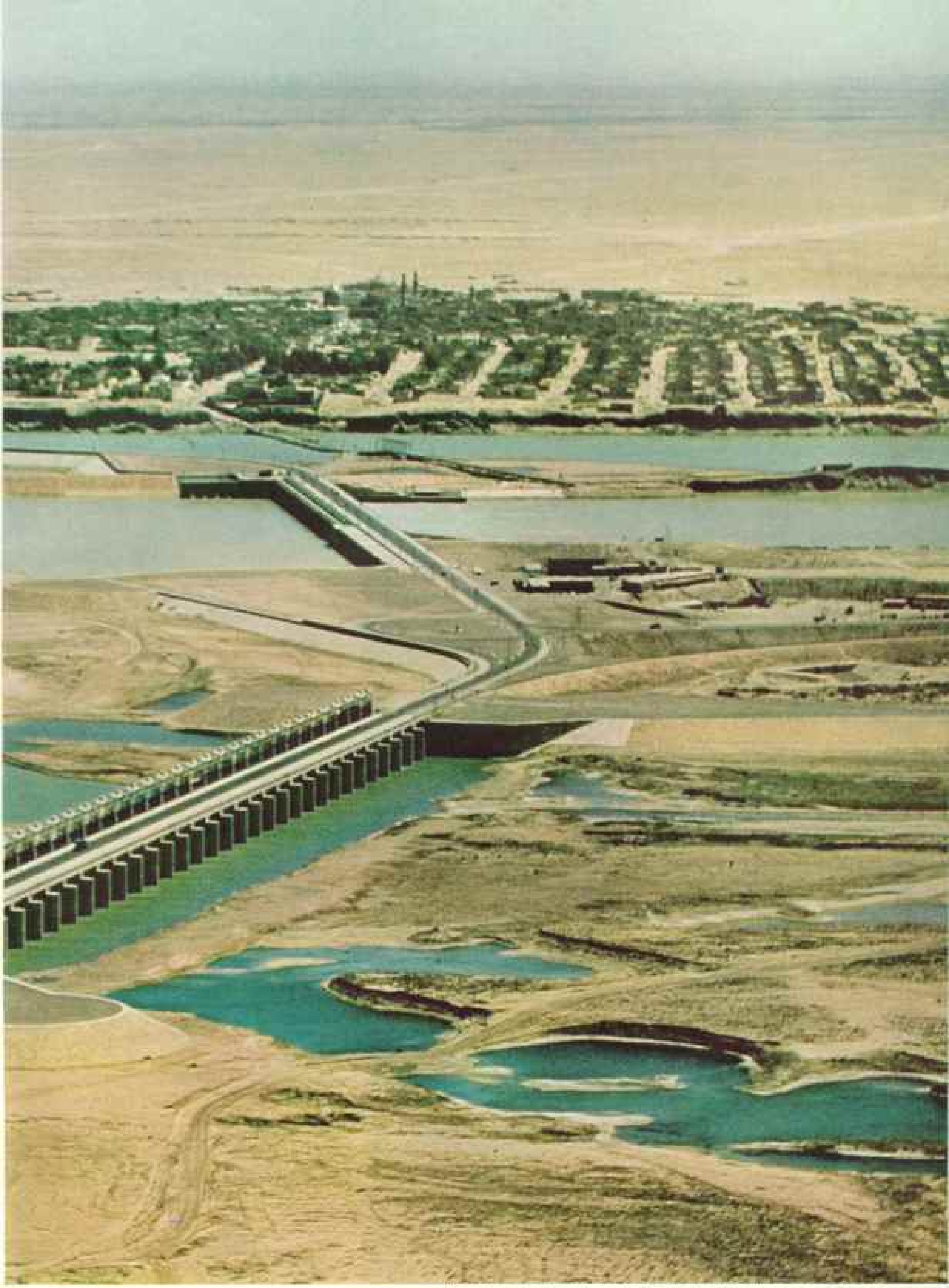
Flowers and Leaves of Beaten Gold Reflect the Art of 4,600 Years Ago

Excavating the ancient city of Ur, archeologist Sir Leonard Woolley made a chilling discovery. Buried with a king and queen were scores of court attendants: soldiers holding their spears, musicians fingering their harps, and ladies of the court resplendent in their finest jewelry. No one knows whether they died by ritual murder or suicide. These pieces in the Iraq Museum include necklaces of carnelian and lapis lazuli; they are displayed on a figure representing a Sumerian beauty.

Kodachrome by National Geographic Photographer J. Baylor Roberts, Courtesy of Iraq Museum © N.G.S.

The Mighty Sāmarrā' Barrage Diverts the Tigris to Tame Spring's Raging Floods

Although ancient man used these waters to make a garden, he and his successors lived in fear of flood. In 1956, for the first time, terror faded



Kodachrome by National Geographic Photographer J. Baylor Roberts © N.G.S.

Now, when the river rises, gates are closed and the water races through the regulator in foreground, down a man-made channel, to the immense Tharthār Depression. Across the river, modern Sāmarrā' lies 'amid ruins of the 9th-century city. Desert surrounds the Friday Mosque (next page).

plained. "I make about 20 dinars [$56] a month, and my wife and I and our three children have been living in a one-room mud hut. A year ago, when this housing scheme was announced, I applied for a unit. Three months ago I was told I had been awarded this one, and could move in as soon as it was completed.

"Well, the walls are still a little wet, but we're in anyhow. It's really wonderful. For the first time, we have running water. And a little room."

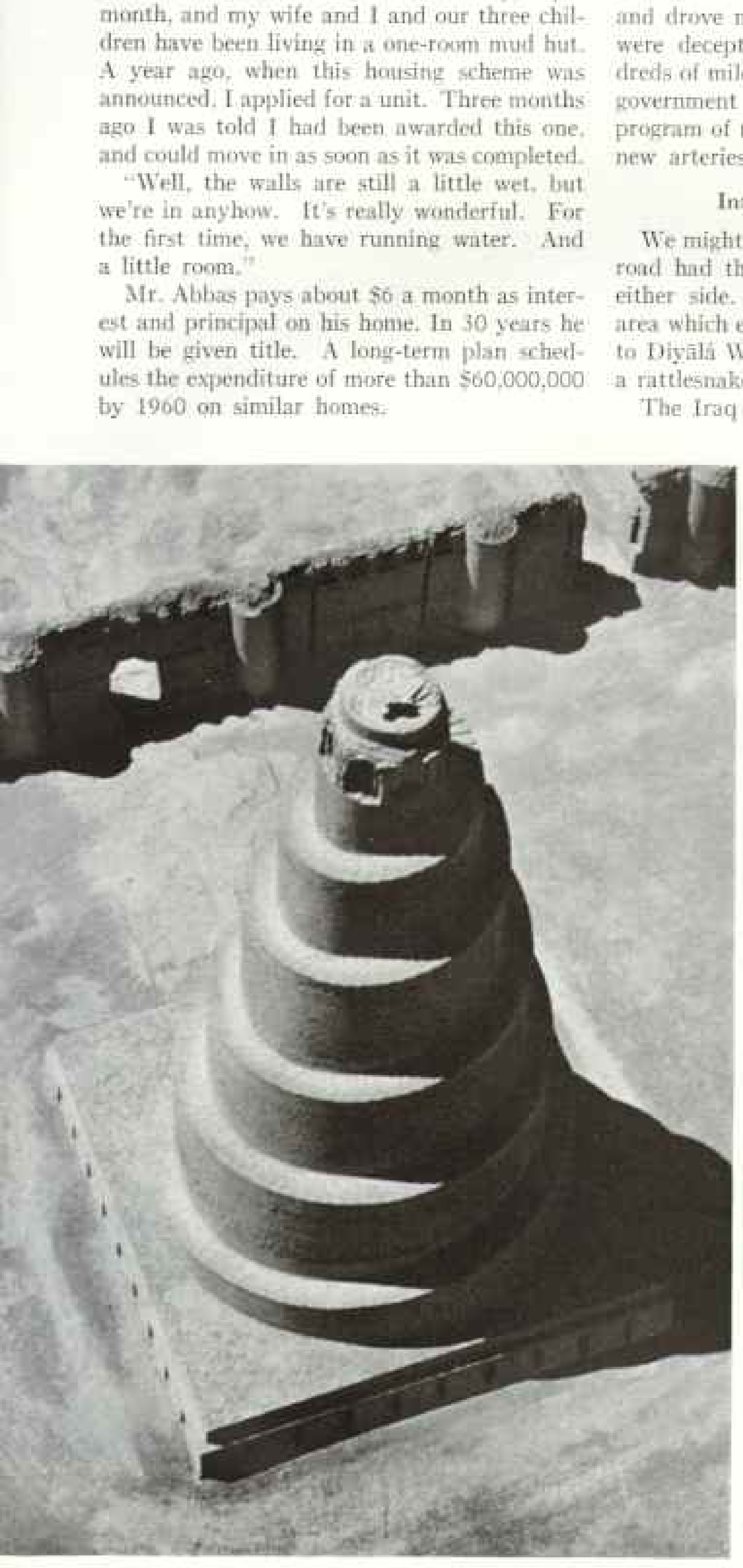
Mr. Abbas pays about $6 a month as interest and principal on his home. In 30 years he will be given title. A long-term plan schedules the expenditure of more than $60,000,000 by 1960 on similar homes.

When we left Baghdad, we rented a car and drove north. The first few miles of road were deceptively pleasant, then began hundreds of miles of backbreaking jouncing. The government has allocated $178,320,800 to a program of road development, but most of the new arteries are still under construction.

Into Iraq's Lonely Desert

We might not have been so conscious of the road had there been anything to look at on either side. But once we left the irrigated area which extends north of Baghdad 60 miles to Diyālá Weir, we were in desert so desolate a rattlesnake would have felt lonely.

The Iraq desert has neither the distinctive



Friday Mosque's Minaret Recalls the Tower of Babel

Inspired by the Babylonian ziggurat, the brick tower rose in the mid-800's to adorn Sāmarrā', a made-to-order capital of the Islamic Empire under the Abbasid Caliphs.

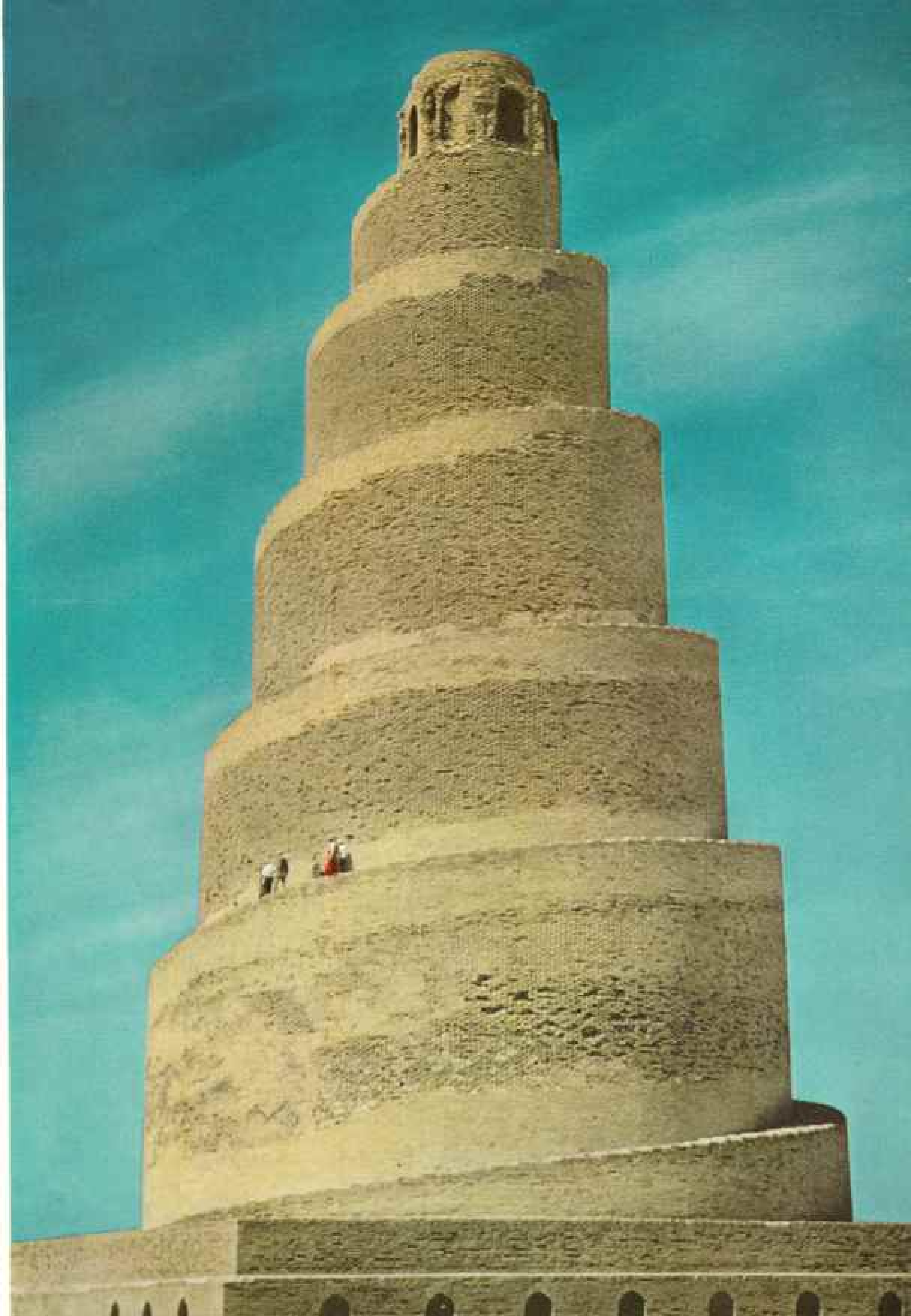
At first the Friday Mosque served as a place of worship for the Caliphs' armies. Tradition says some 60,000 soldiers could pray in the immense courtyard at the foot of the minaret. Moslems today consider the place a historical monument rather than a living mosque.

Here visitors descend the ramp encircling the 140-foot tower. Their tread through the centuries has worn the steps smooth.

Streaks of new mortar on the sides help preserve the structure.

Bird's-eye view shows the spiral as a stark and lonely sentinel beside the ruin of its massively walled prayer yard.

Photographs by National Geographic Photographer J. Baylor Roberts © N.G.S.



Glittering Babylon, "the Glory of Kingdoms," Crumbles into Desolation, as Isaiah Prophesied

"In magnificence there is no other city that approaches to it," Herodotus wrote of King Nebuchadnezzar's Babylon. The Greek historian marveled at the immense wall breached by 100 brass gates and the palaces and temples that filled the metropolis. Today only foundations (upper center) remain of the Hanging Gardens, one of the Seven Ancient Wonders, and the banquet hall where Belshazzar saw the handwriting on the wall.

Ishtar Gate saw the gods on parade. Celebrating the new year, Babylonians carried their holy images through the massive portals to the special festival temple. Sacred beasts adorn the towers. Bitumen, a natural asphalt derived from oil seepage, binds the bricks.

German archeologists shipped the gate's upper sections to the Berlin Museum.

National Geographic Photographer F. Baylor Roberts

sandy sweep of its Arabian counterpart nor the endless acres of rocks and pebbles which mark the Gobi. It is flat, dry, and featureless, covered with lifeless-looking vegetation and protruding shale. It was not until we neared As Sulaymāniyah that a beckoning fringe of mountains on the horizon gave promise of better things.

A Kurdish city of nearly 80,000 near the Iranian frontier, As Sulaymānīyah was worth the shaking it took to get us there. Its broad streets, low buildings, and friendly people offered a welcome change from teeming Baghdad. And the surrounding countryside, with fields ablaze with spring flowers and a horizon ringed with snow-capped mountains, was far more beautiful than we had expected.

It was late March, the season of the wild narcissus, and the main highway was adorned, every mile or so, by a group of Kurdish youngsters selling bunches of the flowers. We stopped to buy a bouquet from one particularly appealing little boy, and were immediately surrounded by a dozen others. While

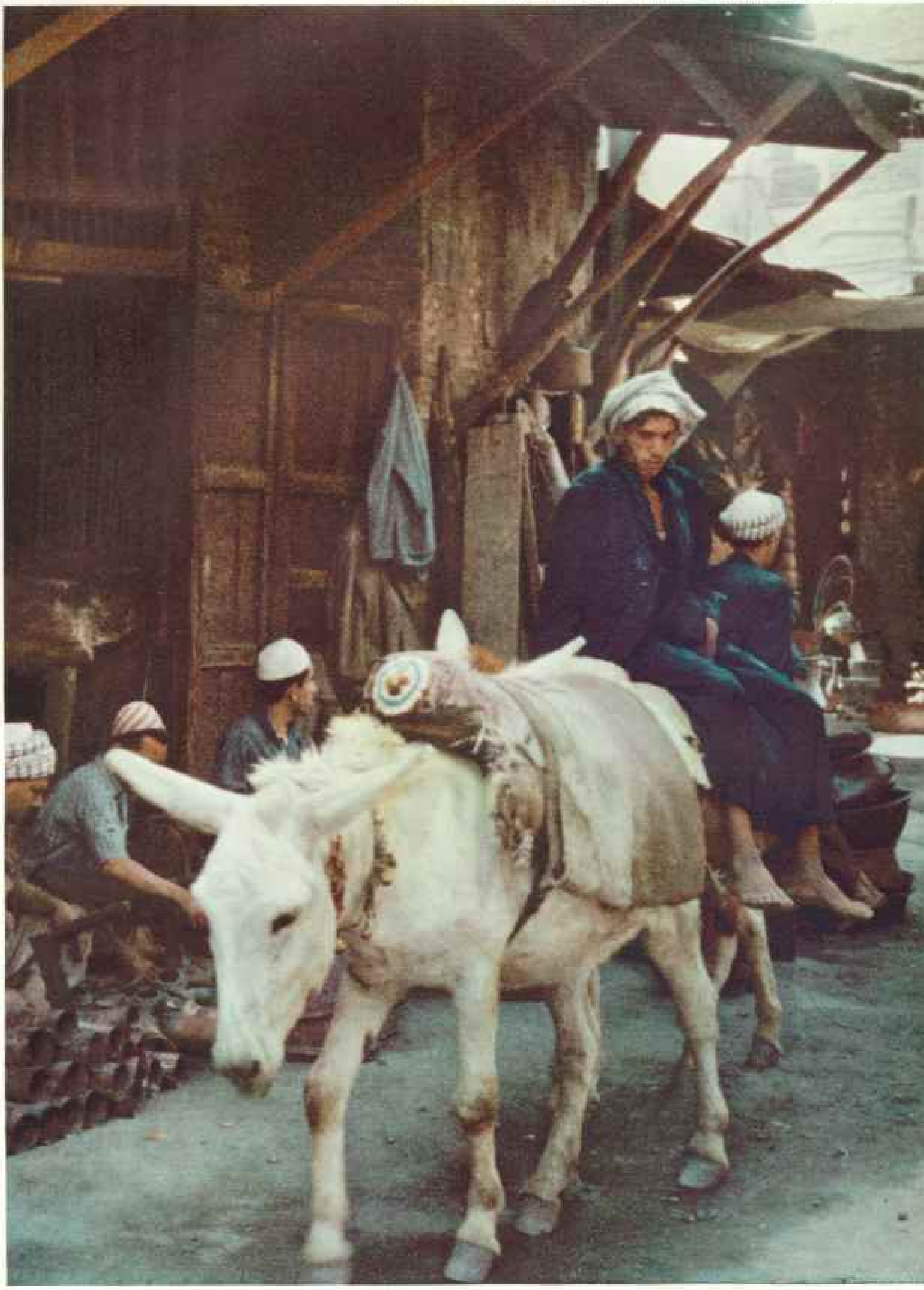
Artisans Shape Gleaming Wares in the Gloom of a Copper Mart

Off the broad new thoroughfares of modern Baghdad lies an Arabian Nights world of shadowy cubbyholes and twisting lanes. Hammers tapping out utensils from imported copper raise an ear-splitting din.

Here water jugs hang above an upended nest of large round pans used for washing clothes. Workmen make pots for Arab coffee, a potent, bitter brew that is the national drink. A drayman and his donkeys swing by.

A bearded sheik, at the dedication of a Mosul sugar factory, views his changing world with dignity.

Paper Anonymous by National Geographic Photographer J. Baylor Roberts © N.G.S.



Jean and Franc Shor, National Geographic staff

472 Mosul's Leaning Minaret Rivals Pisa's Tower. Legend Says It Bows to Mohammed

we photographed them, a Kurdish farmer and his wife came along the road.

The farmer was riding a small donkey, sitting, in Eastern fashion, just over the animal's hind legs. His wife trudged behind. The farmer saw the young flower vendors, halted his beast, walked over and bargained briefly with one lad, selected a bouquet, and walked back to the road.

There, with a courtly manner, he presented his wife with the flowers, smiled away her thanks, got back on the donkey, and rode happily off, while she followed on foot, sniffing her bouquet at every other step.

Kurds Love Colorful Dress

The Kurds are a remarkable and thoroughly lovable people. There are about a million of them in Iraq, perhaps 5 million altogether in Kurdistan, the mountainous area which embraces portions of Iraq, Iran, and Turkey. They are shrewd, independent, enormously courageous, and blessed with a sense of humor which makes their very presence stimulating.*

Their dress is distinctive, notable chiefly for its color. Brilliant hues of green, red, yellow, and blue are mixed with little regard for harmony, but the effect is never unpleasant (page 476). There is a story, one which is probably apocryphal but which I like to think is true, of a Kurdish bandit chieftain who terrorized all northern Iraq before he was brought to justice.

He was sentenced to be hanged, the story goes, but because there had been a certain Robin Hood aspect to his brigandage, he was given one last wish. He thought carefully and, the mountain people of the north will tell you gleefully, then said to the judge:

"I should like to be hanged with a red-and-green rope."

Troublemaker Comes to Grief

Never did we stop to take a picture of a Kurdish family without being asked to remain for a cup of tea. Never did we ask a question which was not answered with a jest. And in As Sulaymāniyah, known as the capital of Kurdistan, we had an experience which endeared those people to us forever.

In the big suq in that city I was photographing Kurdish farmers and their produce when a towering gentleman in a brilliant green costume, standing on a two-wheeled cart loaded with vegetables, invited me to join him for a better view.

I climbed aboard and made my pictures. Through my interpreter, himself a Kurd, we exchanged pleasantries. The farmer offered to accompany me around the market. Together we circled the colorful and crowded square, photographing as we went. Near the entrance we stopped for a shot of a gaily painted pushcart, laden with dime-store wares. The proprietor posed happily, and I was focusing my camera when an intruder arrived.

He was a young man in his early twenties, dressed in exaggerated Western style, with hair carefully duck-tailed behind his ears. As I started to take my picture, he began to shout the by then all-too-familiar refrain that I was only trying to show Americans how backward were his compatriots.

The proprietor looked at him in amazement.

"Who's backward?" he wanted to know. "Look at my wares; they are the most modern. I saved for years to get into business for myself. I would be proud to have Americans see my stand."

And without further ceremony he and my husky new-found friend grasped the young agitator by the elbows, hustled him to the suq entrance, and happily booted him out.

Lake Will Serve Many Uses

Some 40 miles northwest of As Sulaymāniyah is one of the most impressive of Iraq's modernization projects, the Dokan Dam. Jean and I drove there over the best road we found in the entire country, and came upon a breath-taking sight. In the sheer Dokan gorge, through which passes the Little Zab River, a French firm is raising a concrete dam more than 1,000 feet long and about 380 feet high. The base of this monumental barrier is 175 feet thick; when completed, it will taper to 30 feet at the top.

The 100-square-mile lake which the dam will create will store 240 billion cubic feet of water, reclaim by irrigation about 1,250 square miles of land, serve an ambitious electric power program, and provide an ideal site for a summer recreation area. Its total cost is estimated at more than $35,000,000.

Jean and I, accompanied by a panting and reluctant interpreter, toiled to a hilltop above the gorge for a photograph. It was a Sunday, and work had stopped; we looked in awe at the half-finished naked concrete wall and the

* See, in the National Geographic Magazine: "West from the Khyber Pass," by William O. Douglas, July, 1958; and "Mountain Tribes of Iran and Iraq," by Harold Lamb, March, 1946.

magnificent mountain scenery behind it (page 488). As we sat waiting for a cloud to pass, two Kurdish workmen, in the short vests, baggy pantaloons, and fringed turbans of their region, joined us.

"This will make a great difference in your lives," I remarked, after the proper opening pleasantries. "Your countryside will be more prosperous."

"Probably," said one, "but it will not be entirely good."

"Why not?" I queried.

"There is nothing wrong with our lives now," he replied. "We have our sheep, our barley, and a few vegetables. It is enough to eat. When I need money, I sell a sheep. Since my land is poor, no one wants it. When there is irrigation, it will be valuable. More people will come. Life will become more complicated. Me, I am a simple man. This will probably be good for my children, but I wish it had waited until I was gone."

Progress, I thought as we skidded down the steep hill, is paid for in more than mere dollars. It costs as well the pleasures of the simple life.

Industry Centers in Mosul

From As Sulaymānīyah we skirted the western fringe of the Zagros Mountains and rolled across Iraq's fertile plains to Mosul, Iraq's northern metropolis.

Mosul is a bustling city of more than 250,000, a communications center, and a focus of Iraq's industrial development. Its new 25,000-spindle cotton factory is one of the most modern in the world. Cement plants and a new sugar mill add to the city's importance. To us it was fascinating because it stands near the site of Biblical Nineveh.

The ancient city lies just across the Tigris from its modern inheritor, and the seven-and-a-half-mile-long walls which encircled it in the days of its glory can still be clearly traced. Modern archeologists have restored one of its great gates, and left at the entrance two winged bulls which once stood guard there. Here, where Sennacherib ruled in splendor, goats now graze and farmers till small patches of vegetables.

Mosque Claims Burial Place of Jonah

Atop a near-by hill on the banks of the Tigris is a more modern edifice which holds equal interest. In this ocher mosque, called Nabī Yūnus, the prophet Jonah is buried, say the local Moslems, together with a tooth of the whale that swallowed him. Jonah, our Mosul hosts told us, is a prophet to Moslems as well as Christians. It seems fitting that he should rest within sight of the Nineveh whose destruction he prematurely prophesied.

From the scene of this land's ancient glory, we drove southeast to Kirkūk, the source of its modern wealth. Here is the center of Iraq's oil resources, the principal field of the Iraq Petroleum Company, whose mark is strong on the city.

We came into Kirkūk from the northwest just as a full moon was rising. We rolled down over a series of low hills, and as we topped the last, we stopped our car with a gasp. The moon seemed to be melting and spilling a cascade of flame across the landscape. Then we realized we were watching the flare points of the IPC's Kirkūk field, burning off the waste gases from the wells (page 460).

It was an exciting sight. There's much that's exciting about Kirkūk today, but it's nothing compared to the drama enacted in the early hours of October 14, 1927. That's when the Turkish Petroleum Company, now the IPC, brought in the first big well.

Soccer, Iraq's National Sport, Draws Overflow Crowds

Standees on the Scout Sporting Field, near Baghdad's university center, could not find seats in the concrete grandstand. A second stand was under construction.

Innocence lives again in the Garden of Eden. Girls play at a traditional site of man's first home, the confluence of the Tigris and Euphrates Rivers.

Paintbox Colors Splash the World of a Wide-eyed Kurdish Baby (Page 476)

Unlike her black-garbed Arab sisters, the Kurdish mother wears bold, vivid designs and jewelry of bright beads and shining coins. A tattoo decorates her chin.

Photographer Roberts snapped the family at a dance festival near Salāh ad Dīn, a mountain resort named for the Kurdish leader Saladin, of Crusades fame. "When papa arrived on the scene," Mr. Roberts recalls ruefully, "my shooting party was over."

Super Anscochrome (opposite, above) and Kodachrome (pages 476-7) by J. Baylor Roberts; Kodachrome by Joan and Frank Shea, National Geographic Staff © N.G.S.

Big-money oil came to Iraq as many things have come to the Near East: violently, and unexpectedly. It came at Baba Gurgur No. 1, in the rough terrain between Kirkūk city and the foothills to the northwest. Shortly after midnight the driller, an American named H. A. Winger, decided to pull the bit from the 1,500-foot hole to clean out the cuttings. His steam winch had lifted the tools most of the way, when nature took over.

"All at once came gas and oil," Mr. Winger later noted on his daily report form, in a classic of understatement. What came was a black column which spouted 140 feet into the air, accompanied by hissing gas, dumping thousands of tons of oil over the countryside.

Hundred-foot-wide River of Oil

Winger's first reaction was undoubtedly jubilation, but caution followed close on its heels. When he heard the first hiss and rumble beneath his feet, he raced to the boiler to extinguish the fire. Then he doused all lights. Had a spark ignited that roaring column, it would have made the Eternal Fires near by look like a flickering candle.

That was shortly after 2 a. m., and nothing could be done in the darkness. Urgent messages were flashed to the Baghdad office, to other company units in Iraq, and to headquarters in London. Men and materials were rushed to the scene by every available conveyance.

Dawn broke on a field soggy with the black fluid and on a river of petroleum flowing down a depression through the almost deserted countryside. The drilling crew, slippery with the precious fluid, labored to remove the boiler to a safe distance and lay steam and water lines. That afternoon gas and oil pressure became so great that the heavy string of drilling tools was blown up into the derrick with a mighty roar. All that afternoon and night the oil fell in torrents.

Mr. H. C. H. Bull, now chief accountant for the IPC, arrived by train from Baghdad the following morning.

"Twelve miles from Kirkūk," he remembers, "we saw what we first thought to be a clump of trees against the background of buff-colored hills, but we soon realized that the black smudge was Baba Gurgur oil spraying up into the air above the derrick."

More than 80,000 barrels of oil a day were gushing to waste. The well had to be capped. But there was a more immediate problem. The well was gassing badly, and a thick cloud of highly inflammable gas and oil spray hung over the countryside. The flicker of a match could have caused a holocaust.

A mile and a half away burned the Eternal Fires of Biblical fame—reputedly the "fiery furnace" into which King Nebuchadnezzar ordered Shadrach, Meshach, and Abednego (page 460). Company employees smothered the flames with earth. Others visited habitations for miles around, warning residents to put out cooking fires and furnishing them with dry rations. Police and army units guarded the area to keep back the curious.

It took 10 days to bring the gusher under control. Hundreds of Kirkūk residents were recruited to build earth dams to stem the black rivers flowing toward the Tigris. The labor superintendent drove into the desert homeland of the Jibbour tribe and rounded up 800 tribesmen who walked 40 miles in 22 hours to move earth for a reservoir. Storage tanks capable of holding 1,500,000 barrels were needed. One swift-flowing river of oil was already more than 100 feet across.

Baba Gurgur was finally brought under control, and a new era began for Kirkūk and all of Iraq. Long before the Development Board began its operations, the Iraq Petroleum Company embarked on a program designed to bring a better life to its employees.

Youngsters Taught Modern Skills

The company, which today employs more than 7,000 Iraqis, determined years ago to put as many local people as possible into important jobs. With that in mind, a training school was established to teach promising youngsters the basic skills of the oil business.

Barduyr Orchanian, registrar of the school, showed us around its modern quarters in Kirkūk. As we walked through its spotless corridors, returning the greetings of eager-faced lads, he explained its workings.

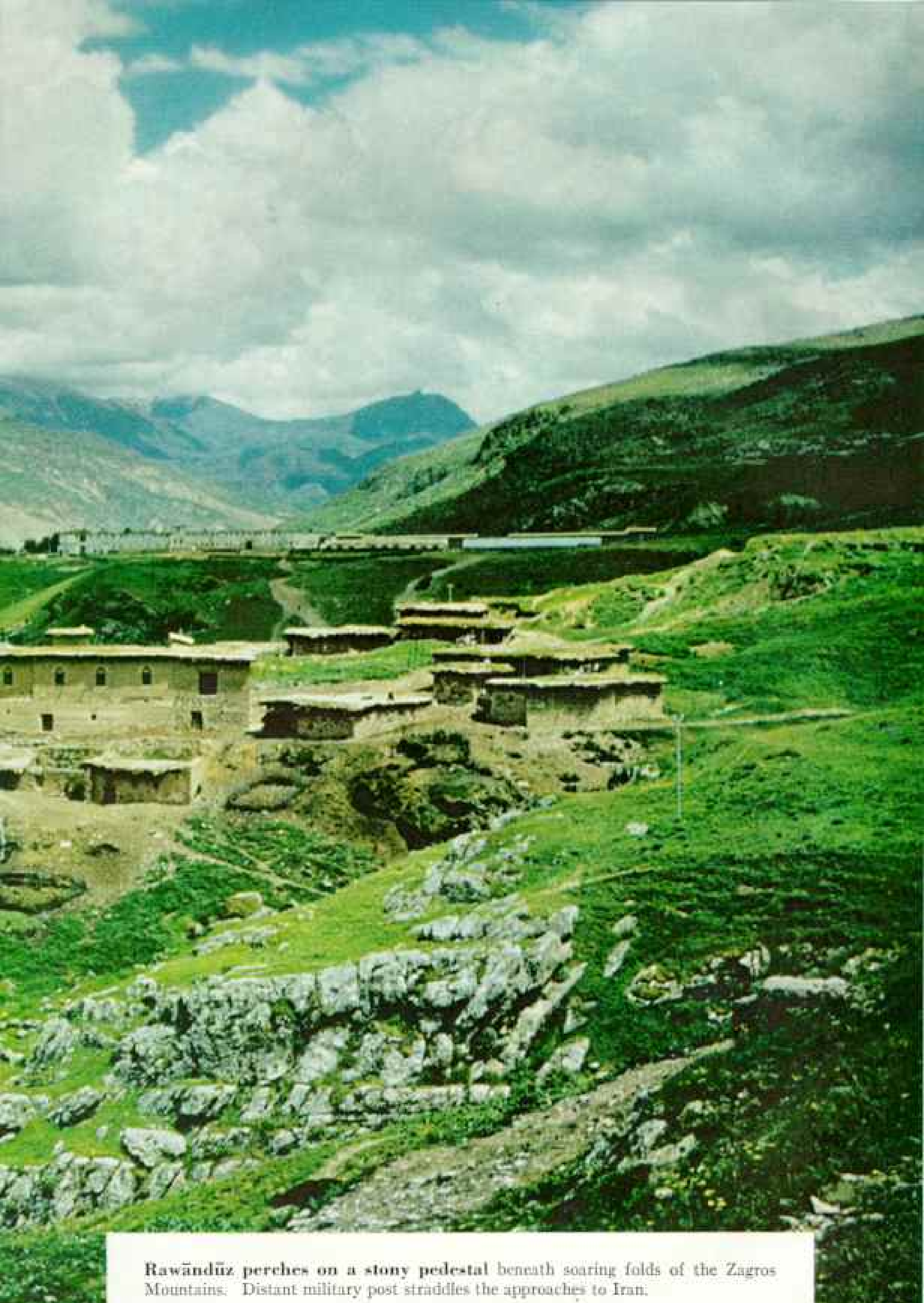
"We have about 250 students at a time," he said, "and they get a five-year course. We take boys at the sixth or seventh grade level and teach them English, mathematics, and technical subjects.

"The first three years they spend all their time in class. We try to discover their aptitudes and the fields in which they are most interested. The last two years they are assigned to a job, and spend half their time on that and the other half in class."

(*Continued on page 487*)

Female date flowers meet their mates. The gardener holds pollen-bearing blooms from a male palm (right). Each fertilized cluster produces a bunch of fruit weighing about 20 pounds; a single tree may bear 12 bunches.

"We flew from Baghdad to Basra over what looked like an enormous chenille bedspread," reports Jean Shor. "The evenly spaced tufts were the palms that grow 80 percent of the world's dates."



Rawāndūz perches on a stony pedestal beneath soaring folds of the Zagros Mountains. Distant military post straddles the approaches to Iran.

Kodachrome by National Geographic Photographer J. Baylor Roberts © N.G.S.

As If Stepping Out of the Past, a Camel Caravan from Baghdad Plods Toward Khān

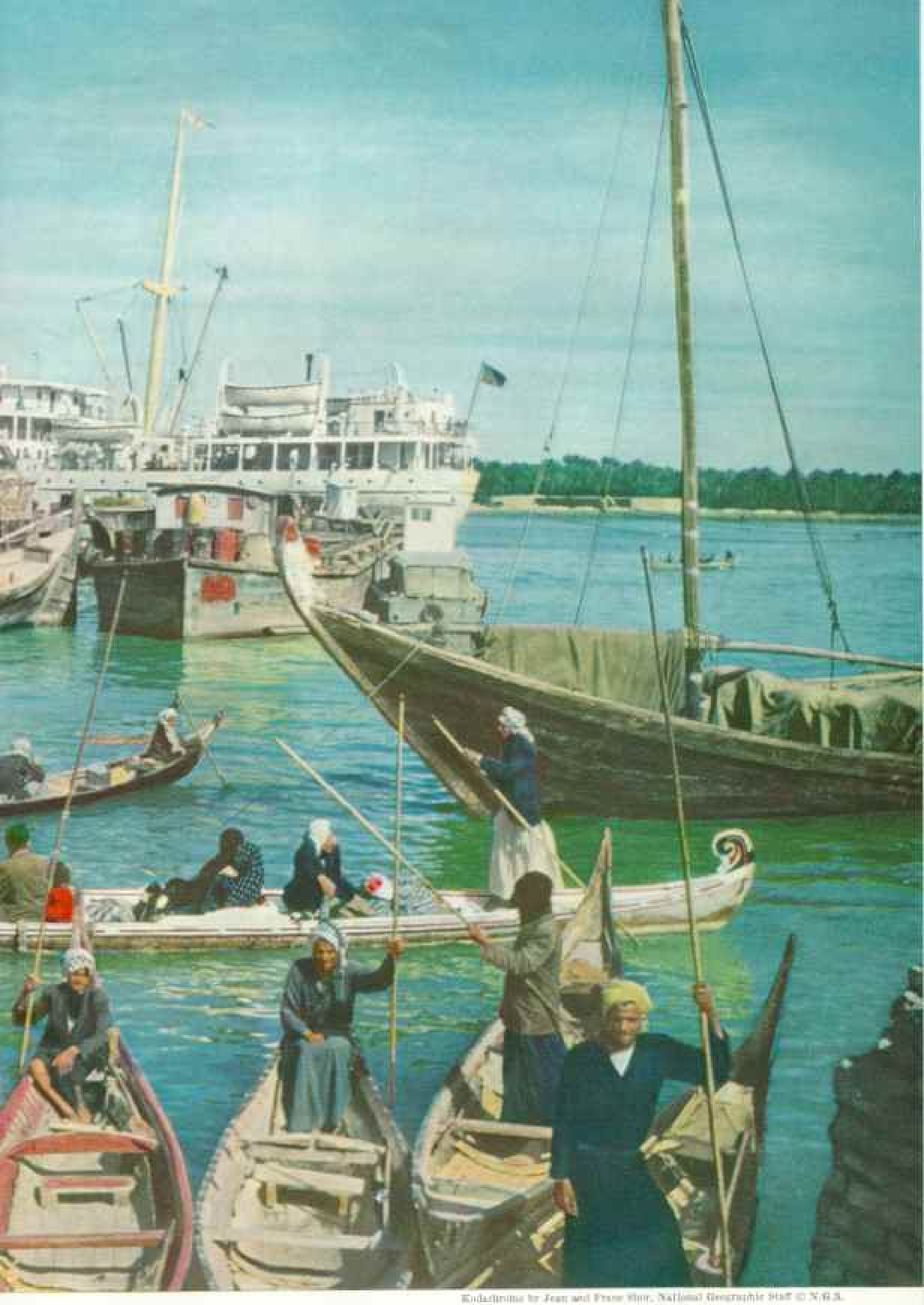
Kodachromes (above and below) by J. Baylor Roberts and (lower left) by Jean and Franc Shor, National Geographic Staff © N.G.S.

al Maḥāwil: Newly Irrigated Fields Spread a Green Cover for Yesterday's Desert

Using strings like puppeteers, farmers toss buskets of water from shallow well to irrigation ditch.

Harvesting barley near Irbil, a Kurd clutches grain with glovelike metal claws that extend his fingers' reach.

Turbaned Gondoliers Pole Long Canoes Along a Canal in Basra, the Venice of Iraq;



Kodachrome by Jean and Franc Shor, National Geographic Staff © N.G.S.

A Freighter Rides the Shatt al Arab, Deepwater Gate to the Persian Gulf

Hooded Falcon Perches on Its Trainer's Hand

Centuries before the art of falconry reached Europe, Arabs trained hawks to pluck wild fowl from the skies and dive-bomb gazelles.

Today the sport is so expensive—a good falcon costs $300 to $500—that few but the rich can afford it.

Here, at Az Zubayr, the trainer for a sheik shows off a prize pupil. Leather jesses bind the bird's legs to his master, who wears glove and arm cuff as protection against scratches. The cushion, attached to a stick, provides an alternate perch.

The hawk's eye-covering hood ensures against fright; it is removed when quarry appears.

Father and son shop for bread in Az Zubayr. Lattice-like loaves travel well aboard a camel.

National Geographic Photographer J. Baylor Roberts

Euphrates fisherman tosses his net from a gufa, a tire-shaped boat made of dried reeds waterproofed with bitumen. Holding up to 20 adult passengers, such vessels have plied the river since ancient days. Herodotus called them "round like a shield," a shape that causes them to spin dizzily when handled by a novice.

About 60 percent of the entering students, Mr. Orchanian told us, finish the course. When they graduate—they are flown to Baghdad for an impressive ceremony—a job is waiting for them. The pay is good, by local standards, and working conditions are far superior to the average for the country.

"Probably the best indication of how popular the school is," Mr. Orchanian added proudly, "is the fact that we have at least ten applicants for every opening."

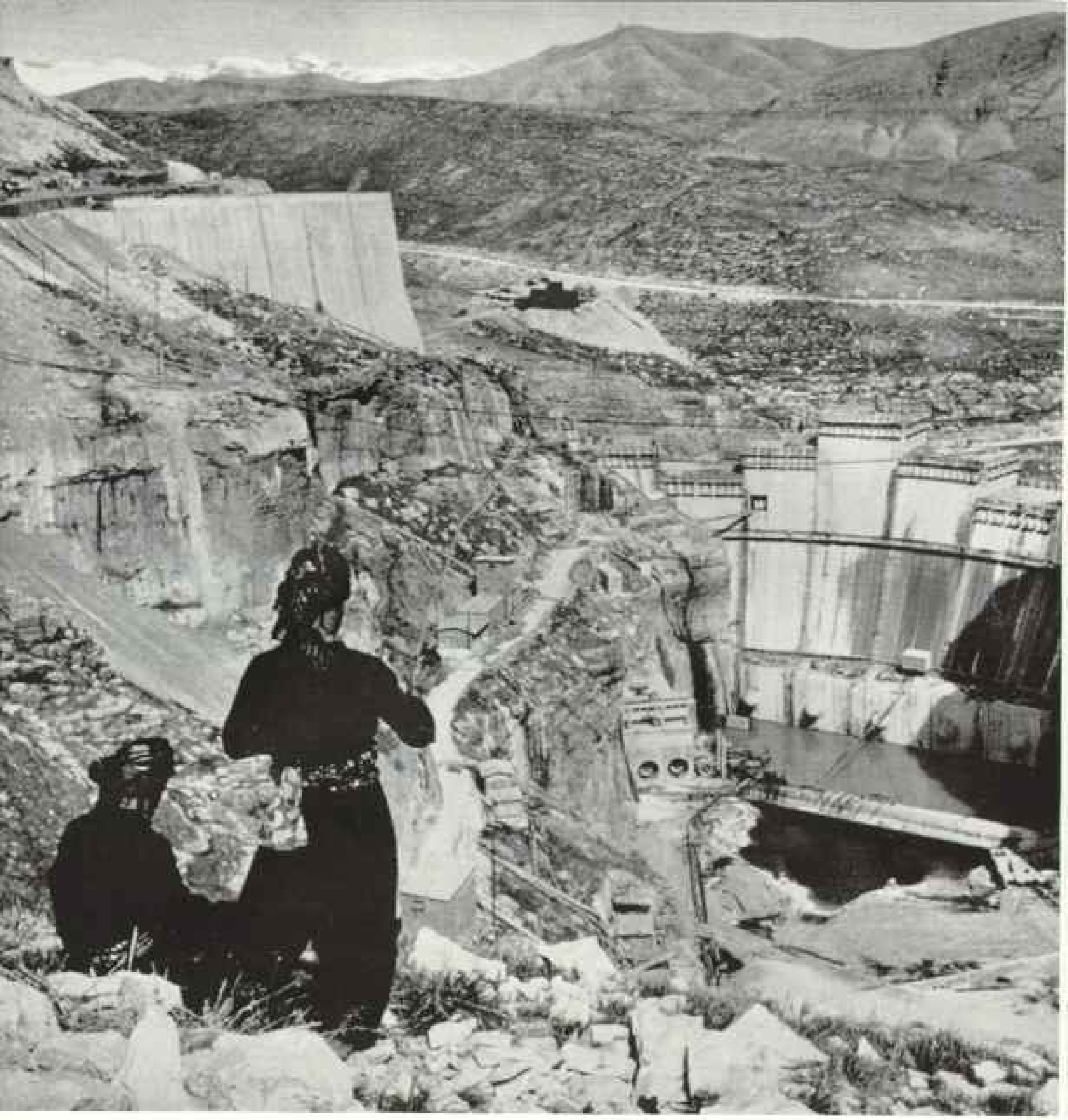
The company does more than merely train potential technicians: it operates a night school for employees who want to fit themselves for better positions or who simply want to improve their own educational standards. When we visited Kirkūk, more than 400 workers were studying in those classes.

Jean and I were impressed with the elaborate equipment in the chemistry and physics laboratories, in the electrical engineering shops, and in the classrooms where youths were learning skills ranging from blacksmithing to metal testing. We stopped to chat with Fuad Hassoun, a youngster with sparkling black eyes, a mop of unruly hair, and unbounded enthusiasm.

Boy Looks to Bright Future

"My father couldn't afford to send me to school after the sixth grade," he told us. "He's a farmer who lives 60 miles from here, and our land is poor. I rode a donkey to Kirkūk and took the test, and they said I showed promise.

"I've been here three years now, and I'm about in the middle of my class. Next year I'll get a half-time job in the metal-working shop, and I'll be able to send a little money home. Two years after that I'll be an apprentice machinist, and I'll be rich. I'm going to get married and buy a house."



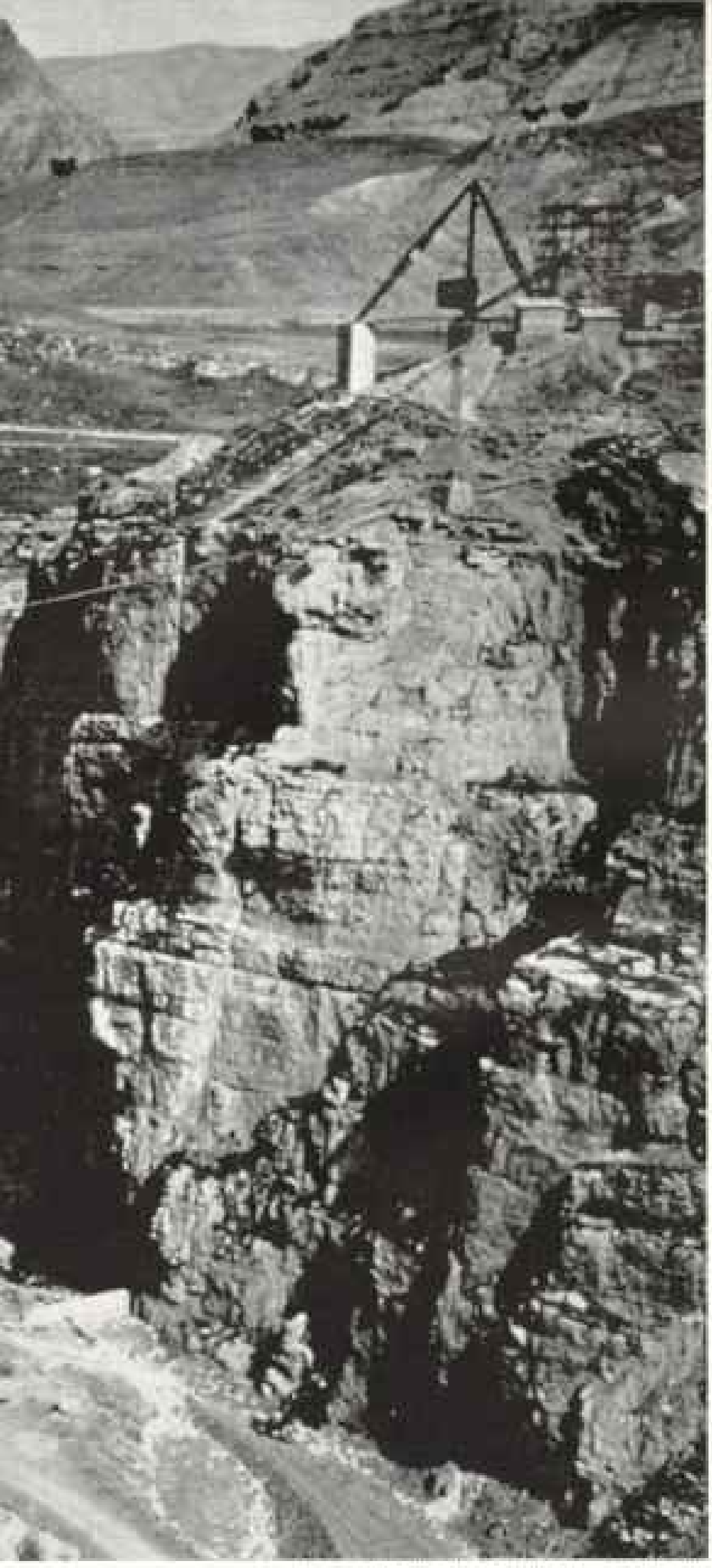
Fuad may not be rich by our standards, but he'll be far better off than most of his countrymen.

The company's housing scheme has been one of the most successful of its employee-relations programs. The IPC finances the construction of attractive modern dwellings, costing from $1,680 to $14,000. Every worker, from day laborers to section chiefs, is eligible to buy one for a 10 percent down payment.

He pays off the balance in 20 years, at 4 percent interest. The company absorbs the difference between that and the 6 percent bank charge. When the plan was initiated, the workers were skeptical. Today, with more than 600 settled in well-built dwellings, there is a waiting list of 1,200 and more than 100 homes are currently under construction.

Our flight south to Basra carried us over the great central plain between the Tigris and the Euphrates, where much of Iraq's grain is grown. It was of this area that Herodotus wrote: "The blade of the wheat-plant and barley-plant is often four fingers in breadth. As for the millet and the sesame, I shall not say to what height they grow . . . for I am not ignorant that what I have already written concerning the fruitfulness of Babylonia must seem incredible to those who have never visited the country."

As we neared Iraq's southern port city, the



Jean and Franc Shor, National Geographic Staff

Dokan Dam plugs the Little Zab River, promising irrigation and power. On completion, the concrete wall will rise 380 feet, creating a 100-square-mile lake for reclamation and recreation. Abutment at left indicates the structure's full height. When water finally races through the five penstocks at the dam's base, it will generate electricity in the turbine house at the bottom of the gorge (page 473).

landscape changed. Flat, featureless delta country spread below us. Suddenly we were flying over date trees, literally millions of them. Iraq produces approximately 80 percent of the world's date supply, and the southeastern end of the country looks, from the air, like one great grove of palms (page 479).

Canals Thread Chief Iraqi Port

Basra is a thoroughly delightful city of 235,000 people, laced with canals which give it, in certain areas, a resemblance to Venice (page 484). Boatmen in high-prowed vessels pole and paddle passengers about the metropolis; Turkish-style balconies overhang the murky waters. Our hotel, the Saint George, stands on the bank of the Shatt al Arab, and from its spacious veranda we watched the busy traffic of the port, a fascinating mixture of dhows, native canoes, freighters, and visiting British destroyers.

Basra's sugs are colorful beyond description. Carpets, copper pots, vegetables, spices, old clothes, new brocades, electrical appliances—all are sold in an atmosphere of fantastic disorder.

I had come to take pictures, but it is always dangerous to bring a wife on such an expedition. Before I realized what was happening, Jean had made us the fortunate owners of a handmade rug, in vivid shades of orange, red, green, yellow, and purple, and a copper *ghoum-ghoum*.

A ghoum-ghoum is a coffee pot, but not one of ordinary dimensions. It is used principally by desert sheiks who must entertain hundreds of their followers—all great coffee drinkers. Our example is 30 inches tall, weighs about eight pounds, and holds three gallons—just the thing for a Washington kitchen!

Basra port handles nearly 1,500,000 tons of cargo a year. Most of Iraq's oil which goes abroad by sea, however, is sent from the downriver port of Al Fāw. Basra services most of the country's principal agricultural exports: dates and barley. Wool, hides, and cotton are also shipped abroad, and in good crop years some wheat is exported. The port was modernized during World War II, when the Allies used it for shipments of war materials destined for Russia.

From Basra, an Iraqi Airlines plane whisked us back to Baghdad in little more than an hour. In our air-conditioned Semiramis Hotel room we packed for our homeward flight. I came upon a post card showing the Eternal Fires ablaze near Kirkūk.

"Want to keep this?" I asked, tossing it to Jean.

"I think I will," she replied. "Reminds me of Iraq—and of this whole area. When you look at this, you realize what a lot of highly inflammable matter lies just below the surface, waiting for something to set it off."

Out of Utah's Pink Cliffs, erosion has sculptured a many-hued amphitheater filled with castles and animals, plants and people

NATURE CARVES FANTASIES IN

Bryce Canyon

By WILLIAM BELKNAP, JR.

With Photographs by the Author

ODD, but my 11-year-old daughter Loie was absolutely right. "They look," she said, "like the gold pagodas Siamese dancers wear on their heads."

Odd, I thought, because what we were all gazing down on—Loie, my wife Fran, my 13-year-old son Buzz, and I—was a sea of jagged rocks. Here in Utah's famous Bryce Canyon National Park, nature has sculptured shapes so bizarre that they seem to cry out: We are unique; we look like nothing else on earth.

But the human mind can't help groping for comparisons. Where Loie imagined a mass of Siamese headdresses, others have conjured up the turrets and spires of mysterious temples. These weird formations are in fact named the Silent City (page 508).

Wise Men—or Guided Missiles?

As we explored the stony fairyland of Bryce, I recalled surveyor T. C. Bailey, who came on the scene 80 years ago and decided it was the wildest and most wonderful sight the eye of man had ever beheld. "There are thousands of red, white, purple, and vermilion rocks, of all sizes," he reported, "resembling sentinels on the walls of castles, monks and priests in their robes, attendants, cathedrals and congregations."

Today many of the most distinctive rocks, ranging from the size of a man to hundreds of feet high, have names of their own: the Turtle, the Gossips, the Happy Family, Thor's Hammer, the Organ Grinder's Monkey, and dozens more. But Buzz couldn't resist the name-it-yourself urge. He thought the pillars known as the Three Wise Men looked like a battery of guided missiles, "all set to blast off" (page 507).

As for me, at first I couldn't see the rock named Queen Victoria as anything but that illustrious monarch (pages 506-7). And then I got a view from an unusual angle, and the Queen changed into a bear on its hind legs.

Soon we discovered that as light and shadow varied with the time of day, so did the shapes of the rocks and the amazing array of colors.

In the morning we saw deep cordovan brown to light gold, with touches of purple, blue, and lavender in the shadows. As the sun rose higher, these tones warmed and were replaced by flaming yellow, tan, brick red, and orange, accented by the bright blue sky and the deep green of shrubs.

When a cloud crossed the sun, the yellows and oranges turned reddish brown and rust. Then the returning sunlight would splash the closer formations golden orange. Some glowed like embers. Some of the very highest tips sparkled bone white, reminding Loie of frosted cakes waiting in rows in the bakery.

My wife summed it up best. "It all looks like something by Walt Disney," she said. "What really happened?"

The Paiute Indians had an explanation for it. Long ago, Bryce Canyon was the home of lizards, birds, and creatures much like man. Because they fell into evil ways, a god turned them to stone.

The scientific version of how Bryce got its rocks is hardly less awesome. We learned

(*Continued on page 499*)

A Flying Buttress Arches from the Rim of Utah's Paunsaugunt Plateau

In the wild country of southern Utah, erosion has created some of the most fanciful and richly colored formations on the face of the earth. The finest of these scenic wonders fill Bryce Canyon National Park, a series of breaks in the plateau's eastern edge. Here park rangers check the 80-foot Natural Bridge for changes wrought by water and frost; visitors are barred from the dangerously narrow and crumbling span.

Artful Fingers of Frost and Rain Carved the Enchanted Castles of Bryce Canyon

Bryce, most spectacular of the park's sculpture-crowded basins, takes its name from a Mormon pioneer who homesteaded near by in the 1870's.

© National Geographic Society

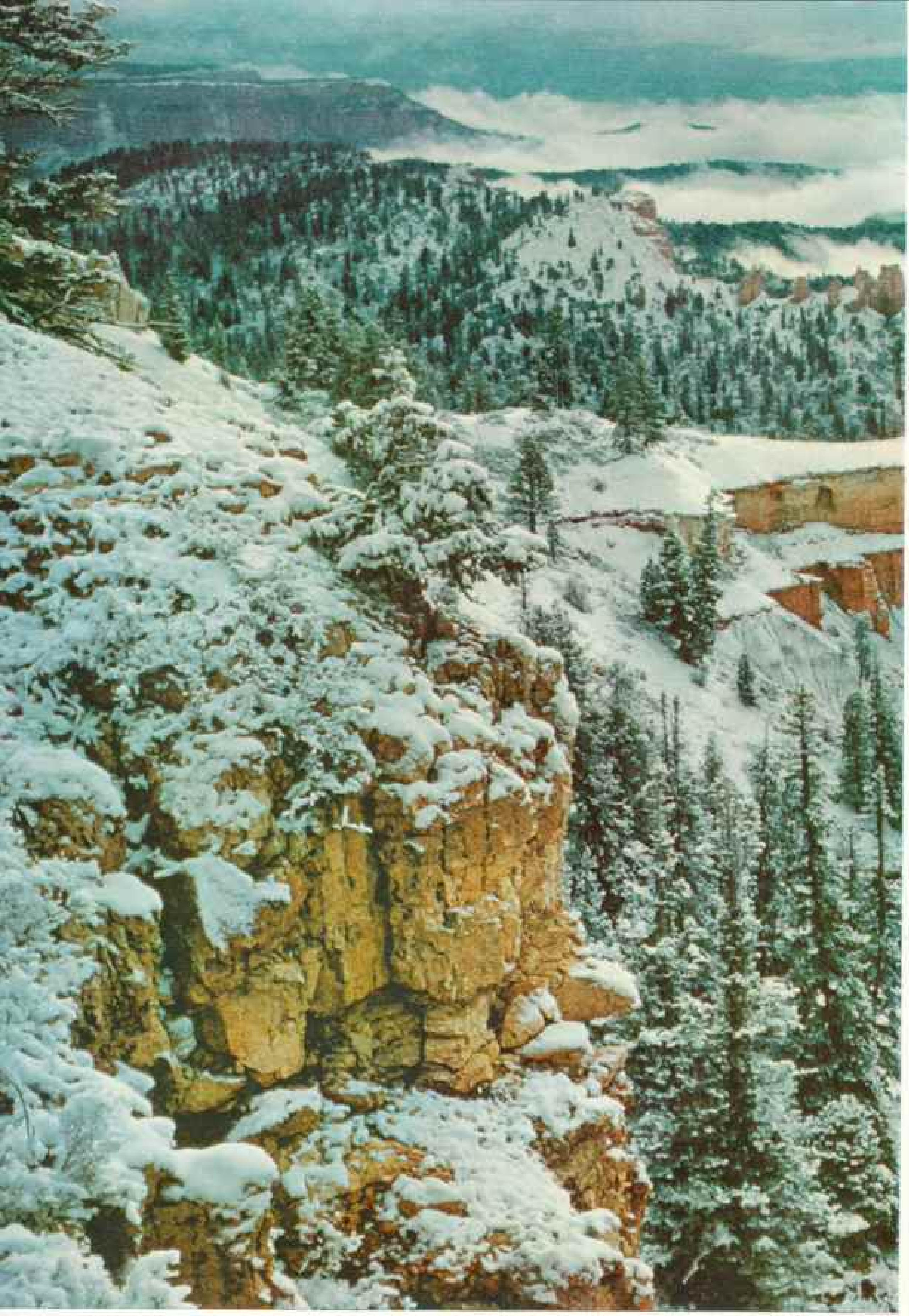
Paiute Indians labeled it with far more imagination: "Red rocks standing like men in a bowl-shaped canyon." This rim view from Sunset Point is a favorite with visitors. Here the camera looks northeast across a bewildering landscape, past Boat Mesa to Paria River Valley and the distant Table Cliffs.

Hikers Zigzag up the Switchbacks of Navajo Loop Trail

From Sunset Point the trail drops more than 500 feet into Wall Street, a narrow chasm that suggests the skyscraper-edged canyons of Manhattan. A series of hairpin turns eases the way up this 35° slope.

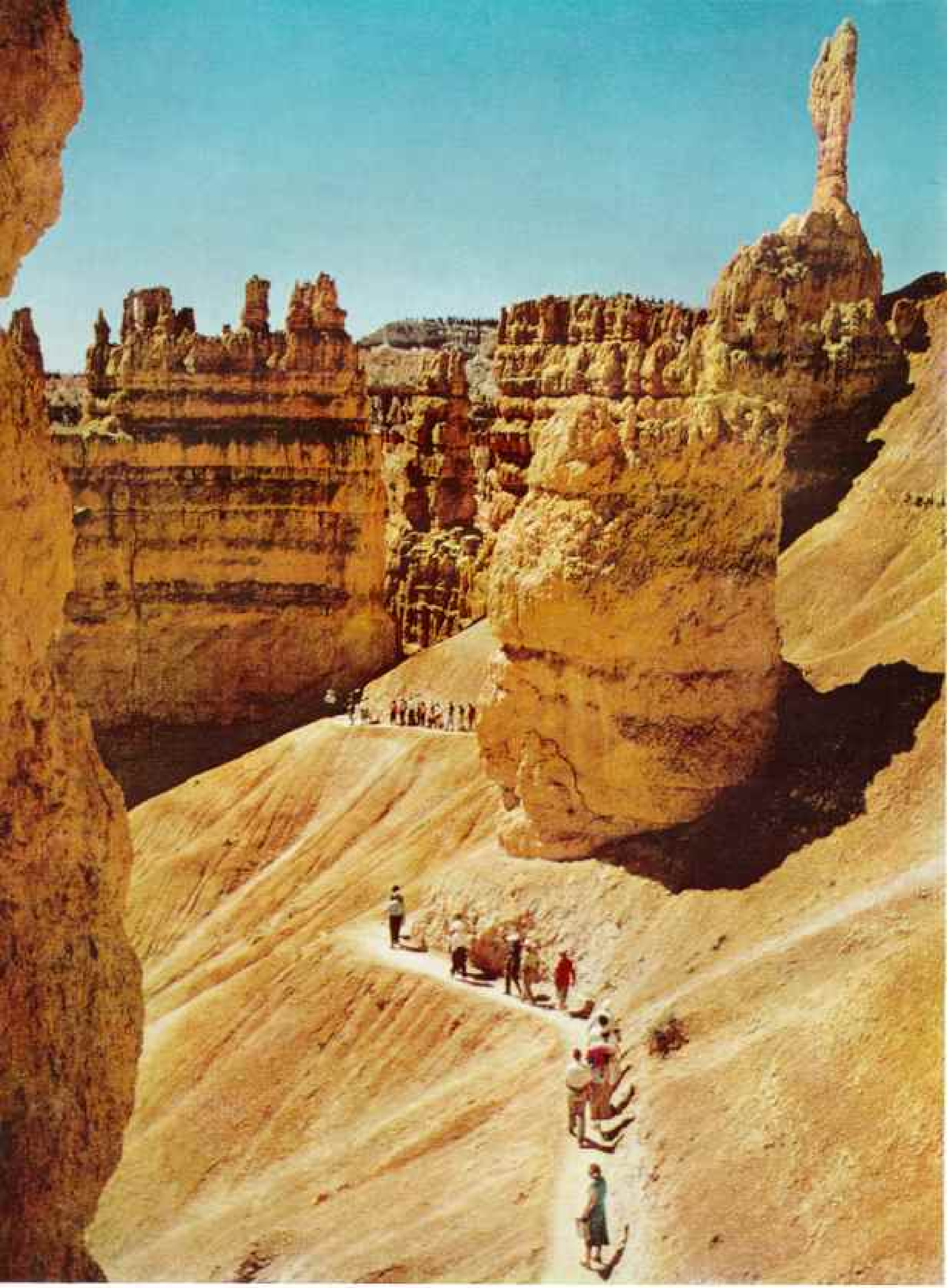
Direct sunlight seldom reaches Wall Street's depths, but bounces off steep walls. In the reflected glow of flaming rocks, faces assume a fiery hue.

Glowing lantern in the hand of a park naturalist created this dramatic ribbon of light threading the switchbacks of Navajo Loop Trail. An exposure at dusk caught trees and rock; the lens was then opened for seven minutes to record the lantern's descent into Bryce Canyon.



496 Snow Drapes a Mantle of Quiet over the Park's Vibrant Colors. Whipped-cream Clouds,

Hovering Low, Creep into Each Canyon, Hollow, and Alcove



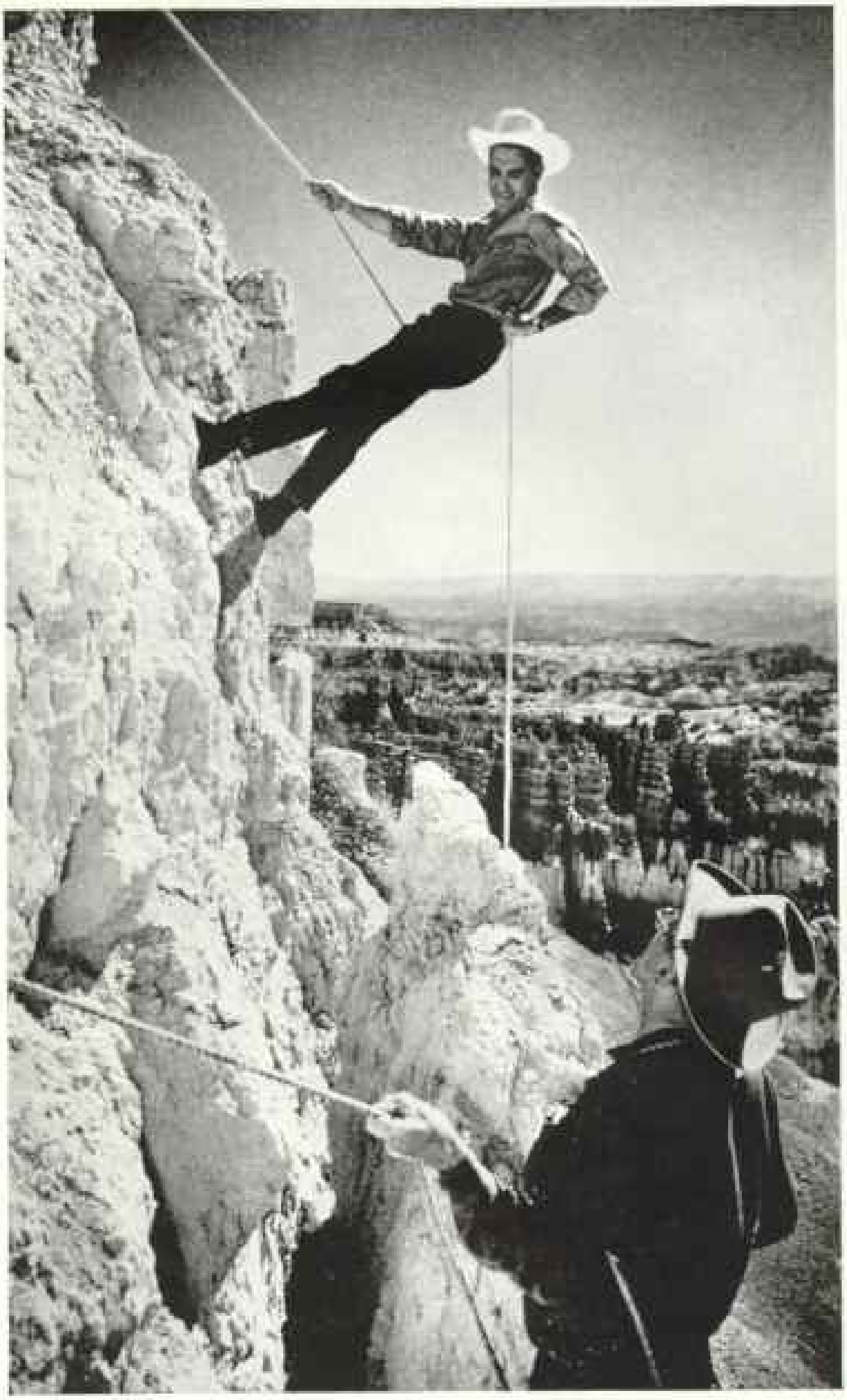
The Sentinel Keeps Vigil Above an Eerie and Barren Land

More than a quarter of a million travelers are expected at Bryce this year, the park's 50th anniversary. These hikers thread Navajo Loop Trail (pages 494-95) for intimate glimpses of eroded fantasies.

about it in the museum at the visitor center, where more than 250,000 people will call this year. There geological models illustrate the drama of uplift, faulting, and erosion. No wonder a renowned geologist, H. E. Gregory, has called Bryce one of the world's best spots for appreciating the forces that shaped the surface of our globe.

Park Naturalist Jasper Crawford did the explaining. Beginning nearly 60 million years ago, he said, the spot we stood on was covered by water which deposited silt, sand, and lime some 2,000 feet thick. Then tremendous pressure from within the earth made southern Utah rise slowly, from sea level to heights of nearly 10,000 feet, draining its waters. Huge beds of rock cracked into blocks that burst apart as they rose.

Bryce Canyon is an amphitheater carved from one of these blocks, the Paunsaugunt Plateau. Some of the blocks rose higher than their neighbors, so that their sides stood exposed like slices lifted from a layer cake. Erosion nibbled away at the bare cliffs, eating irregularly into the variously hard and soft layers of sedimentary rock, chiseling the craggy beauty of Bryce.*



Below the rim. Chief Ranger Wayne Howe rappels down a precipitous cliff to help clear debris from a spring. Rangers occasionally use their mountain-climbing skills to rescue foolhardy visitors and to retrieve lost valuables.

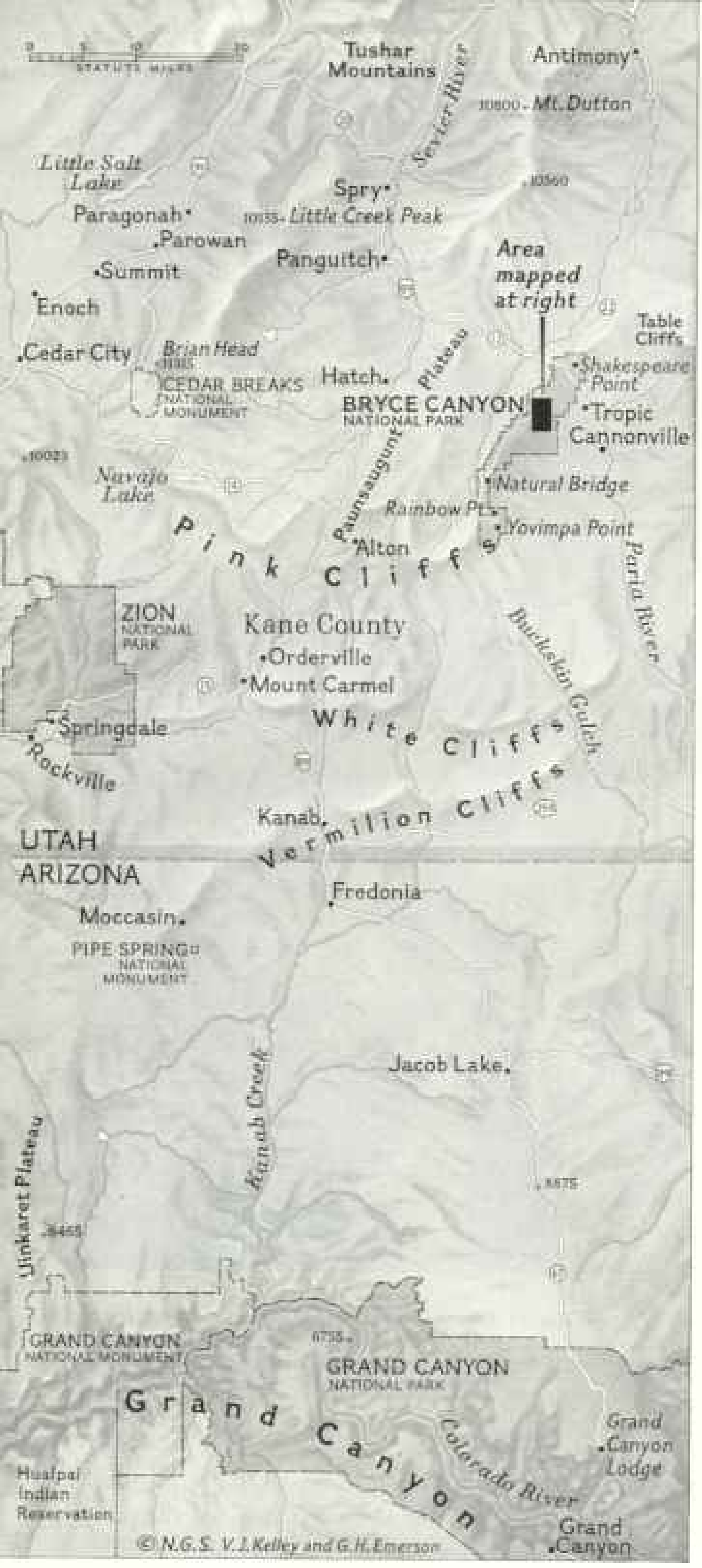
Most of the work was done by rain water and melting snow—freezing and thawing and freezing again, thus driving tiny wedges of expanding ice into cracks in the rocks. Wind-blown soil particles added abrasive action.

And the varied coloring? That's metal, mostly traces of manganese and iron in different stages of oxidation, literally the rust of the rocks. From afar the over-all effect is a rosy glow that has brought the crags their name: the Pink Cliffs.

Consulting a map on our first day, we found Bryce Canyon National Park to be a narrow 20-mile-long strip along the rim of this colorfully eroding side of the Paunsaugunt Plateau (maps, following pages). We asked Park Superintendent Glen T. Bean what to see.

"We can keep you busy for two hours or a week," he said. "Did you bring walking

* See "Utah, Carved by Winds and Waters," by Leo A. Borah, NATIONAL GEOGRAPHIC MAGAZINE, May, 1936.



Bryce lies within easy reach of two other choice scenic attractions: Zion National Park, 85 miles southwest, and Grand Canyon, 160 miles south. An almost waterless and roadless wilderness stretches southeast between Bryce and the Colorado.

Bryce Canyon (shown in detail on the opposite page) is but one of a dozen basins, or amphitheaters, that make up the park.

shoes?" I said we had, and wanted to see as much as possible.

"Then drive the length of the park today. First go to Rainbow Point, and then stop at the lookout points on the way back."

Thus we discovered that erosion here has taken about a dozen major bites out of the Pink Cliffs. Bryce Canyon itself is the most spectacular bite (page 492). Our 18-mile drive took us from warm summer back to cool early spring, as we climbed more than 1,000 feet to Rainbow Point. We looked north over the plateau to the snow-capped Tushar Mountains, while Navajo Mountain loomed like an overturned bowl 85 miles southeast, beyond Glen Canyon.

Next, from Yovimpa Point, the White and Vermilion Cliffs stair-stepped south into a wilderness of 8,000,000 uninhabited acres. Through the haze I made out the mountains of the Uinkaret Plateau, 85 miles away near the rim of the Grand Canyon.

Chipmunks Preferred Orange

At another scenic lookout there wasn't anyone in sight, but after a few minutes we became aware that something was watching us.

That "something" turned out to be four bright-eyed chipmunks, peeking from bushes. Soon curiosity got the better of them. They scampered out to investigate us, and the children rewarded each with a piece of hard candy. After experiments at different lookouts—giving the animals a choice of several flavors—Buzz and Loie decided that the chipmunks liked orange best.

Bryce Point ends in a narrow promontory. About 1875, Ebenezer Bryce built his cattle ranch here, near the mouth of the canyon now named for him. Through the cottonwoods to the east shimmered the little Mormon town of Tropic, founded in 1891. Near-by Shakespeare Point is named for the Shakespeare family, who still live in Tropic today.

Our favorite view along the rim was from Inspiration Point (page

BRYCE CANYON,
the park's greatest spectacle

New visitor center and headquarters, May, 1959

Campground

Headquarters

Bryce Inn

Bryce Canyon Visitor Center

Service Station

Bryce Canyon Lodge (Post Office)

Garage

8154

Boat Mesa

8023

Campbell Canyon

Campbell Canyon Trail

Oastler Castle

Stone Tree

Tower Bridge

8017 Sunrise Point

Queen Victoria

Queens Garden

7881

Bryce Amphitheater

Thor's Hammer

Temple of Osiris

The Pope

Sunset Pt.

Happy Family

Organ Grinder's Monkey

Wall Street

Silent City

The Sentinel

The Gossips

The Turtle

Bryce Canyon

7479

7207

Navajo Loop Trail

Rainbow Point, 15 miles

Fairy Castle

The Cathedral

Inspiration Point

8316

Bryce Amphitheater

Hindu Temples

7467

Wall of Windows

The Alligator

Three Wise Men

7887

Bryce Point

8294

8331

7517

Hat Shop

STATUTE MILES

© N.G.S. V. J. Kelley and J. L. Loughlin

508). The spires below looked as regular as if turned on lathes, and some craggy walls seemed laid out with architectural precision. Rainfall made the colors appear even more intense.

After visiting the other lookout points, including Sunset and Sunrise, we drove to the park's campground, where each site has a fireplace and a picnic table, and naturalists give nightly talks about the plant and animal life and the geology of the park.

Slip on the Ridge Can Mean Death

Next morning we joined a group shepherded by Park Naturalist Crawford for our first walk below the rim right among the eroded formations themselves.

"We have 23 miles of trail, mostly around Bryce Amphitheater," Crawford said. "This one is the Navajo Loop. Walk carefully. Those pebbles can throw you."

Sure enough, when Buzz tried walking down a steep ridge, the pebbles acted like ball bearings. He sat down hard, but stopped before sliding too far. Such slopes often end in steep cliffs; in 1954 a woman visitor plunged from one of them to her death.

After 10 minutes of zigzagging, we stopped to admire the fascinating figures of the Sculptor's Studio—the Sentinel (page 498), the Pope, Temple of Osiris, and Thor's Hammer.

Then we walked on down a shady canyon. Its walls had a golden glow that made all of us look as if we had spent a whole summer on the beach. When we emerged into sunshine again, 500 feet below the rim, we heard a strange clicking sound in the trees.

"Cicadas," Crawford said. "Sometimes they're so noisy we have to move out of the trees to talk."

He walked over to a juniper and brought back a cicada clicking like a Geiger counter.

I was entranced by the way colored light poured out of the landscape, making the rocks seem to glow. Crawford explained that this effect photographs beautifully, and that color pictures often show an incandescent quality. This spectacular bounce light is brightest in the mornings, when the Pink Cliffs make a marvelous reflector.

Returning, we passed through Wall Street —we could hardly see the sky for the overhang—and began to snake up 29 switchbacks (pages 494-5). I looked at Fran's hands and got a shock. They were a purplish green! So were mine.

"Don't worry," Crawford said. "We were in the shade half an hour and our eyes got used to reflected colored light. Now that we're in the sun again, our eyes play a trick. It's especially strong today.

"Tomorrow," he added as we headed back to camp, "come and see the Hat Shop. It's something special."

Slender Pillars Wear Stone Hats

The next day we followed him down a trail near Bryce Point, and, after walking two miles, we stood on a ridge overlooking a cluster of gravel pillars 10 to 15 feet high. They seemed too slender to hold even their own weight; yet each one supported its "hat," an immense boulder. We approached cautiously, for some of the bonnets must weigh tons.

"This gravel is more tightly cemented than it looks," Jasper reassured us. "I've never noticed any hats on the floor."

The ravine, he explained, was once filled with clay, pebbles, and boulders washed down from the Pink Cliffs. Then the stream that had carried this load changed its course, digging a deeper channel near by. Raindrop erosion went to work on the dried-up banks, eating away at the clay and pebbles, narrowing the support for the boulders. Finally the hats acted like umbrellas, keeping the pillars from being attacked further by rain.

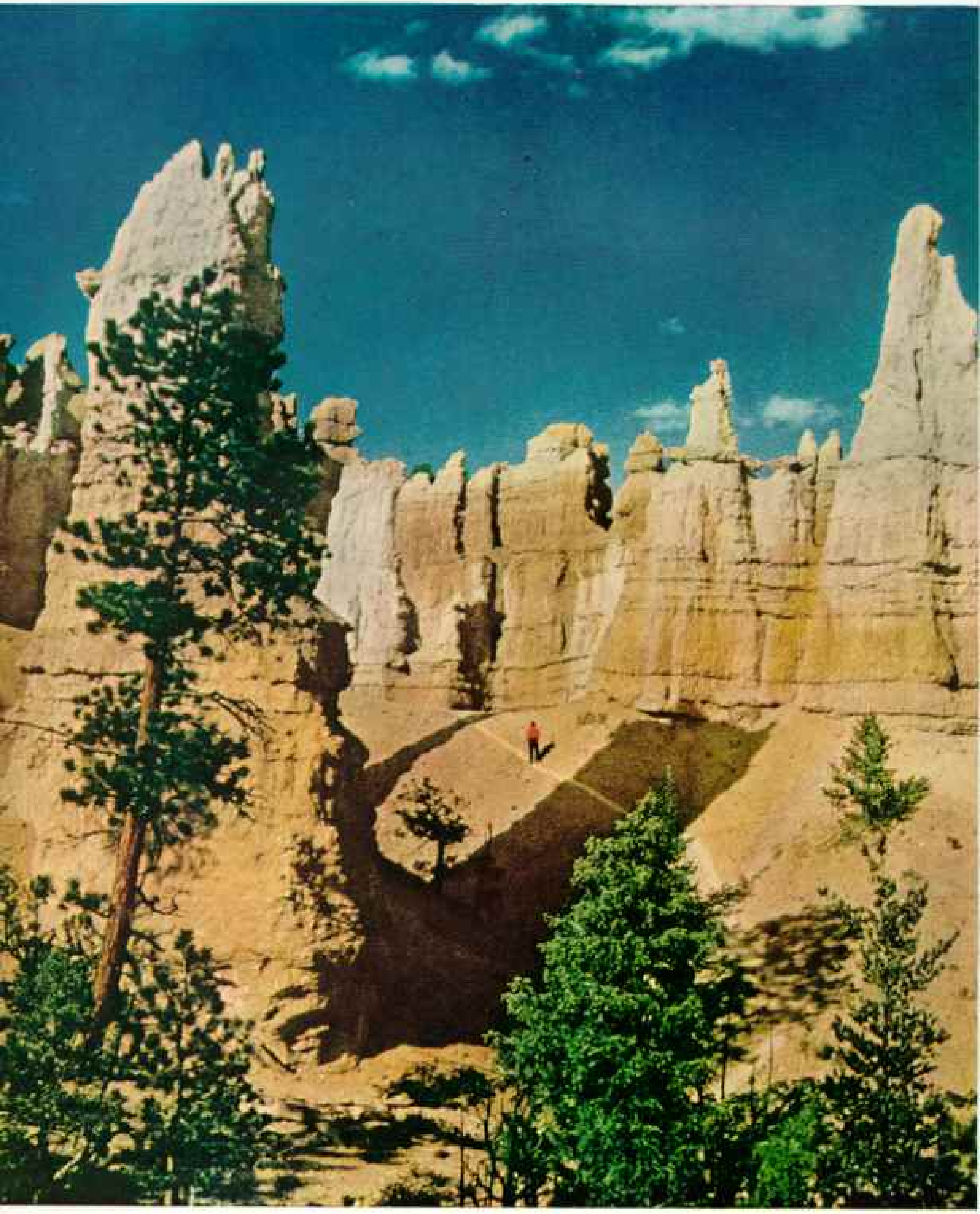
Exposed tree roots show how quickly erosion is proceeding at Bryce. "The rim is being cut back one foot every 50 years," Crawford said. "Geologically speaking, that's

(Continued on page 511)

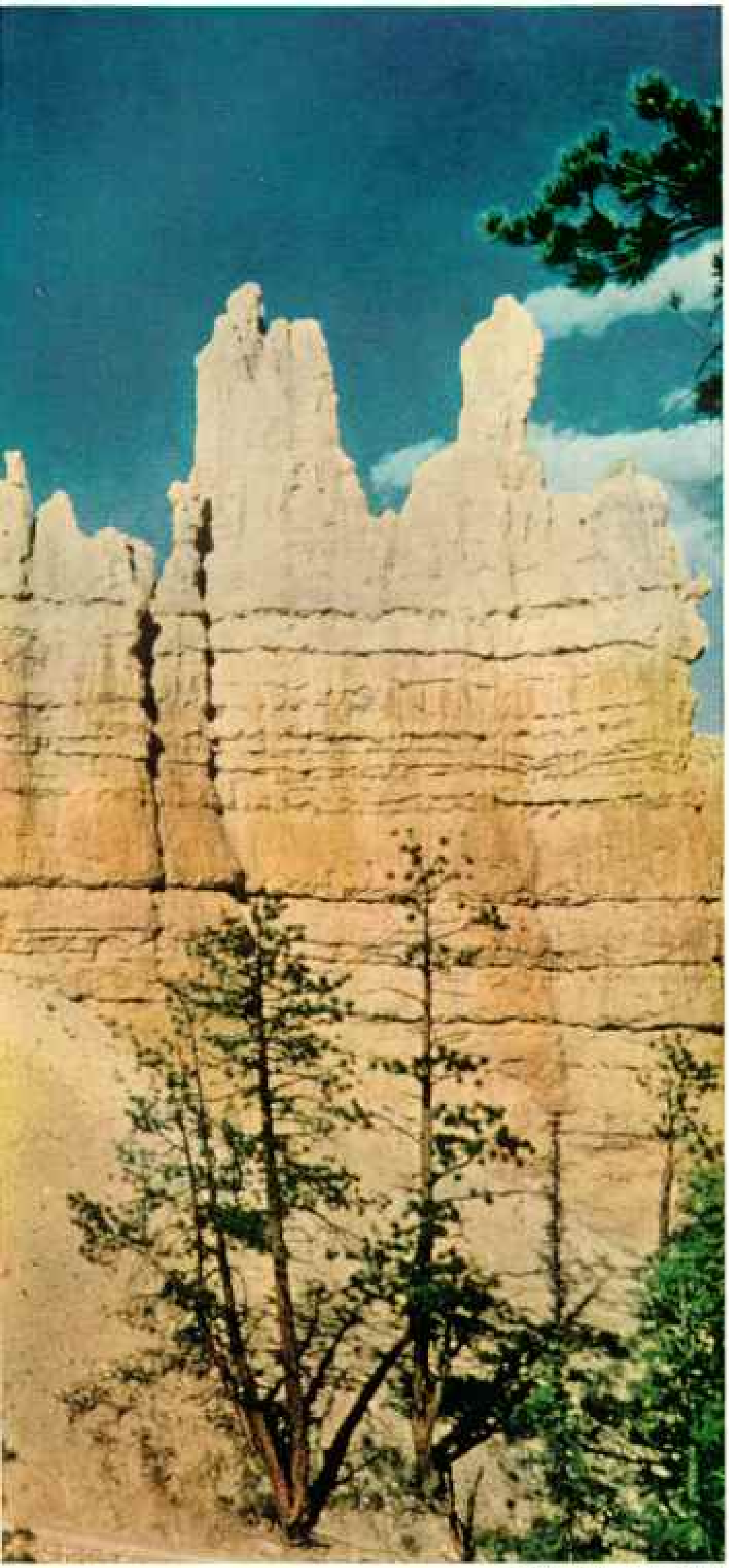
An Atomic Cloud in Solid Stone Strains to Rise from Its Slender Stem

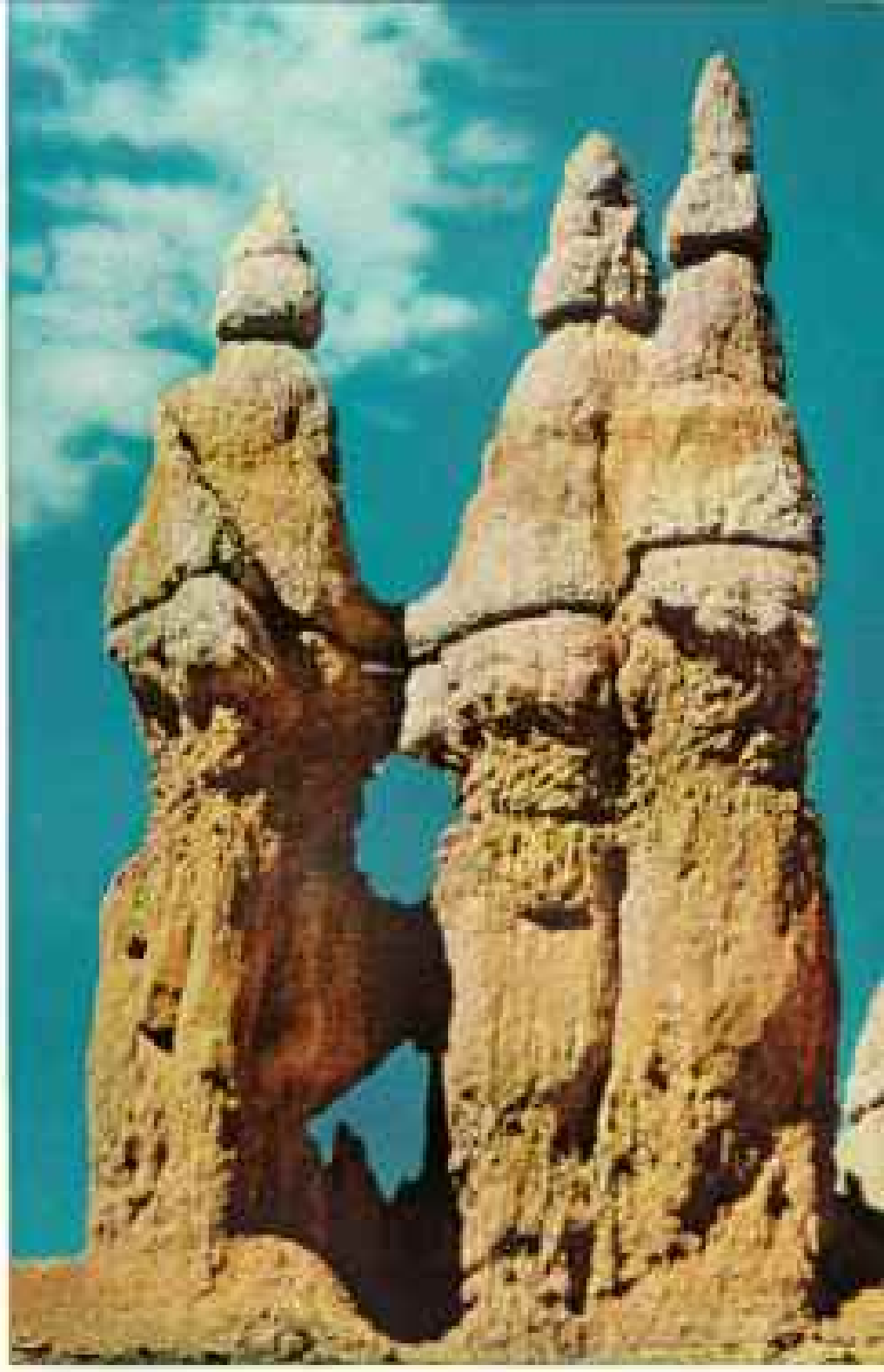
Geologically speaking, Bryce is young. Rain, frost, and running water began to carve its bizarre figures only a few million years ago, and the work of these gentle sculptors still goes on. Each year formations wear down by the thickness of tissue paper, and the canyon's rim recedes about a quarter of an inch. The ancient lake and sea beds that underlie the park contain sedimentary layers and pockets of varying hardness. Some strata resist erosion, as does this apparition, known as the Stone Tree.

Puny Mortals Crowd the Fence at Bryce Point Overlook (pages 504-505)



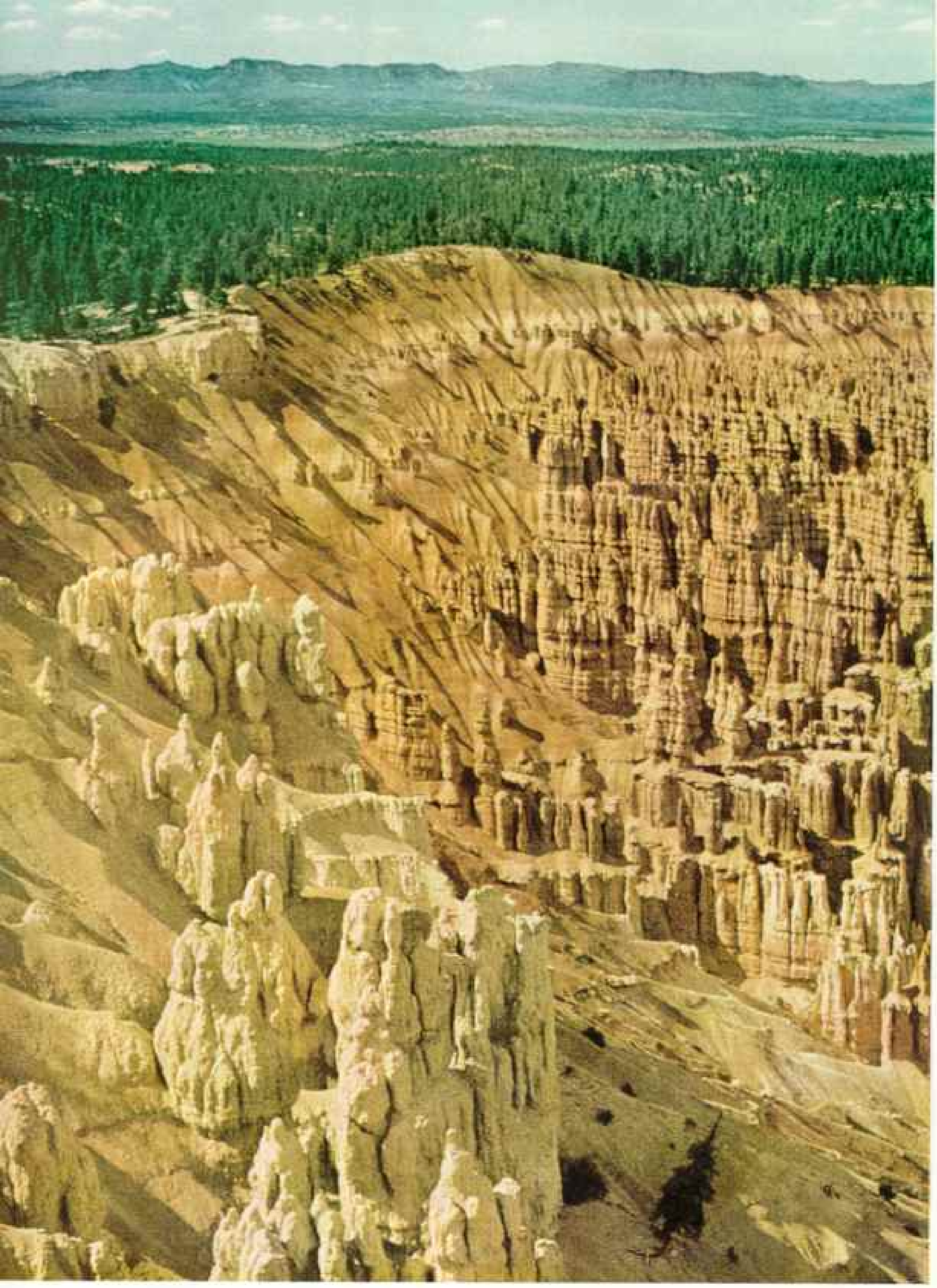
Queen Victoria, a regal lady in limestone, stands on the skyline (center) amid a garden of stone trees and shrubs. "So lifelike does she look," says the author, "that I found myself talking in hushed tones without realizing what made me do it." From crown to voluminous skirts this natural statue (close-up, opposite) catches the dignity of Britain's 19th-century ruler.





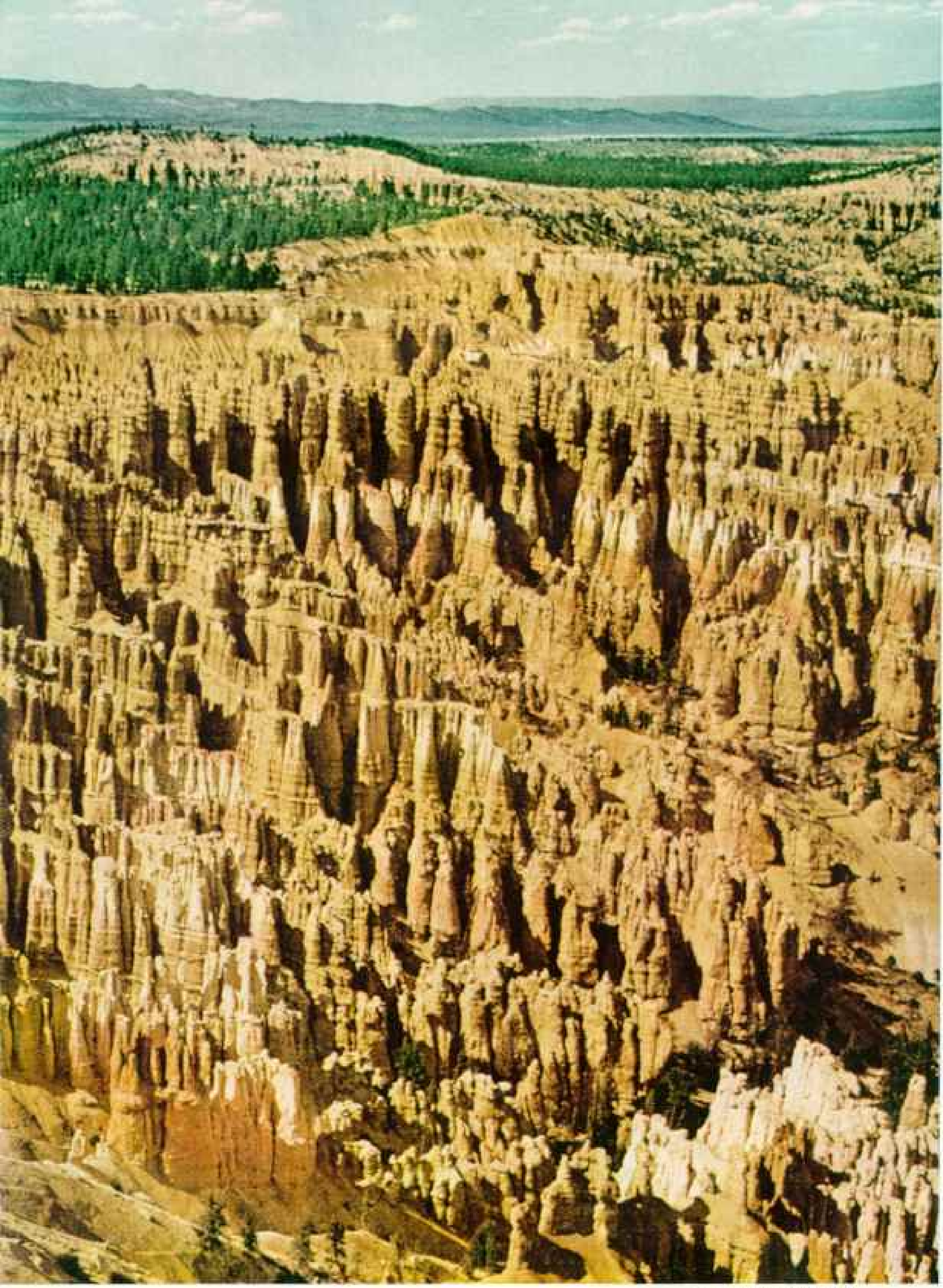
© National Geographic Society

Three Wise Men (top) eternally seek the road to Bethlehem. This formation is only one of thousands that visitors delight in naming for fancied resemblances. The author's son thought it looked more like a battery of Nike missiles.



Javanese Spires Rise from Silent City: the View from Inspiration Point

Colors of this great gash in a green plateau range from red and pink to gold and frosty white, with touches of blue and lavender. Varying tints depend



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on traces of iron and manganese oxides in the rock. Throughout the day patterns and hues shift constantly with the moving sun. Some rocks seem to glow as if lit by internal fires. By moonlight they appear almost phosphorescent. Inspiration Point rises above the sloping walls of Bryce Amphitheater (left).

breakneck speed. When the ground thaws, you can actually hear erosion—water running down crevices, rocks tumbling, and the rattle of gravel."

After a single cloudburst, the wash at the bottom of Bryce Canyon often carries about 20,000 tons of gravel, sand, and silt to the Paria River and thence to the Colorado.

Spring Thaw Brings Problems

"With all this erosion," I asked Marion Willis, the trail foreman, "how do you keep the trails so clear?"

We were watching his crew lower themselves along a canyon wall. They carried dynamite and cement to a spring 300 feet below the rim—planning to blast a hole around it and turn it into a well (page 499).

"Right now the trails are no great problem," Willis said, and gulped from his canteen. "The hard work comes in the spring. We use a special tractor, sort of a pint-size bulldozer. But it still takes weeks to clear off the rocks and mud that pile up during the spring thaw. In some places a slide will wipe out a trail completely. We take care of the campground, too."

If you're not camping at Bryce, you can stay at the inn, with its cafeteria and cottages open from May 15 to October 12. Near by is the lodge, with a big fireplace blazing in the lobby and nightly illustrated talks by naturalists in the recreation room. There are de luxe cabins of native stone and timber, a soda fountain, a souvenir shop, and a dining room, all open from June 15 to September 6.

Loie, the horse enthusiast of our family, had been wanting to ride. So one afternoon we drove to the corral just below the lodge and met John Nelson, boss wrangler at Bryce, who grew up on the Hualpai Indian Reservation in Arizona. He is known at Bryce as Walapai Johnny.

Walapai said to a young lady from New York who had never been on a horse before: "Okay, cowgirl, lead off right behind me."

We fell into line and soon dropped below the rim at Sunrise Point, then jogged past the entrance of the hikers' trail to Queens Garden. Then the trail topped a ridge near Fairy Castle and twisted toward a picnic area. Here we could hear people talking 600 feet above us on Bryce Point (page 504).

As I looked around, I marveled that in such poor soil so much vegetation was thriving. Each day we found newly blooming Mariposa lilies, blue flax, paintbrush, iris, and primroses. On the rim I could see juniper, piñon, and ponderosa pine; elsewhere in Bryce we had encountered Douglas fir and aspen. On chalky white ridges, where nothing else grew, survived the indestructible bristlecone pine—the oldest known living thing.*

Back at the corral, the young lady from New York dismounted stiffly and complained she could hardly walk.

"Don't worry," Walapai said. "You'll dance away that soreness at the lodge tonight."

We enjoyed the evenings at Bryce. Among the 175 college students who work there each summer, anyone who can sing, dance, or act takes part in the nightly variety show. We could usually spot our pretty waitress in the chorus line.

Herm Pollock, a hotel employee who grew up at Bryce, sometimes joined in with his guitar. We loved to hear him sing:

"Hooray for Kane County, land of the free,
Home of the grasshopper, bedbug, and flea.
I'll sing loud her praises; I'll boast of her fame,
While starvin' to death on a Government claim."

Dudes Get Musical Send-off

Each afternoon when the buses left for Cedar City, the entire crew gathered at the lodge for "Singaway." Often a "dude of the day" was escorted off the bus and crowned with a Western hat. Then everyone joined in a lusty chorus of, "Goodbye dudes, we're sorry to see you go!"

The departing visitors were sorry to go, too, even those used to feasting on magnificent scenery. At the lodge they still remember the lady who said:

"Zion was the fruit cocktail, and Grand Canyon was the main course. But I had to come to Bryce to get my dessert!"

*See "Bristlecone Pine, Oldest Known Living Thing," by Edmund Schulman, National Geographic Magazine, March, 1958.

Tower Bridge Leaps a Dry Moat; Solid Rock Forms Its Drawspan

Close by, light pierces a window of Oastler Castle (above), named for Dr. Frank Oastler, a New York physician who served on the first advisory board to the National Park Service in the 1930's. The castle's crenelated wall flanks Campbell Canyon Trail.

A worried zoologist takes three of Australia's egg-laying duckbills on a harrowing 10,000-mile journey to the Bronx Zoo

FLIGHT OF THE Platypuses

By DAVID FLEAY

With Photographs by the Author

"WHAT do you have in the box?" asked a fellow passenger on the airliner from Los Angeles to New York.

"A duck-billed platypus," I replied.

"Sure, sure," said my neighbor. "Have it your own way," and he buried his nose in a magazine.

But it was true. Not just one, but three duck-billed platypuses, first of their kind to fly from their native Australia to New York, rode this plane with me. It was a desperate voyage as well as a historic one. Two hours longer, and I think I should have delivered to anxiously waiting officials at the New York Zoological Park only three pathetic little corpses.

The story of my three flying duckbills begins in the streams of southeastern Queensland—the Albert, Logan, and Coomera Rivers, and Cedar, Palen, and Burnett's Creeks. Only in such places along the eastern fringe of Australia and in Tasmania (map, page 517) lives *Ornithorhynchus anatinus*, a furry little beast that looks like a bemused duck and lays eggs as a duck does, but then proceeds to confound the world by nursing its young after they hatch.

Fourteen years ago I raised the first and only platypus ever bred and raised in captivity. At

Four months out of the egg, newly captured Pamela shows no fear of her human perch. Sitting on her tail, a normal resting pose, she reveals the platypus's leathery duck's bill. When scientists a century and a half ago heard descriptions of this egg-laying mammal, they pronounced it a hoax. A living reminder of an ancient age, *Ornithorhynchus anatinus* retains certain reptilian characteristics lost by most other mammals. Nature restricted the species to Australia and Tasmania.

Courier-Mail, Brisbane

Platypus Paul surveys Brisbane after a 60-mile flight to test his ability to withstand the rigorous four-day journey from Australia to New York. Author Fleay and a stewardess take their passenger on an airing. Pamela and Paddy remain under cover.

that time I directed a sanctuary near Melbourne; I now operate my own Fauna Reserve at West Burleigh, Queensland.

In 1947 I trapped 19 platypuses and delivered three to the New York Zoological Park. They were Penelope, Cecil, and Betty Hutton. Betty died about six months after arriving in the Bronx. Penelope and Cecil spent 10 years there—the first platypuses ever to survive outside the down-under lands.

Not long ago I received a series of letters from Dr. John Tee-Van, General Director of the New York Zoo. Penelope, he reported, had escaped from her platypusary and disappeared, and Cecil had died 49 days later. Would I, asked Dr. Tee-Van, replace the animals that had brought his zoo such renown?

I pondered. For 25 years I have dealt with platypuses, and I have come to the conclusion that few members of the animal kingdom are so difficult to keep in captivity. The duckbill preserves some of the primitive reptilian characteristics of the early Mesozoic mammals, but it is highly developed in the way it has adapted to its natural surroundings and food supply. Once caught, it will soon die if these are not duplicated.*

Along with this specialization, it has a nervous system exceedingly well developed for a beast with such primitive features. Subject the nocturnal platypus to too much noise, light, and handling, keep it too wet or too dry, hold it in surroundings that do not remind it of home in the country—the result can be panic, frantic rushing about, death within 24 hours.

In the end I agreed to undertake the mission. Whereas 10 years ago I had brought my duckbills to the United States by steamer, this time I was asked to fly.

Now when you want to fly a platypus from Australia to New York, you must first catch your platypus. I started by deciding I would take youngsters, since they would know least about life in the wild and thus adapt best to confinement. Young animals are available

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Australia's Patchwork Creature, the Platypus," by Charles H. Holmes, August, 1939; and "Biggest Worm Farm Caters to Platypuses," by W. H. Nicholas, February, 1949.

in Queensland only from January to about mid-February, which is Australian summer.

As I waited for winter to pass into spring, an unforeseen hitch developed. For the first time in years no rains fell. Rivers dropped to record lows, creeks dried up. It was going to be a bad time for aquatic creatures like the platypus.

Colin Veivers and I went into the duckbill country in early January and found our worst fears realized. Streams were a series of still pools. Most serious of all, we could find few signs that the females had dug their wondrous, long nesting burrows.

When her time comes, the female duckbill chooses a stream bank with tight-packed soil and a fairly steep face. Into it, starting above water level, she drives a burrow that may be as long as 80 feet (below).

At the end of this she builds a snug nest of leaves and grass or reeds in which she lays from one to three eggs, usually two, about the size of sparrow eggs and a bit leathery in texture. Cuddling the eggs between her flexible chubby tail and a brooding hollow in the fur of her abdomen, she "sets" for approximately 12 days, until the eggs hatch into foetuslike young (page 522).

Somewhat like the bird called the hornbill, the mother walls herself into her den while brooding and nursing. She does this by blocking the burrow off at several places; we call these earthen obstructions "pugs," a mining term. Unlike the hornbill, however, the duckbill mother makes excursions to the outside after the hatching period is over, tearing down and rebuilding all the pugs every time.

Each of us prowled alone as we looked for platypus sign. This is because the platypus is a wary, timid animal possessed of excellent sight and hearing. Voices, a footstep, a cracking stick, and even the littlest platypus disappears like magic.

We worked in the early morning and evening. Duckbills are nocturnal creatures. So are mosquitoes. Pitiless, buzzing squadrons dogged us

Scuttling out of her camping burrow in a stream bank, a mature female lands in the hands of the author, who later released her. At nesting time she will abandon this small den, with its otterlike slide ramp, for a long, compartmented tunnel.

Australian International Films

A denizen of an Australian platypusary seizes a crayfish, leaves the claws dangling, and shakes it as a terrier would a rat. A moment later the creature surfaced for air and ground up the tidbit, not with teeth, which it lacks, but between horny plates, assisted by grit and gravel in its cheek pouches.

Webbed front feet, constantly paddling, hold the buoyant hunter under water; hind feet serve as stabilizers and rudders. Eyes and ears remain shut during submersion; a single lid closes both organs.

In zoos, as in the wild, the platypus feeds by night.

W. Robert Moore, National Geographic Staff

unceasingly as we camped out night after night and crawled through swamps.

Days passed. We patrolled river pools covered with masses of slimy green algae, worrying constantly about the prospects of being beaten out by the monsoon rains of February. These would change the stagnant streams into raging torrents and end the platypus hunt until another year.

In the half-light of dawn the morning of January 22, I saw concentric ripples in an Albert River pool. Behind a screen of bottle brush I crawled closer. A baby platypus was busily hunting food in the shallow water at the base of what once had been rapids.

To picture a platypus feeding, one must first understand the duckbill's bill. It is not a thing of horn like a bird's beak, but a muzzle of thick skin absolutely jam-packed with nerves. It is quite the most sensitive thing about the platypus (page 519).

The animal swims to the bottom of the pool. As it does so, it shuts eyes and ears simultaneously; the same elongated furrow closes both. This leaves it with only the bill for orientation purposes, but the duckbill needs nothing more. The bill weaves along ahead of the owner and apparently finds small water creatures by their

The platypus is found only in the shaded areas, nowhere else in the world.

©N.G.S.

Mesh Cage on the Albert River Trapped Pamela; Air Space Allowed Her to Breathe

A day's ration for a hungry platypus wriggles out of the keeper's fingers. The average duckbill can polish off 800 earthworms, a handful of grubs, and a dozen crayfish at a single meal. A healthy specimen devours half its weight overnight. A two-pound nursing female in the author's care gorged her own weight in a 14-hour marathon.

A giant worm overcomes a duckbill's shyness. Eyes high on the sides of the head warn the mammal of swooping owls and hawks; the sensitive bill, atingle with nerves, ferrets out food under water. His broad tail stores up fat against lean times.

vibrations and by a truly magnificent sense of touch.

"Plop-lop!" My little platypus crash-dived, and I realized it had spotted me. I waited an hour, letting the mosquitoes feed upon me as they would. The platypus suddenly reappeared and stared at me with its beady eyes. Obviously it disliked what it saw, for it swam rapidly across the pool and started up the trickle of water coming down the former rapids.

In a matter of seconds I had sprinted to the spot. Too late! The platypus had vanished. I finally found a small crevice running deep beneath a basalt shelf. Into this the little creature had crawled. Like so many small animals, the platypus can squeeze into incredibly narrow quarters.

Next night Veivers and I set a wire funnel trap and caught the baby. It proved to be a small, thin female—"She's in mighty poor nick," as Colin put it in Aussie slang—and probably would have died of starvation had we not caught her.

We called her Pamela, and she was to become one of my Brisbane-to-New York plane passengers. Extreme youth—about four months, I judged—plus hunger quickly tamed her. She fretted little and ate well from the

beginning (page 513).

Now we rushed Pamela to West Burleigh and my platypusary, a very important piece of equipment. As I said before, the specialized platypus will not tolerate strange surroundings. Hence a platypusary must have these things: Solid sides so the occupant cannot see open spaces into which it would immediately try to escape. Subdued light. A shallow pool of fresh, clean water. Food animals alive in the water. A landing stage. And a burrow with a series of flat-bottomed, arched openings that fit the platypus's body.

The burrow cannot be simply a box with grass and leaves in it. It must be a maze of passages and compartments. The reason is that a platypus cannot stand to enter its nest wet; it must squeeze through narrow places to wring out its fur.

If one is breeding platypuses, there must also be a bank of earth into which the female may dig her nesting burrow. She uses this burrow only in breeding season. Her mate never ventures into it. He lives in his own shorter burrow, and she builds one, too, when she is not nesting. The solitary creatures never set up housekeeping together.

Four nights after we caught Pamela, we took Paul from a trap in another pool of the Albert. He was in very good nick, his fur glossy and his body plump beneath its covering of loose skin. Like Pamela, he was about four months old.

Telegraph Feature Service, Brisbane

Held by the tail, a duckbill exposes poison-dealing, half-inch spurs in each hind foot. Nature arms only the male; the female lacks spurs and venom. Australian anglers wounded while freeing hooked platypuses have suffered agonized swollen arms that disabled them for a week. Among other mammals, only the American short-tailed shrew carries toxic weapons.

Suffering untold agonies from heat, mud, and mosquitoes, we dragged wire traps up and down the Albert. Big water lizards (*Physignathus*) hurtled into river pools from overhanging bean trees. Cicadas sang their pulsating songs in the rain-forest heat.

We wanted a second female duckbill, but morning after morning our quivering traps yielded only fresh-water crabs, tortoises, fish, and big eels. Three times we caught large water rats, specialized Australian rodents comparable to the American muskrat.

In the first days of March, Colin sent word he had caught a big female platypus in one of the traps he was tending.

But when we examined her, she turned out to be old and practically blind to boot. We returned her to her pool and went on with our labors. It was heartbreaking work. One night we braved a terrible stench to set a trap in a likely pool. Next morning we found a dead bullock in the pool! But we also found a young male platypus in the trap. We gave him a name—Paddy.

We continued to suffer and trap, and we caught several more platypuses, all of which we released as unsuitable.

While we were in the field, Paul, Pamela, and Paddy were undergoing conditioning at West Burleigh. Each afternoon they were shown to the public to accustom them to movement and voices. They learned to take delicacies from the hands of my staff. Slowly they overcame their fear of man, completing a most vital part of their conditioning to the long trip and the zoo life ahead.

Also, they ate. Because of drought, earthworms were hard to get. We hired neighborhood boys, aborigines, anybody who would help. The price of fresh-water crayfish went up to threepence, any size. We had to buy, because the animals had to develop an accumulation of fat in their tails; otherwise they could not be subjected to the rigors of a Pacific crossing. The expense was prodigious.

On March 21, by arrangement with Trans-Australia Airlines, the platypus trio took a special tryout plane ride to Brisbane. This

Digging Spurs into Cloth, an Irascible Old Male Fights an Imaginary Enemy

Proof That Some Mammals Lay Eggs: Mother Eyes Her Clutch, the Normal Pair

Charles R. Bolton

Blind, helpless, furless, three newly hatched young lie in their Australian burrow. Mother incubated the eggs, permanently cemented together, by pressing them against her warm abdomen with her tail. Her infants presumably went hungry for several days until milk started to flow; then it oozed, not from nipples, but from the skin, like sweat.

Australia's spiny anteater, the echidna, is the only other mammal known to lay eggs.

The only baby platypus ever bred in captivity cannot move her body or open her eyes at 8½ weeks. At 17 weeks she left the nest in the author's sanctuary for her first look at the world. Here nine inches long, she eventually stretched 18 inches from shoeborn bill to beaver tail.

was a crucial flight. How would they take to the one element in which no platypus is equipped to live? Above all, how would the bill that could feel a tiny shrimp vibrating in the still, deep waters react to the thunderous roar of modern aircraft engines?

Well, we lined the traveling boxes with grass, and we placed the boxes on a foam-rubber mattress, and we wound up back at West Burleigh with a two-out-of-three score. Paul and Pamela were themselves again in 48 hours. Paddy, however, held his head under water, spent hours trying to escape, and refused food.

I released Paddy in near-by Currumbin Creek. Obviously, a long trip by air would have killed him.

Platypus Brought Home in a Shirt

Out in the bush, week after weary week, I endeavored to trap another lady platypus, although the season for baby duckbills was fast drawing to a close. As time passed without success, I began to give up hope. In early May I drove to Cedar Creek, one of the Albert River tributaries, and set a trap in the center of a cow pasture. Colin Veivers rode horseback to it morning after morning, not even bothering to carry a bag. It was that hopeless.

On May 9 my telephone at West Burleigh rang. It was Mrs. Veivers.

"Colin just came home with a platypus tied up in his shirt," she said.

The catch was a mature female 15 inches long, healthy and unusually placid. Despite her age, I decided to give her a try, and I took her the 50 miles to West Burleigh. We named her Patty.

By now the arrangements for the trip had been made. The animals would travel in a miniature platypusary built of light wood. Made to stay in it every second night to become accustomed to it, they adjusted by degrees, though there were a great many headaches and setbacks.

Early in the morning of June 3 we loaded the platypuses into an automobile and drove the 65 miles to Brisbane, whence a Trans-Australia Vickers Viscount would fly us to Sydney to board a Pan American clipper for Honolulu. Our baggage, to say the least, was unusual: It contained 10,000 worms, 2,500 meal grubs, and 550 crayfish!

Even that menagerie proved inadequate. A two-day delay at Sydney necessitated my sending an S O S to West Burleigh for 2,000 more worms and 50 additional crayfish.

At noon on June 5 the Pan American *Clipper Polynesia* took off from Sydney and headed northeast. In the cargo hold were the platypuses, riding inside their model platypusary, which rested on the rubber mattress. As we stowed them, I heard them rustling around in the artificial burrows, and I worried a little over their restiveness.

Once in the air, the captain and crew kindly let me go forward as often as I wished and climb down into the cargo hold to check on my charges. They did warn me not to touch a certain lever. If I tripped it, they said, the escape hatch would open and the contents of the hold, including me and the platypuses, would pop out of the pressurized plane like a cork from a champagne bottle!

Panic Averted, New Peril Appears

For an hour all went well. Then, to my horror, the platypuses came out of their burrows and swam frantically around the tank. Surest sign of impending panic, they reared against the plywood walls and splashed over backward into the water. The vibration of four powerful aircraft engines was having its effect.

There was nothing I could do. I fretted, and the platypuses swam round and round all the way to Nandi Airport in the Fijis (page 526). Then the duckbills, wet and bedraggled, went back into their burrows, and I relaxed.

That is, I relaxed for 10 seconds. A man in uniform entered the plane and began to spray the cabin with insecticide.

"He will squirt that stuff on my platypuses and their food only over my dead body," I said to myself, taking a stand beside the cargo hatch. For some reason he overlooked the plane's "basement."

We took off and roared through the night toward Canton Island. This is the time all good platypuses come out to feed. I slid worms, grubs, and crayfish into the tank. No platypuses emerged from the burrows. I checked at intervals all night. The animals stayed out of sight. There was no sound.

Were they dead in the burrows? I had no way of knowing. We put down at Canton Island at dawn, the business of the plane was attended to, and we flew away for Hawaii. There was still no sign of the duckbills.

At Honolulu I faced a major problem. The United States Department of Agriculture authorities, I had already been warned, would insist on taking out and destroying all the bedding in the platypusary, as well as the earth in which I had packed the worms. At least, I thought, I would find out whether the animals were dead or alive.

I must say the United States officials, who had been forewarned of our arrival, did everything they could to minimize the shock to both the platypuses and their keeper.

First out of the plane, I whisked through customs, health, and immigration formalities without a hitch.

On the ground stood the platypusary. A crowd of spectators, including the press, stood around it. Now came the ordeal. Carefully I unlocked the lids and took out handful after handful of bedding. I saw a bit of fur. I touched it. It moved. Pamela, at least, was alive!

So were the other two. Bedraggled, nervous, and much too thin, even though only 24 hours from their last meal at Sydney, they were still with us. I smiled for my picture; I think it was my first smile since Sydney.

The Department of Agriculture people, true to their word, took every bit of Australian earth and every scrap of bedding, even using a vacuum cleaner to catch the last bits. Paul L. Breese, Director of the Honolulu Zoo, was ready with soft Rhodes grass and sterilized soil for replacements.

While we were hosing out mud and dead worms, a lady dropped a lei around my neck and kissed me. In all the years I had cleaned out platypusaries, no such thing had ever happened to me. I shall always cherish my memory of Hawaii!

Paul Swims Across Pacific

Five hours later we were on our way again, this time in the *Clipper Queen of the Pacific*. I shall not attempt to describe in detail the 11½-hour night flight to Los Angeles. It was a nightmare. I looked in on the duckbills, and Paul was paddling ceaselessly about the tank, moving slowly and weakly. I expected him to die at any time. Pamela was almost as bad; only Patty was doing fairly well.

At Los Angeles I hovered around the platypusary like a mother hen. I'd like to apologize here to the press photographers I shooed away. One flash bulb in his eyes, and Paul would certainly have succumbed.

I believe United Air Lines saved the duckbills' lives. We had arranged to fly from Los Angeles to New York in a freight plane. I asked if we could go by a faster and earlier

Gordon L. Johnson, National Geographic Staff

Mission accomplished, the author delivers his charges to the Bronx Zoo. Disturbed by engine noises, Pamela, Paul, and Patty barely survived the long flight. Here Dr. Fairfield Osborn (left), President of the New York Zoological Society, and Sir Josiah Francis, Australian Consul General in New York, "unveil" Patty. Mr. Fleay uses her tail as a handle.

flight, despite the stringent rules against carrying wild animals in passenger planes.

The office people left the final decision up to the plane captain, J. D. Milstead. He blinked once or twice, but he was game to the core.

"Do they bite? Do they smell bad?" he asked.

"They have no teeth, and anyway they'll be in boxes," I said. "Only old male platypuses smell; we don't have any."

"Bring 'em aboard," said Captain Milstead.

End of a Harrowing Odyssey

And that is how I happened to have a platypus in a box to arouse the curiosity of a fellow passenger on a transcontinental airliner; the platypus was Paul, weakest of the lot, and the captain had allowed me to take him to the rear of the plane, where the engine noise was at a minimum.

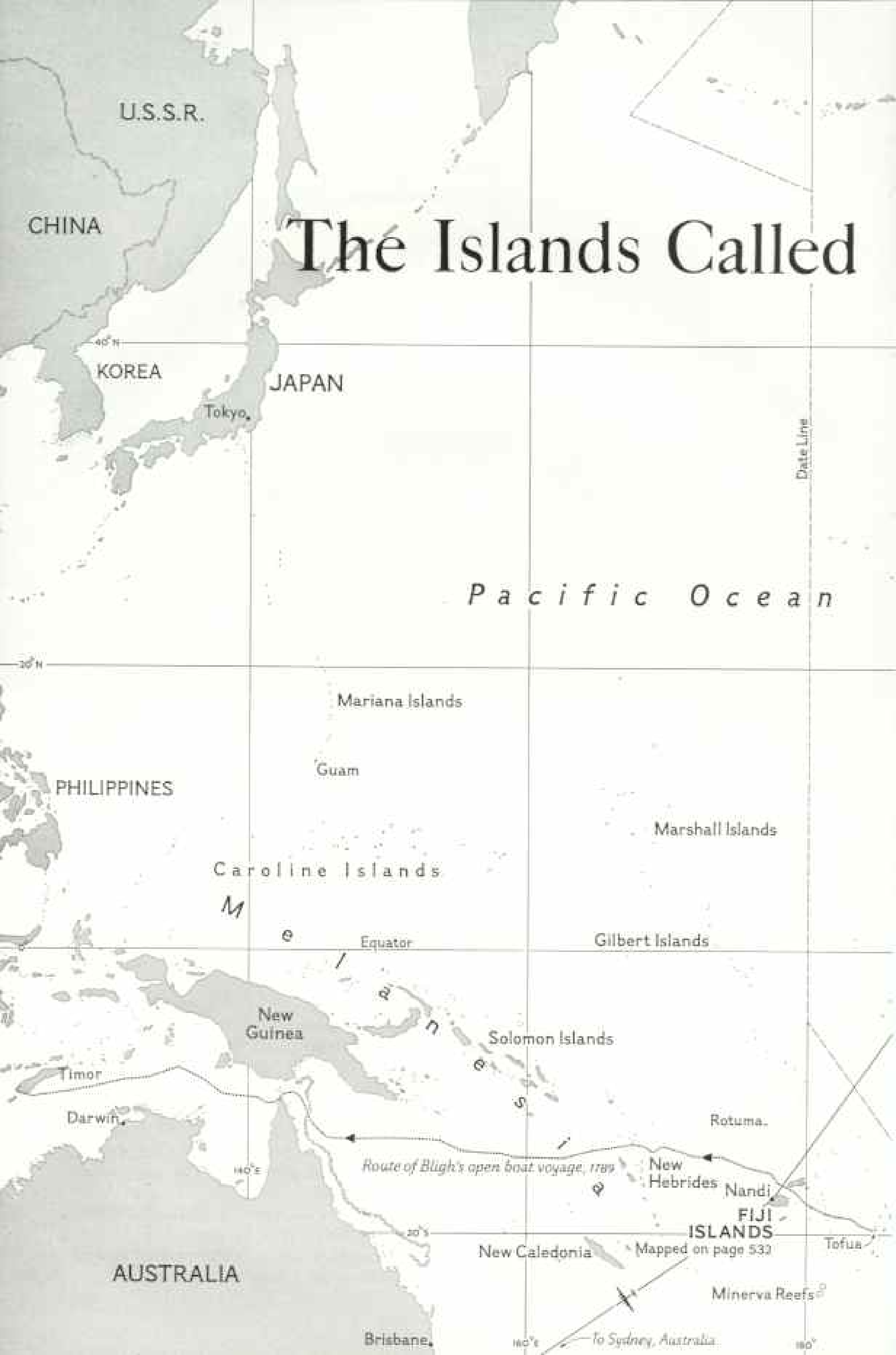
We arrived in New York, and I still had three live duckbills, but only by the skin of my teeth. As I said at the beginning, I do not think the trio would have survived two or three more hours of traveling. The zoo people who met me at the plane rushed us to the Bronx, and we turned my charges loose in the old shipboard platypusary I had used during the sea crossing of 1947.

There they quieted down, and within five days resumed normal feeding. I stayed over for the "unveiling" in the big outdoor platypusary. The Australian Consul General and other officials attended the ceremony (above). So many press photographers and reporters and ordinary zoo goers swarmed in to see the animals that Joseph Neglia, their keeper, became worried and closed the platypusary within an hour.

Myself, I flew home to Queensland after these heartfelt words to Joe:

"Take care of them. Not even after another ten years would I make this trip again!"

The Islands Called



Fiji

Men walk on fiery rocks and women sing to turtles in Britain's Pacific colony

By LUIS MARDEN
National Geographic Foreign Editorial Staff

With Photographs by the Author

ADRIFT in an open boat on the Great South Sea, Lt. William Bligh, late commander of His Majesty's Armed Vessel *Bounty*, wrote in his journal on May 3, 1789:

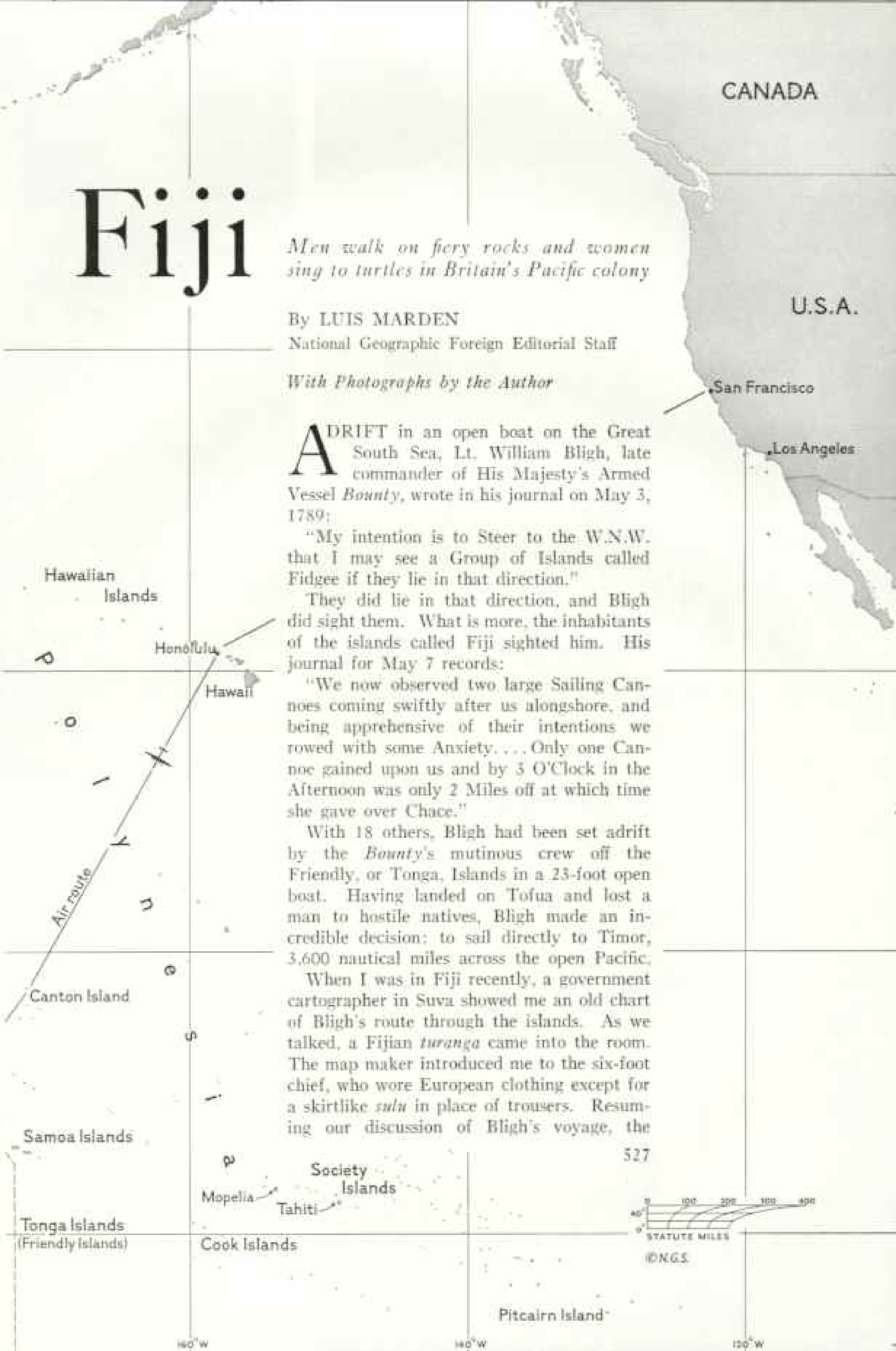
"My intention is to Steer to the W.N.W. that I may see a Group of Islands called Fidgee if they lie in that direction."

They did lie in that direction, and Bligh did sight them. What is more, the inhabitants of the islands called Fiji sighted him. His journal for May 7 records:

"We now observed two large Sailing Canoes coming swiftly after us alongshore, and being apprehensive of their intentions we rowed with some Anxiety. . . . Only one Canoe gained upon us and by 5 O'Clock in the Afternoon was only 2 Miles off at which time she gave over Chace."

With 18 others, Bligh had been set adrift by the *Bounty*'s mutinous crew off the Friendly, or Tonga, Islands in a 23-foot open boat. Having landed on Tofua and lost a man to hostile natives, Bligh made an incredible decision: to sail directly to Timor, 3,600 nautical miles across the open Pacific.

When I was in Fiji recently, a government cartographer in Suva showed me an old chart of Bligh's route through the islands. As we talked, a Fijian *turanga* came into the room. The map maker introduced me to the six-foot chief, who wore European clothing except for a skirtlike *sulu* in place of trousers. Resuming our discussion of Bligh's voyage, the



Dancing Fijians Brandish Spears and Palm-leaf Shields

Muscled men of Vanua Levu, second largest of Fiji's 300 islands, perform the same spectacular spear dance that was presented for Queen Elizabeth during her visit in 1953. The group times its movements to the chanting of women and to the beat of the *lali*, a wooden drum.

Dancers leave their chief's towering thatched house for the village green.

A triton shell's mournful bellow signals to fishermen on Vatulele. The girl produces the sound by blowing across a hole near the shell's extremity. Hibiscus blossoms adorn her upstanding hair, which she grooms with coconut oil.

Kodachromes by Luis Marden,
National Geographic Staff © N.G.S.

cartographer recalled the incident of the canoe chase. Turning to the chief, he asked:

"What would have happened to Bligh had the canoe caught up with him?"

"Oh," said the turanga, nonchalantly rolling a cigarette, "we should have eaten him all right."

They would have, too. The fierce Fijians practiced cannibalism, and castaway sailors, "people with salt water in their eyes," were legitimate prey.

Bligh and his companions sailed right through the center of the Fijian archipelago, on to Timor and to immortality. Suffering from thirst, hunger, and exposure, and using only a quadrant, compass, and pocket watch, this master navigator recorded the positions of 23 islands with astonishing accuracy.

In a feat of open-boat navigation that has yet to be surpassed, and without loss of a single man after leaving Tofua, Bligh reached Timor in 41 days.

Three years later Bligh sailed over part of his old route, confirming and amplifying his observations. For years afterwards the charts showed Fiji as "Bligh's Islands."

Bligh Story Beckoned Author to Fiji

Always fascinated by the *Bounty* story, I welcomed the opportunity to go to the Fijis and see what life on these once-feared islands is like today.*

The Fijians themselves call their land Viti. Bligh, like Cook, had first heard of these islands from the Tongans, who with their softer consonants called them Fichi.

The more than 300 Fiji Islands are scattered like a handful of emerald dust across 250,000 square miles of the southwest Pacific (map, page 532). A British Crown Colony, they stand astride the 180th meridian halfway between New Zealand and the Equator.

About 100 of the islands are inhabited, and they vary strikingly in size.† The biggest, Viti Levu—Great Fiji—is almost exactly the size of Hawaii, and the next largest, Vanua Levu—Great Land—is half that. No other reaches one-tenth Vanua Levu's size.

Of volcanic origin, the bigger Fijis are steep sided and mountainous, heavily clothed with green forest on the southeast slopes.

During the rainy season, from November to April, tons of moisture fall on this windward side. Beyond, the lands lying in the rain shadow are sere and brown; the line of demarcation is sometimes as straight and sharp as a ruler's edge.

I flew to Viti Levu from San Francisco via Honolulu and Canton Island. The airport at Nandi is a stopover on the Australia-North America air route. As we came into the big field, I could see yellow-green rectangles of sugar cane growing around it, and at near-by Lautoka ships were loading crude brown sugar, the colony's chief export.

From Nandi I drove to Suva on a motor road that runs all the way round the island. During the 134-mile drive I was almost always within sight and sound of the sea. Offshore, the reefs traced a line of foaming white as the long Pacific swells burst against the coral. Beyond, the open sea was cobalt.

Coconut palms in their thousands leaned out to sea. Inland, the verdure-clothed hills rose, range after receding range, to the fantastic blue peaks of the central mountains.

Under the coco palms, grouped neatly round a close-cropped green, stood the reed-walled, palm-thatched houses of the Fijian villages. On the Singatoka coast grow all the best materials for housebuilding: reed, bamboo, palms, and tree ferns. The big timbers for posts come from the hills a short distance inland. The Fijians build some of the finest native houses in the Pacific, and the elaborate houses of the chiefs, standing on platforms of coral rock, are works of art (page 528).

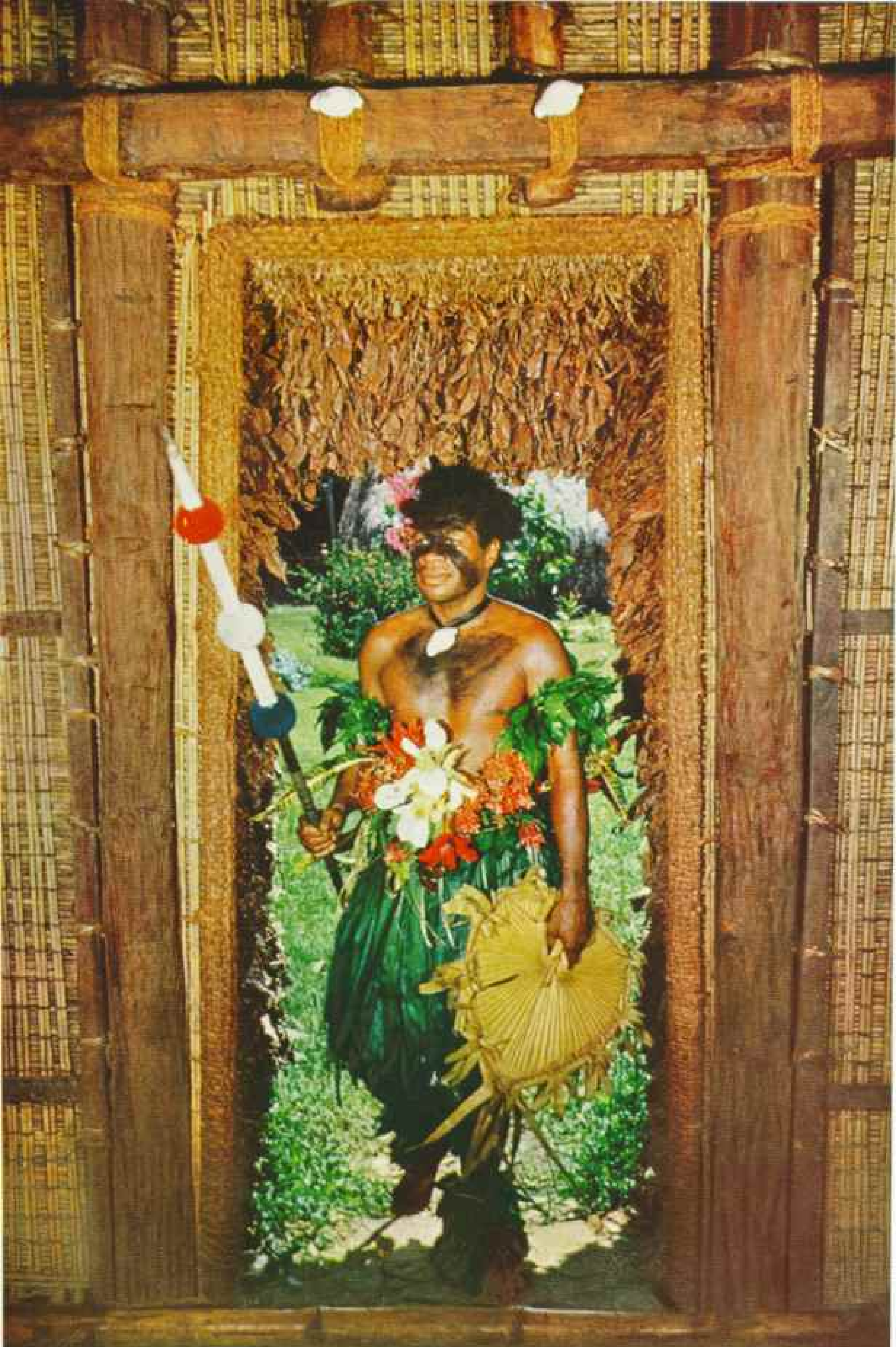
The Fijians are a handsome race whose superbly muscled men frequently stand six feet or more. They are Melanesians, with dark skins and frizzy upstanding hair, but they show a strong Polynesian strain, as Fiji stands on the dividing line between the black-skinned and brown-skinned Pacific.

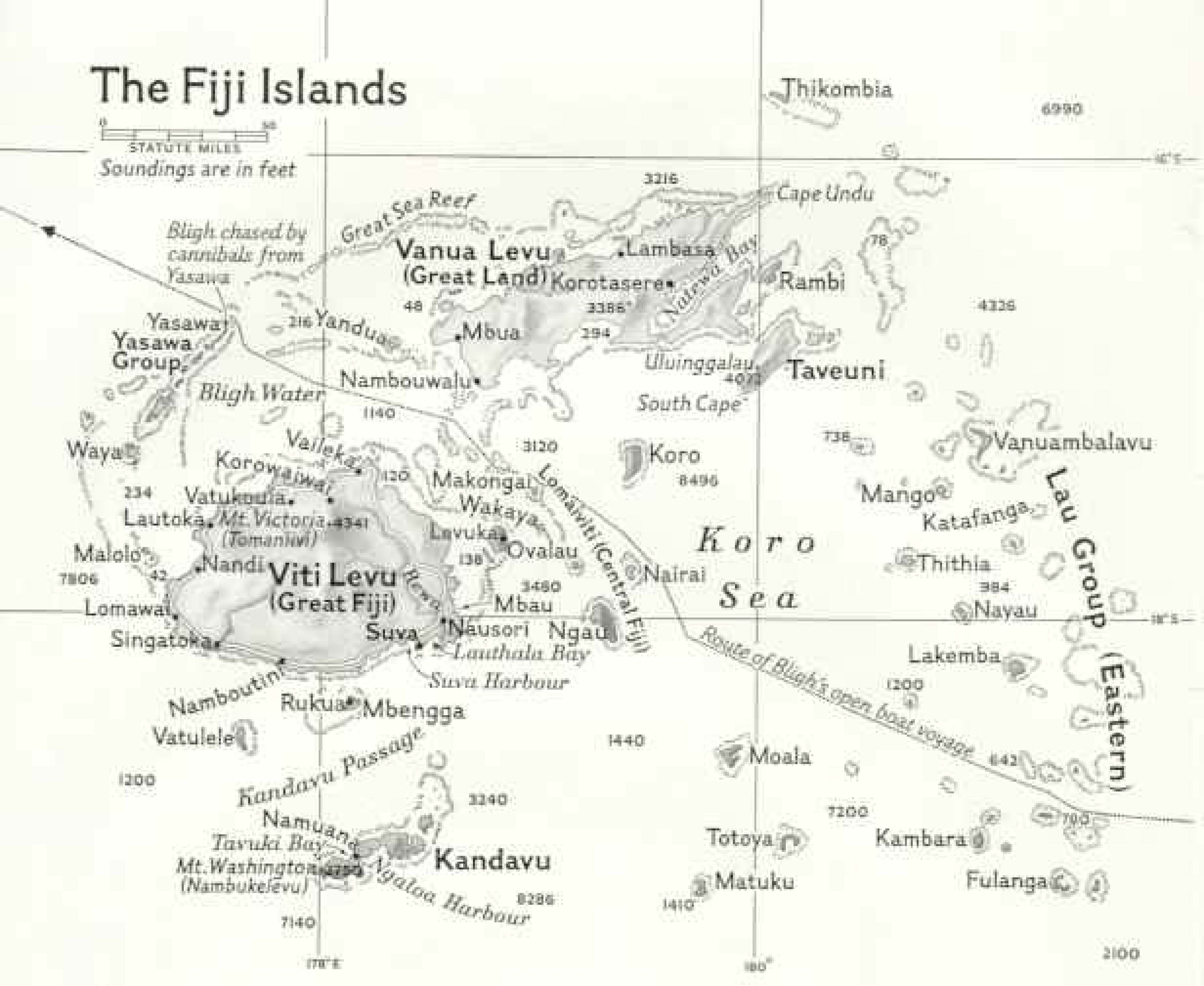
* For a vivid account of life among the descendants of the *Bounty* mutineers today on Pitcairn Island, see "I Found the Bones of the *Bounty*," by Luis Marden, author of this article, in the December, 1957, National Geographic Magazine.

† See "Copra-ship Voyage to Fiji's Outlying Islands," by Marjory C. Thomas, National Geographic Magazine, July, 1950.

Dressed for the Dance, a Chief Carries a Tufted Ironwood Spear

White cowrie shells above the door mark this as a chief's residence. A similar shell hangs from the man's neck. Croton leaves encircle his arms and waist. *Vesi*, an almost indestructible wood, forms the house timbers. Coconut-fiber cord binds the reed and palm-leaf walls.




The Fiji Islands
STATUTE MILES
Soundings are in feet
Thikombia
6990
3216
Cape Undu
Great Sea Reef
Bligh chased by cannibals from Yasawa
Vanua Levu (Great Land)
Lambasa
Korotasere
Natewa Bay
Rambi
78
48
3386
4326
Yasawa
Yasawa Group
216
Yandua
Mbua
294
Uluinggalau
4072
Taveuni
Nambouwalu
Bligh Water
South Cape
1140
738
Vanuambalavu
Waya
Vaileka
3120
Koro
Korowaiwai
120
Makongai
8496
Lomaiviti (Central Fiji)
Mango
Lau Group (Eastern)
234
Vatukoula
Wakaya
Katafanga
Lautoka
Mt. Victoria (Tomaniivi)
4341
Levuka
Koro Sea
Malolo
Ovalau
138
Thithia
7806
42
Nandi
Viti Levu (Great Fiji)
Rewa
Nairai
3460
384
Lomawai
Mbau
Nayau
Singatoka
Suva
Nausori
Ngau
Lauthala Bay
Lakemba
Suva Harbour
Route of Bligh's open boat voyage
1200
Namboutini
Rukua
Mbengga
Vatulele
1440
Moala
Kandavu Passage
1200
642
3240
7200
Namuana
Tavuki Bay
Totoya
Kambara
700
Mt. Washington (Nambukelevu)
Kandavu
Ngaloa Harbour
Matuku
Fulanga
8286
1410
7140
178° E
180°
2100
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Vatoa

"My intention is to Steer to the W.N.W. that I may see a Group of Islands called Fidgee if they lie in that direction. ..."

"We now observed two large Sailing Cannoes coming swiftly after us alongshore, and being apprehensive of their intentions we rowed with some Anxiety..."

from Bligh's Journal, 1789

The people I saw walking about the villages had the grace of big cats. Most of the women and some of the men still wore the combed-out, upstanding hairdress that has long been a symbol of Fiji (page 529). Masculine "big heads" are disappearing, however, because many men went into military service in the last war and cropped their hair in order to wear metal helmets.

The Fijians are very proud of their hair, and it is extremely bad manners to touch another person's head. To do so once meant almost certain death.

At one village I walked to a thatched house close beside the road. A resinous scent of palms and pandanus mingled with the salt smell of the sea. A woman sat on a pandanus mat before her house and combed her black hair with a long-toothed wooden comb, pushing it straight up from the head. When she finished, she thrust a blood-red hibiscus blossom in her hair and smiled at me.

"*Ni sa mbula*," she said. "How are you?"

I had been coached. "*Au sa mbula vinaka*," I replied. "I am well."

Suva, the capital, is built on a peninsula at the southeastern, or rainy, end of Viti Levu. This city of 37,000 extends along the waterfront facing Suva Harbour. Near it once stood a mound which gave the town its name: *suva*, a mound or landmark.

After Honolulu, Suva is the most important city in the Pacific islands. A center of trade and commerce, it straddles the air and sea lanes between Australia and the North American Continent. It is a pleasant place of wide-verandaed public buildings, tree-shaded promenades, and many flowers.

War Drum Now Calls Guests to Dinner

In Suva much of Somerset Maugham's Pacific lingers on. Shops and offices close at one o'clock for luncheon and siesta, clubs fill at sundown, and the tight social life of the European community follows a ritual pattern.

From the veranda of the Grand Pacific Hotel, on the waterfront facing Albert Park, I listened to the sounds of Empire—the crack of cricket bats and the mellow Westminster chimes of the clock on Government Buildings (page 537)—mingling with the boom of the *lali*, the hollow log drum or gong of Fiji. The drum that once beat the call to war and cannibal feasts now takes the place of the dinner gong at the hotel.

The Grand Pacific Hotel was built at the time of World War I and has a spacious air, with big, high-ceilinged rooms facing an inner glassed-over patio and opening onto a wide veranda. I used to sit on the seaward side in the evening and look across the smooth water between shore and reef. Fijian women stood waist deep, fishing with hook and line and catching little fish right around their feet.

It is a pleasant life, but, as everywhere else, there is change. More and more local people and New Zealanders and Australians, rather than Englishmen, hold positions in government; the Suva radio broadcasts commercials, and one no longer need leave two cards when signing the book at Government House.

As I sat on the hotel veranda with Jim Lahore, a Suva bank manager, he motioned with his glass toward the improbably shaped mountains, eroded volcanic plugs of old lava, that rose across the harbor.

"When you can see those mountains, it's going to rain," said Jim, "and when you can't see them, it's raining."

Rain Reaches 10 Feet a Year

It does rain in Suva, something like 10 feet a year, and the total has reached 19 feet. On two occasions while I was in Fiji four inches of rain were recorded in 24 hours. There is a trace of rain on two days out of three. But nearly always the sun reappears at the end of the day. Then come spectacular sunsets that paint Suva Harbour with hot orange and gold and wash the towering cumulus over the central mountains with glowing pink.

Downtown Suva is a mixture of races and tongues. Indian tailors and taxi drivers, Chinese shopkeepers and restaurateurs, Gilbertese and Solomon Islanders jostle the owner of the land, the tall and dignified Fijian, who seems to walk with unconcern through the babble of trade. Fijian policemen in dark tunics and magnificent heads of stiff hair direct the left-hand traffic.

More than half the population of Suva is Indian. The first Indians came as indentured labor in 1879. Large-scale immigration ceased in 1917, but by then nearly 63,000 Indians had come to the islands. The government offered to repatriate them, but quite naturally nearly two-thirds elected to remain.

This much of the South Sea legend is true: no one starves, and in the benign climate man needs a minimum of housing and clothing. The result was inevitable: the Indians, who came from an arid land overpopulated for

Fluttering Empire Banners Greet Fiji's Queen

Suva, capital of the Crown Colony, prepared for weeks to greet Britain's sovereign on her world tour in 1953-54. These Commonwealth flags stretch across Thompson Street.

Two chiefs wait to board the *Gothic*, the Queen's tour vessel. One carries a whale's tooth (opposite, above).

Ceremonial Whale's Tooth Welcomes Her Majesty

Since whaling days *tambuar*, stained and polished cachalot teeth, have been used as symbols of welcome in the islands. This fine specimen has been rubbed with coconut oil and smoked. Braided palm strips form the cords.

Queen Elizabeth, accompanied by Prince Philip, disembarks at Suva. In his plumed helmet, Sir Ronald Garvey, Governor of Fiji, greets Her Majesty. The Royal Standard flutters from the barge's bow.

As the Queen drove through the streets of Suva on her way to Government House, she met absolute silence from the Fijians, their mark of highest respect. Later, on the green before Government Buildings, she received the greetings of loyal Fijians from all parts of the archipelago.

Kodachromes by Hassell Walker and (above) by Luis Marden, National Geographic Staff © N.G.S.

centuries, throve in the rich islands of Fiji. Marrying early, producing ten or a dozen or more children, the Indians exceeded the Fijians in numbers shortly after World War II.

Today the Indians are mainly agriculturists, but a Suva banker told me they also transact 90 percent of all banking business in Fiji.

The Indians are used to scrambling for a living, something the Fijian has never needed to learn. It is not that the Fijian is lazy, but he is by heritage a landowner, who does not like to work for someone else. In a land where it has never been very hard to get plenty to eat, his approach to the problem is understandably casual.

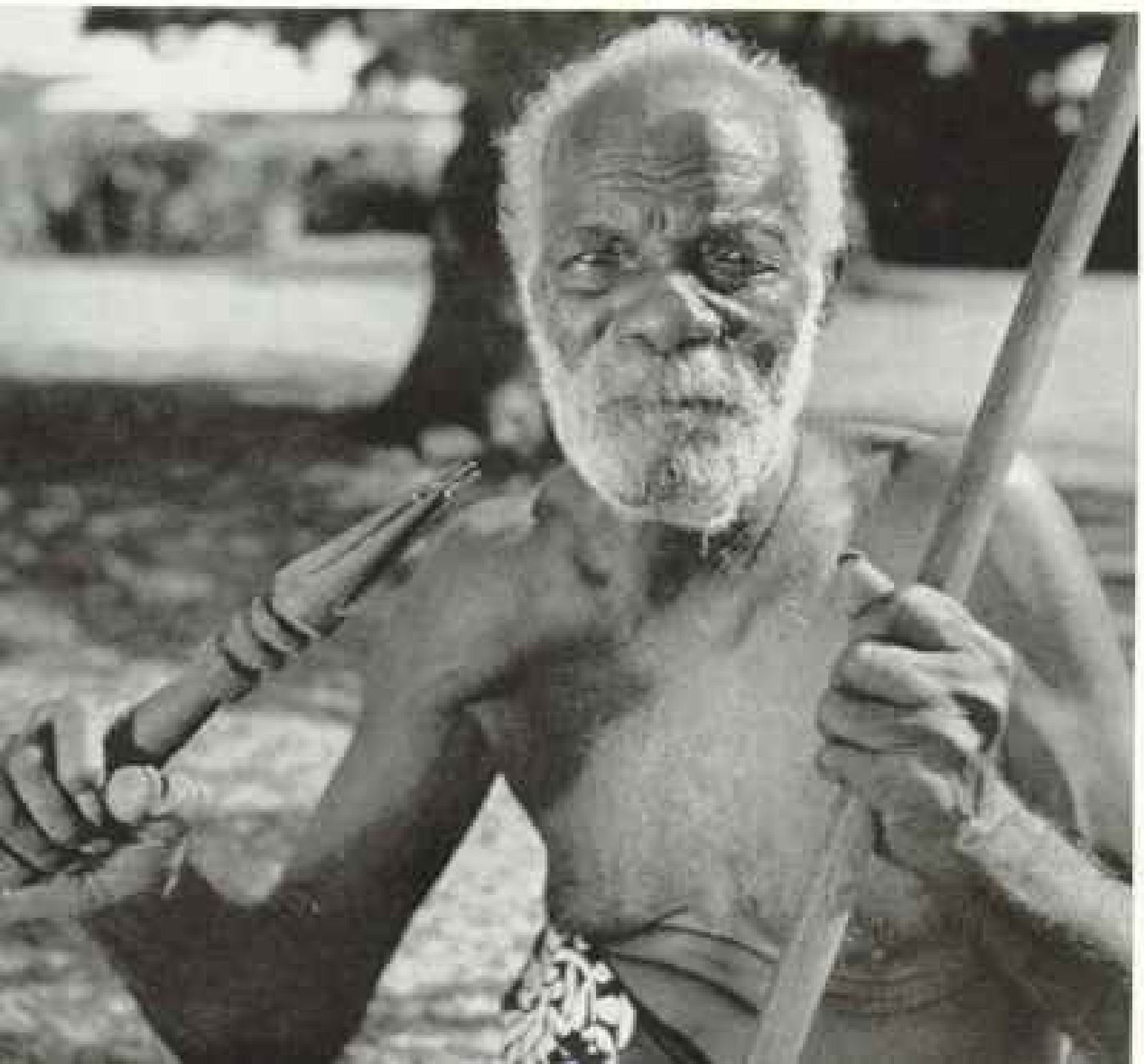
A Fijian, speaking to a European, expresses his philosophy this way:

"Why do you work? To make a lot of money so you can stop? Well, I've never started."

His Excellency Sir Ronald Garvey, K.C.M.G., K.C.V.O., M.B.E., Governor of Fiji, expressed the same idea to me a bit differently. Said the Governor:

"The Fijian believes that the man who made time made plenty of it."

The concept of getting and saving is completely foreign to the rural Fijian. His sense of possession is guided by *kerekere*, a system of share and share alike which demands that if anyone of one's own family or tribal group admires something, it must be given to him at once. While this may be laudable from a philosophical standpoint, it is unhap-



Last Cannibal Holds the Wooden Fork Used at Long-pig Banquets

Cannibals were the only known users of the fork in the pre-European Pacific. Fijians believed that eating human flesh with the fingers would make them ill. They ate prisoners taken in battle, or ambushed victims especially for a feast. British authorities put an end to the practice by the 1890's.

Sanaila, pictured at 96, told the author he and his sister had been captured as children at the siege of Korowairwai. Brought up as a minor chief of Mbau, he learned to eat and relish human flesh.

Bob Wright

Crack of Cricket Bat and Chimes in Suva Clock Tower Bring Sounds of England to Fiji

pily an attitude which ill equips one for survival in a modern world.

The Fijians were and are superlative craftsmen, skilled in canoe building, wood carving, and mat and pottery making. The Fiji Museum in Suva displays an extensive collection of their artifacts, as well as of the flora and fauna of the islands. There I talked to Curator R. A. Derrick, M.B.E., author of a history of Fiji and a brilliantly written geographical handbook on the islands. For years Fiji was known to the European world as the Cannibal Islands, and I asked Mr. Derrick about cannibalism.

"You should meet the Last Cannibal," he said. That afternoon a bent old man, who leaned on a stick and was naked except for a blue-and-white sulu around his waist, came to the museum (opposite). Sanaila, who has died since my visit, claimed to be 96 years old and to have been present at a famous siege of the fortified village of Korowaiwai, in 1873.

"During the fighting," said Sanaila, "my parents were killed, and my sister and I were taken as prisoners to Mbau. There a minor chief saw us weeping and said, 'Do not kill them. I will rear them as my own.'"

Old Chief Recalls Cannibal Feasts

Sanaila grew up a Mbau chieftain and took part in many cannibal feasts. After a fight the bodies, which Fijians called long pig (*vuaka mbalavu*), were cooked, either by boiling or by baking in underground ovens, and portions were sent round to each household.

"Usually we got our *mbokola* [human flesh] after a battle, but sometimes raiding parties went out just for meat. Then, a man cultivating his patch of taro or yams had to keep a sharp lookout for the *mbati-kandi*, the ant warriors, who might ambush him.

"I first tasted mbokola when I was a boy at

Breadfruit in Suva: Green Cannon Balls Taste Like Bread

Polynesians love breadfruit, but Fijians prefer yams and taro with their meals of fish and pork.

Lt. William Bligh, whom the Royal Navy sent to Tahiti to load breadfruit trees for transplanting to the West Indies, discovered most of the major Fiji Islands on his famous open-boat voyage in 1789 after a mutinous crew seized his ship, the *Bounty*, and set him and 18 others adrift. On his return to England, contemporaries dubbed him "Breadfruit Bligh."

Fijian parrot's showy plumage stands out against the dark green of deeply indented breadfruit leaves. Several species of parrots and parakeets inhabit the islands. This one is common on Kandavu.

Korowaiwai, but I thought it was pig. Later, at Mbau, I knew better. I learned to tell by the aroma when warriors were being cooked, because they always rubbed themselves with scented coconut oil before battle.

"What part did I like best? Oh, I don't know; when we took a town we clubbed everyone and they all went into the ovens together. We always used a special wooden fork to eat long pig, because we thought that otherwise it would be bitter or poisonous.

"We had special vegetables to cook with mbokola, too. One, *mboro ndina*, is a kind of small hot pepper. We wrapped *malawathi* leaves round the body before putting it in the oven."*

Britain Stamped Out Cannibalism

"I remember we had heaps of human bones on Mbau. Things are different now."

They are. The British Government, with strong help from missionaries, finally put down cannibalism in Fiji by the 1890's.

Wherever cannibalism was practiced, it was generally for one of two reasons: to acquire, by eating him, the prowess of a vanquished enemy; or, as was the case in Fiji, to subject an enemy, by eating him, to the ultimate defeat and humiliation. Even today the worst insult to a Fijian is to be called *kaisi mbokola*—low-class long pig.

The Fijians also ate long pig because they had little other meat. Before the coming of the Europeans, the largest mammal in the islands was the pig; there was no beef. As one Fijian chief said to a protesting missionary:

"It is all very well for you to remonstrate who have plenty of tinned corned beef, but we have no beef but men."

Missionary's Boots Too Tough

Modern Fijians do not, on the whole, like to be reminded of the old days. A taunt that infuriates a Fijian even today is *kana nai vāvā Misi Baker*—"eat the boots of Mr. Baker." In 1867 a missionary, the Reverend Thomas Baker, was killed and eaten. The wild hill people had never seen boots, and boiled Mr. Baker's for hours trying to make them tender.

I suspect it is the imputation of ignorance of the use of boots, rather than the accusation of cannibalism, that makes the hill people's descendants angry today. The coast people have always been more worldly and sophisticated than the "big heads" from the hills. Lowland Fijians use *kai tholo*, hillman, as a term of scorn roughly equivalent to "hayseed."

Across the peninsula from Suva proper, at Lauthala Bay, the Royal New Zealand Air Force maintains a flying boat base. I flew one day on patrol with the RNZAF in one of their big white Sunderlands. The four-engined aircraft headed northeast, across the delta of the Rewa, Fiji's largest river. Sugar cane fields checkered both banks of the broad stream, and around knolls I could see the circular outlines of moats that once defended long-vanished villages from attack.

We flew past the precipitous island of Ovalau where the town of Levuka, the old capital, clutches at the feet of mountains that run down into the sea (page 548). Our course lay northeast across the group of small islands known as Lomaiviti—Central Fiji—past Wakaya, where Count Felix von Luckner was captured in World War I; Makongai, site of a famous leprosarium, and Koro. All these islands have coral reefs that surround them with white breakers (page 546). Beyond lies Taveuni, a slipper-shaped island close to Vanua Levu.

Taveuni from the air looks like one big coconut plantation. Here are the biggest copra estates in Fiji, owned by European families.

Little Work to Growing Copra

Copra, the source of an oil used in cooking, cosmetics, and explosives, brings a good price at the moment, about $200 a ton in London, compared with as little as $12 in the 1930's.

I am a city boy, and copra growing is the only form of agriculture I have ever seen that appeals to me; it is so easy. First, you plant the coconut; or better still, you inherit a stand of trees. They begin to bear in five to seven years, reach their peak at 30, and still produce at 90 or 100. When ripe nuts fall to the ground, men crack them open and spread the pieces of meat to dry in the sun. When the stuff is dry, it's copra.

A few days later I took to the air again, this time in a Fiji Airways plane. We flew across the humped back of Viti Levu, from Suva northwest to Lautoka. The eastern slopes rose in stiff dark-green folds to meet the highlands which culminate in Tomaniivi (Mount Victoria), 4,341 feet.

These highlands were the domain of the kai tholos, the "big heads" of the hills. Old trails,

* Scientific names of these two plants, *Solanum anthropophagorum* and *Trophis anthropophagorum*, reflect their onetime grisly use; "anthropophagorum" means "of the eaters of human flesh."

Chanting Waders Carry Their Governor Ashore

When Sir Ronald Garvey made a viceregal visit to the island of Mbengga, he and his aide-de-camp left ship in the manner of old-time Fiji's highest chiefs. As the embowered platform proceeded landward, the bearers shouted defiance to possible enemies.

Viti II, the Governor's yacht, lies offshore.

Kava Makers Begin a Fijian Welcome

Men knead the ground root of a pepper plant in water. Called *yanggona* by Fijians, the brown, opaque liquid has an insipid taste. The drink numbs tongue and lips but does not intoxicate.

Advancing stiff-legged to rhythmic clapping of cupped hands, an islander presents the first shellful of yanggona.

***Ndalo*, a Fijian staple food,** lies stacked in Suva market. Called taro elsewhere, ndalo is a starchy tuber. Here a bearded Sikh policeman checks the permits of vendors. Turbaned Indians add color to Suva's polyglot population.

still visible from the air, ran from village to village along the crest of the ridges, so that travelers met face to face, with no opportunity for ambush.

In highland forests grow hardwoods used in shipbuilding, house construction, and cabinetmaking. At Vatukoula, near the north coast, rooftops and an open pit mark the site of gold workings discovered in 1932. The township, with some 5,000 inhabitants, is now the third largest in the colony.

From Lautoka I took passage to the Yasawa Group, a chain of volcanic islands that stretches to the northwest of Viti Levu. I sailed with a New Zealander named Trevor Withers, who makes weekly trips to these outlying islands.

The volcanic Yasawas thrust straight up out of the sea. From the northern end of the island of Yasawa came the two canoes that pursued Captain Bligh (map, page 532). One of the most bizarre masses of sheer rock rises above Yalombi village on Waya, where we anchored the first night. There we were welcomed next day with an old form of the kava ceremony.

Yanggona Acts Like Novocain

Fijians, like most Pacific islanders, love to drink kava. The drink, called *yanggona* in Fiji, is a mixture of the ground root of a pepper plant, *Piper methysticum*, and cold water. Yanggona contains no alcohol, but the flat-tasting brownish liquid partially anesthetizes the drinker's tongue and mouth, which feel as if they had been injected with Novocain. Copious drinking of yanggona seems to paralyze the legs. Yet in a hot climate it is refreshing, and in many offices and warehouses in Suva groups gather round the yanggona bowl frequently throughout the day. The ceremonial preparation of yanggona is the nucleus of Fijian social life.

When Withers and I went ashore, one of our Fijian crew went with us to act as our *mata-ni-vanua*—the "Eye of the Land," or official spokesman. As we approached the largest and finest *mbure*, the chief's house, our herald called out in a low voice. A muffled chorus answered from within.

Removing our shoes at the door, we walked between two lines of seated, silent men. At the far end we sat cross-legged on the floor, facing our hosts and a carved wooden bowl, nearly a yard across and standing on six legs. From the bowl a cord of plaited brown coconut fiber with a bunch of white cowrie shells at its end was unrolled toward us. In cannibal times it was certain death to cross between the cowries and the guest of honor.

The yanggona maker squatted behind the bowl, facing us. An assistant placed some ground root in the bowl, then added water from a section of bamboo. The maker kneaded the thin paste until the liquid became the color of milk and coffee. His assistant handed him a bundle of fibers made of hibiscus bark. With circular motions the maker swirled the fibers through the liquid, straining the milky fluid; then, squeezing the bundle dry, he tossed it over his shoulder to the assistant who shook out the strained particles.

The other men chanted in a deep bass, except for one blind old man who sang in falsetto. As they sang, they clapped cupped hands in hollow rhythm. The maker doubled the fiber hank, passed it slowly through the fluid, then twisted it dry and flung it away. The yanggona was ready.

The cupbearer, a man with a blackened face who wore a kirtle of grass and hibiscus, advanced to receive the yanggona in a *nbilo*, the polished half of a coconut shell. Holding the breast-shaped cup in both hands, he advanced to the chanting and handclapping of the company, crouching and extending first one leg and then the other, but never spilling a drop from the cup (page 541).

Handclap a Sign of Respect

With a handclap like a pistol shot, the chanting ended and the cupbearer, kneeling, handed the cup to Withers. Then he stepped back and clapped his cupped hands thrice in the Fijian sign of respect. While the assemblage watched closely, Withers tilted back his head and drained the cup. As he tossed down the shell, thirty voices cried out:

"*A-a-a matha-a-a!*"—"It is dry; it is finished!"

The next cup went to me, then another to our master of ceremonies; the one after that, to the local chief. When the chief had drunk, he tossed the cup down with a twisting motion, so that it spun on its pointed nipple.

The cupbearer then handed drinks to everyone, in order of rank. Each time he held out the cup in both hands. This is basic etiquette; whenever a Fijian handed me anything, he offered it in both hands, or at least touched a finger of the other hand to the article.

(Continued on page 551)

All Kodachromes by Luis Marden, National Geographic Staff © N.G.S.

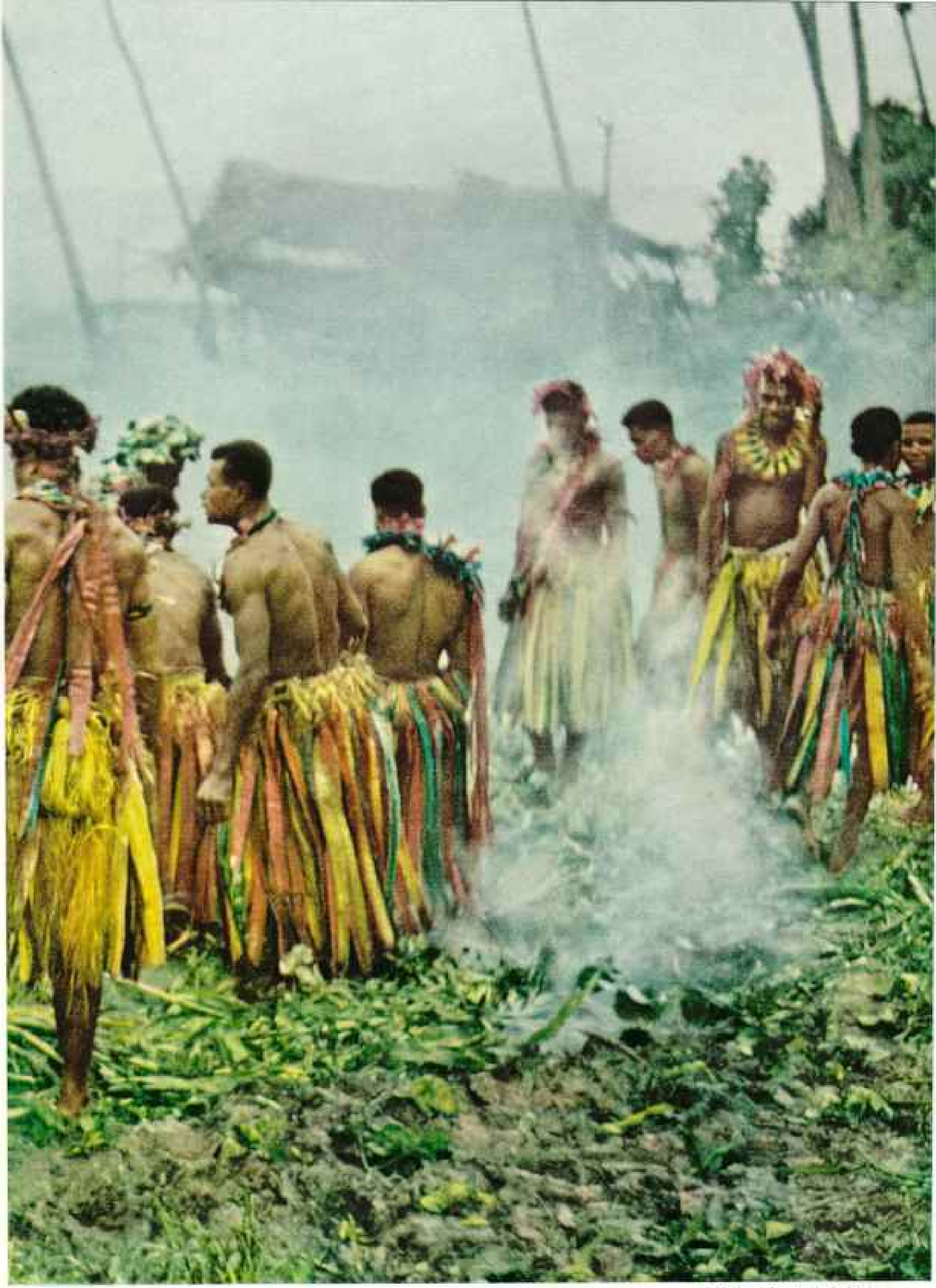
Mbengga Islanders Level Searing Rocks for a Fire-walking Ceremony

Logs (below) have burned all night, heating the boulders. Now men with long poles rake the smoldering embers from the pit and smooth the stones. In a moment the fire walkers will emerge in single file and slowly circle the fiery pavement (next page).

Fiji's Governor and his aide inspect the pit and hear a chief explain the ceremony.

Barefoot Believers in Their Own Magic
Cross Steaming Stones Unharmed

"Talking with a small devil," the brawny fire walkers remain secluded all night in a hut. Then, at a signal, they come out and walk across the pit of red-hot stones. Immediately their assistants throw damp



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leaves on the rocks. Hissing clouds of steam and the chants of performers heighten the eerie effect. Foreigners can detect no evidence of trickery; they can only guess at reasons why the Fijians never wince with pain or suffer blisters on their feet. One physician who examined the men before and after the ceremony attributed the phenomenon to self-hypnosis induced by deep faith.

Coral Reefs Trace Stony Arcs on the Wind-lashed Pacific

Rings of limestone, built up over the centuries by tiny coral polyps, form the distinguishing features of many islands in the Pacific. Some formations create barrier reefs fringing mountains of volcanic origin (opposite). Others enclose shallow lagoons with atolls of coral.

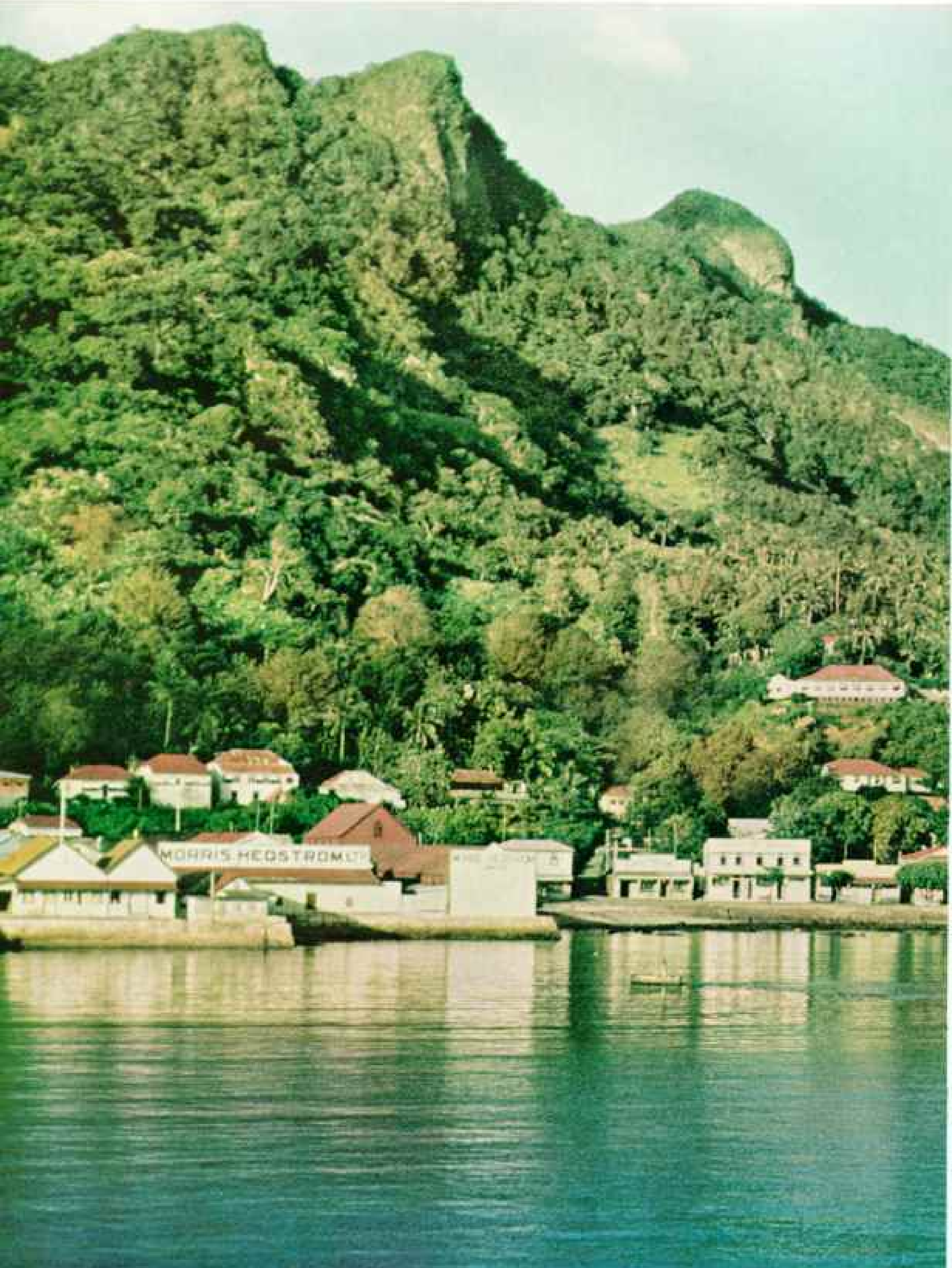
North Minerva Reef (above) is a true atoll, with only a single narrow passage to the sea breaking its nearly perfect circle (left).

Whitecaps dot Minerva's blue water off its outer edge, here all but awash. The lagoon's bright sands dip into quiet waters.

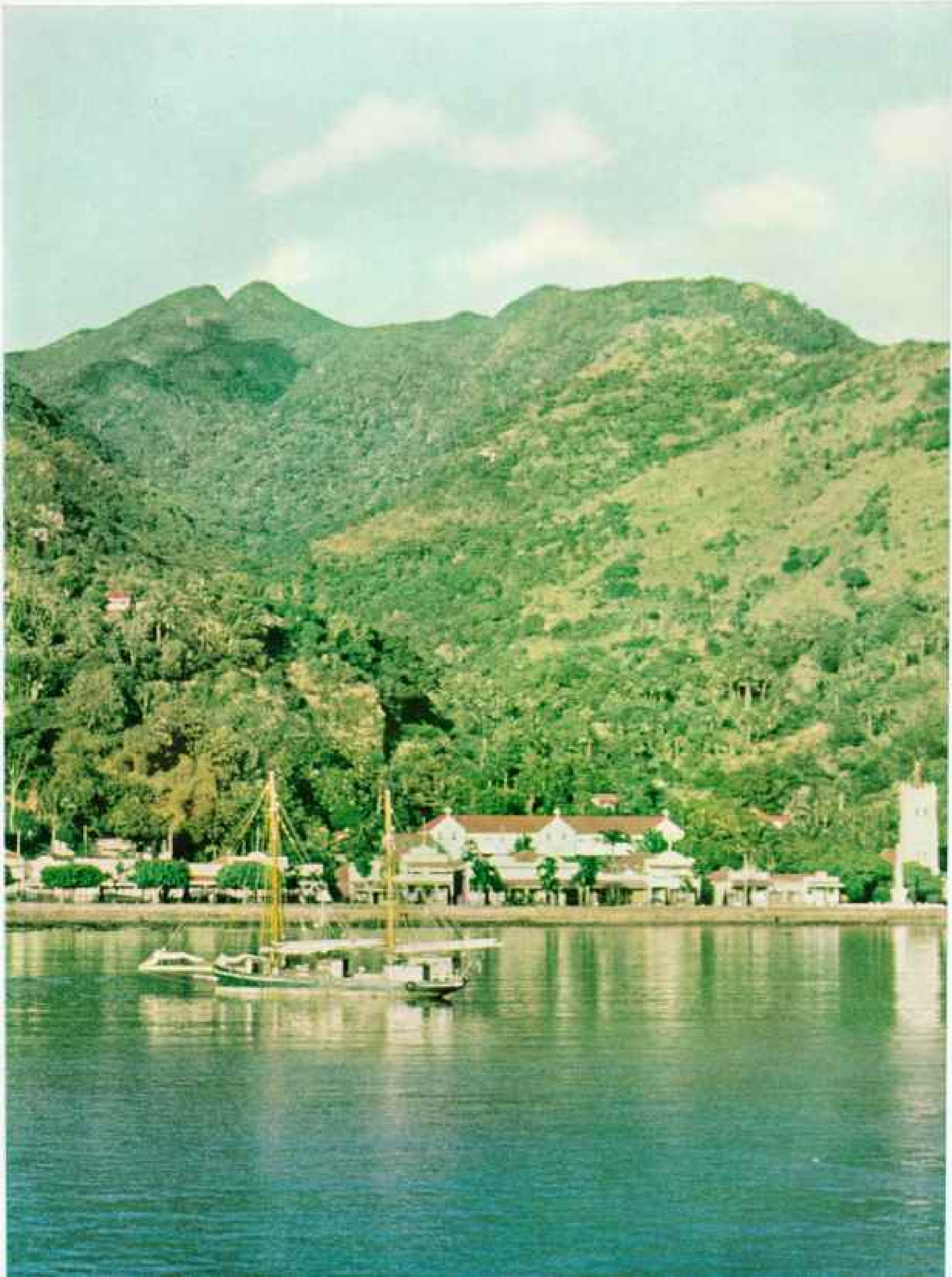
Barrier reef flings an uninterrupted curve around the windward side of Mbengga, home of the fire walkers.

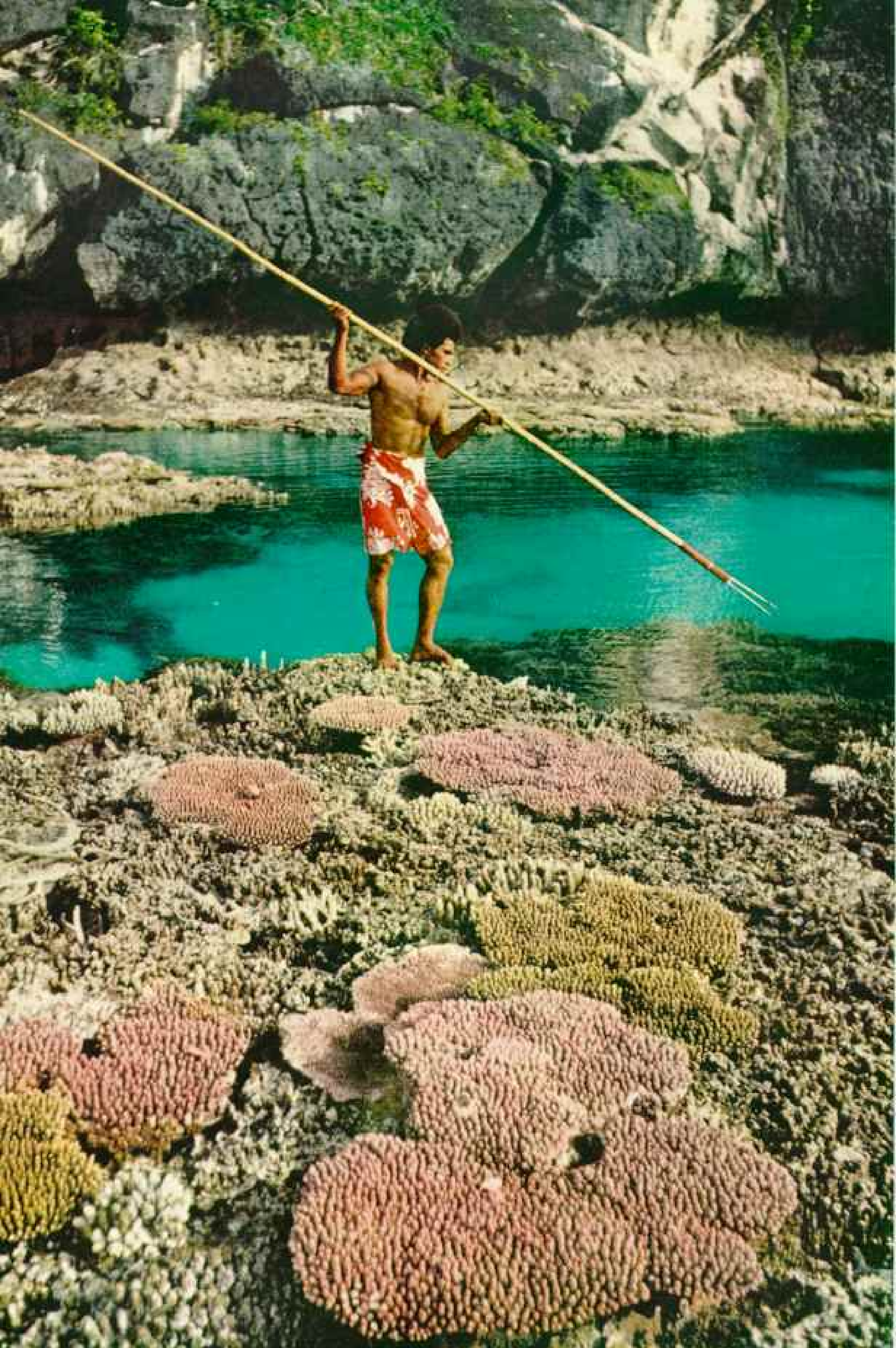
Green Hills Plunge into the Sea at Levuka, Fiji's Old Capital

A succession of chiefs, warring among themselves, originally controlled Fiji. Europeans picked Thakombau, the most powerful leader, as king. Other



chiefs did not agree, and Thakombau repeatedly asked Queen Victoria to take his islands under her protection. In 1874 he ceded Fiji to Britain. Because the crowding hills prevented expansion of Levuka, Europeans built a new capital at Suva. Levuka retains the sleepy charm of an earlier era.





From the Yasawas I returned to Suva to board a cutter leaving on a coasting voyage to the island of Kandavu, to load bananas.

We sailed past Ngaloa Harbour, where Australia-bound steamers stopped in the '70's to transship passengers and goods for New Zealand, round the western end of the island, and along the north coast to pass through the foaming reef at Tavuki Bay.

I went there to see the curious ceremony of turtle calling. Women of Namuana village mass on a headland at Tavuki Bay and, by chanting, call great turtles up out of the sea. We witnessed this strange rite in the company of the *roko*, or provincial chief. As we hove to off the headland, the women were clambering in single file up the steep path to the crest.

We went ashore and followed them, slipping in the wet clay of the trail. When we got to the top we sat on the hillside behind the 50-odd women who were seated astride two smooth boulders, looking out to sea (following page).

Chant Begs Turtles to Rise

Under a lowering sky the empty Pacific shone like steel. The women began an ancient chant of half-forgotten meaning:

> We, the women of Nambukelevu,
> Adorn ourselves with black ceremonial skirts,
> We assume an attitude of reverence,
> We paint ourselves with intricate markings,
> We disguise ourselves thus, Raunindalithe,
> That we may look upon you, O great one.

Raunindalithe was the turtle to whom the women sang. The sea glistened dully; not a mark appeared on the smooth surface. On and on the women droned.

Suddenly one of the women pointed downward, and all chanted with renewed vigor. I leaned over the precipice. Far below I could see a yellow-brown smudge under the surface; it grew larger, and then the mottled brown back of a big sea turtle emerged. The chant rose triumphantly as the turtle rocked on the sea, flippers outspread and head turned upward as if to listen. For half a minute the turtle floated quietly, then tilted downward and swam smoothly into the depths.

The women rested a moment and then began their chant again, using the same words, but calling this time on Tinandi Thambonga, the Mother of Turtles. Almost immediately a shieldlike shape broke the surface, and an enormous turtle, half again as big as Raunindalithe, floated on the water. The Mother of Turtles rested there nearly a minute, turning her head slowly from side to side, then slipped down into the sea. The women finished their chant with a drawn-out cry.

I was astounded at the seemingly magic power of these women, and asked the roko if these turtles were protected from fishermen.

"No," he said, "turtle fishermen regularly hunt them around here, and we never feed them. On the contrary, they feed us."

He said that the ceremony is performed infrequently, and pointed out that the village is some distance away, so that turtles cannot be accustomed to seeing people on the point. Yet the same two always seem to show themselves when called by name.

"Except," added the roko, "when the people of a certain village are here. They are professional turtle hunters. When they see one lying on the bottom, they wait until he is ready to come to the surface for a breath, then throw stones at him, so that he must dive immediately. They do this till the turtle is exhausted, then they swim to him and overpower him. No; Raunindalithe and Tinandi Thambonga do not show themselves to those people."

This seeming power of communication with animals occurs in several places in the Pacific. In Fiji certain islanders seem to possess the power to call up red prawns, eels, turtles, and even sharks. I offer no rational explanation for it; I can only describe what I saw in the case of the turtles.

The Red Duck Flies by Night

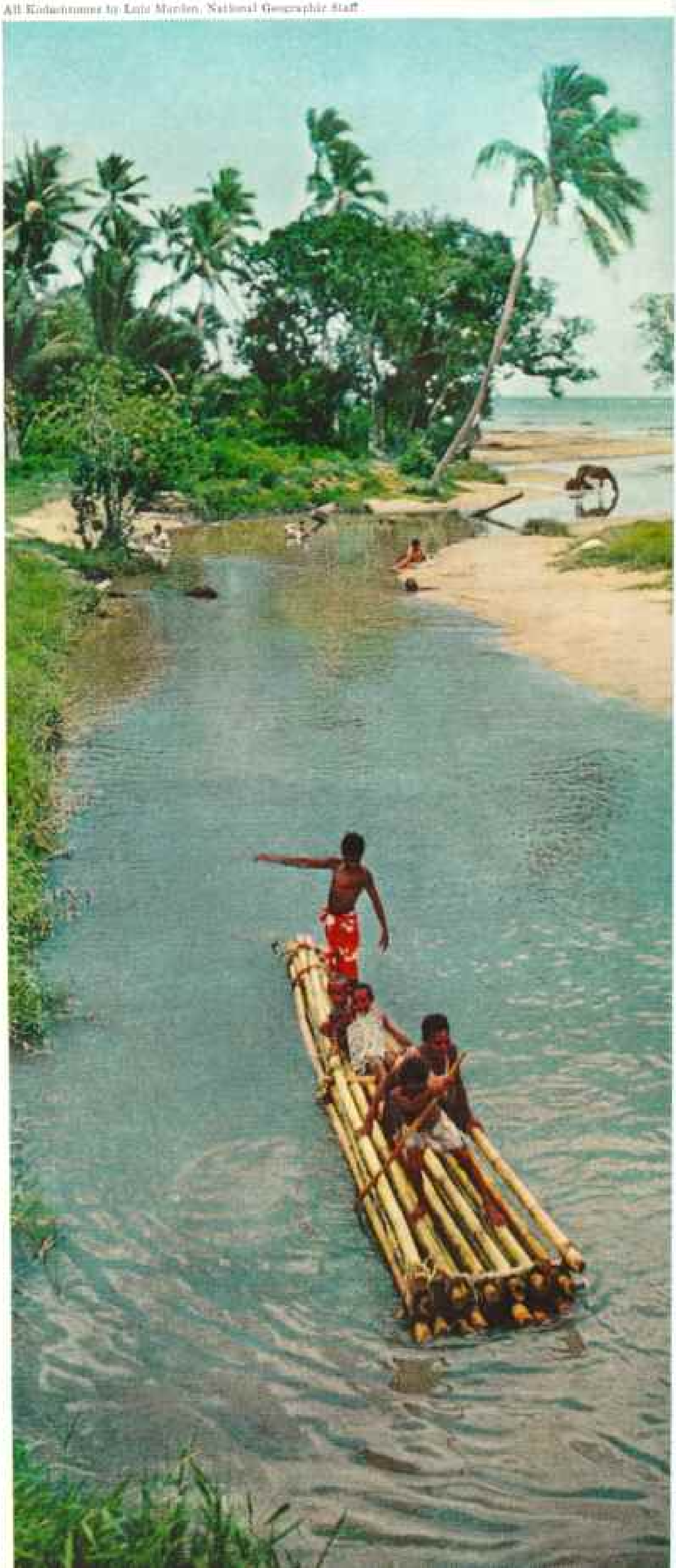
That evening we lay at anchor in Tavuki Bay. A long line of flying foxes, silhouetted against the afterglow, flapped like pterodactyls toward some nocturnal feast of fruit.

At midnight we weighed anchor and stood up Kandavu Passage for the main island and Suva. In the blaze of southern stars overhead the five bright stars of the Southern Cross wheeled through the diamond dust of the

Motionless as a Statue, a Spear Fisherman Stands on Living Coral

Rising from a reef off the island of Kambara, the coral heads house live polyps. These sea creatures withstand the sun's glare during the short intervals of unusually low tides. Fijian spearmen are astonishingly accurate even at long range.

All Kodachromes by Luis Marden, National Geographic Staff



Singing Women Call Turtles from Pacific Depths

Sitting high above the sea, residents of the village of Namuana, on Kandavu, entreat turtles to emerge from the depths. The author saw two answer the summons.

Only certain Fijians possess this mysterious rapport with sea creatures. Their secret is their own; white men cannot fathom it.

Mother of Turtles, called Tinandi Thamboriga, rocks gently on the surface, as if listening to the woman's chants.

Boys balance precariously on their bamboo raft in a stream on Viti Levu. Islanders float goods from mountains to coast with rafts.

Milky Way. To the Fijians these stars do not form a cross; they are *Ngā Ndamu*—the Red Duck.

On the steamer *Ai Sokula*, I left Suva some time later to go to Ovalau. Ovalau lies close to the east coast of Viti Levu, and vessels sailing from Suva at midnight reach the port of Levuka in the early morning (page 548).

In the 1860's there was a cotton boom in Fiji, and many new settlers came to join the traders who lived in Levuka. Because European laws were inoperative in Fiji, Levuka became a haven for fleeing debtors and escaped convicts, and by 1870, the peak of the cotton boom, it was a roaring, wide-open town.

Today white range markers on a hillside show the passage through the reef, but in the old days navigators said they could find their way into the passage by the bobbing line of gin and rum bottles floating out.

The law-abiding white element in Fiji wanted a strong government, and supported Thakombau, paramount chief of Mbau, who in 1871 was proclaimed King of Fiji.

Fijis Once Offered to United States

The new kingdom had a short life. Rival chiefs would not acknowledge Thakombau as sovereign. Thakombau, seeing his realm about to fall apart, asked Britain to annex Fiji—repeating an offer he had first made as far back as 1858. He had also offered Fiji to the United States, but received no reply.

Queen Victoria's Government accepted, and on October 10, 1874, Fiji was formally ceded to Great Britain at Nasova, near Levuka.

Shady citizens fled, and gradually tranquility descended on the little port. As the population grew, it became evident that mountain-hemmed Levuka would not do as a capital; so government moved to Suva in 1882. Levuka remains a copra port.

In the Ovalau Club one night I saw a memento of World War I: a framed letter of Count Felix von Luckner, the German sea raider who sank $25,000,000 worth of shipping without taking a single life.

In the summer of 1917 Luckner took his sailing ship *Seeadler* to Mopelia atoll in the Society Islands, to replenish stores and refresh his crew. A tidal wave ran the ship ashore and wrecked her. Luckner rigged and provisioned one of the *Seeadler's* boats and with five other men sailed to the Cook Islands, and thence to Katafanga in the Fijis.

Katafanga belonged to a Mr. T. O. U. Stockwell, who was absent. Luckner and his men remained ashore five days, eating bananas and other fruits to cure their scurvy, then sailed for the main islands of the Fijis, leaving for Stockwell a note signed with a pseudonym:

"Dear Sir!

We are very sorry that we have not mett you here although we had a good time on your island. I and my man sleept in your house. We had a good rest and are now quite fit to proceed on our sporting trip. The wonderful stroll around your little island we shall never fooget. Perhaps we shall call at your island again and hope to meet you the next time. All the things we took is paid for. A turkey 10 sh[illings]. Bananas 2 sh[illings]. I and my man are thankful to you and your good Maciu [Matthew].

With best regards

Yours truly,

M. Pemberton"

Luckner landed at Wakaya, near Ovalau, where he was spotted and captured.

Pearls and pearl shell have always been associated with the South Pacific. I had never seen a pearl oyster alive until I dived one day along the Ovalau reef. The seaward face of the reef that drops sharply into deep water is embayed with fissures and canyons.

I swam along the edge of the reef with some Fijian girls, who wore diving goggles made of glass set in cups carved of cow's horn. Clouds of blue and silver fish flitted up and down the face of the reef. Wary green parrot fish nibbled at rose and lettuce-green coral, and troops of flat-bodied jacks patrolled the luminous blue depths.

A Pearl Oyster—but No Pearl

Clinging to the base of a coral tree I saw a thin disk-shaped shell. I dived for it, swam over the reef, and opened it with my knife. The halves fell open and revealed the bright-orange oyster on its bed of mother-of-pearl.

The dark-skinned girls grinned and said:

"*Thiva, thiva.*" A pearl oyster.

But there was no pearl. Indeed, thousands of shells must be opened to find one pearl. Compared with the value of the shell, which is used chiefly to make buttons, the pearls are negligible in commerce—unless, of course, an especially fine one turns up, such as the smoky-gray domed pearl, big as a sixpence, that was presented to Queen Elizabeth when she visited the islands in 1953.

No One May Harm Vatulele's Long-whiskered Prawns—Taboo!

Possibly because of their bright color, these salt-water crustaceans are held sacred. A paramount chief raised the taboo long enough for pictures to be taken. The goggled diver caught four prawns (below) in the pool, then freed them.

Most people call pearl oysters inedible, but in Fiji they are sometimes eaten. One day a lady on Ovalau, whose cook made a pearl oyster curry, bit something hard and found a round black pearl, more than a quarter of an inch in diameter. Unfortunately, the cooking had left it dull and lusterless.

Collectors of sea shells find a rich hunting ground in Fiji. The exposed flats and the submerged reefs hold many species of cowries, cone shells, sea snails, and tridacna, giant clams. Though it is the commonest, the spotted cowrie, dotted with rich brown, was the most beautiful to my unsophisticated eye.

The white cowrie, not a true cowrie but a related species, looks like a pure white porcelain egg. It is a symbol of chiefdom; two or more are always fastened to the lintel of a chiefly house (page 531).

Fiji's most celebrated sea shell is the very rare golden cowrie, one of the world's most sought-after shells.

During many weeks I saw a lot of the Fiji Islands, journeying by airplane, road, cutter, and canoe. On Natewa Bay, the gulf of the sea that bites deeply into Vanua Levu, I saw the most spectacular of the Fiji dances—a spear *meke* at Korotasere (page 528). The chief was named Inoke Thaundremalua—Lightning Comes Slowly—and he lived in the most splendid beehive-shaped house I had seen.

Korotasere is an unspoiled Fijian village, far from any road, with beautifully made houses round four sides of a broad green. In its school I heard a little boy recite in English. In a singsong voice he gave a good picture of community life.

"Get up and have tea; then some go out and weed; some go for firewood; some go to plant; then we have lunch and rest. Then go for swim; women go fish. . . ."

At that point a booming lali signaled the end of the class, and the child ran off.

Another time, in a plunging motor launch bucking the southeast trade winds that blow from April to November, we bore away to the Lau Group, the Eastern Islands of Fiji that lie out in the Pacific halfway to Tonga.

At Kambara I watched craftsmen carve wooden kava bowls from hard yellow-red *vesi* wood, using only an ax and an adz. Deep in the island forest six men hollowed a 40-foot vesi trunk to make an outrigger canoe.

So prized was the timber of Lau that, long before the coming of the Europeans, Tongans made the long westward journey from their islands to Lau to build their canoes. It was easy sailing on the trades from Tonga to Fiji, but it might be months before the wind blew fair for the return. The big canoes took as long as seven years to build. So the colony of Tongans grew in Lau, and their influence was reflected in the shape of the houses and the language.

Fiji Canoes, Fastest Sailers in the Pacific

Mbengga Men Walk on Fiery Stones

Of all the ceremonies I witnessed in Fiji, the most curious was fire walking, as performed on Mbengga, a steep volcanic island that lies just off the coast of Viti Levu (page 547). I accompanied the Governor of Fiji, Sir Ronald Garvey, on a visit to Mbengga.

The Governor's yacht, the *Viti II*, anchored off Rukua village inside the reef. Solid sheets of rain nearly obscured the hillside that rose behind the clustering houses. A billow of blue-gray smoke hung over the fire pit prepared for the ceremony.

A canoe put off from the shore almost as soon as our hook was down. Sir Ronald waited in white full-dress uniform, seated in a chair on the afterdeck. Beside him squatted his Eye of the Land. Crouching respectfully,

Bob Wright

Can Do 15 Knots. Bows Become Sterns When Boatmen Reverse Sails to Change Direction

the silent delegation came aboard and sat crosslegged before His Excellency.

The brown skin of the men glistened with scented coconut oil. They wore skirts made of dyed grass and strips of hibiscus fiber, and garlands of flowers round their necks.

Kneeling before the Governor, the spokesman produced a *tambúa*, a ceremonial object of respect made of the polished tooth of the cachalot, or sperm whale, attached to a plaited cord. The spokesman held up the tooth and made a speech of presentation, expressing the welcome and loyalty of the people of Mbengga.

Sir Ronald took the tooth in both hands, then passed it to his master of ceremonies, who clapped his cupped hands and made an eloquent speech wishing prosperity to the people of Mbengga. He finished by crying, in unison with the other Fijian crewmen:

"*Mana, e-e-e ndina!*": "So be it indeed!"

The old *vaka-Viti*—true Fiji—ceremony had been complied with; His Excellency was now officially welcome and might go ashore. The custom dates from the old times when a visiting chief anchored off a strange island or village, but did not lower his sail or attempt to go ashore until assured of his welcome.

The whale's tooth has been used ceremonially in Fiji for more than 150 years, since the first whaling ships touched at these islands. Only the teeth of the sperm whale will do for the making of a tambua. In preparation, the tooth is stained with turmeric or smoked to a deep yellow color, then polished with coconut oil (page 535).

Soldiers Cause Whale-tooth Shortage

Tambuas have no official monetary value, but Chinese merchants take them in pawn for about five Fijian pounds ($13).

During World War II, so many soldiers who passed through Fiji took away tambuas as souvenirs that there was a critical shortage of these teeth, especially for the elaborate ceremonies attendant on the visit of Queen Elizabeth in 1953. How to replenish the depleted whale's-tooth treasury? A Fiji Government official inquired in New Zealand about the availability of whale's teeth. He got very few, because most New Zealand whales are toothless. But the publicity went round the world.

Stamping Men and Women of Mbengga Surround a Milling School of Fish

This drive began with two lines of people stretching from the shallows to the reef in background. Advancing toward each other, the two parties splashed

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the water, shouted frightening cries, and pounded the bottom with long poles. When the lines met, the islanders closed ranks and converged on a submerged purse net, chasing the darting fish before them. Spearmen waiting on canoes impaled most of those that escaped between the legs of the fishermen.

A Norwegian shipping firm donated several cases of cachalot teeth. A Scottish whaling firm sold the Fijians 1,200 pounds of them. Many of these new teeth were placed in circulation, but the Fijian administration still maintains a sizable whale's-tooth bank.

To save the cachalot Fort Knox from depletion, a law prohibits the export of tambuas from the colony without special permission of the Governor. Visitors leaving Fiji are a bit surprised when the customs inspectors ask: "Have you any whale's teeth?"

Tribesmen Bear Governor to Shore

As suddenly as the rains had come to Mbengga, they stopped, and the hot sun shone out of a blue sky. The Governor embarked in his launch with his aide-de-camp and started for shore.

From the beach a green bower detached itself and started slowly out to sea. The embowered platform, carried on the shoulders of men, came out as far as depth would permit. When His Excellency and his aide had seated themselves on it, the men raised their voices in a shout and started toward shore (page 540).

As the platform was borne landward, the brightly dressed warriors shouted a chant of defiance to their Great Chief's enemies, whoever they might be.

Rai tu mai, rai tu mai!
Koi au na viriviri kemu mbai.
Tomba, tomba kandi, i, a, e!
Tomba, kana kandi ni vanua tani!

Which is to say: Look at me, I am the defending bulwark round your person! I shall vanquish and eat the warriors of enemy lands!

Ashore, His Excellency was received by the district chief, and the party moved to a thatched shelter at one edge of the village green. Here the full welcoming ceremonies took place.

The fire pit at the village's edge had burned for hours. The great logs were reduced to glowing embers, and the air above them shimmered with heat. The pit, about 15 feet across and 5 feet deep, was filled with stones the size of a man's head. Hardwood logs had been piled on top and left to burn for 24 hours. Now the pit was ready (page 543).

The rain had started again, and the heavy drops hissed as they splashed on the embers. From time to time stones burst with reports like cannon shots. The men of the *mataanggali*, or family group who are the sole performers of this old rite, cleared away the smoldering wood by raking it off the stones with stout long lianas.

At last the grayish-white stones stood bare. The deep-toned chants ended abruptly and utter silence fell, broken only by the hiss of the steadily falling rain.

The men who would walk on the fiercely hot stones waited in a small hut, concealed from all eyes, conferring, the roko said, with "a small devil," who was invisible but apparently articulate.

Four is a magic number to the Fijians, as seven is to European peoples. No fire walker may consort with women for four days before the ceremony; he may not participate at all if his wife is pregnant, or if there is a dispute in his family group. If any of the prohibitions are ignored, the walker will inevitably be burned, said the roko.

"In 1950, one man's feet were badly burned. Afterward, his wife was found to be pregnant."

Suddenly the fire walkers appeared, 12 men walking silently and quickly in single file. Neither slowing their pace nor hurrying, they walked out upon the hot stones. They made a complete circuit of the pit, then walked out on the sodden ground again. Assistants tossed bundles of green leaves on the hot stones, then everyone massed in the fire pit, at first standing, then sitting and chanting amid the rising steam (page 544). The Mbengga fire-walking ceremony was over.

Many observers through the years have witnessed this unusual custom with critical eyes. All have come away convinced that there is no trickery involved, and that, like the turtle and shark calling, fire walking is another Fijian mystery that cannot be explained by European science.

Physicians Failed to Agree

In 1935 the rite was performed before two members of the British Medical Association. The eminent doctors examined the men carefully before and after the ceremony. They found that the soles of the men's feet, though toughened from walking barefoot all their life, were not abnormally thickened, nor were they smeared with any unguent or protective coating. The men responded normally to pain stimuli when pricked on the soles with pins or touched with lighted cigarettes. Yet they walked unharmed on stones hot enough to ignite paper and sticks instantly.

One physician thought that by repeated

practice, the men had become inured to the heat, and could therefore endure temperatures that would be intolerable to untrained persons. The other was of the opinion that the men could perform this rite by reason of autosuggestion, or suggestion of their chief or leader —a kind of hypnosis that would seal them off from any feeling of pain. The men of Mbengga, not knowing of these learned disputations, unconcernedly carry on the strange custom of their ancestors.

Half a mile off the coast of Viti Levu lies a small islet. Mbau is only a little more than 20 acres in extent, and one can reach it from the main island by wading at low tide. Yet this was once the home of the most feared fighters in a nation of fighting men.

Mbau was the stronghold of Ratu Thakombau, the Vunivalu, or Root of War, who by 1860 had extended his power over most of Fiji and made himself the most powerful chief in the islands.

Victorious war parties were constantly coming and going, and Mbau saw more cannibal feasts than any other part of Fiji. More than 200 victims were served up at one banquet. Some accounts say the long-pig ovens never were cold on Mbau. In 1840 one chronicler found it worthy of record in October that he "did not know of a single person eaten in the Mbau district since the previous March."

Today nearly all of Thakombau's people have become Methodists, and the lali calls to church meetings and not to war. The stone against which war prisoners' brains were dashed out has become the baptismal font in the big white church.

When Thakombau ceded his country to Great Britain in 1874, he sent Queen Victoria his favorite war club and an eloquent pledge of fealty:

"The King gives Her Majesty his old and favourite war-club, the former, and, until lately, the only known law of Fiji. In abandoning club law, and adopting the forms and principles of civilized societies, he laid by his old weapon and covered it with the emblems of peace.

"... With this emblem of the past he sends his love to Her Majesty, saying that he fully confides in her and her children, who, succeeding her, shall become Kings of Fiji, to exercise a watchful control over the welfare of his children and people, who, having survived the barbaric law and age, are now submitting themselves, under Her Majesty's rule, to civilization."

Ancient Law of Fiji: the War Club

Once wielded in battle by King Thakombau of Fiji, the heavy silver-ornamented club now serves as the mace of the colony's Legislative Council. This policeman stands beneath Fiji's coat of arms, which bears the motto *Rerevaka na Kalou ka doka na Tui* —Fear God and Honor the King.

Vevey, a town famous for wine, stages a gay celebration honoring the vinegrowers who have brought it prosperity

SWITZERLAND'S

Once-in-a-Generation Festival

By JEAN AND FRANC SHOR, National Geographic Magazine Staff

With Photographs by the Authors

THE harvest festival is as old as the art of cultivation. From the Panathenaea of ancient Greece, through the Pilgrim Fathers' Thanksgiving, down to the present-day county fair, man has celebrated the bounty of nature. But few people of any country or any era have done it as thoroughly as the townsfolk of Vevey, in the Swiss Canton of Vaud.

During at least 95 years of every century, Vevey is a charming little town of 15,000, nestling beside the Lake of Geneva beneath steep hills covered with some of Switzerland's finest vineyards. Tourists throng its narrow streets in summer; in winter it offers skiing and tobogganing.

Growers Crowned with Gilded Leaves

During those 95 years Vevey lives for—and by—its tourists and its wine trade. But it is the other years that highlight its existence. For four or five times in every century the Confrérie des Vignerons—an association devoted to the improvement and exploitation of the vines of Vaud—stages a festival that is remarkable even for fete-loving Switzerland.

The Fête des Vignerons is not produced as a tourist attraction. It has become one, it is true, but simply because of its beauty and the magnificence of its setting. Its primary purpose is to honor those *vignerons* (vinegrowers) whose skill has produced grapes that have enhanced the reputation of Vaud.

The central feature of each performance is still the crowning of these men with wreaths of gilded vine leaves. But the people of the whole Canton, and particularly of Vevey, have adopted the festival as part of their community life, and their enthusiasm has created a glittering display of showmanship that thrills thousands of visitors from all over the world.

Jean and I first heard of the fete early in 1955 in a letter from M. Ernest Maurer of Vevey, a long-time member of the National Geographic Society. The Confrérie had scheduled a production for that summer, he wrote, and The Society was invited to send a representative.

I replied that we were planning to visit Switzerland soon to prepare an article on the whole of the country.* We would, I assured him, look in on the vinegrowers festival, and I added that we planned to visit as many such fetes as possible during our stay.

M. Maurer's polite reply was typical of the attitude of the Vaudois toward their great event. We shouldn't come with the idea, he carefully explained, that we were going to see "just another local affair in fancy dress." The fete was Canton-wide, celebrating an important part of Swiss life; it was worthy of separate treatment.

And when we reached Vevey, we found that he was right.

Flags and Grapes Adorn Streets

Vevey's streets were bright with banners and bunting, flags draped the lampposts, and great bunches of papier-mâché grapes festooned trees and building fronts. A stadium seating 15,000 had been erected on the market place (page 563).

Everywhere was displayed a seal of the Confrérie with its motto *Ora et Labora*—Pray and Work. The streets were crowded with Swiss hurrying to and from rehearsals in colorful costumes, many of which were

* See "Surprising Switzerland," by Jean and Franc Shor, NATIONAL GEOGRAPHIC MAGAZINE, October, 1956.

Drums Roll as Swiss Guards Assemble Below Terraced Vineyards of Vevey

The town hugs the shore of Lac Léman (Lake of Geneva) in the Canton of Vaud. Tiers of vines climbing its slopes produce wines that rank among Switzerland's best. Four or five times a century the townsfolk stage a spectacular two-week festival in honor of the vintagers. These resplendent drummers in scarlet suits and plumed hats will lead a parade through town.

Gilded leaves wreathe a prize-winning vine-grower's lofty straw hat. Golden grapes trim his pruning hook, and medals decorate his lapel.

Thousands Jam a Lakeside Arena to Enjoy the Spectacle's Dazzling Finale

Nearly 4,000 dancers, singers, and actors, including featured performers from all parts of Europe, take part in Vevey's August pageant. The three-hour show, staged by the managing director of the Paris Opera, extols the cultivation of the grape during the four seasons. Here, in the final act, autumn holds the stage.

Bacchus, god of wine, sits on the center throne atop the staircase, flanked by the goddesses of flocks and agriculture. Their breeze-swept banners flutter above the stage, and their attendants line the steps.

Autumnal revelers whirl in the center of the oval as dance groups of the other seasons perform around them. Marchers carry flags of vine-growing communes around the outer ramp; orchestra and chorus jam the crescent-shaped pit.

The amphitheater, erected especially for the festival, fills Vevey's main square. Behind it, clouds across the Lake of Geneva veil the mountains of Switzerland and France. The excursion steamer sails for Geneva.

Illustrations by Jean and Franc Shor, National Geographic Staff. © N.G.S.

copied from typical Vaudois dress of a century ago (page 569).

"Nearly 4,000 people from this area will take part in the production," M. Maurer told us. "Maurice Lehmann, managing director of the Paris Opera, is designing the pageant, and we have hired featured singers and dancers from all over Europe. But the great bulk of the performers are local people who give their time for nothing.

"More than that, they spend a lot of their own money on costumes. The festival committee pays half the cost of each outfit—but not more than $25. But a lot of people have spent $100 or more to make sure they have something really beautiful. If admissions produce a surplus, they'll get the balance back later. But the risk is all theirs."

Festival Shows a Profit

I asked M. Maurer how the production was financed. It was, he told me, a community enterprise. Almost everyone in Vaud had put a hand in his own pocket to guarantee a successful spectacle.

"The Confrérie des Vignerons put up its own treasury of $100,000 to start the ball rolling," he explained. "Then business firms, local and cantonal government bodies, and private individuals guaranteed another $300,000. Local banks advanced the rest."

The production cost more than $1,000,000, we learned later from M. Philippe Dénéréaz, secretary of the fete's central committee. Happily, nearly 150,000 people paid to see the 11 performances, and about 500,000 bought tickets to the three parades.

Gross receipts approached $1,500,000, everyone got back the full cost of his costume, and the Confrérie was left with a profit of $300,000. It used part of this for charitable donations, part for vinicultural research, and had enough left over to set up a comfortable trust fund for the next fete.

No one in Vevey worried about money, however, during the first two weeks in August, when the spectacle was presented. Their sole aim in life was the successful presentation of their beloved pageant. The opening performance was held on the morning of August first, Switzerland's national holiday.*

The day was bright and clear, and the actors wended their way through the milling crowds with smiles brighter than the early sun. There was, of course, a heavy insurance policy in case of rain, but no amount of money could have consoled them for a canceled show.

The performance lasted more than three hours. And when the spectacle came to a colorful conclusion in a burst of dancing and melody, the 12,500 spectators stood in their seats and cheered for a full five minutes.

The Swiss are seldom regarded as demonstrative people, but the atmosphere of the fete seemed to inspire even the most staid of Vevey folk. Their enthusiasm almost got out of hand when thousands of festival participants and hundreds of officials, committeemen, and invited dignitaries gathered in a specially erected pavilion for a gala luncheon to celebrate the success of the opening performance. Halfway through the elaborate meal—to which the vinegrowers had contributed generously of their best produce—a group of performers rushed to the head table, seized the leading soloists, and carried them about the hall on their shoulders, singing as they went.

So enthusiastically did the audience receive this demonstration that the performers gave a similar ride to the dignified M. Lehmann, art director of the spectacle.

President Given a Shoulder Ride

Inspired by renewed applause, they set M. Lehmann down at the far end of the hall and raced back to the celebrity-crowded dais. Then, before anyone realized what was happening, they lifted to their shoulders the guest of honor, the President of Switzerland, and transported him gaily among the tables to the accompaniment of a mass serenade.

"This is terrible," murmured a Vevey business man seated next to me. "Nothing like this has ever happened before. We'll never live it down."

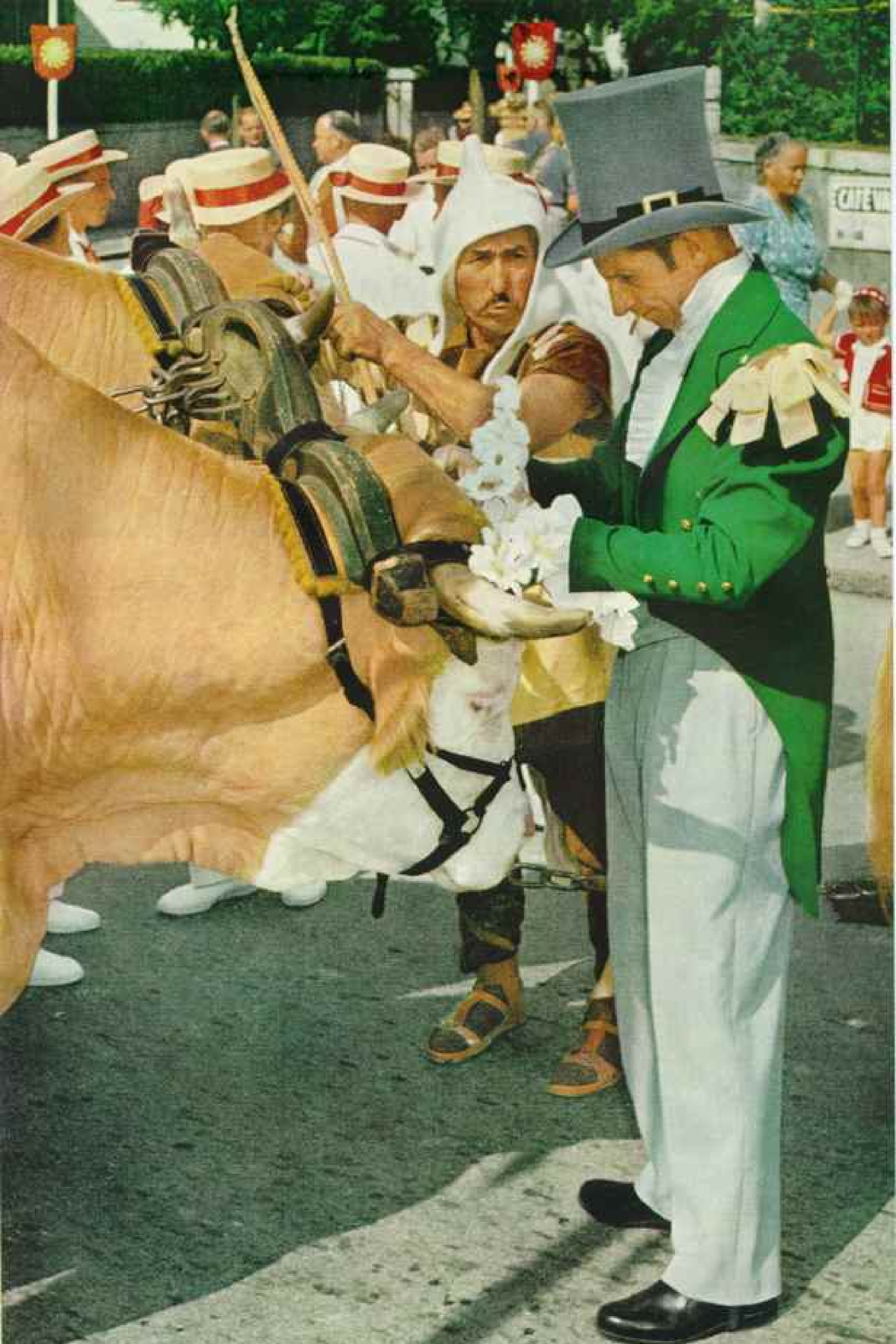
He looked up from his misery just as the President was borne past our table. "Good heavens," he exclaimed. "He's enjoying it!"

(Continued on page 571)

* See "August First in Gruyères," by Melville Bell Grosvenor, National Geographic Magazine, August, 1936.

Even Beasts Wear Flowers; a Top-hatted Guildsman Decks These Oxen

Yoked team will pull a chariot bearing Ceres, goddess of agriculture, into the stadium. Outsize epaulets adorn the official's cutaway coat, marking him as a member of the Confrérie des Vignerons, the vinegrowers brotherhood sponsoring the festival.



Trumpeters, rehearsing on a lake-front pier, sound clear, bright notes. During the festival's 11 performances they stand on the Tower of Bacchus above the amphitheater. Emblem of the grape emblazons instruments as well as costumes.

Kodachrome (below) by Jan Baan © National Geographic Society

Vevey's Bakers Parade with Fresh Bread

Representing the people of summer, the baker and his family follow the wheat harvesters on stage in the pageant's third act. Cantonal dress of a century ago inspired their costumes. Daughter demonstrates how she delivers loaves by dogcart.

Hundreds of youngsters participated in the festival. "They performed like troupers," report the authors. "Never once did we see a child misbehave or grow restless."

Dancers Swirl in the Arena

In midsummer, Swiss villagers take vacations in the mountains. Picnics, hay rides, and songfests enliven their interval of leisure. These couples, representing the country folk at play, dance in the third act of the pageant. Other performers wait off stage.


BOUCHERIE
CHARCUTERIE
PFEIFFER

Whether the President was really as pleased as his smile would indicate, I do not know, but everyone else certainly was. Miraculously, the weather held fair for two weeks, nearly every performance was sold out, even the choice $20 seats finding eager takers, and the hotels, restaurants, curio shops, and guides of Vaud did a thriving business.

I met only one unhappy man in Vevey during that whole period. He was the owner of a small cleaning establishment who, not expecting any great increase in business, had failed to lay in an extra supply of cleaning fluid. He had been turning away dozens of eager customers every day.

"Why didn't somebody tell me," he lamented, "that they were going to release all those pigeons at every performance?"

Centenarian Sees Her Fifth Fete

Perhaps the most interested spectator of all was Mme. Emilie Vuichoud, from near-by Montreux, who had just celebrated her hundredth birthday. As a girl of 10, Mme. Vuichoud had seen her first Fête des Vignerons in 1865.

She had attended the succeeding productions in 1889, 1905, and 1927, but none of them had brought the thrill that she found in her fifth spectacle. Her 18-year-old great-grandson, Henry Payot, played the leading role of Bacchus, god of wine, and her wrinkled face beamed with pride and delight when the lithe youth was escorted into the stadium by his attendant fauns and bacchantes.

Music is always an important part of the festival, and well-known composers are employed to produce the scores. The orchestra of the famed Republican Guard of Paris was featured at each performance, but Jean and I were far more fascinated by the alpenhorns, which look like gigantic calabash pipes.

I had frequently seen these huge instruments, some of which are 12 feet long, but never realized that they were capable of producing actual harmony. They might bring forth a single note for calling cattle, I thought, but nothing that could really be described as music.

But at each performance a trio in mountain costumes, dwarfed behind their alpenhorns, mounted the steps at the end of the amphitheater. In perfect harmony they played the nostalgic strains of "Ranz des Vaches," an old mountain folk song familiar to every Swiss. The audience responded as they did to no other part of the production. Some hummed with the instrumentalists; others sang the familiar words. Everyone seemed strangely touched by the tune, and after attending a couple of performances Jean and I found ourselves singing it as lustily as our Swiss friends.

No one knows just how old the Vevey festival really is. A fire in the early part of the 16th century destroyed the records of the Confrérie des Vignerons, but local historians maintain that some sort of harvest festival was held in the area as long ago as the 12th century. The first organized spectacle was presented in 1819, and the affair has grown in importance and beauty with each succeeding performance.

I asked a friend of mine, a public official of Vevey and one of the leading members of the Confrérie, why the fete wasn't presented more often than four or five times a century.

"I should think it would be good for business," I told him. "It brings thousands of people and millions of francs into the area. Why don't you hold one, say, every ten years?"

He smiled a tired smile and shook his head.

"In the first place," he explained, "we don't do this for money. We do it to honor the vinegrowers, and for our own pleasure. We're glad that others want to come, but that isn't the reason for the production."

Rehearsals Last a Full Year

He paused to stare ruefully at the piles of papers on his desk, and at his rumpled costume hanging in a corner of his office.

"More important," he mused, "is the sheer labor of the thing. It takes six months to hire the composers, the writers, and the producers. We rehearse for a year. And then there is the constant worry lest a rainy spell make the whole thing a failure.

"I guess the simple truth is that once is enough for each set of officials. They do their job and then forget it. Then they wait for a new generation to come along to tackle the fete again."

Bacchus Tours Vevey in a Golden Chariot Drawn by Coal-black Horses

"Vevey is a town more beautiful in its simplicity than any I have ever seen," wrote the poet Shelley in 1816. Festive banners here fly above a shadowy, canyonlike street.

"All the continents are open . . . the Nile and the Paraguay . . . and the veil of the past has been lifted."

Theodore Roosevelt

By BART McDOWELL, National Geographic Magazine Staff

IN RETROSPECT, a report card from Professor McMullen's Academy reads like a prophecy for the young New Yorker. Spelling 88, his lowest grade, hinted at his later interest in reforming written English . . . arithmetic 92, foreshadowed bold national budgets . . . history 96—this youngster would both write it and make it. His highest grade, 97, was in geography—an interest that would goad him across deserts and jungles and into the company of ferocious lions and friendly kings. Indeed, Theodore Roosevelt, born a century ago this month, found a fascination in geography that proved more durable than any of his several careers.

Desperately asthmatic, the boy usually studied with tutors. Wild creatures fascinated him. With two cousins he launched the "Roosevelt Museum of Natural History"; specimens such as stuffed mice were kept in his room—until a chambermaid rebelled.

Theodore's father took his family abroad, and Teddy climbed Vesuvius and collected bird skins along the Nile. Still his asthma attacks returned. "You have the mind," his father told him, "but you have not the body . . . Theodore, you must *make* your body."

First Love: the Great Outdoors

Spurred by this challenge, the lad worked out in a New York gymnasium, then went camping in the Adirondacks, where he found his first love for "grand but desolate wilds." At Harvard he decided to devote his life to natural history. He also started writing a naval history of the War of 1812.

As a newlywed law student, he took time out for a Matterhorn-climbing honeymoon in 1881. His young wife's sudden death, only hours after his mother's passing, momentarily turned young Theodore Roosevelt from a political career in New York to ranch life in the West. He returned to the East with "iron qualities," as he put it.

His career advanced with dash in the year 1898: Assistant Secretary of the Navy in Washington, a Rough Rider in Texas, the hero of Cuba's San Juan charge, and Governor of New York—all between April and November. Two years and four months later he was Vice President, and in another half year President McKinley died by gunshot.

Youngest U. S. President

Roosevelt was mountain climbing in the Adirondacks when he learned he had become the youngest President in history at 42. He returned to Washington, bringing the outdoors with him. Geography was never the same again. His foreign policy ranged from Panama, where he won a controversy and a canal, to the Alaskan boundary and the Far Eastern battlefields of the Russo-Japanese War.

At home his powerful personality focused attention on conservation. On a Mississippi hunting trip in 1902, he refused to shoot an undersized brown bear. Washington political cartoonist Clifford K. Berryman sketched the incident, and the original Teddy bear was born.

Roosevelt's similes added vigor to American speech. Asked how he felt about a hard campaign, he judged himself "as strong as a bull moose"—and a partisan movement was unofficially named. His "big stick" quotation was first used not as foreign policy dogma but as advice to New York politicians.

An enthusiastic traveler, he was the first man to leave the United States while still President. He loved horses, especially Bleistein, shown on the opposite page taking Roosevelt over a fence in Washington's Rock Creek Park.

At 50, Roosevelt left the White House still restless for action. He sought it on an African hunting expedition, a European tour, along Brazil's River of Doubt, in more of fiery politics, and even in a brave, futile request to be allowed to lead troops into the battles of World War I.

Harvard College Library

The Badlands of North Dakota were responsible for Roosevelt's becoming President, or so he told an interviewer in later years. Certainly hunting and ranch life from 1883 to 1886 hardened the wiriness of his Harvard days. In college he had boxed and wrestled so that no one would laugh "because I was decent." Gradually, the bewhiskered collegian at upper left grew into the buckskin-clad cowboy beneath.

"Hasten forward quickly there!" the bespectacled Easterner shouted on one roundup. His rough companions howled, but he won their respect. On his first buffalo hunt, Roosevelt's dogged high spirits outlasted his veteran guide's. After luckless days of getting lost, losing horses, injuring his forehead—he "bled like a stuck pig," said the guide—running out of food and water, and getting punctured by cactus spines, Roosevelt turned over in rain-soaked blankets and exclaimed: "By Godfrey but this is fun!"

Roosevelt started a ranch of his own; his adventures during this episode included a dueling threat (the threatener begged off), a broken shoulder, and a 40-foot fall from a cliff.

Pursuing three thieves, Roosevelt and two friends once traveled the wildest part of the North Dakota Badlands. They surprised and caught the culprits and marched them to jail; in the rare picture above, young T.R. holds a rifle on the prisoners. In the last 36 hours of this 13-day ordeal, he walked 40 miles and got no sleep at all.

Cowboys—"Sinewy, hardy, self-reliant"—appealed to T.R. "The moral tone of a cow camp . . . is rather high," he wrote, referring to scenes like the chuck-wagon group he himself photographed at right. Said a cowboy of him: "A plumb good sort."

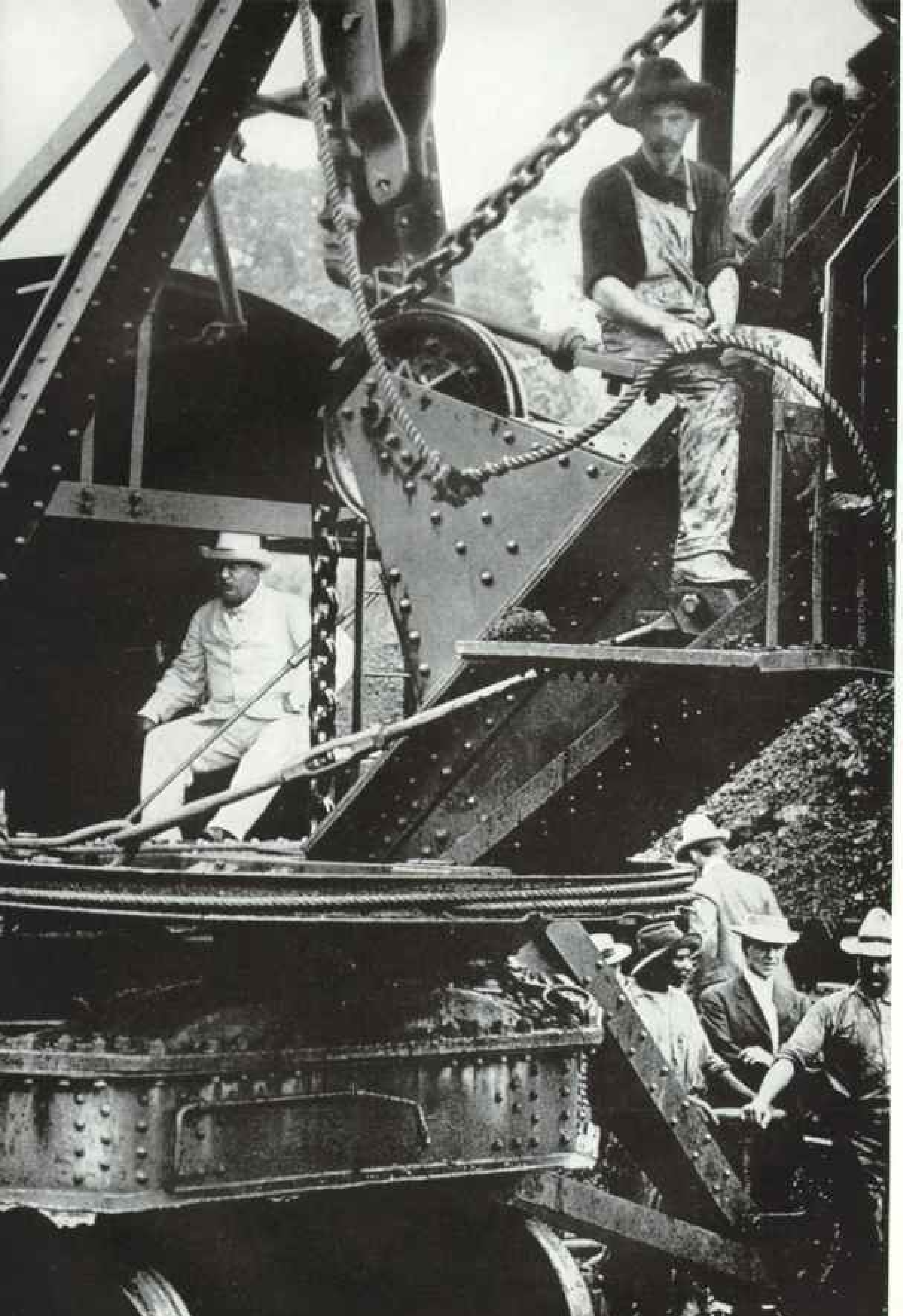
Rough riding, Western style, served Roosevelt well in the Spanish-American War. Organizing a regiment, he sought men in Arizona, New Mexico, and Oklahoma who were "young, good shots, and good riders." Newsmen named them the Rough Riders, but only officers' horses were transported to Cuba. On July 1, 1898, when T.R. led his San Juan charge, his Riders walked. "Are you afraid to stand up," Roosevelt asked, "when I am on horseback?"

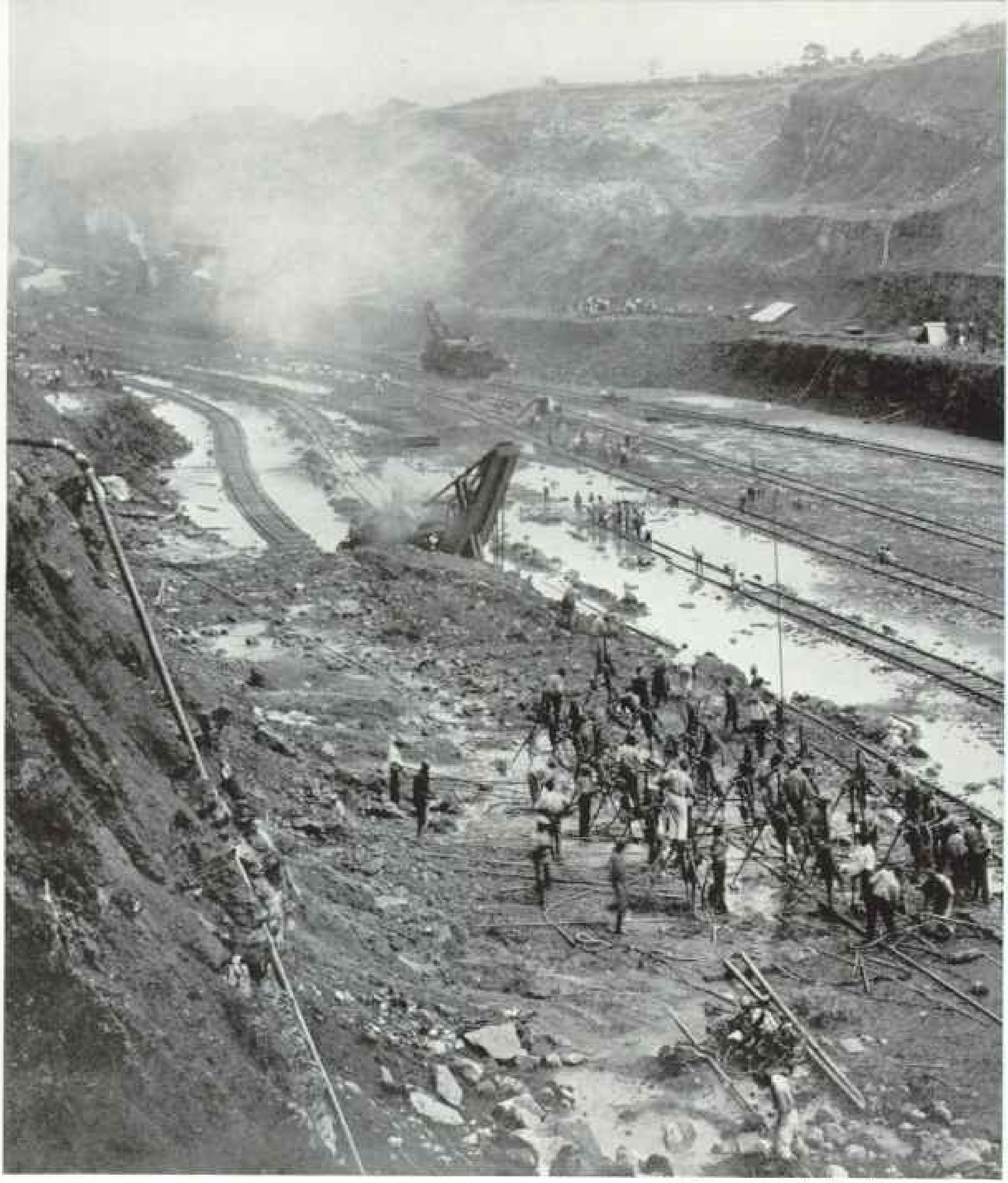
Their costly victory was painted by Frederic Remington from battle tales and his own experiences. "Half of the men who soldiered with me . . . might have walked out of . . . Remington's pictures," Roosevelt wrote.

Always sentimental about San Juan, Roosevelt at later reunions gave his Rough Riders a Presidential embrace.

Courtesy of Frederic Remington Art Memorial, Ogdensburg, N. Y.

Harvard College Library

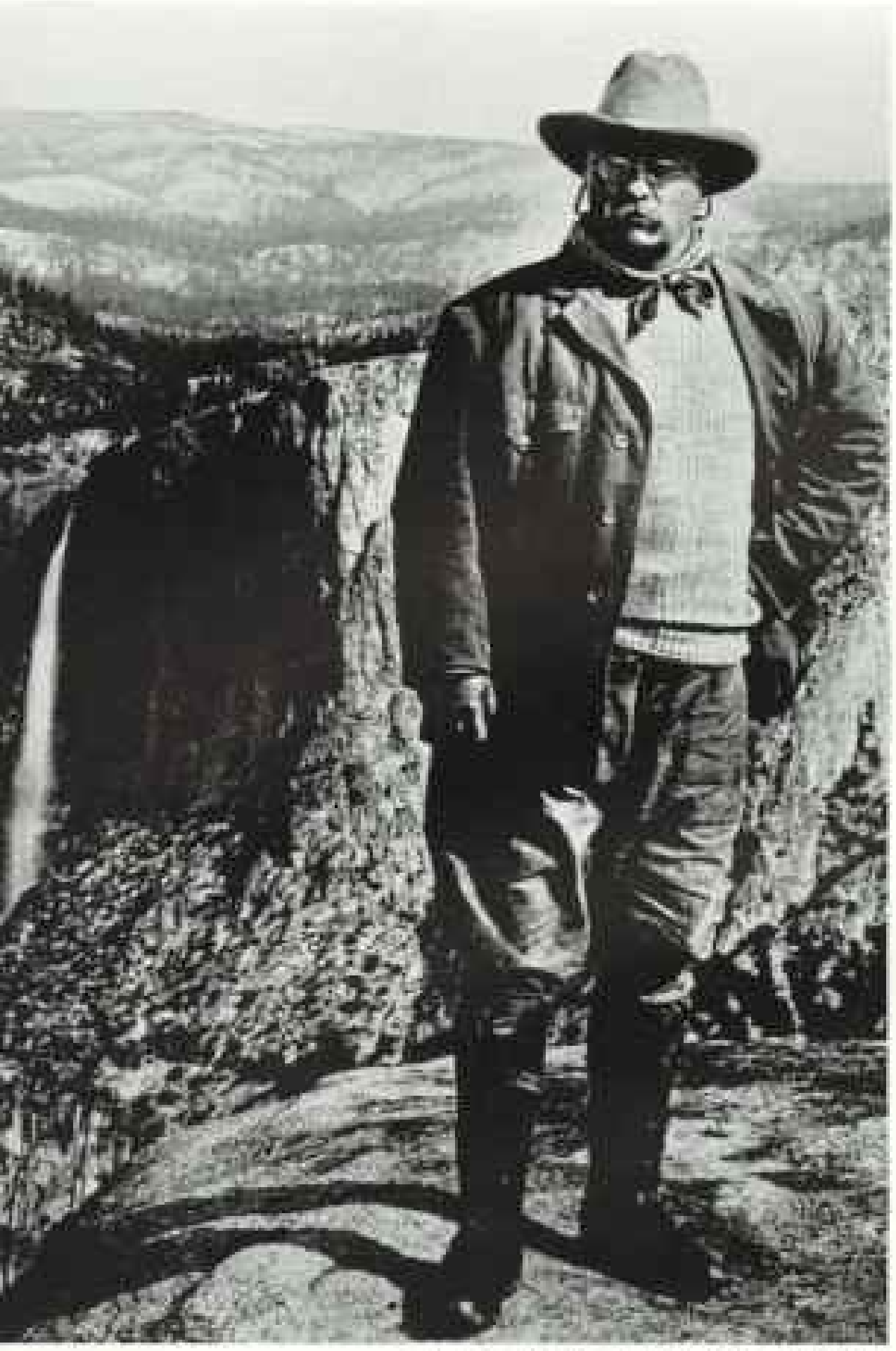




Underwood & Underwood (left) and Staelin

Panama Canal problems were handled by President Roosevelt with a San Juan flourish. In getting rights to dig, he admitted not having "acted strictly according to precedent." And after years of hedging, he finally said, "I took the Isthmus, started the canal, and then left Congress—not to debate the canal, but to debate me. . . . But while the debate goes on the canal does too." Aside from diplomacy, he had to pick men who could conquer landslides and yellow fever.

In 1906 the President himself visited the project and boarded a steam shovel. To his son, Theodore Jr., he wrote, "The five thousand Americans at work on the Isthmus seemed to me . . . a mighty good lot." The last cut, at Culebra (above), was carved in 1913.



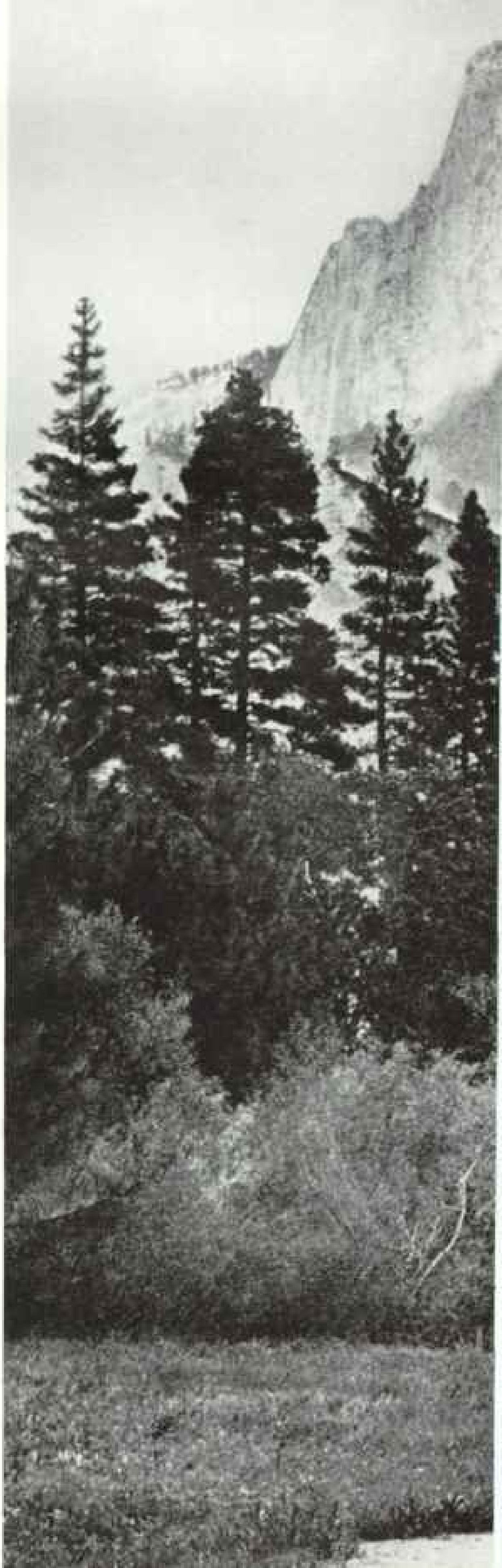
Underwood & Underwood and Harvard College

Naturalists considered Roosevelt one of their own. He was 38 when he debated scientific fine points of coyote nomenclature with the noted biologist Dr. C. Hart Merriam before the Biological Society of Washington at the Cosmos Club. Dr. Merriam, one of the founders of the National Geographic Society, later named the Roosevelt, or Olympic, elk in T.R.'s honor.

Newspapers often attacked Roosevelt for his interest in hunting. In 1903, when he was accused of wanting to slaughter the game in Yellowstone National Park, T.R. countered by inviting naturalist John Burroughs to accompany him on a camping trip there. Burroughs called Roosevelt "wonderful" and compared him to an "electric battery."

In Yosemite National Park Roosevelt later spent four days camping and riding with the bearded naturalist John Muir; these photographs were taken on the trip. Muir had a "perfectly glorious time." It was T.R. who set aside the first 51 United States wildlife refuges.

These wanderings among the trees made a lasting impression on the conservation pioneer. In one of his last books T.R. wrote: "A grove of giant redwoods or sequoias should be kept just as we keep a great and beautiful cathedral."



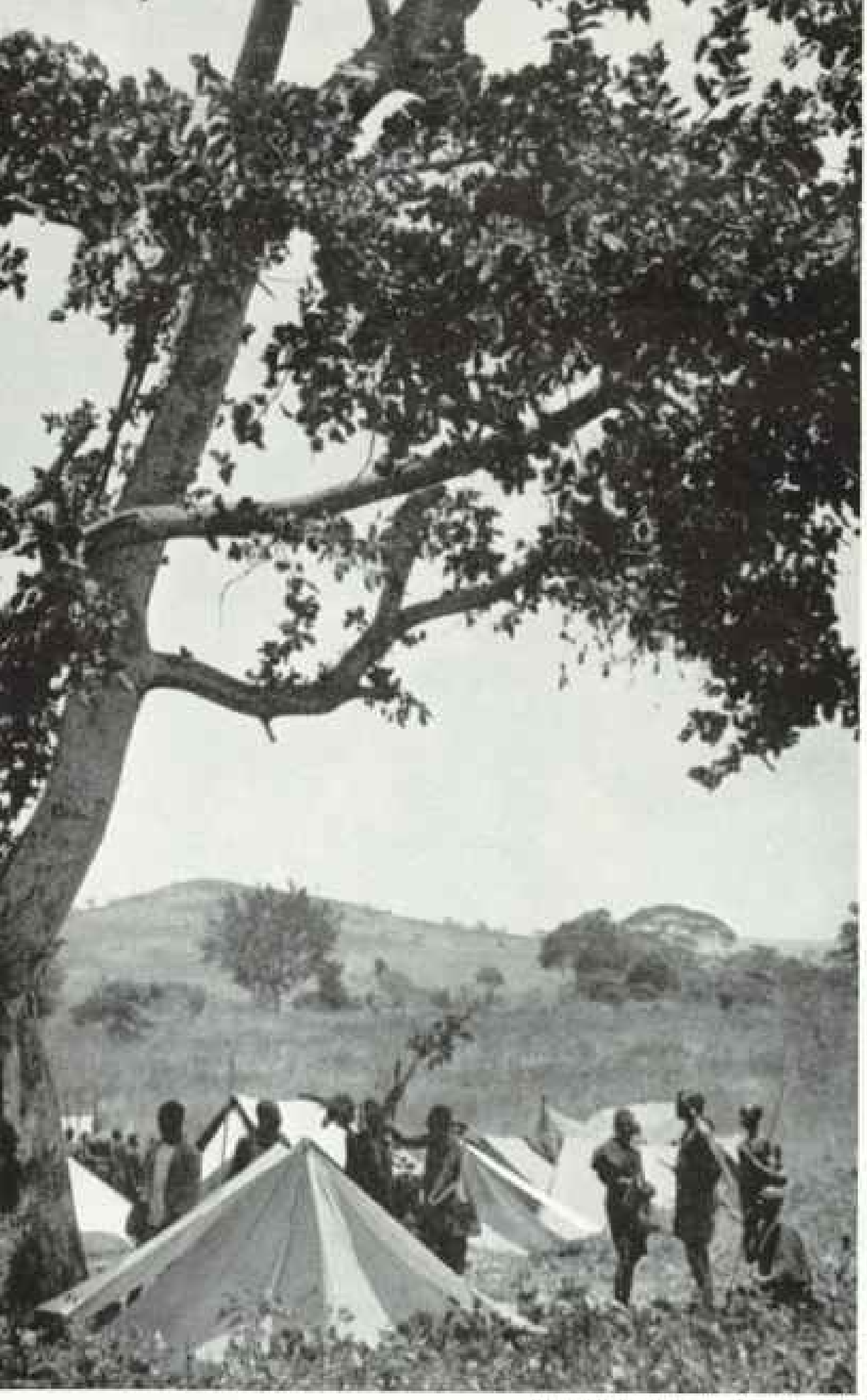
Underwood & Underwood

"The Navy . . . is the right arm of the United States and is emphatically the peacemaker," said Roosevelt. Cruising often on the Presidential yacht *Mayflower*, he watched the fleet almost double in size. Sending it around the world was, he felt, his most important service to peace.

Explorers found Roosevelt a sympathetic listener. When Robert E. Peary built a ship for Arctic exploration, he named it the *Roosevelt*, and en route to his successful "dash to the Pole," he paused off T.R.'s home at Oyster Bay to bid the President goodbye. Photographers, friends, and relatives all clambered on the windy *Roosevelt* deck—the President and Peary are the two men in white suits—then Roosevelt wished his friend good luck. Later he characterized Peary: "Great physical hardihood and endurance, an iron will and unflinching courage, the thirst for adventure, and a keen and farsighted intelligence."

In Africa T.R. got the news from runners that Peary had reached the North Pole. "Your farewell was a royal mascot. The Pole is ours." Peary cabled. Roosevelt, retired from the Presidency, was camped at Mt. Kenya in Meru country, where natives in treetop lookout posts guarded crops from foraging elephants. T.R. was collecting game specimens for the Smithsonian Institution's National Museum in Washington.

His safari was large, requiring 450 men at times. Traveling heavy—as they did crossing the shallow stream below—was not Roosevelt's idea; their tents "were almost too comfort-

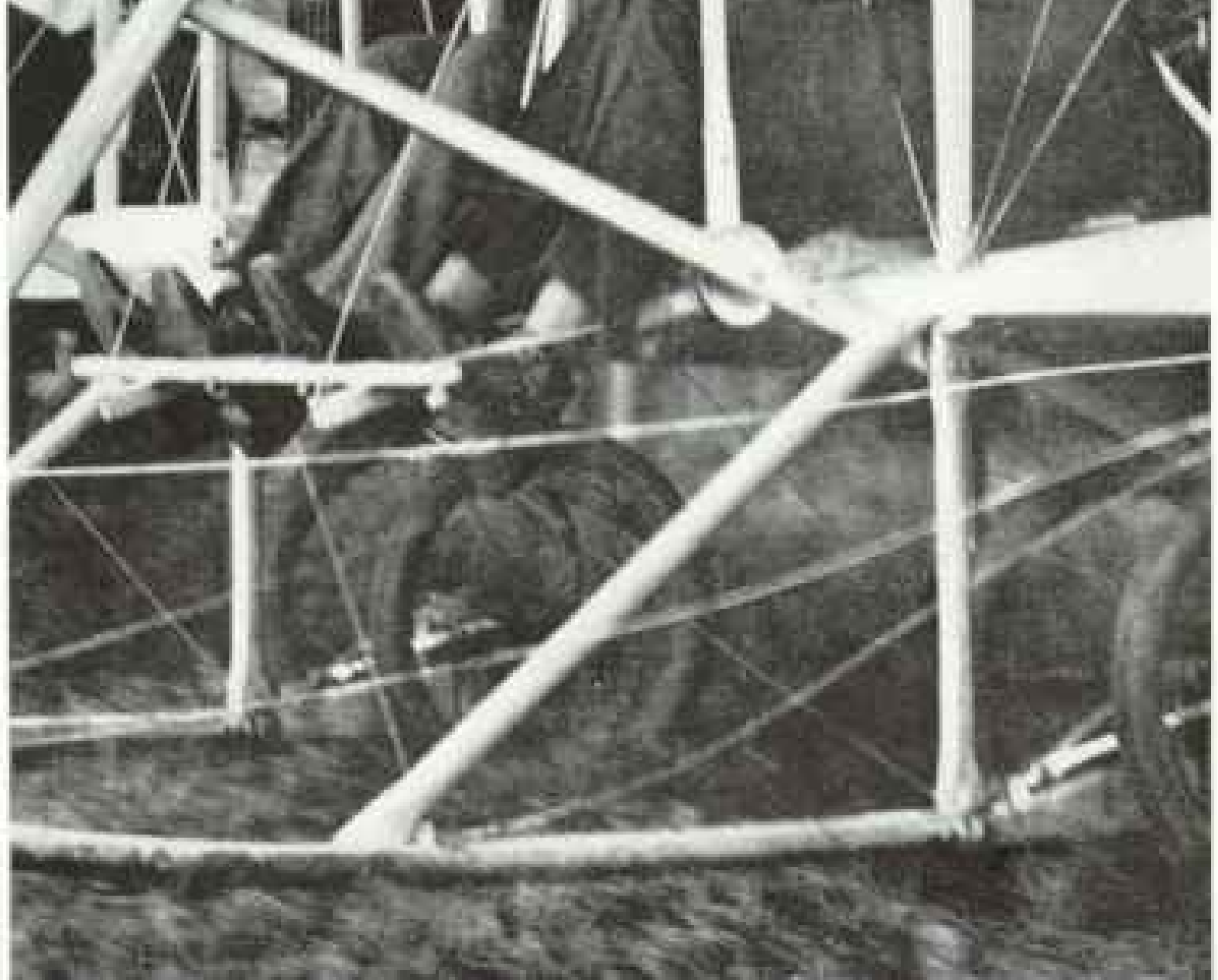


Edmund Heller (left) and Kermit Roosevelt

able." For luck, Roosevelt carried a gold-mounted rabbit's foot sent him by the boxer John L. Sullivan. He experienced "no real hardships," but one attendant was mauled by a leopard and another was tossed by a rhinoceros. T.R. himself diverted the attention of a rhino one day while his companions stalked buffalo. "That settles the question as to what shall we do with our ex-Presidents," he said. "They can be used to scare rhinos away."

His son Kermit and T.R., seen seated upon an African buffalo, brought back some 14,000 "zoogeographic" specimens from the year-long trip.

Frank Fellgiebel (above) and Harvard College Library



Kings seemed "just as funny as American politicians" to T.R. when he toured European capitals after his African hunt; he said a king was "a kind of sublimated American Vice-president." Yet he got on well with royalty.

"Roosevelt, my friend," said the Kaiser on the day the photo above was taken in Germany. "...you are the only private citizen who has ever joined the Emperor in reviewing the troops of Germany."

In spite of the pageantry, Roosevelt returned to the U. S. concerned that Germans "did not like my country" and that "war plans contemplate ... flank marches through ... Belgium."

Air power—both planes and pilots—had a growing fascination for T.R. Here, at St. Louis, Missouri, in 1910, he flew for 3½ minutes with pilot Arch Hoxsey.

1883-86
North Dakota
Ranches

Oyster Bay, N.Y.

Portsmouth, N.H. 1905 Russo-Jap Peace Treaty

Washington, D.C.
Hampton Roads

Berlin
London
Paris
1910 European tour
Rome
Gibraltar
Suez Canal

30° N

1907-09
T.R. sent fleet around the world

Magdalena Bay

Cuba 1898 Rough Riders charge

Port of Spain

1906 Panama Canal

1909-10 African Hunting Expedition

Atlantic Ocean

Amazon

Mt. Kenya

0°

1914 River of Doubt, Brazil
Later named the Theodore Roosevelt

Callao

Pacific Ocean

Paraguay

Rio de Janeiro

30° S

Valparaíso

30° W

0°

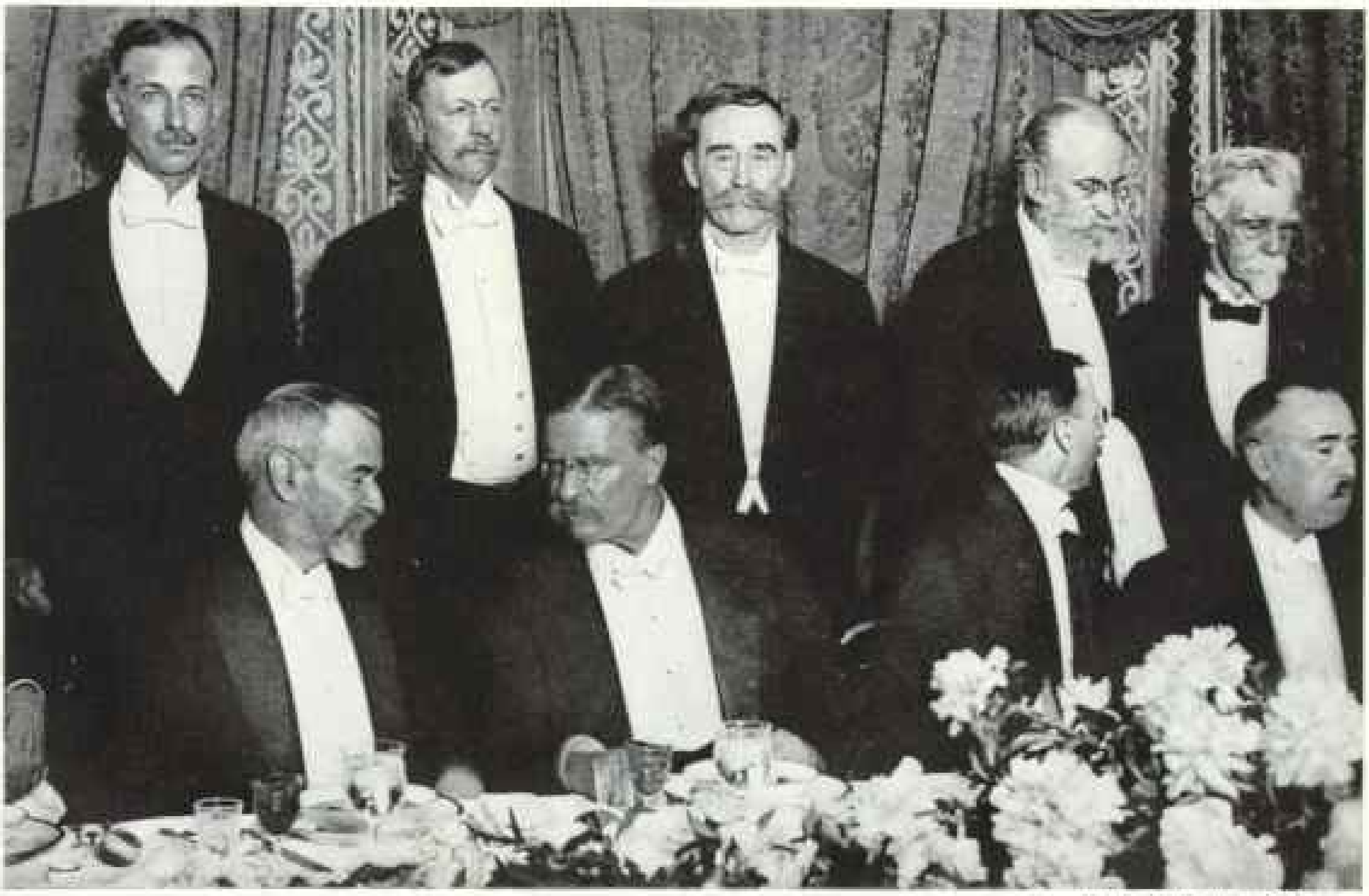
30° E

Punta Arenas

60° W

©N.G.S. Gilbert H. Emerson

T.R.'s ventures into geography covered the map. After his post-Presidential trips abroad, Roosevelt gave his first U. S. lectures before the National Geographic Society. At the dinner shown below, Dr. Gilbert Grosvenor, National Geographic Editor, sits at Roosevelt's left and Robert E. Peary stands behind. T.R.'s party was the first to explore Brazil's 950-mile-long Rio da Dúvida—now the Theodore Roosevelt River.



Kermit Roosevelt and David Attenborough (below)

In South America T.R. met danger and hardships. The Rio da Dúvida, or River of Doubt, had treacherous rapids. Boats were lost, rations cut; men ate monkeys and vicious piranha fish (below).

Brazilian Colonel Rondon (above), who shared leadership with Roosevelt, was attacked by piranhas and lost part of his foot. Three men died: one drowned; another, crazed, killed a companion and fled into the jungle. Roosevelt was injured while saving two canoes; he suffered an abscess and fever of 105°. He asked his friends to leave him: "I am only a burden to the party." But though his health was permanently impaired, he lived through the ordeal, which he called his "last chance to be a boy."

Brown Bros.

"Vigor of soul" stayed with Roosevelt until his death in 1919. On the loss of his son Quentin, he had written: "Only those are fit to live who do not fear to die; and none are fit to die who have shrunk from the joy of life. Both life and death are parts of the same Great Adventure."

National Geographic Wall Maps Revised to Keep Pace with World Events

"LET the great world spin for ever down the ringing grooves of change."

Thus wrote Tennyson, who was old when the National Geographic Society was young, but his challenge sounds as if aimed straight at The Society's map makers today.

A new nation emerges in the Caribbean. Alaska becomes the 49th State. New borders divide Central Europe, and in the Balkans cities get new names. An entire settlement moves in Greenland, and, in the Canadian Arctic, aerial surveys reveal that Borden Island has really been two islands all along—one of them larger than Rhode Island.

To meet the challenge of change, The Society's monumental Atlas program is charting the entire globe anew in a series that will total more than 50 maps. By the end of this year, some 2,250,000 member-families will have received their first seven Atlas sheets, each measuring 25 by 19 inches, as supplements to their NATIONAL GEOGRAPHIC MAGAZINE. In addition, more than 135,000 members have ordered the handsome Atlas Folio, into which they may bind their maps to build a valuable yet inexpensive Atlas of the World.

Three New Maps Available

While producing Atlas Maps, however, The Society's cartographers also continue to revise the larger 10-color wall maps to keep them up to date with current news headlines. Each revision takes note of the latest developments in world politics; in highway, bridge, pipeline, and dam construction; in modern aerial surveying; and in movements of people.

Three such newly revised wall maps are now available, covering **Canada, Alaska, and Greenland; Central Europe including the Balkan States;** and the **Countries of the Caribbean.** They incorporate changes with causes as varied as our fast-changing world itself. Consider the happenings behind some of the revisions in the Canada, Alaska, and Greenland map:

Jet plane noises from the USAF base at Thule, on Wolstenholme Fjord in Greenland, frightened away seals and walruses. Concerned over the game-hungry Eskimos' food supply and the impact of a military base upon their ancient customs, the Government of Denmark moved their village 64 miles north to Inglefield Bay. At this new Thule the Eskimos once more enjoy privacy and good hunting, and also modern comforts such as prefabricated houses, electricity, and a central steam plant.

In Canada's Northwest Territories, calamity confronts Aklavik—an Arctic metropolis boasting nearly 1,500 summer inhabitants and the bank farthest north on the American Continent. The sun and the heat from Aklavik's buildings keep melting the permafrost floor beneath them into a lake of mud, and the Mackenzie River threatens to sweep them all into the Beaufort Sea. Now the town is moving 33 miles east.

At the new site cement piles driven deep into the ground will keep the buildings from sinking. The population is expected to reach 2,500, including technicians from the strategic Distant Early Warning (DEW) Line.

New Names Reflect Changing Times

In the Canadian Arctic new names include the Queen Elizabeth Islands, Prince Charles Island, and Air Force Island; also Mackenzie King Island, considered part of Borden Island until the airborne camera proved it to be separate. To the southeast, the former colony of Newfoundland and its dependency Labrador now form a Province of Canada.

The many changes seen on the newly revised map of Central Europe stem primarily from the political backwash of World War II. The map ranges from the Baltic Sea to the Mediterranean, from the German Rhine to the Russian Dnepr, and includes countries and capitals whose names make daily headlines.

Gone are the occupation-zone boundaries of 1951 and the flags that symbolized Allied rule. West Germany—formerly administered by British, French, and United States High Commissioners—became independent in 1955 and is now the Federal Republic of Germany. The Soviet zone emerged as East Germany, the so-called German Democratic Republic.

Berlin's present status mirrors this split. The former western sector evolved into a state of the Federal Republic. The Soviet sector now functions as East Germany's capital.

The long-disputed Free Territory of Trieste disappeared in 1954, when the United Kingdom, United States, Italy, and Yugoslavia agreed to end the military occupation of this area at the head of the Adriatic. The West-

ern powers returned most of their sector—including Trieste itself—to Italy; Yugoslavia took the remainder.

Political developments have also altered place names. In the wake of the Trieste settlement, Italian names on the Istrian Peninsula gave way to Yugoslav forms: Capodistria now is Koper; Cittanova is Novigrad. Bulgaria lists 13 politically induced name changes, such as the dropping of Stalin's name from the Black Sea port of Varna.

A corner of Tunisia is shown on the map, with more new names. When France recognized that former protectorate as independent in 1956, most French names were replaced by Tunisian. Cap Bon, for instance, became Ras el Tib.

No name changes at all are planned, however, by the West Indies federation. This youngest nation on earth, next to the United Arab Republic, is recorded on the revised map of the countries of the Caribbean.

3,000,000 Islanders Form Federation

Here 10 British Colonies, united on January 3, 1958, expect their federation to become an independent member of the British Commonwealth after five years. Trinidad, home of calypso singers and rollicking carnivals, already plays host to the new federation's parliament. It represents 3,000,000 islanders of European, African, and Asian descent, scattered across 1,700 miles of sea and linked by sailing schooners and jet-prop planes.

The 41-by-25-inch Caribbean wall map includes a slice of the southern United States, all of Mexico, Central America, and the entire West Indies with their French, Dutch, and United States islands.

Graphic evidence of progress in transportation appears on this map in the recently finished sections of the Pan-American Highway in Mexico and Guatemala and in great new roads in Venezuela. Special insets enlarge the Canal Zone and Cuba, Bermuda, and other islands of special interest to vacationers.

One of the insets reveals something new on U.S.-owned St. John: the Virgin Islands National Park. Half of its 10,000 acres of lush forests and glistening white sand was given to the American people in 1956 by a conservation group headed by National Geographic Society Trustee Laurance S. Rockefeller.

North along Florida's east coast, a new but already familiar name appears on the Banana River at Cape Canaveral: Patrick Air Force Missile Test Center. There enormous rockets lift earth satellites into orbit; other missiles streak thousands of miles southeast toward Ascension Island and Africa.

Map Charts Alaska's Progress

As Alaska takes its place as the 49th State, The Society can also offer members a detailed and recent wall map of this new member of the Union that dwarfs all other States. Anticipating statehood, The Society in 1956 prepared a new **Alaska** map, using the latest surveys. Dozens of red stars mark landing fields with scheduled air service—indicating how far Alaska has progressed since the gold-rush days when prospectors pursued the mother lode behind teams of huskies, carrying lumps of sour dough to leaven the next batch of bread (hence their name "sourdoughs").

On the Alaska map members may soon follow one of the greatest changes wrought by man upon the face of the earth. Along the Arctic coast between Cape Thompson and Cape Seppings, scientists are now studying how to carve a deep harbor and ship's channel into the shore with nuclear explosives.

Such a harbor would provide fishermen with a much-needed haven and might open the way for exploiting possibly rich deposits of coal, oil, copper, and gold. This momentous feat of fusion may be attempted as early as 1960—resoundingly in keeping with Tennyson's "ringing grooves of change."

Copies of the newly revised wall maps of **Canada, Alaska, and Greenland; Central Europe;** and **Countries of the Caribbean;** and of the recent map of **Alaska** may be obtained by writing to the National Geographic Society, Washington 6, D. C. Price, postpaid to all countries, $1.00 each. Also available are additional copies of the Maps of the Atlas Series (especially designed for binding in the Atlas Folio). Price of Atlas Maps, 50¢ each; Atlas Folio, $4.85; postpaid. Atlas Maps already published: **Southeastern United States, Southern South America, National Parks, British Isles, Poland and Czechoslovakia.**

Notice of change of address for your NATIONAL GEOGRAPHIC MAGAZINE *should be received in the offices of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your December number, The Society should be notified of your new address not later than November first. Please give BOTH your OLD and NEW addresses, including postal-zone number.*

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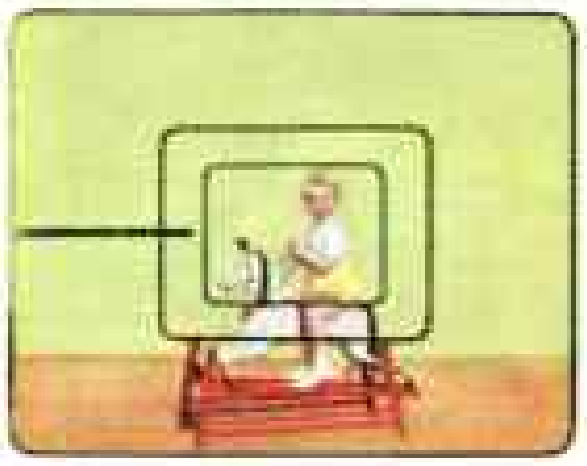

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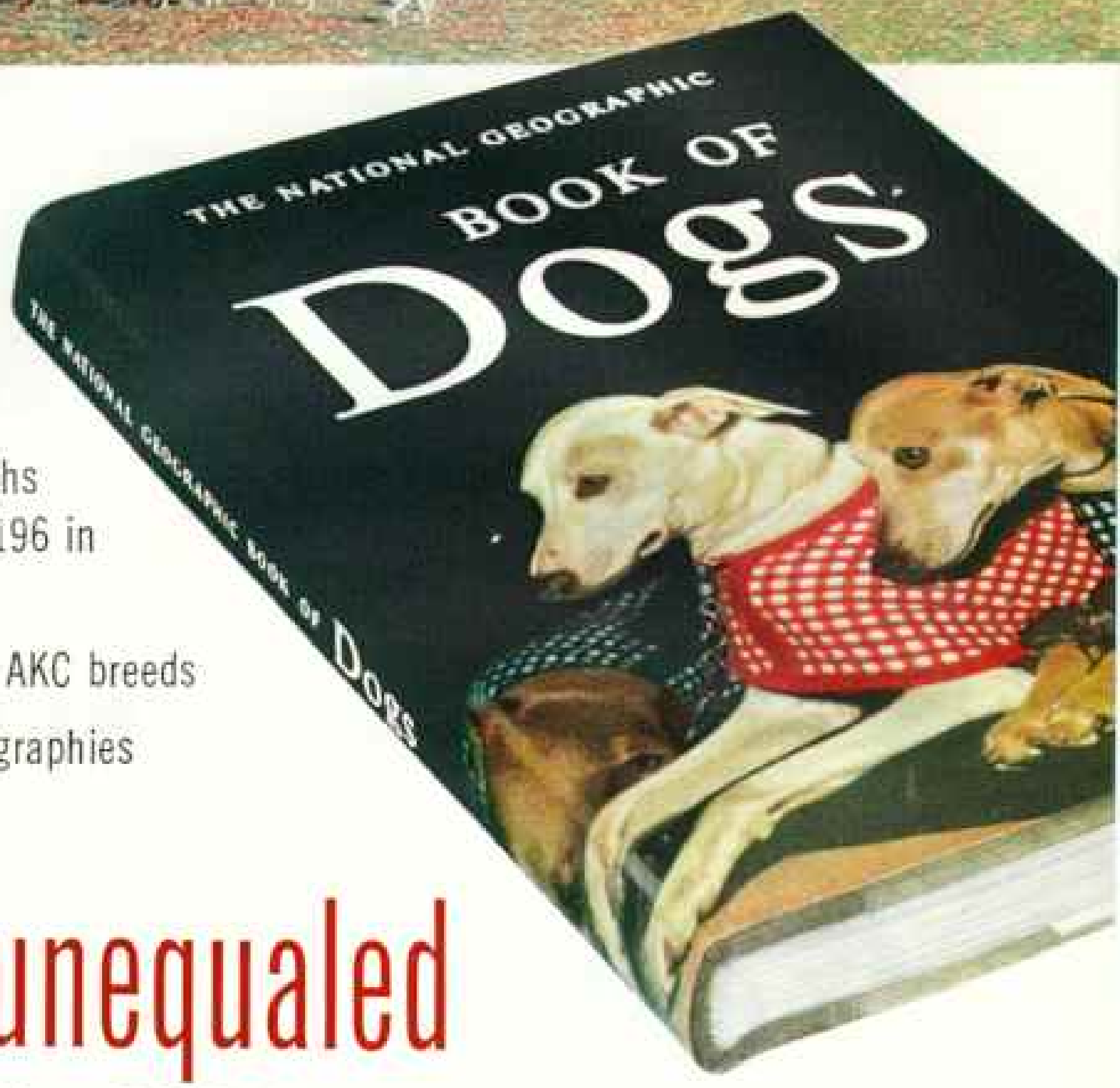

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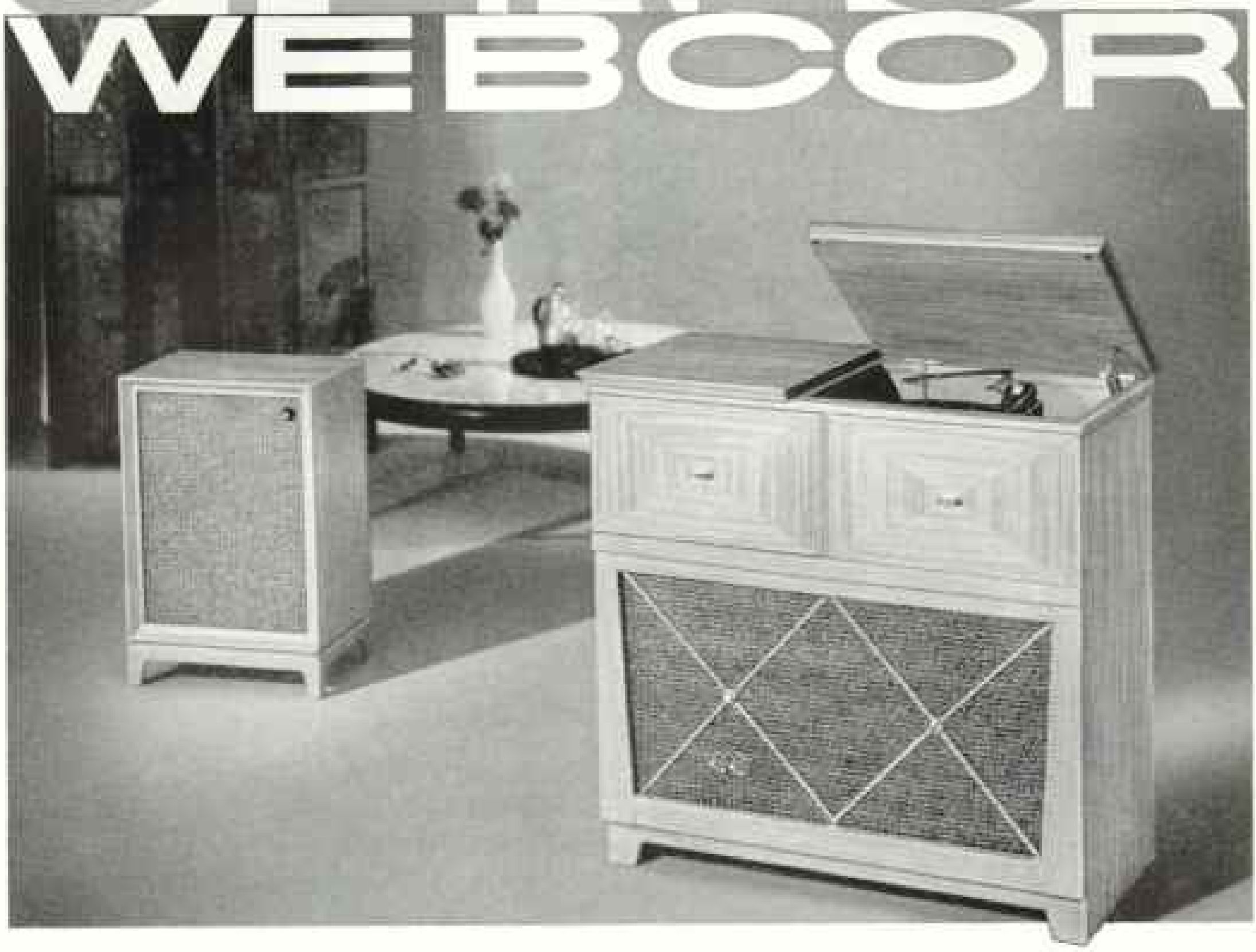

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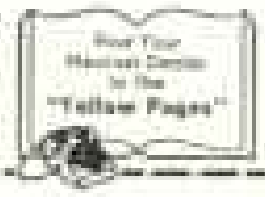

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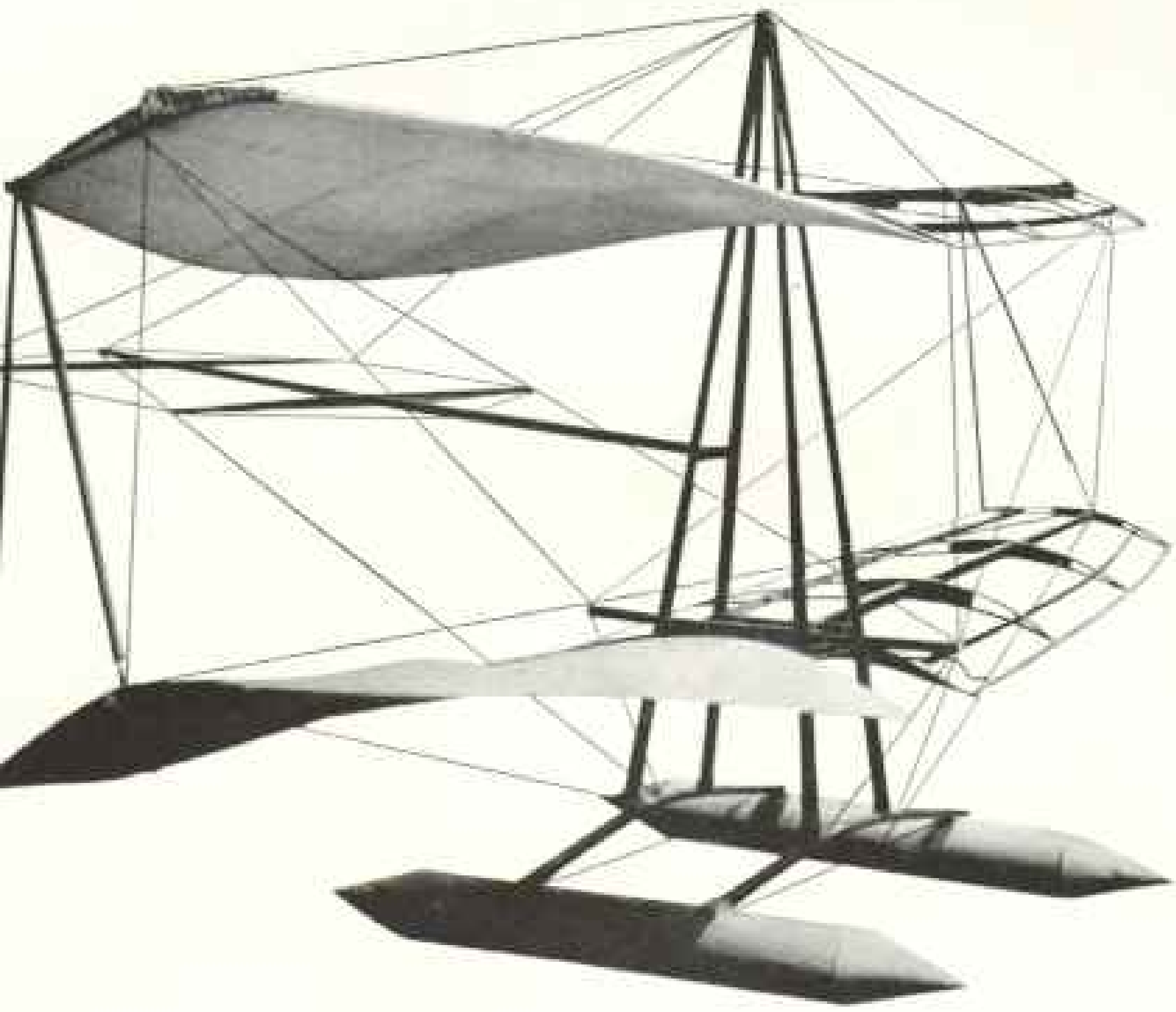

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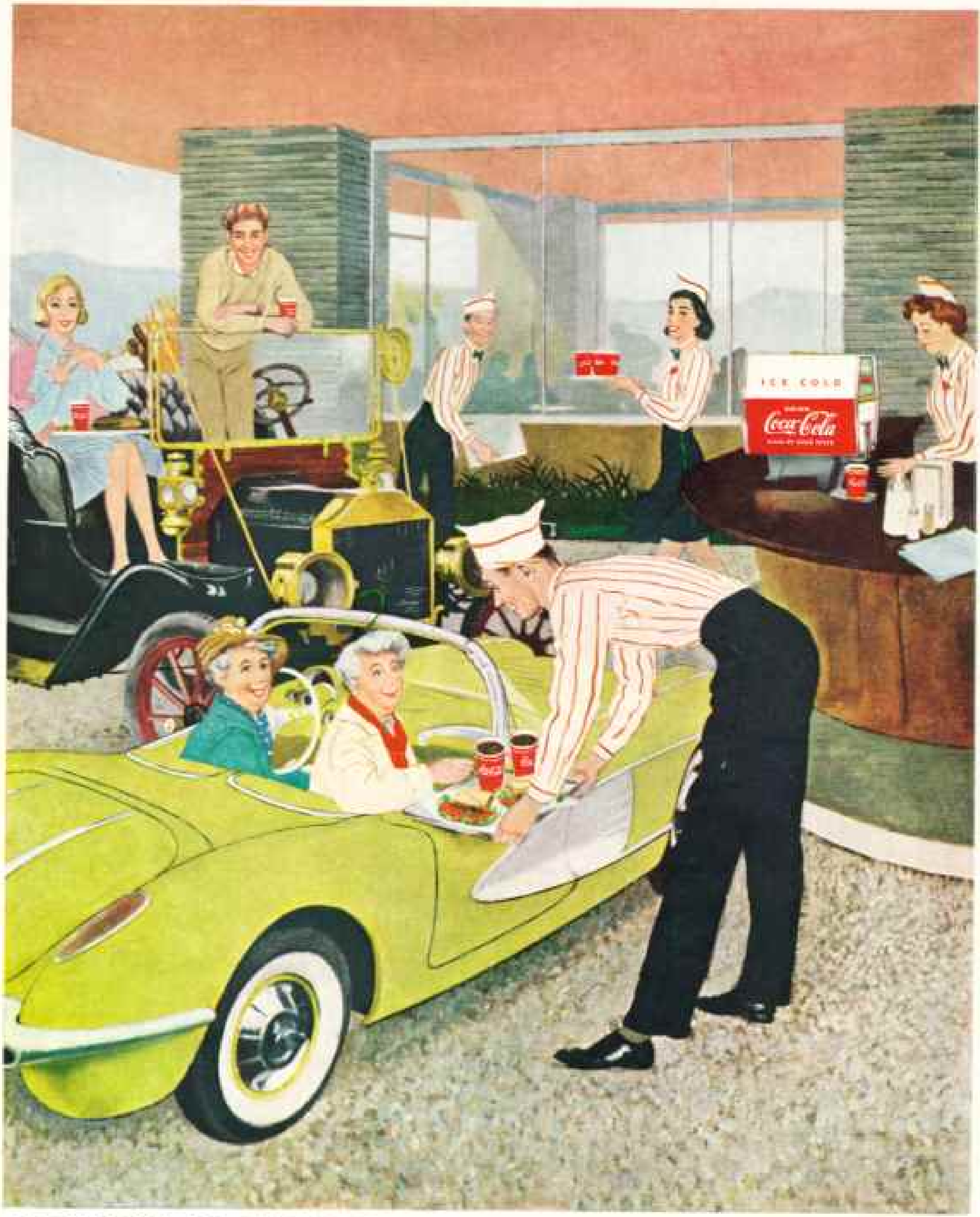
From Chapter 4 of "Dynamic America," a history of 420 pages and 1500 illustrations to be published soon by Doubleday & Company and General Dynamics Corporation, 445 Park Avenue, New York 22, N. Y.

GENERAL DYNAMICS



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