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ARTICLE AND PHOTOGRAPHS BY HELEN AND FRANK SCHREIDER

# FROM THE HAIR OF SIVA

*Climbing mountains and bucking swift waters in an amphibious jeep, two Americans find high adventure along India's Ganges and in her crowded cities and villages*

SOMEWHERE in the old red-brick building a shutter banged. Overhead the swish of ceiling fans struggled against Calcutta's hot, humid air. No other sounds punctuated the stillness as we sat there in the Foreigners Registration Office, waiting.

The Security Police inspector studied a folder containing our passports and our declarations that we had come to India to write about the plain of the Ganges for NATIONAL GEOGRAPHIC. With a brisk decision he snapped the folder shut.

"Remember," he said, "as you float your *Tortuga* past Benares, that you will be sailing by what may be the oldest inhabited city in the world." With that he smiled, handed us the documents—and we were off on the most colorful adventure of our lives.

*Tortuga II* was our amphibious jeep, bought from a World War II surplus depot. We had fitted her out with a sink, alcohol stove, bunks, storage space, and even a seat for Dinah, our German shepherd. Drive shafts to the four wheels and a propeller at the rear ran through rubber-sealed holes in *Tortuga's*

steel hull. There was a rudder connected to the steering wheel.

In a similar craft, four years before, we had bounced and sloshed the most tortuous part of the 20,000-mile journey from Circle, Alaska, 75 miles south of the Arctic Circle, to Tierra del Fuego.\* To make the trip, I had given up a job as an electrical engineer and Helen one as a draftsman.

### Ganges Holds Key to India's Past

Now in *Tortuga II* we planned to travel the plain of the Ganges, a vast sweep of land and sacred river that is the heart of India's life, history, and religion (map, page 458).

Sometimes *Tortuga* would roll the roads and highways, carrying us to venerable cities and princely palaces. Sometimes she would serve as our campsite in the countryside, where the only wealth was in the stars. And sometimes her wheeled hull would ride the brown breast of the stately river as we slipped

\* An account of the Schreiders' Alaska-to-Tierra del Fuego journey, *20,000 Miles South* (Doubleday), was published in 1957.

by the swarming, fecund life on the banks.

The story of the Ganges and the land it drains, as Prime Minister Jawaharlal Nehru once said, "is the story of India's civilization and culture, of the rise and fall of empires, of great and proud cities, of the adventure of man and the quest of the mind. . . ."

First we needed some information on the Ganges and its most westerly outlet, the Hooghly, which flows past the old British East India Company port of Calcutta. So we called on Capt. W. B. Killick, of the River Steam Navigation Company, a genial Briton reputed to know more about the Ganges and

its eccentricities than anyone else in India.

The captain was a stocky individual with quick eyes and a trace of Bristol salt.

"Aye," he said, "I know a bit about the Ganges. I've had 30 years on it. What would ye like to know?"

Briefly we told how we hoped to travel along the river from its source to its mouth.

"Which mouth?" asked Captain Killick. "There are dozens of mouths to the Ganges, though the Hindus believe that the true outlet is the Hooghly. But ye must have respect for that river, lad. It's broken the back of many a ship. There was a Japanese vessel



here not so long ago that went hard aground. A week later only the masts were visible. And the following week, nothing. The currents dug her grave in 70 feet of mud. And we've got tidal bores the likes of which ye've never seen. But why don't ye come with me and take a look?"

We had heard about the wall of water that races upstream in such rivers as the Hooghly, created when the capacity of the channel is overtaxed by the volume of the

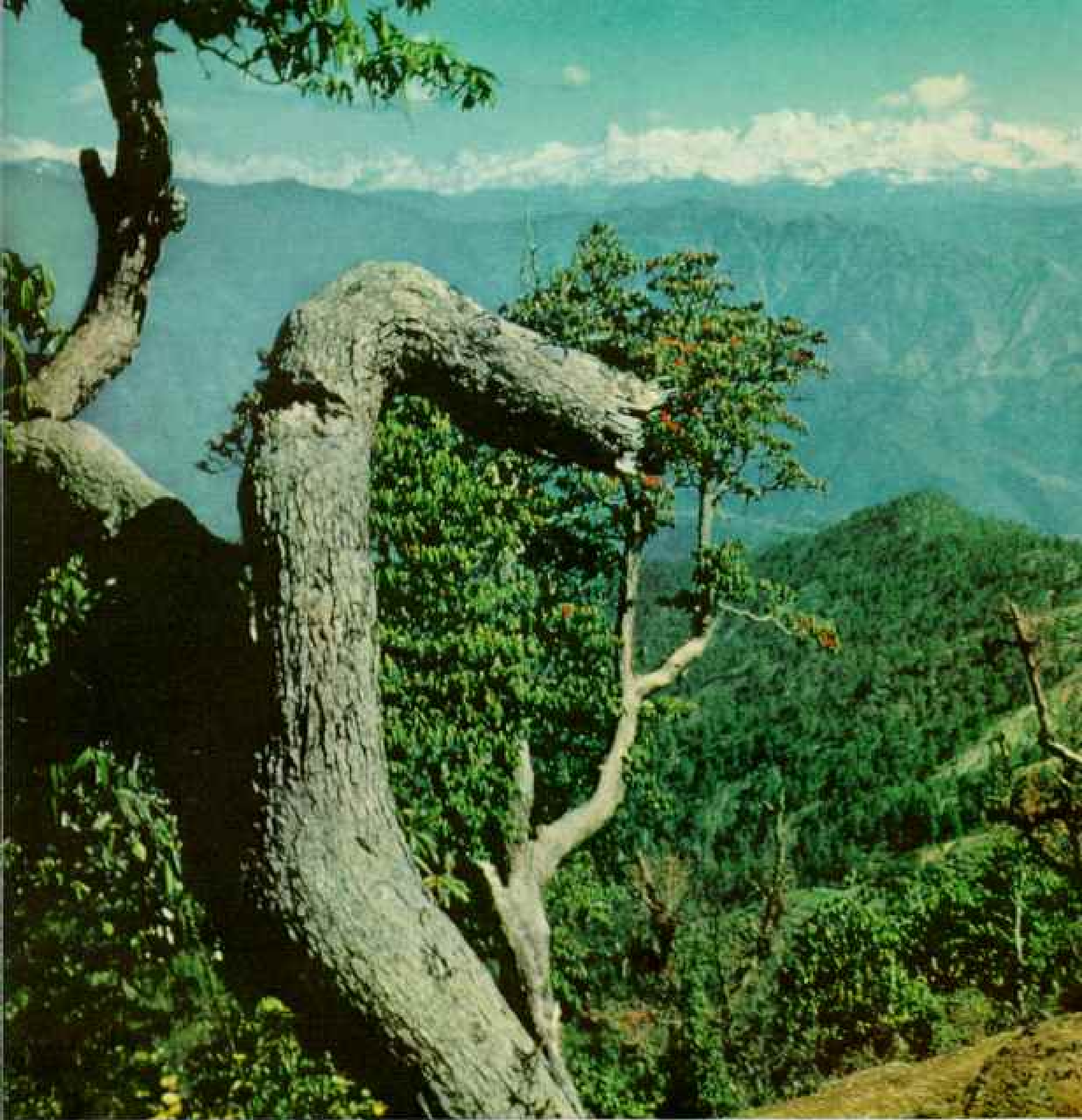


Helen and Frank Schreider capture the essence of India in this profile of life along the Ganges. Traveling in an amphibious jeep christened *Tortuga II*, the California couple spent five months tracing the river from source to mouth. Accompanied by Dinah, their German shepherd, they scaled mountains, swam rivers, and battled mud.

The Schreiders enjoy tea (above) in Buddh Gaya, cradle of Buddhism. Mahabodhi Temple in the background glorifies the Gautama Buddha, who attained enlightenment here 25 centuries ago after meditating 49 days beneath a pipal tree.

Testing *Tortuga* (left), Helen Schreider pilots the craft past a temple to the goddess Kali on the Hooghly, an outlet of the Ganges.

The authors wore out the first *Tortuga*—Spanish for turtle—during an 18-month drive down the Pan-American Highway from the Arctic to Tierra del Fuego. A new NATIONAL GEOGRAPHIC assignment has taken them to Indonesia.



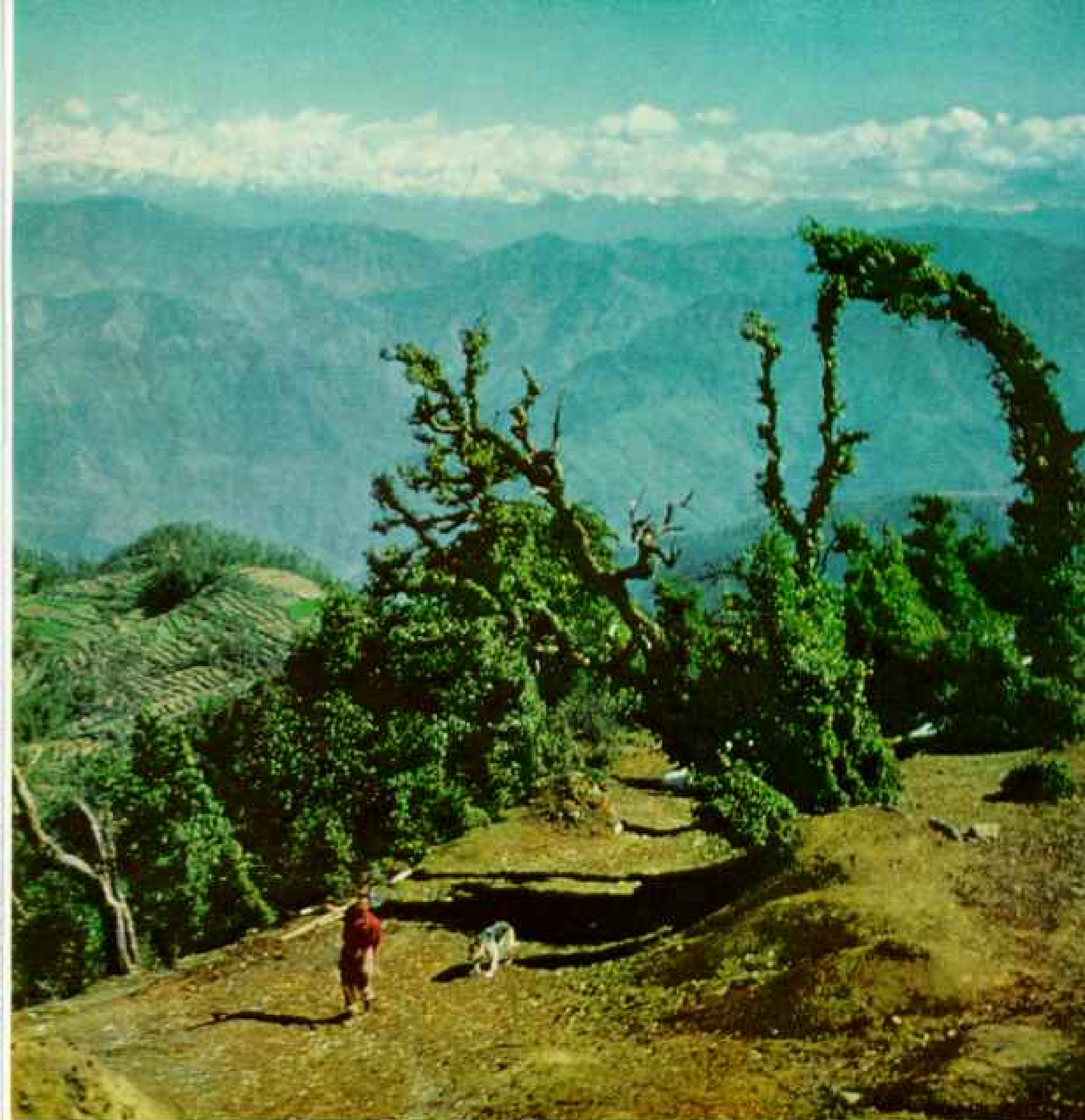
### Ice Crowns the Himalayas, Birthplace of the Ganges

Fed by melting snow, the Bhagirathi, principal parent of the Ganges, springs from glaciers high in the mountains near Gangotri (map, page 458). Swollen by tributaries, the stream merges with the Alaknanda and becomes the Ganges.

Barred from Gangotri itself by snow drifts, the Schreiders snaked along a cliff-hanging road to Kanatal. There, after a frigid night at 9,000 feet, they made this photograph as early light illuminated the spine of Asia.

incoming tide. But *Tortuga* was ready for our journey; so we left Captain Killick with a promise we'd take up his invitation on our return.

The Grand Trunk Road that led us from Calcutta on our quest for the source of the Ganges was a narrow, rippling thread of asphalt. This same road, where bullock carts now clattered, had known the marching cadence of British Tommies and the retinues of British governors general. The mile upon mile of trees that arched overhead and the mango groves where nightly we camped had shaded the mighty Mogul armies of Akbar, Shah Jahan, and Aurangzeb.



KODACHANDRAN © NATIONAL GEOGRAPHIC SOCIETY

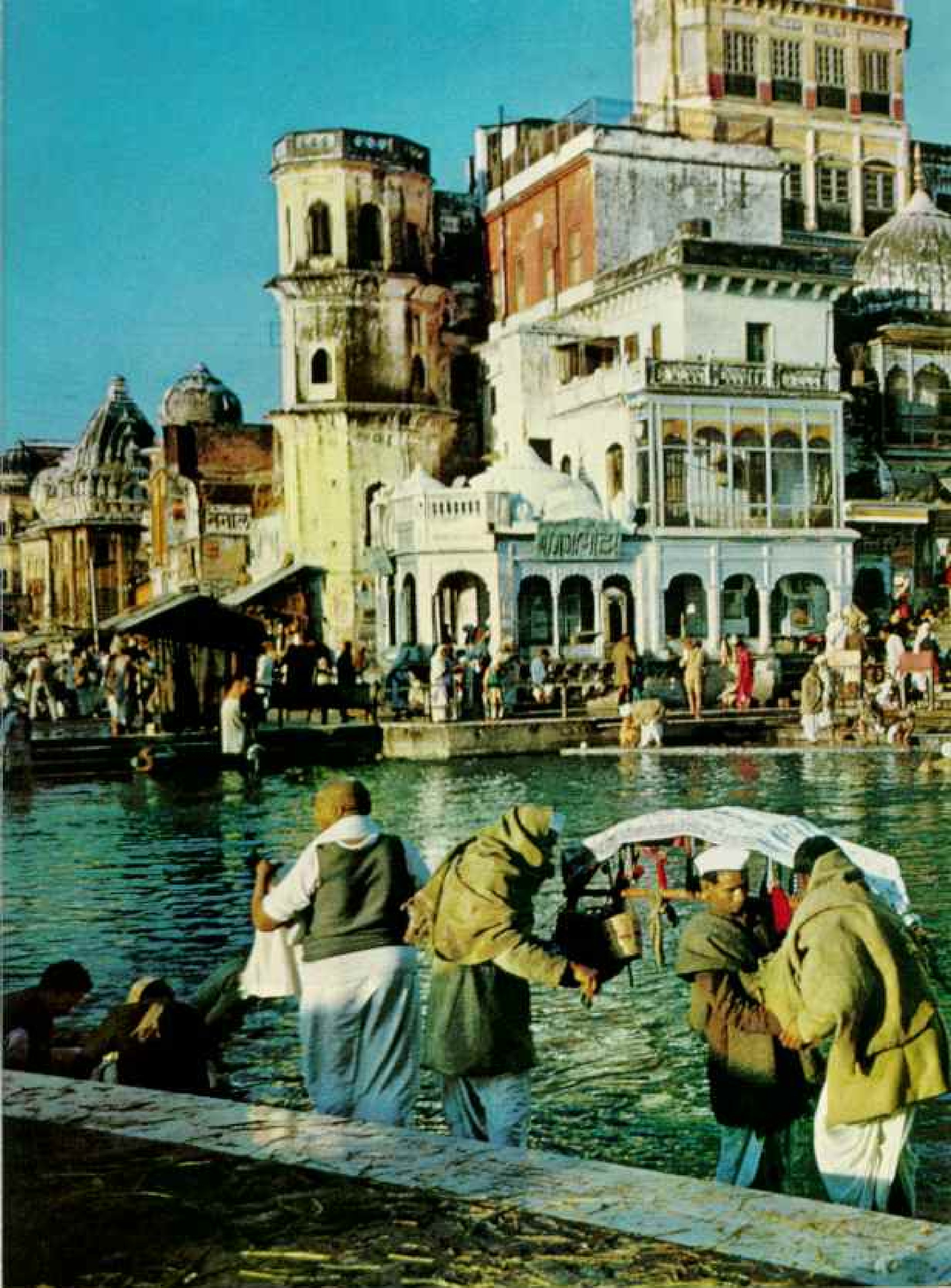
Before that the noble Asoka had sent his missionaries over this same route to spread the brotherhood of Buddhism. And long, long before that, nomads from beyond the Hindu Kush had spread over the plain of the Ganges, leaving a heritage of Aryan gods and a physiognomy that makes people of north India more Caucasian than Asiatic.

Where legions of armored war elephants once thundered over the tablelike plains, uninhibited Sikh drivers now pilot their diesel pachyderms, defying everything in front of them—except the sacred cows that plod unconcernedly along the highway.

Helen and I had smiled in Calcutta when

brakes screeched and buses swerved and street cars ground to a halt as some cow ambled nonchalantly along Chowringhee, crossing with complete safety where but moments before pedestrians had gambled with their lives. But now, faced with thousands of miles of driving among the two hundred million of India's cattle—one for every two Indians—we didn't think it was so funny.

However, we soon learned the psychology of the road: that you could pass safely in front of a cow, but that a water buffalo must be passed to the rear; that a pedestrian will jump at the sound of your horn, but not until you've almost run him down; that buses will politely



Hindu Pilgrims in Hardwar Wash Away  
Their Sins in the Sacred Ganges

To this ancient city at the foot of the Himalayas come Hindus eager to bathe in the holy river and drink its water. Some bring the ashes of departed relatives for sprinkling in the stream. Pilgrims



PHOTOGRAPH BY NATIONAL GEOGRAPHIC SOCIETY

in foreground bottle water for those unable to make the journey. Canopies shield their hallowed cargoes from the weather. Umbrellas on the far shore mushroom from the stone steps of the

Hari-ka-charan, a bathing ghat held sacred because it bears the reputed imprint of the foot of the god Vishnu. Pious Hindus protect the fish that thrive in the river here.



move aside, but that trucks will move for no one, not even each other.

As we sped northwestward toward Hardwar, there was a sameness that fused the days, a sameness of delightfully warm winter afternoons and bracingly chill evenings, a sameness of flat, yet undulating country. The villages were never more than a few miles apart, and we felt that their bucolic beauty could have changed little in the five thousand or more years of India's known history.

#### Worshippers Called by Conch-shell Horns

Muted, the call of conch-shell horns filtered through the trees as the village priests summoned the people to worship. Sometimes we could see, against the red sunlight, sari-clad women sprinkling flowers and water over the lingas, the stone symbols that represent the god Siva to Hindus. Then we would sleep. At dawn the same conch shells, medleyed with creaking well pulleys and the sonorous, deep-toned cowbells, would drift over the plains to awaken us.

Hardwar, at the foot of the Himalayas and a thousand road miles from Calcutta, is a city of priests, catering to the pilgrims who each year trek to the source of the Ganges. There we were directed a little farther up the road to Rishikesh, where the Ganges spills out onto the plain from its rocky gorge.

At Rishikesh the office of the Forestry Service was perched on a hill overlooking the green water of the Ganges. It seemed out of place in a town dominated by monasteries and with shaven-headed priests walking about in their saffron robes.

The Forestry Service officer welcomed us cordially and began briefing us before a large map on his wall. In the careful, pausing inflection common to English-speaking Indians, he said:

"Actually, several rivers make up the Ganges. Two of them join at Devapryog, about 30 miles from here. But I think the place you want is the mountain peak near Gangotri, where glaciers form the highest source of Ganges waters. However, I'm afraid you're a bit early for that. The mountain's elevation is more than 20,000 feet, and the passes are blocked with snow. Even in summer you would have to go on foot for seven days to reach it. But I know a spot where you might have a long-distance look."

He walked to the map and sketched in a road. "It's nearly a day's drive to Kanatal—

not an easy drive, either. And even after you get there, Gangotri peak probably will be clouded over."

From Rishikesh the Kanatal road veered into the Himalayas, a twisting tunnel through tall, gaunt trees where langur monkeys swayed from the branches, their fur like tarnished silver in the sun. As we climbed, the country changed and the road snaked along the faces of precipices with thousands of feet of nothing below.

Ten miles before Kanatal we left the main road and continued over a dirt trail, muddy and slippery from a recent snowfall. Slides partially obstructed the way, and we edged close to the sheer drops to get by. The road ended at Kanatal, nothing but a lonely, pine-crested ridge projecting from the screen of clouds that obscured Gangotri.

It was too late to return that day, so we parked *Tortuga* in the shelter of a wind-contorted pine. The altimeter indicated nearly 9,000 feet; as the sun set, the air grew bitter and the jeep rocked in the wind. Chilled, we heated some soup. When its warming effects wore off, we hunched in our bunks. But even that was no barrier to the penetrating cold, and we spent the rest of the night crouched in the seats, fully clothed and swathed in blankets, with a pot of coffee on the stove and the engine running to keep it from freezing.

I must have dozed, for I remember being awakened by Helen's excited cry. The clouds were gone. In the pale light of dawn we saw an unbroken chain of dazzling Himalayas. They stretched to either side as far as we could see, sharp and clear, as if cut from paper and pasted against the brightening sky. There, just beginning to know the rosy tint of sunlight, was the birthplace of our river (page 448).

#### Ganges Flows From the Hair of Siva

An ancient Hindu epic, the *Ramayana*, tells how the Ganges came to earth. The goddess Ganga was ordered down to redeem the souls of a group of condemned princes. But the gods feared the destruction to earth that her descent would cause, so Siva, one of the Hindu trinity, offered to break her fall. He caught her in his matted locks and allowed her to seep out slowly.

The ashes of the princes were washed by the waters of Ganga, and their souls ascended to heaven. Thus it is said that those who bathe in the holy waters of the Ganges will

### Turbaned, Bearded Sikh Weighs Sweets in a Hardwar Bazaar

Famous as fighters, India's Sikhs number more than six million. Their faith, which stems from an effort to bridge the gulf between Hinduism and Islam, evolved into a militant sect. Like Hindus, they cremate their dead and eat no beef. Like Moslems, they worship only one god and oppose the barriers of caste. An orthodox Sikh never shaves. He winds his hair into a topknot and wraps it with a turban. He winds his hair into a topknot and wraps it with a turban.

KODACHROME BY HELER AND FRANK SCHREIDER © NATIONAL GEOGRAPHIC SOCIETY





Rice terraces stairstep slopes in the foothills near Hardwar. Helen Schreider admires the silver bracelets that adorn this nose-ringed villager of northern India.

be endowed with virtue and spiritual strength.

This story is sung all over India, and any child will tell you that the Ganges flows from the hair of Siva.

For untold centuries the Ganges has been holy to Hindu India. People of all stations come to bathe in it, and for those unable to make the pilgrimage, its water is bottled and carried home. It keeps for years without stagnation—so the story goes—and a single drop on the tongue or eyelids of a dying man is believed to cleanse him of sin.

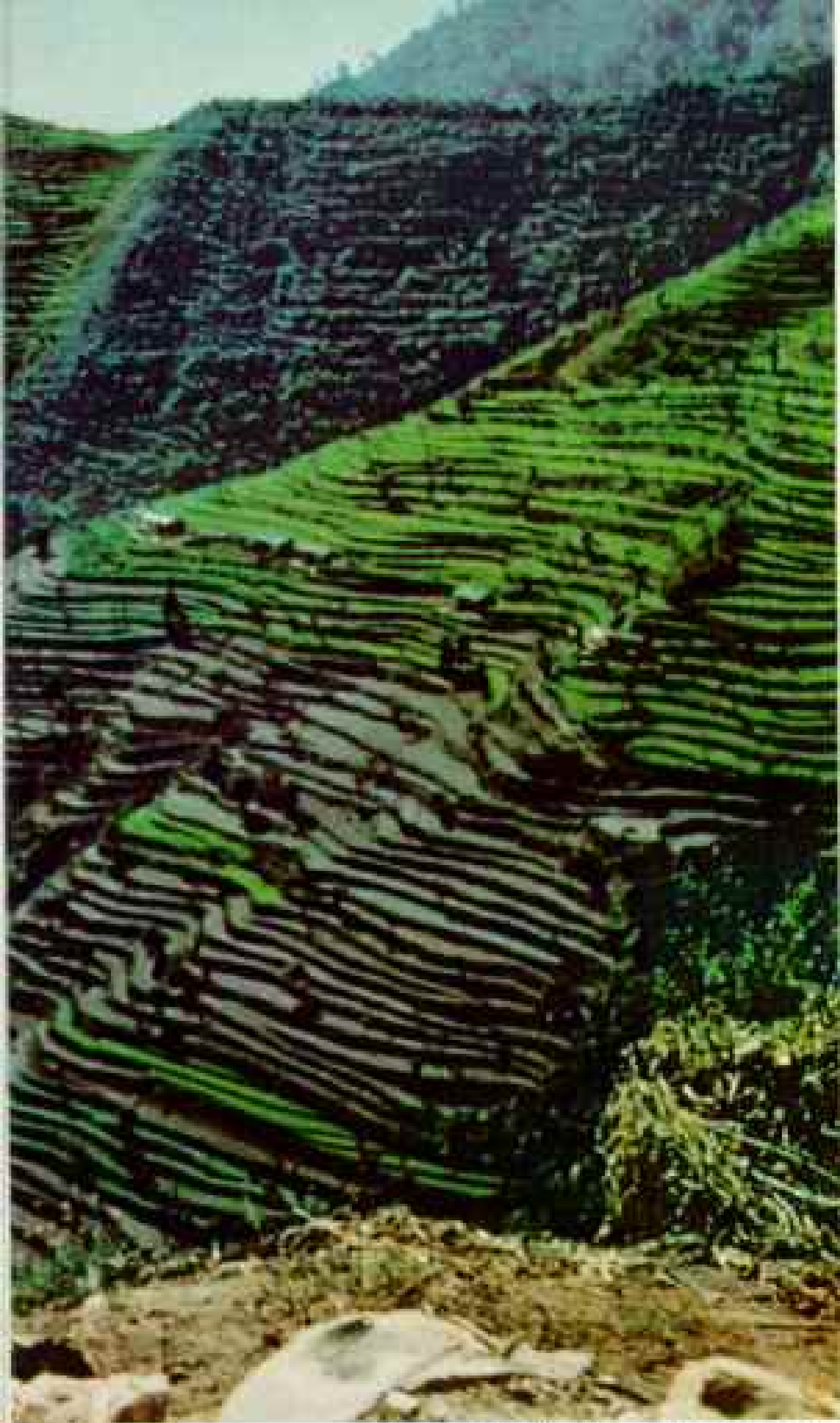
#### Sacred Water Must Not Touch Ground

When we returned to Hardwar, Helen and I watched these bottles being filled; some were no larger than a thimble. They were ladled full by people who had come on foot from all over India, carrying the ashes of departed members of their families. Ritually, they sprinkled the ashes in the Ganges, filled

their bottles, and returned, vowing that the baskets that carried their sacred burdens would not touch the ground until they reached home (page 450).

During our stay in Hardwar, we lived comfortably in a government inspection bungalow. Servants and a cook were in attendance at all times, but the diet left something to be desired. By custom, Hardwar is vegetarian—even eggs are frowned upon—and Dinah's tinned horsemeat almost drew cries of heresy. But she won out, and gloatingly looked on while we ate our meals of lentils and rice.

Each evening of our stay in Hardwar, we mingled with the throngs that gathered on the bathing steps to pay homage to Ganga. As the afternoon waned, little boats of leaves were launched. Laden with rose petals and marigolds, with a lighted candle to guide them, they were swept downstream by the cold, swift current. With the dying sun, more leaf boats



KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

were launched, until the river sparkled like the reflection of a starlit sky.

Then, precisely at the moment of sunset, a soul-shaking tolling of bells began, and from the three temples of Ganga a galaxy of oil lamps was carried to the water's edge.

Onlookers prayed silently—arms crossed on their chests, hands touching their shoulders, and their faces an eerie yellow under the lambent flames—as three times the lamps were raised and lowered, circled, and then extinguished.

By day, Hardwar had a gayer atmosphere. Chatting on the bathing ghats, the pilgrims wore their brightest clothes, only slightly less colorful than the ribbon-festooned baskets with their bottles of sacred Ganges water. Vendors went about noisily hawking religious pictures.

The Ganges Canal system, which begins at Hardwar and flows south for several hundred miles, was one of India's first attempts to

Veiled and necklaced with cowrie shells, a traveling cow returns Dinah's wary sniff on the road to Hardwar. Hindus revere the cow because her milk feeds children, her dung provides fuel and fertilizer, and her male progeny plow fields. This animal's master leads her from place to place, collecting donations from devout Hindus.



bring large areas of arid land under cultivation. Started during British rule, the intricate system of canals, power plants, and dams is being rapidly enlarged by the Indian Government. Perhaps its most ambitious part is the Bhakra Dam, in the Punjab area. Considered by many engineers to be the most difficult project of its kind ever attempted, it will be the highest in Asia.

Mr. Manly Harvey Slocum, the American adviser on Bhakra's construction, had much more to say of the project's importance. Called by Indians the "mother and father of Bhakra," this peppery man with steel-gray hair and amber eyes led us on a breathless tour of the nearly completed dam.

"It used to be that power was the tail of the dog," he told us. "Now power is the dog itself, and irrigation is the tail. Bhakra can do more for the industrial progress of India than any other project conceived."

India is well aware of the importance of rapid industrialization; more than half the budget for her Second Five Year Plan is de-

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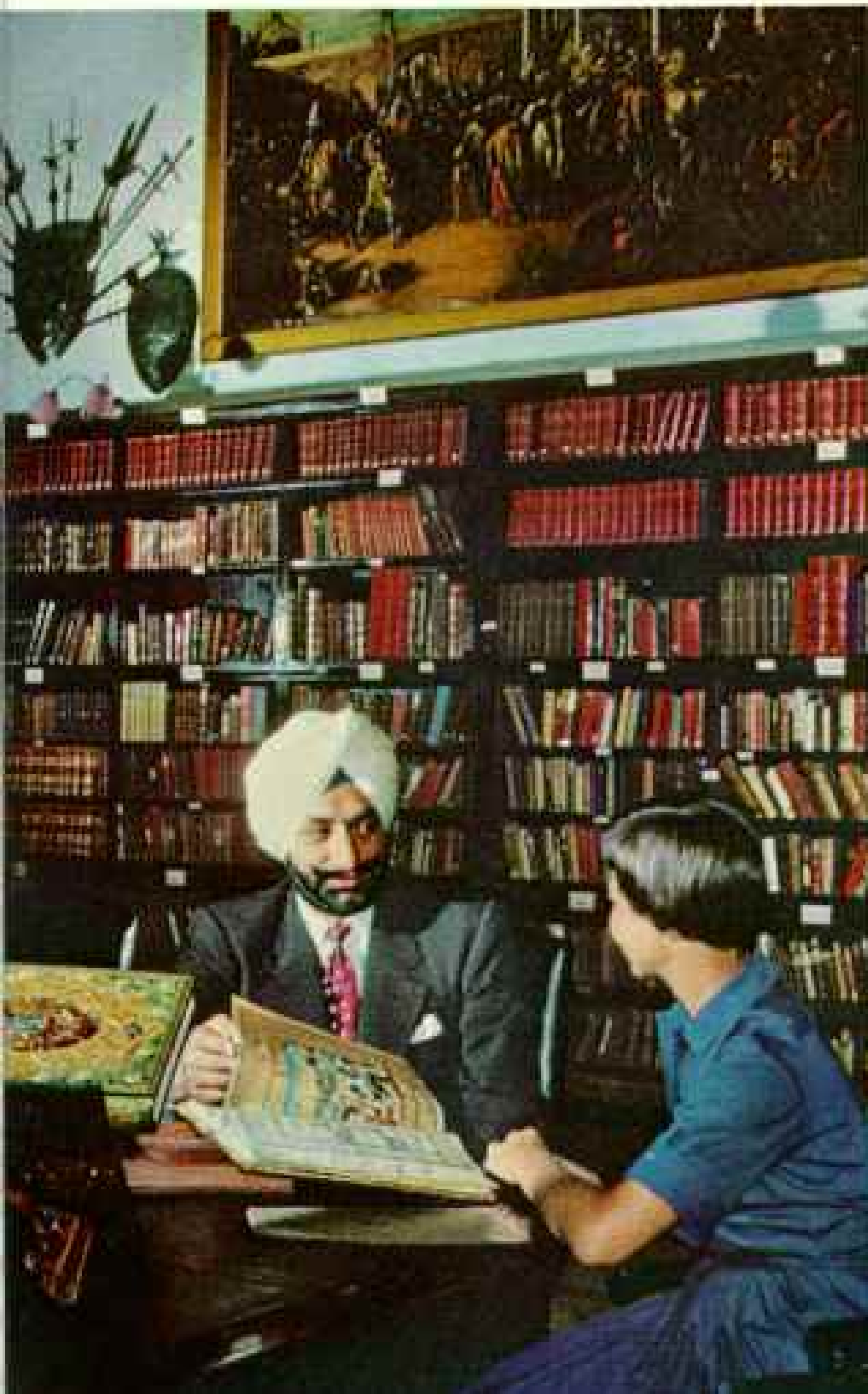


### Lofty Bhakra Dam Corks the Sutlej, Impounding Water for Thirsty Fields

The new dam will block a gorge in the Siwalik Range, where engineers scooped out more than 140 million cubic feet of earth before sinking the foundations 190 feet below the riverbed. Enough concrete will go into the 740-foot-high dam to build a one-lane road 5,000 miles long.

By harnessing the Sutlej, India will generate 450,000 kilowatts of electricity and irrigate 10 million arid acres. The river passes within 50 miles of the Ganges headwaters, but flows in the opposite direction and merges with the Indus.

Literary treasures fill the library of His Highness Sir Yadavindra Singh, Maharajadhiraj of Patiala. He shows Mrs. Schreider a 17th-century volume containing works of the celebrated Persian poet Sa'di. Diamonds and rubies stud the volume at his elbow.





STRUCTURE BY S. S. SUDHAKAR © NATIONAL GEOGRAPHIC SOCIETY

voted to the expansion of industries, mining, transport, communications, and power.

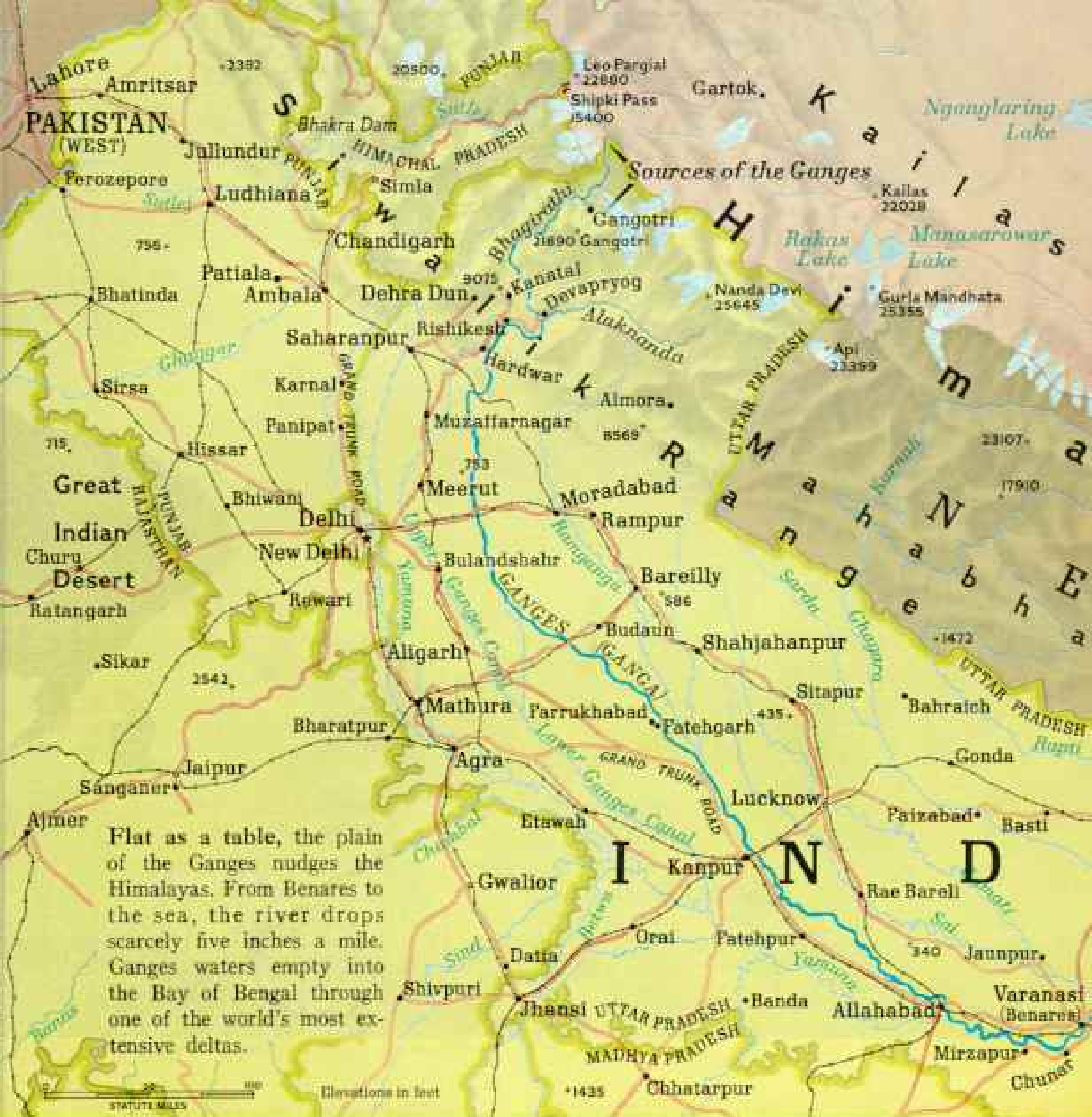
With ample coal and fabulous iron-ore reserves, the country is raising steel mills and factories everywhere. Though her economy is overwhelmingly agricultural, at the end of World War II she ranked tenth in industrial output in the world.

Now her products range from bicycles and automobiles to steam locomotives and light aircraft, from fertilizers and cement to radio-isotopes, from telephones and cable to machine tools and heavy electrical equipment. Industrially, India is a potential giant, though up to now her production has barely scratched the surface of her demand.

From Bhakra Dam we turned to the Punjab, scene of one of the bloodiest civil wars in history. A victim of India's partition, the

once-prosperous Punjab—the breadbasket of India—was flooded with millions of refugees. What's more, when the India-West Pakistan border was drawn, the divided Punjab lost its capital, Lahore, to the new Moslem nation. Rather than move it to another already established city, the Punjab chose to begin afresh. Under the guidance of the French architect Le Corbusier, the "cubist" city of Chandigarh rose from a virgin plain.

These new walls thrust against old walls of custom from India's past. People live in superblocks, grouped according to income, but even the poorest home has two rooms, modern plumbing, and electricity. Houses in each superblock sector face in toward a core of parks, shops, schools, and pedestrian walks; streets forming the grid of superblocks are exclusively for vehicles.



A friend had given us the name of a former student at the University of Southern California, a neighbor of our own UCLA, who lived in Chandigarh. Jaggi Singh was a Sikh, a member of the bearded sect that, after Hindus, Moslems, and Christians, represents the fourth most important segment of India's population. We had considerable trouble finding him, and we told him of our difficulty.

"Every time we asked where Mr. Singh lived, all we got were confused shrugs."

"I'm not surprised," Jaggi replied with a laugh. "All Sikhs are named Singh, and half of Chandigarh is Sikh. The initials are the important thing; they identify us. Singh means 'lionhearted.' It's just a title, indicating

that we're members of the Sikh brotherhood."

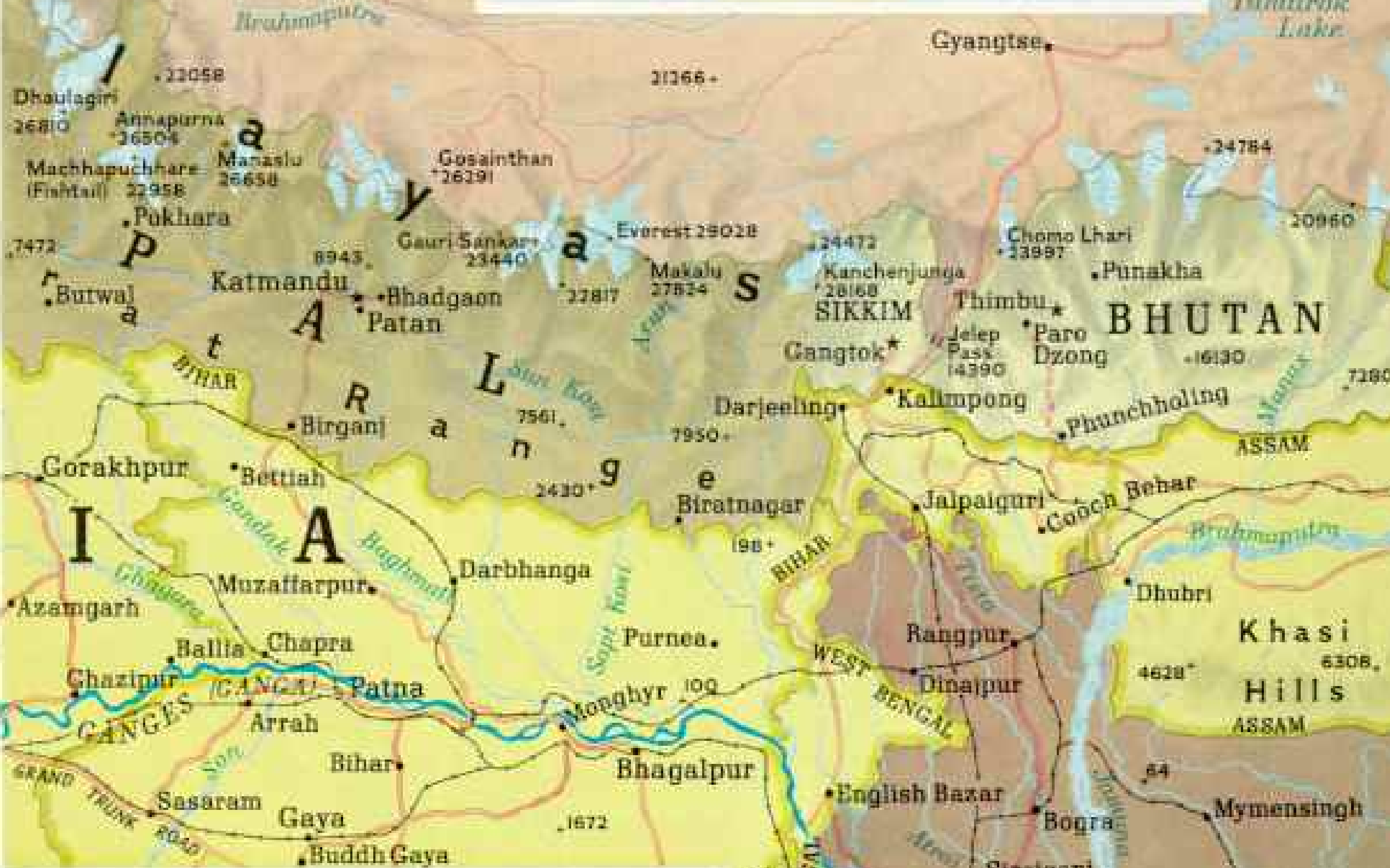
"Why do Sikhs wear beards?" I blurted boldly. Jaggi smiled.

"That's just one mark of a Sikh. There are five altogether; each has a reason. As a sign of strength and virility, we let our hair and beard grow. For the long hair we wear a wooden comb. And this," he said, indicating a thin iron bracelet on his right arm, "is to make us think before doing anything rash. The orthodox Sikh still carries an iron-handled knife for protection."

"That makes four," Helen said. "What about the fifth?"

Jaggi flushed a bit and mumbled something about short underpants, but that mysterious

# TIBET



allusion was all we ever got out of him.

"Tell me," he parried, "are the campus cops at USC still as kind as they once were? Instead of a ticket, they used to leave notes on my car's windshield saying, 'Maharaja, you parked your elephant wrong again.'"

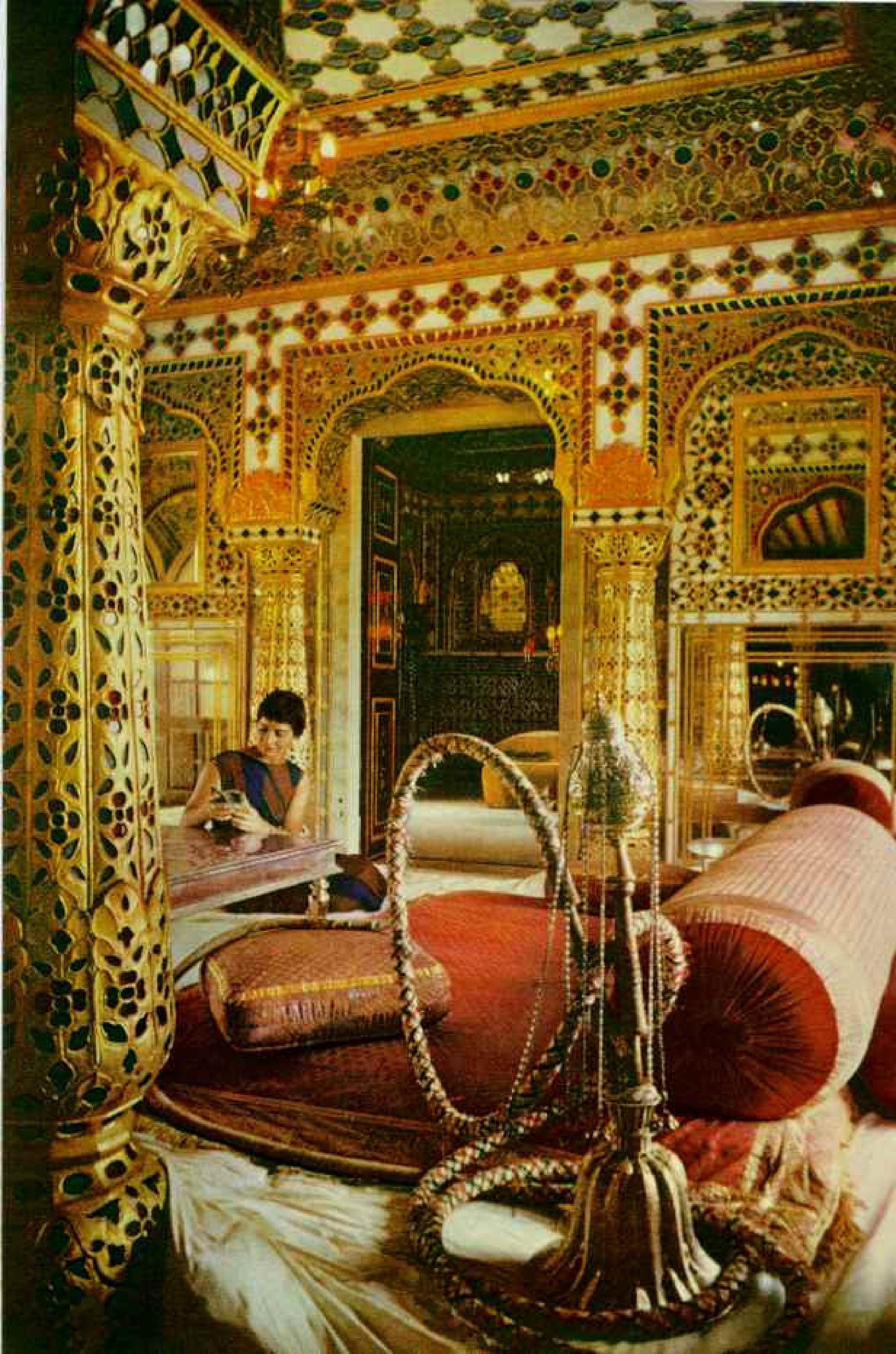
The next day, with Jaggi, we drove *Tortuga* 45 miles to Patiala, a neatly laid out city that was once considered in place of Chandigarh for the new Punjab capital. On the way Jaggi mentioned that he had telephoned for permission to see the gardens at the palace of His Highness the Maharajadhiraj of Patiala. Casually he added:

"When I spoke to the military secretary, I also requested an appointment with His



Drawn by V.L. Kelley and G.H. Emerson





Highness. He will see us at three this afternoon."

With a disturbed glance at her culottes and my khaki pants, Helen protested, "But we're not dressed to meet a maharaja."

"Never mind," Jaggi reassured. "I know His Highness well; he's not at all stuffy."

The military secretary met us at the palace entrance and led us down a long hall where carved elephant tusks and Chinese vases added to the Eastern atmosphere.

But when we stepped into the drawing room, it was as if we had entered another world, a world of 18th-century France. Oval-backed chairs and marble-topped tables gave the room a quiet dignity that was only enhanced when a few moments later His Highness Sir Yadavindra Singh strode through the door.

He was extraordinarily tall, but it was his

face that held our eyes. Framed by a pink-chiffon turban, it was a strong face with aquiline nose, heavy brows, and a jet beard that was rolled and parted and combed tightly to his cheeks (page 456). As he greeted us, he said:

"I've been a member of the National Geographic Society for many years. One whole shelf in my library is devoted to the magazine. But do sit down and tell me about your travels in India."

An hour passed quickly in pleasant conversation. Then the maharaja looked at his watch.

"Please excuse me," he said, "but I have an appointment. You will stay with us a few days, won't you?"

From across the room I could sense Helen's electrified thrill as I accepted with thanks.

The small plaque by the door of guest

REPRODUCED BY HELEN AND FRANK SCHREIDER © NATIONAL GEOGRAPHIC SOCIETY



Sacred bull Nandi, mount of the god Siva, stands in shining brass in a temple at Jaipur. Visitor at right drapes her sari from the right shoulder, the vogue in western India.

Maharaja of Jaipur's opulent penthouse gleams in lacy gilt atop the Palace of the Moon. The maharaja has moved to a new palace outside the city wall; he uses this old abode in the heart of Jaipur for state occasions only. Mrs. Schreider examines a perfume flask. Tall silver hookah, or water pipe, rests close to a velvet divan in His Highness's sitting room.



Woman of Sanganer, using an age-old technique, prints designs on cotton. Hand-carved wooden blocks create the pattern.

Arms wreathed in silver jewelry, a vegetable vendor offers squashes from a curbside in Jaipur.



Palace of the Winds—the many-tiered Hawa Mahal—commands a street in Jaipur. In prerepublican days the window lattices, carved in stone, gave the royal ladies and their maids a private view of life's daily parade.

An astronomer-maharaja in 1728 laid out Jaipur's plan in neat squares and broad avenues. Bright sandstone and red marble buildings give it fame as India's pink city. In this view, parked camels disdainfully survey the authors' jeep; cyclists pedal past a horse-drawn tonga.



KUDACHHOMER © NATIONAL GEOGRAPHIC SOCIETY

room No. 3 had our names on it. Shortly before eight, a tap summoned us.

"His Highness is expecting you for cocktails."

In the drawing room we met for the first time the maharaja's other guests: the Indian Ambassador to Ethiopia and a retired British general whose love of India was so great that he had returned to work for its development.

The maharani, a petite, attractive woman, joined each guest in turn. In her flame-

colored *salwar-kameez*, the flowing, pajama-like costume of the Punjab, she made a striking picture beside the towering, handsome maharaja.

The conversation at dinner centered around a problem in chess, a game that may have originated in India. Between courses the moves of the chessmen were discussed until the problem was solved.

Afterward trays of bonbons were passed. Selecting one, I started to unwrap the micro-



tomically thin foil. "No," my dinner partner said. "You eat the foil. It's pure silver, and very good for the digestion."

I popped it into my mouth. The silver foil gave no trouble, but an acrid tartness shriveled my tongue. Trying to disguise my expression, I swallowed hard as my partner added:

"There's nothing like *pan*—I think you call it betel—after a fine meal."

#### 40 Feet of Muslin "Build" a Turban

From Patiala we went to the pink city of Jaipur.\* Renowned for its rose-pink buildings, its Rajput paintings, its brasswork, and its warrior kings, Jaipur shines in the heart of Rajasthan with the brightest colors of the dyemaker's art.

"Wait until you see the turbans they build in Jaipur," we had been told. And "build" them they do, with as much as 40 feet of thin muslin in blues, purples, yellows, and reds. Viewed from the top of any building on market day, the crowded streets look like never-ending beds of animated sweet peas.

On other days, when there was room to move around, Helen and I walked the streets, marveling at the varied handmade products being fashioned on the sidewalks, the enameled brassware, the boldly patterned wood-

block prints on cotton, the delicate tied-and-dyed saris in designs traditional for centuries.

Paintings of elephants and soldiers on walls of buildings and homes caught our eyes, and we asked our guide about them.

"In the old days," he told us, "the maharajas had their private armies, and at the gates of their palaces they posted guards. The people wanted the same protection, but since they couldn't afford it, they had the symbols painted on their walls."

The feudal magnificence of India's princes has all but vanished because of high taxes, soaring costs of living, and assimilation of estates by the central government when India gained independence. Yet each year in New Delhi a pageant of a different nature keeps some of the traditional splendor alive. We arrived in India's capital just before that pageant, the Republic Day parade (page 466).†

Since midnight the crowds had been waiting for the festivities to start. Trees flanking the Raj Path were filled with villagers craning for a glimpse of Prime Minister Nehru

\* See "Around the World and the Calendar with the Geographic," by Melville Bell Grosvenor, NATIONAL GEOGRAPHIC, December, 1959.

† For a vivid description of India's seat of government, see "Delhi, Capital of a New Dominion," by Phillips Talbot, NATIONAL GEOGRAPHIC, November, 1947.



PHOTOGRAPHS © NATIONAL GEOGRAPHIC SOCIETY

Camping on the desert's edge between Delhi and Agra, the Schreiders were awakened by Dinah's growls; they found themselves surrounded by caravan camels. Here, next morning, a half-grown dromedary tests *Tortuga's* spare tire for edibility.

Masks protect germs and insects, not the nuns. Two Jain women, members of an ancient but relatively small sect, cover their mouths to spare life, no matter how invisible. Wandering barefoot, begging and singing, they pause to chat with Mrs. Schreider near Gwalior.

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and Prince Philip, Duke of Edinburgh, who was in Delhi for the occasion (page 471).

In time to clashing cymbals, elephants with painted faces and golden headpieces padded majestically along the Raj Path. Over the rumble of tanks and armored cars, the shrill of bagpipes blended with the high voices of marching school children. Groups in local dress from all parts of India performed their dances. But it was at the end of the parade that the diversity of India's heritage was most striking. Screaming above the Raj Path, a squadron of jets swooped low over the tall India Gate as the feathered Nagas of Assam brandished spears in a wild dance of the hunt.

The week of festivities in honor of Republic Day was climaxed by a retreat ceremony with all the pomp of British times. But though this was supposed to end the celebrations, at almost any hour in the days that followed we could see gaily uniformed brass bands on street corners. Since the Republic Week program didn't enlighten us, we asked at the Government of India Tourist Office. With

#### Republic Day Parade Rolls Through New Delhi

Like Washington, D. C., the Indian capital was carved from the territories of two adjoining states. Seven other Delhis have risen and fallen here.

Crowds lining the Raj Path, the Indian capital's former King's Way, on January 26, 1959, hail the ninth anniversary of their country's independence. Dome, flag, and slender commemorative column identify the Rashtrapati Bhavan, the Indian White House. North (right) and south blocks of the Central Secretariat, the government's administrative offices, flank the President's home.

Britons, who constructed these buildings and ruled from them, turned them over to India when they granted self-rule.





a smile the young man behind the desk explained:

"Why, this is the marriage season. As a matter of fact, I'm getting married myself. I think you'd be interested in the ceremony; we'd be pleased if you could come."

Helen and I accepted gladly. As we left, our new friend said, "I almost forgot to mention that the priest has selected two in the morning as the wedding hour. But why don't you come early and watch the bridal preparations. I'm sure Usha wouldn't mind."

#### Wedding Flouts the Caste System

That was our introduction to Pal and Usha, a refreshing young couple who in many ways represent a new trend in India. For Pal is a Vaisya and Usha a Kshatriya, and not so many years ago they could not have married.

Still strong after more than 3,000 years, the caste system dictates the life and activities of every orthodox Hindu. Traditionally conceived to segregate the light-skinned Aryan conquerors from the darker aboriginal Dravidians, the caste system developed into a division of labor: Brahmans were the priests and scholars; Kshatriyas the warriors; Vaisyas the merchants; Sudras the workers; and beyond caste were the untouchables, condemned to the most menial of tasks.

Though the traditional lines of occupation are no longer strictly followed—and, thanks to Mahatma Gandhi, untouchability has been outlawed—custom dies hard, and intercaste marriages are still frowned upon.

In other ways, too, Pal and Usha were breaking away from tradition. In a land where marriages are still arranged by the parents, Pal and Usha were marrying for love. What's more, after the wedding Usha would continue in her profession as a teacher. And yet, in spite of these breaches of custom, tradition would be maintained in a ceremony exactly as prescribed in the Vedas, that ancient collection of Aryan rituals and thought.

When we arrived at Usha's house one morning of the following week, the striped *shamianah*, or canopy, for the wedding dinner was already in place, and inside the house

a group of women—friends and relatives of the family—were singing teasing songs to the accompaniment of a drum.

"But where's Usha?" we asked.

From one corner of the room, a small, tired voice answered. It was Usha. Her lustrous dark hair hung disheveled, and, wrapped in her oldest sari, she sat shelling peas.

"I'm not supposed to talk," she said, "but I don't want you to think I always look like this in the morning. All this is supposed to make the contrast more apparent when I put on my wedding dress."

For the rest of the day Usha sat patiently while her aunt decorated the palms of her hands and soles of her feet with red dye. She was still waiting for the color to dry when we left to dress for the wedding feast.

When we returned that evening, hundreds of guests milled about. A brass band approached, leading the groom's wedding procession. Pal, mounted on a white mare, brought up the rear.

The groom's arrival was the signal for the feast to start. Preparations had been going on for weeks, and steaming platters of delicacies were carried in by white-coated bearers. While relays of guests were dining, final arrangements for the ceremony were completed. In the small courtyard at the rear of Usha's house, the priest made an elaborate symbol of Ganesa—the elephant-headed god of good fortune—and built a sacred fire.

#### Symbolic Knot Unites Hindu Couple

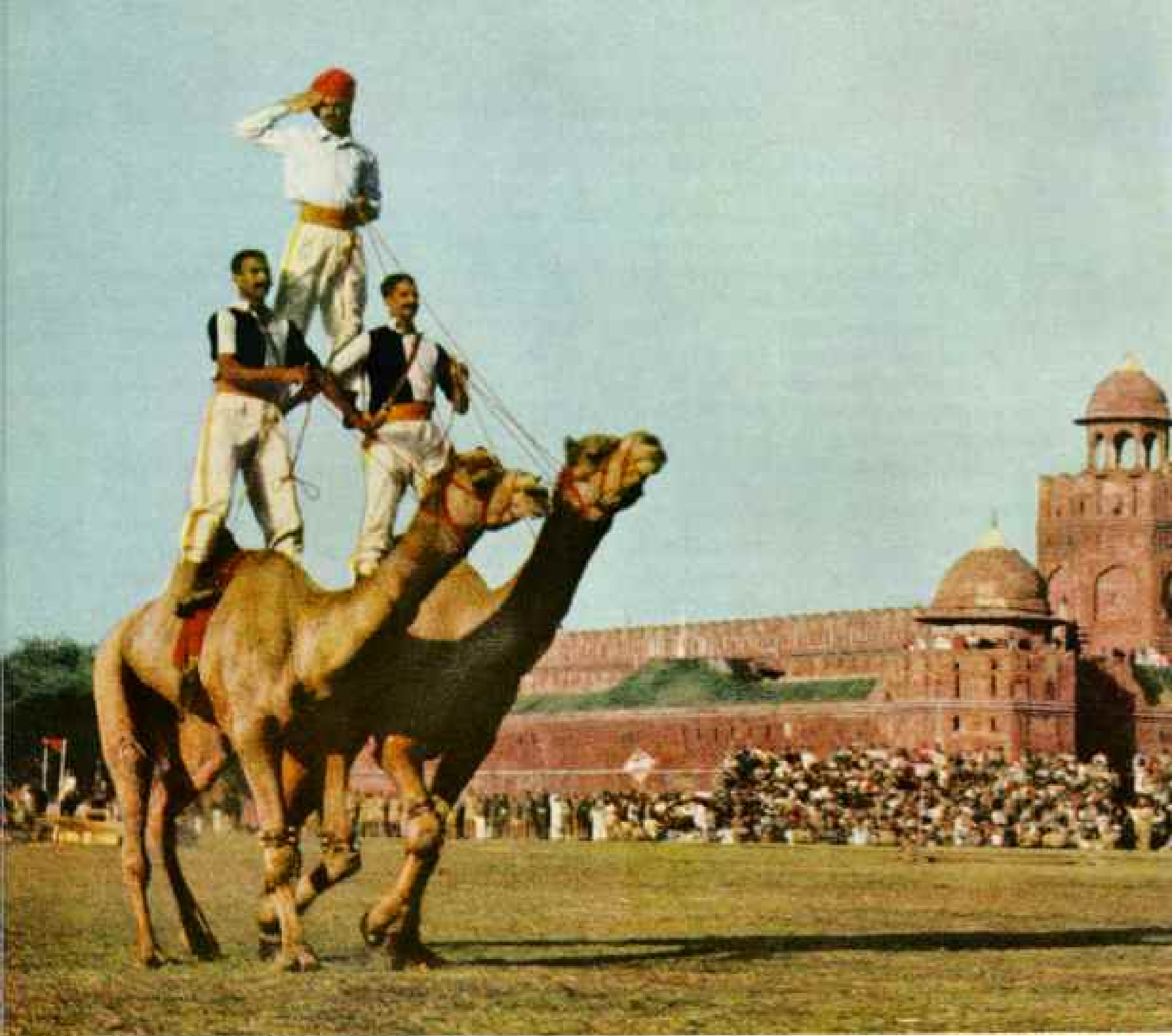
Above the priest, Usha's brothers erected a canopy of *tulsi* leaves, and by midnight everything was ready. We asked Pal why the hour of two a.m. was chosen.

"Most Indians," he explained, "are firm believers in astrology. The pundits are always consulted before any undertaking, especially marriage. Horoscopes of the boy and girl must be compatible. If not, they are considered to have little chance for a happy life together. What's more, certain seasons are thought to be particularly auspicious, and even the hour and minute are selected by the priest."

By 2 o'clock the guests had thinned to the

#### Flaming Red, Symbol of Joy, Garbs a Bride; Flowers Veil Her Man

Replenishing the sacred fire with rice and ghee, a turbaned priest intones the vows. Usha (left) and Pal, friends of the authors, hold hands as they repeat the words in Sanskrit, sacred language of Hinduism. Astrologers fixed the hour—two a.m.—for this ceremony in New Delhi because the time seemed auspicious.



immediate family and a few close friends. In the brisk night air we all huddled on the benches while the priest began his chanting (page 468).

Blessing a piece of cloth, the priest tied one end to Pal and the other to Usha as a symbol of their union. Then he recited marriage vows, which the couple repeated; this went on for nearly two hours. Finally Pal and Usha walked seven times around the sacred fire, each turn accompanied by Pal's admonition to his bride:

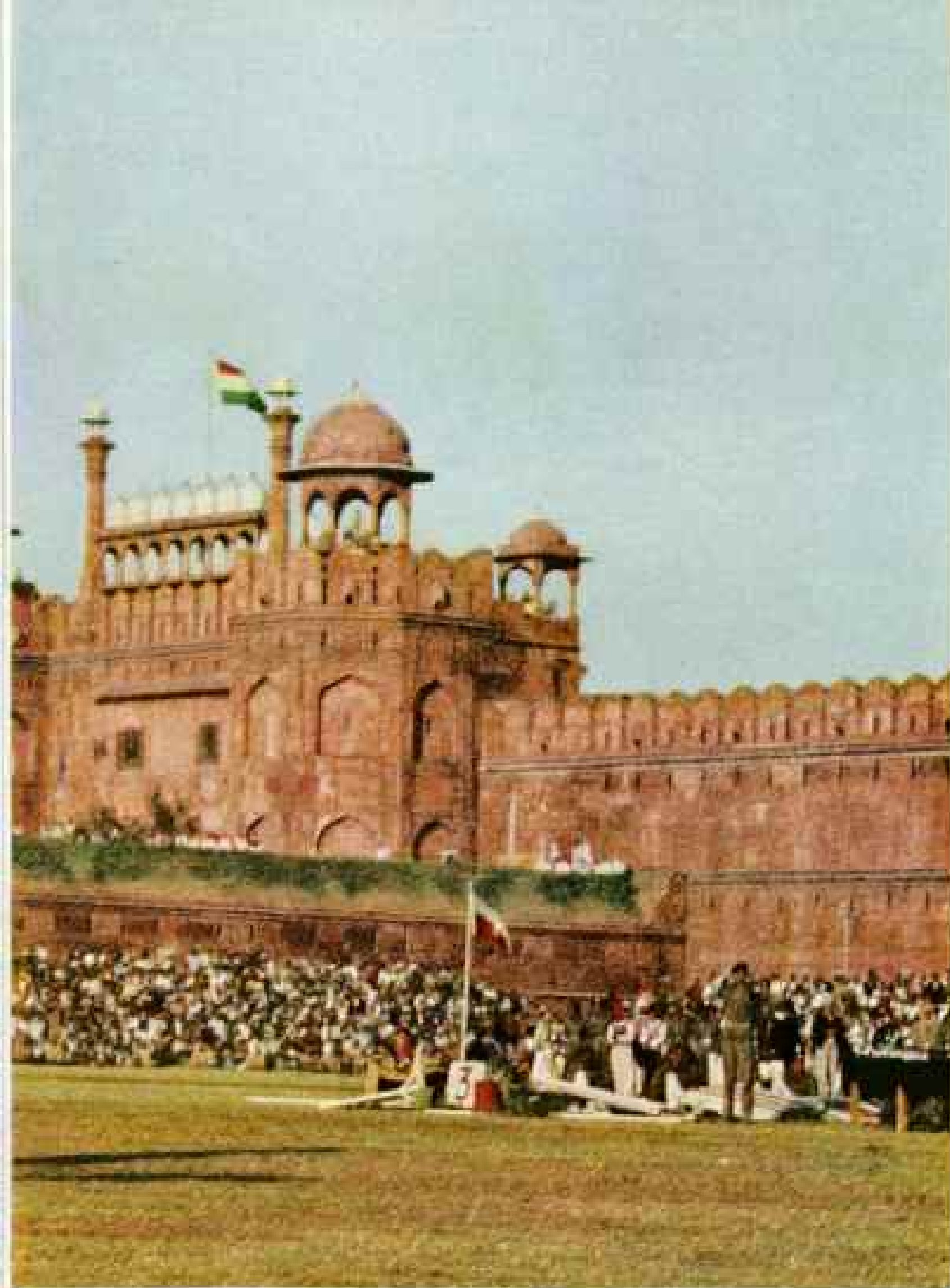
"Take thou one step for the acquirement of force, two steps for strength, three steps for the increase of wealth, four steps for well-being, five steps for offspring, six steps for the season, seven steps as a friend. Be thou faithful to me, may we have many sons, and may they attain a ripe old age."

At the end of the long ritual, Pal tied the sacred thread around Usha's neck, and there was a sigh of relief. There were the trousseau

and wedding gifts to display, and the procession to the house of Pal's family, where Usha would enact some small task symbolic of respect for her mother-in-law. With Usha, however, it was a token, for the couple were breaking away from yet another tradition, the joint family, which is almost universal in India.

Most grooms bring their brides home to live with grandparents, parents, unmarried sisters, brothers, and all the offspring—often as many as 15 people in one house, and all expecting the bride to wait on them. In overpopulated India, where housing is scarce, the joint family has many advantages: the elders are cared for, there is little need for orphanages, and family income is shared. But many of India's leaders complain that the system encourages slackers and stifles individuality.

With Pal and Usha thoroughly married, thoroughly tired, and facing a full day of visiting, Helen and I offered our congratulations and farewells.



ENTER BRIDGEMORE, LEAVE, AND HIGGARDONE BY HELEN AND  
FRANK SCHNEIDER © NATIONAL GEOGRAPHIC SOCIETY

### A Living Pyramid of Riders and Camels PASSES Delhi's Red Fort

Shah Jahan, fifth Mogul Emperor of India, raised the fort in 1648 as a nucleus for his new capital. Some 50 Britons were imprisoned and massacred there during the Sepoy War, or Mutiny, of 1857, when Indian soldiers revolted against the English and laid siege to Delhi.

The fort's red sandstone walls once sheltered a magnificent palace with jeweled marble walls, gardens, and royal baths. Time, earthquake, and invaders have taken toll, but the delicately inlaid stonework remains a feast for the eyes.

This team entertains spectators at the Indian Army's annual horse show.

Polo fans at New Delhi: Prince Philip, Duke of Edinburgh, who visited India in January, 1959, and Prime Minister Nehru converse with Mrs. K. S. Thimayya, wife of the Indian Army's Chief of Staff. Defense Minister V. K. Krishna Menon sits at far right.



### Moonlit Taj Mahal Floats on an Inky Sea

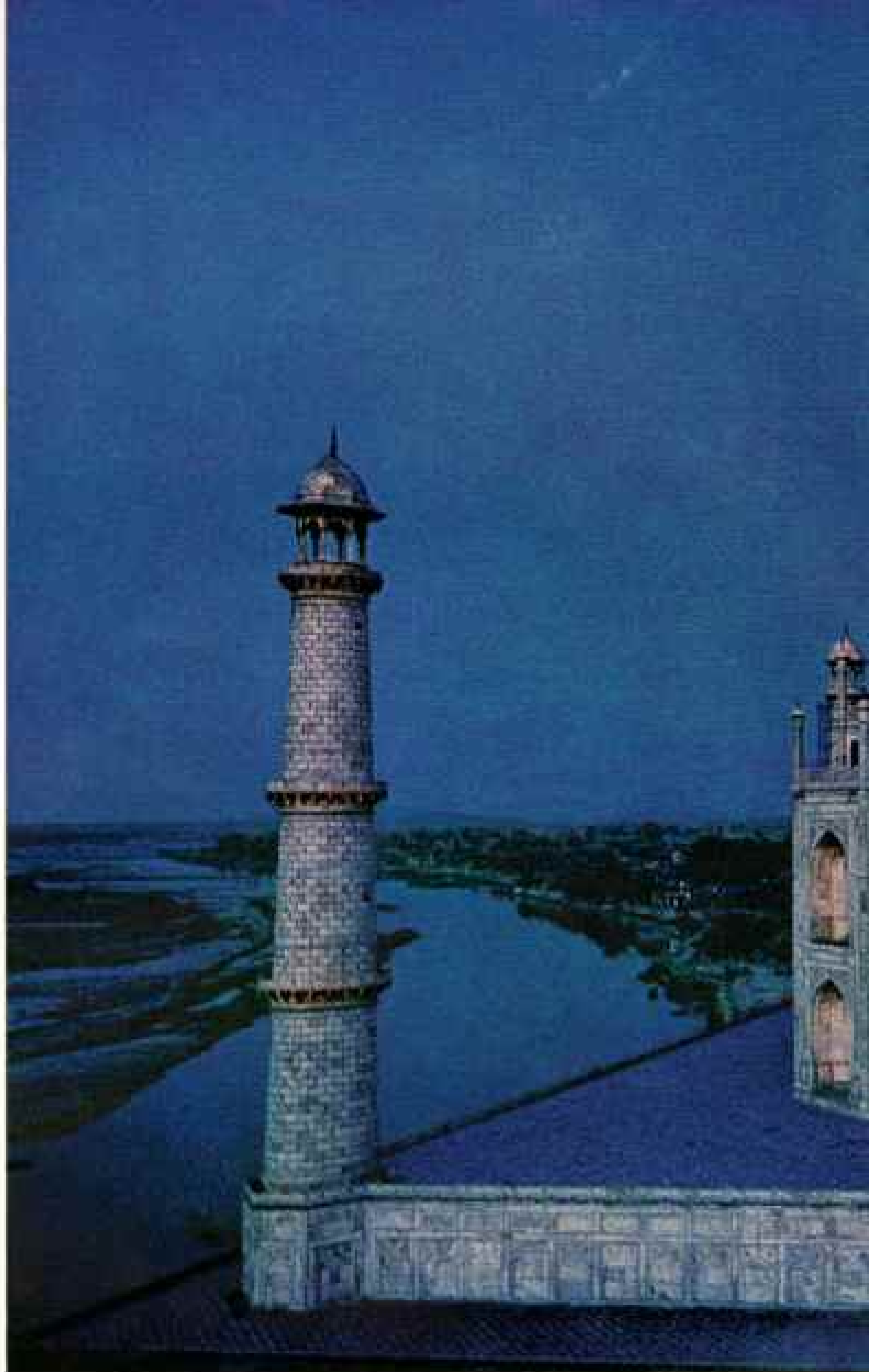
A 400-year-old love story that never palls in the telling, the Taj was built at Agra by Shah Jahan to shelter the tomb of his wife Mumtaz-i-Mahal, who died in 1631 bearing their fourteenth child.

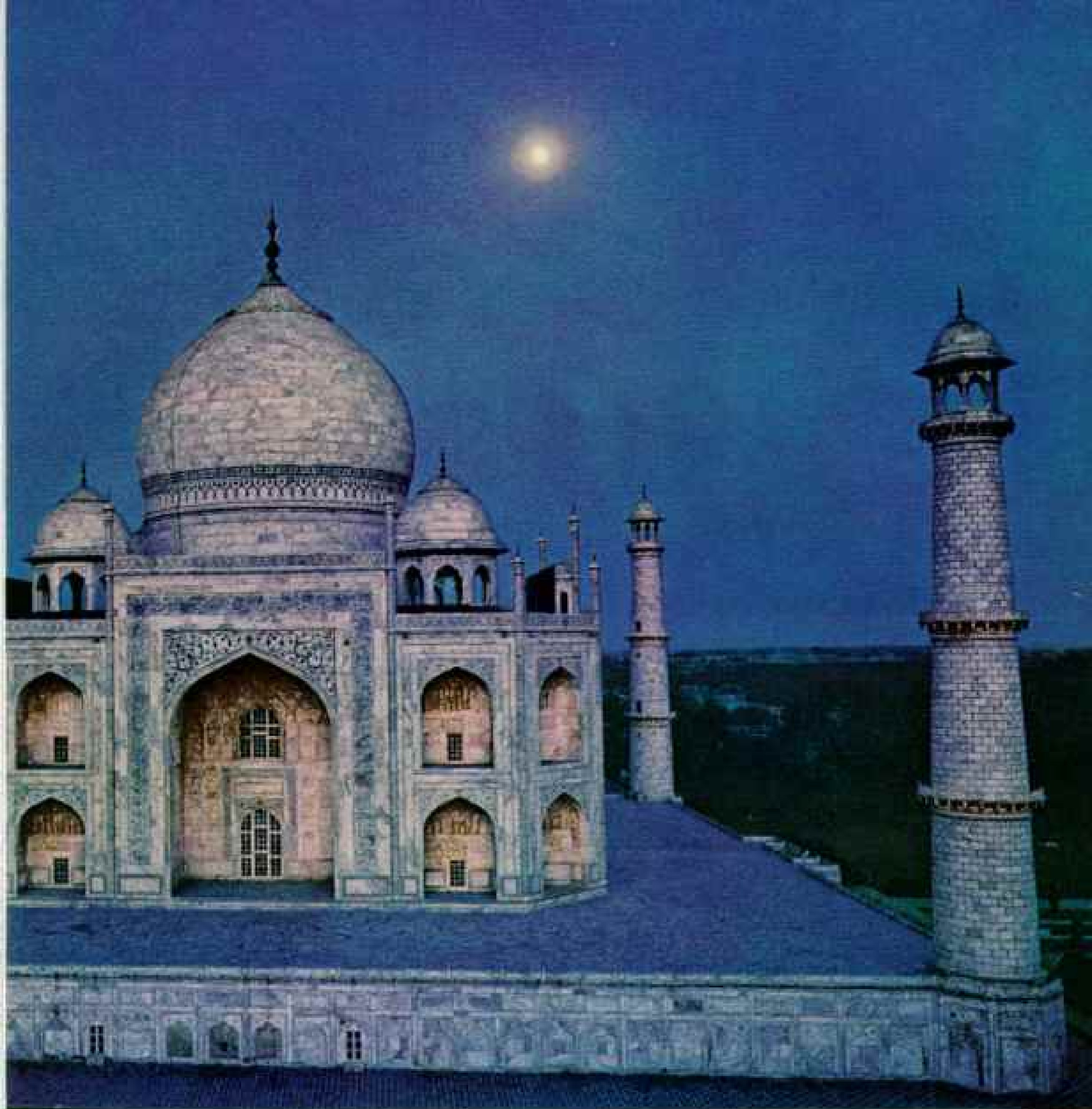
Marble mausoleum rose on marble platform; tapering minarets at the corners took shape like lighthouses; Jewelers cut gems into wreaths, scrolls, and flowers and laid them in the stone.

Imprisoned by his usurper son in a tower close by, the Mogul Emperor spent hour upon hour gazing at his beloved Taj. His last wish was to be carried to a window where, "dimly looking across the waters at the glowing whiteness and the glittering of that melody in marble, he fell into a deep and endless sleep." Shah Jahan was buried next to his wife in the monument he had raised to their love (page 474).

Mirrored in a pool, the sunlit Taj stands on its marble dome.

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"Can you imagine," Pal remarked as we left, "this is the short ceremony. It used to last many days. I only wish I could have persuaded the priest to choose a more convenient auspicious hour."

#### City Rebuilt at Least Seven Times

A few days later Helen and I were sitting in Delhi's new United States Embassy near closing time, reading our mail. As two departing officials passed, one said to the other:

"I'm on my way to the graveyard for a round of golf. Why don't you join me?"

I nudged Helen. "Did you hear that?"

Engrossed in her letter, Helen didn't even look up. "So he's going to the graveyard for golf. What's so strange about that?"

Helen had adjusted herself to India's incongruities. A few days later I mentioned the incident to our friend Ram Narain, a young Indian businessman.

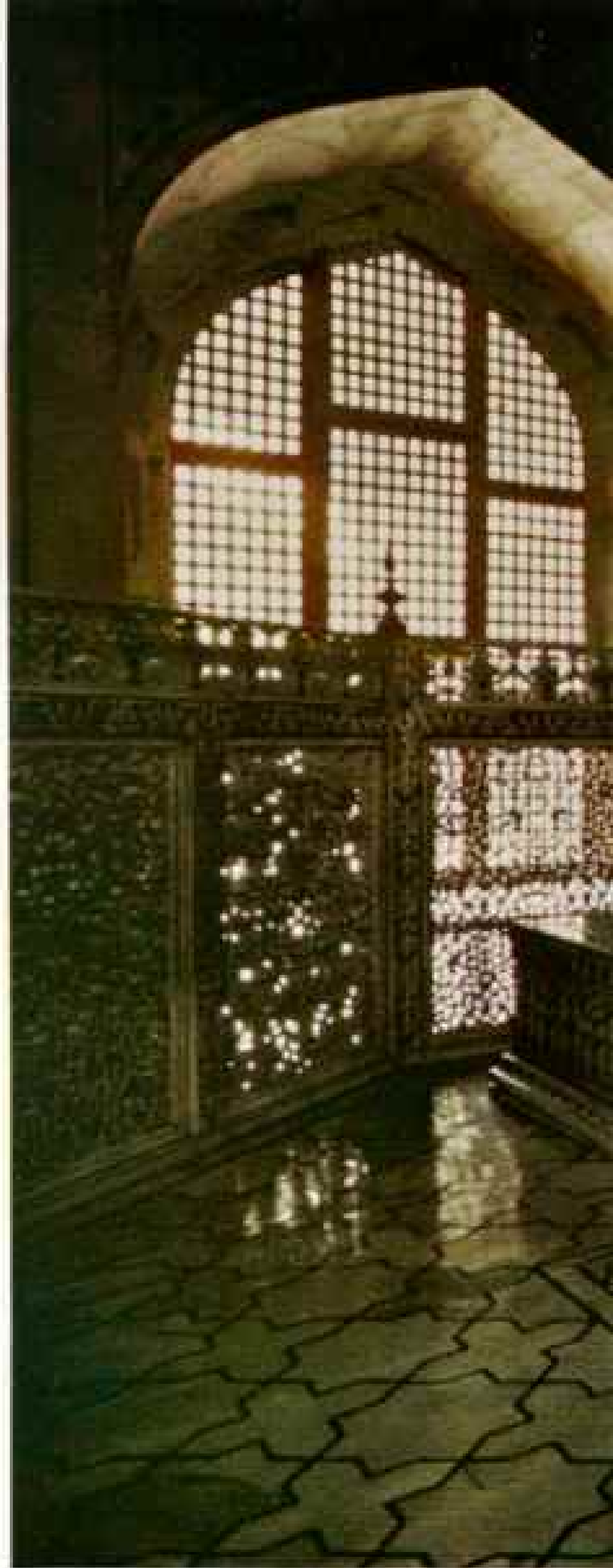
"That's right," Ram said. "Part of the golf course runs through an old Moslem graveyard. But there's really nothing so odd about it. Delhi is at least the eighth city to be built here. The Afghans built on the Hindus, the Moguls on the Afghans, and the British on the Moguls. But the Moguls were the real architects. And it was in Agra that the Moguls really lavished their talents."

It is only 120 miles from Delhi to Agra, but we started late in the afternoon. So about midway we made camp a few hundred yards off the road behind a clump of thorn-



Delicate stone flowers on the cenotaphs (right) in the Taj Mahal rival nature's own creations. Lapis lazuli from Ceylon, turquoise from Tibet, jasper from the Punjab, jade from China, carnelian from Arabia, and amethyst from Persia verify the saying that the Moguls "designed like Titans and finished like jewelers." Italians describe this sort of marble inlay as *pietra dura* (hard stone).

Artisans in Agra slice jewels into thin petals and leaves and embed them in marble so smoothly that even a microscope scarcely reveals the joints.



Elaborate cenotaphs of Shah Jahan and Mumtaz-i-Mahal stand empty in the central chamber of the Taj. Their true tombs, similar to these, lie in a crypt directly beneath, where no one may step on the marble.

Shah Jahan did not intend to rest in the Taj; he planned his own black-marble tomb across the Yamuna River, but the son who seized his throne destroyed the dream.

Heien Schreider examines the floral pattern of the ruler's cenotaph; his queen's memorial rises beside it. A lacy screen carved from marble surrounds the false sepulchers.



RESEARCHER © NATIONAL GEOGRAPHIC SOCIETY

bushes. By the time we had washed up, mixed our powdered milk and chocolate, and heated a can of stew, it was dark and the jackals were out. Though Dinah had long ago become accustomed to their incessant cries, she stirred restlessly. As the moon rose, her growls grew more persistent. Just to satisfy her, I roused myself.

#### Sharing a Campsite With Camels

For a moment I thought I was still dreaming. Towering over the jeep was what looked like the long, swaying neck of a dinosaur. In the gloom shadowy forms moved slowly about, and from the bushes came a queer chomping and an overpowering stench. It was the smell that gave us the clue. We had camped amid a herd of camels (page 464).

Next day, at Agra, when we checked into the hotel, the clerk told me we had time before lunch to rush down and see Agra's famed Taj Mahal. He seemed almost hurt when I replied that I would rather eat first.

To tell the truth, we had seen so many pictures of the Taj that it seemed as familiar to us as the Golden Gate Bridge. Consequently, we were in no hurry, and late that afternoon we drove leisurely to the gate that opens on to its gardens. We topped the last step, unprepared for the impact of our first view of what has been called the most ethereal building in the world (page 472).

In the dark frame of the gatehouse, the arched dome of the Taj Mahal was gilded by the afternoon sun; it seemed to float, far away at the end of the long, cypress-spired





Dye-splashed revelers hail the advent of spring by drenching one another with colored water. Wise inhabitants stay indoors during Holi, a carefree Hindu festival. Not even policemen escape the good-natured battles with buckets and squirt gun.

The authors observed Holi in Mathura. To save their clothes, they donned pajamalike suits of white.

Mrs. Schreider snapped this shot as her husband focused his camera. Moments later a mob of merry-makers, their eyes glazed from drinking narcotic bhang, surrounded the couple, bombarded them with pails of dye, and daubed their faces with powder. Clear-eyed Samaritans broke through and helped the pair escape.

**Holi aftermath:** Spattered clothing attests the celebrators' marksmanship. Safe at their hotel in Agra, the authors vainly strive to remove the gaudy splotches. Dye marked their faces for weeks and permanently stained their suits.

pool. Delicate, yet grand in scale, it was the air castle of imagination. Almost breathlessly, Helen whispered, "It's everything and more that has ever been said about it."

The next day was the great spring festival of Holi, gayest of Hindu holidays, described in the travel folders as a time of singing, dancing in the streets, and good humor. When we learned that Holi coincided with our visit to Agra and that the best place to experience it was at near-by Mathura, one of the sacred centers of India, we were delighted. It came as a surprise, therefore, when the Agra police posted a notice warning tourists to stay within the hotel compound on Holi.

"That notice," I reassured Helen, "is probably just for people who don't want to get their clothes spotted. We don't have to worry. That's what we bought our Holi suits for." They were of homespun cotton, and looked like baggy white pajamas.

At the desk I reserved a car to take us to the station in the morning for the 40-mile trip to Mathura. A few minutes later the manager hurried to our room.

"I'm terribly sorry," she said, "but our cars never leave the compound on Holi. Not even the taxis will be running tomorrow."

"What do you suggest, then?" Helen asked.

"I suggest you stay here," was the reply.

#### Prices Soar on Holi Day

Not to be discouraged, we located a ricksha wallah who agreed to take us for three times the normal rate, and at six the next morning, left for the station. In an hour we were in Mathura. As we stepped from the train, a man with a large badge that said "Stationmaster" took our tickets. His clothes were streaked with colors, and his face was smeared with red, green, yellow, and black powder.

Eying our spotless white Holi suits, he clucked sympathetically, and as we climbed into a horse-drawn tonga, he called after us:

"There's a train back to Agra in an hour."

"What happened to him?" Helen asked.

"Part of the Holi celebrations," I replied.

"It says so right here in the folder: 'The faces of the Holi revelers are smeared with powder of all colors, their clothes are dyed in rainbow hues, and the very air seems wet with colored spray from squirt guns.'"

The Mathura station was on the outskirts of town, but we could hear the revelry long before we neared it. In the streets were small

bands of merry-makers, even more colorfully stained than the stationmaster. Every time they ran shouting after us, the driver whipped his horse to greater speed.

"Stop," I cried, "we want to look at them."

"No, no, sahib, faster, faster," he answered, whipping his horse even more.

We reached the center of town. The noise was deafening now, but it was hardly gay singing and laughter. It was an incoherent frenzy of shouts and clanging bells.

"I don't see any women at all," Helen said, "or any flowers or dancing."

"And these chaps coming now don't seem to be in a very good humor," I added.

#### Besieged by Dye-throwing Revelers

We had reached a T intersection. From both sides came a mob of shouting revelers. Desperately the driver tried to turn the tonga. The horse reared, but it was too late. *Splash!* Helen caught her breath as a bucketful of cold purple dye hit her full in the face.

"Cover the cameras," I yelled as a stream of red doused me.

Both of us hunched over as bucket after bucket of color drenched us. From her lap, I heard Helen's muffled voice.

"I thought you said they used squirt guns," she said reproachfully.

Momentarily the crowd ran out of ammunition, and in the lull we lifted our heads. Hundreds of people surrounded us. Their faces were streaked with dye; their clothes dripped with it, all colors and intensities. Several of them jumped on the tonga and smeared our faces with green powder. "Don't resist now," they said, "don't resist." One look at their glazed eyes was all I needed to convince me that resistance was the last thing I would think of (opposite).

Just then a small group pressed through the crowd and formed a ring around us. They looked just as wild as the others, but their eyes seemed clear. One of them grabbed the horse's bridle and swung the tonga around.

"Go back," he said. "They've been drinking bhang. Go back! You'll be hurt." Bhang is an intoxicant and narcotic made from hemp.

He slapped the horse, and the crowd scattered before its charge. But reinforcements had also arrived. From all sides buckets were emptied, and from the balconies hoses shot scarlet streams at us as we raced past. The ride of Paul Revere was nothing com-



Dancing bears entertain Helen Schreider with an impromptu roadside ballet near Agra. Trainers prod the beasts with bamboo poles to compel obedience.

Saints in sandstone surround the base of Gwalior Fort, a hilltop stronghold dating from the sixth century. The images represent holy men of the Jain religion.

pared to that mad dash back to the station.

In Agra the crowd of hotel guests seemed even more immaculate than usual. Drinks paused in mid-sip, and there was a shocked silence as we made our way across the veranda, two saturated macaws. As we passed the bulletin board, Helen looked at me.

"Yes, dear," she said. "That notice is just for people who don't want to get their clothes spotted."

#### Thousands Gather for Magh Mela

The Grand Trunk Road leading from Agra to Allahabad was queued with heavily laden pilgrims, for Allahabad is the scene of the Magh Mela, the biggest bathing festival in India (pages 480-483). This affair reaches so far into the past that no one knows when the first one was held.

We looked down on the *sangham*, or joining, where the Ganges and the Yamuna rivers met in an agitated line of brown and blue water. Along the *sangham* a line of boats stretched almost across the river as pilgrims

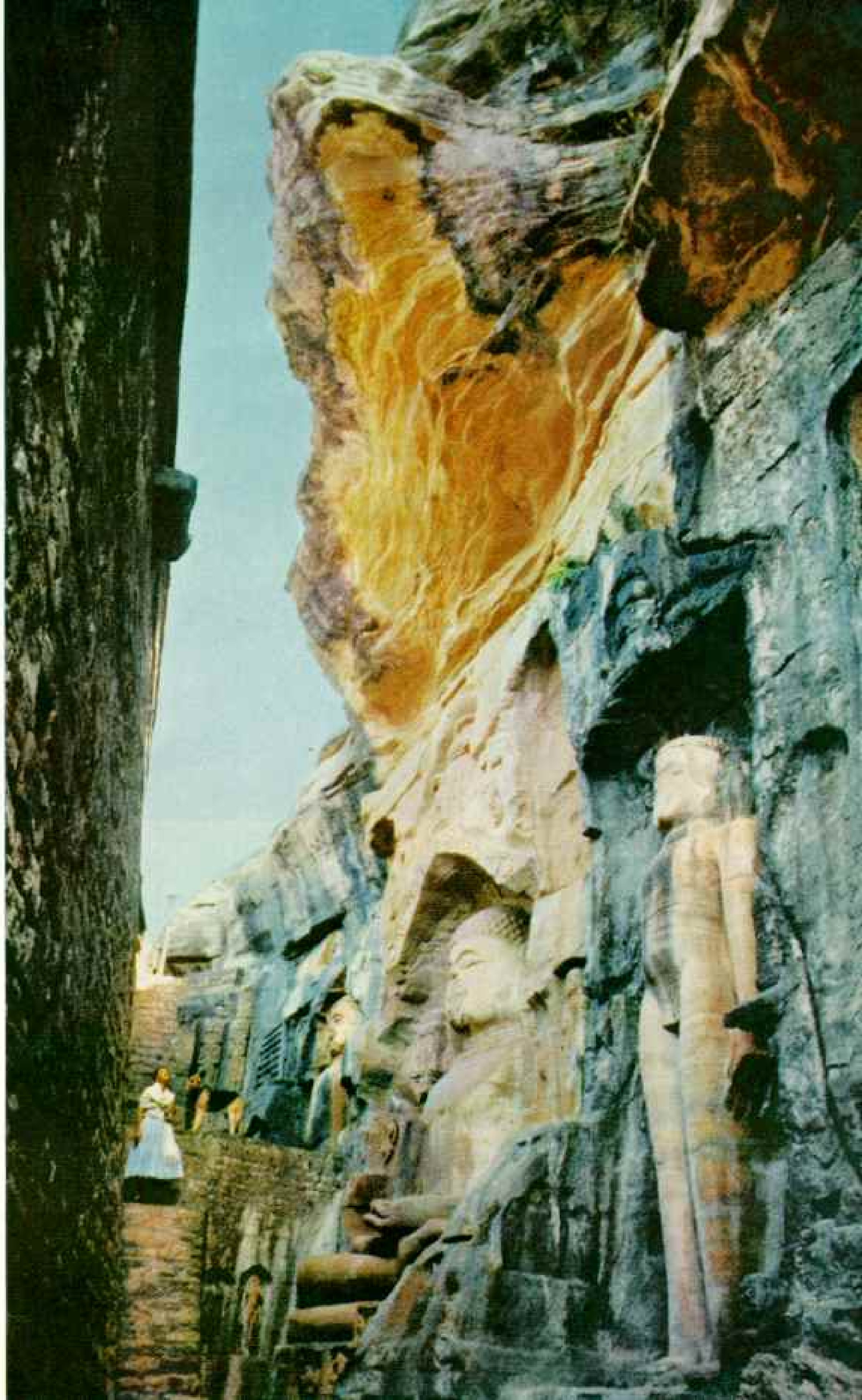
flocked to bathe at this most sacred spot.

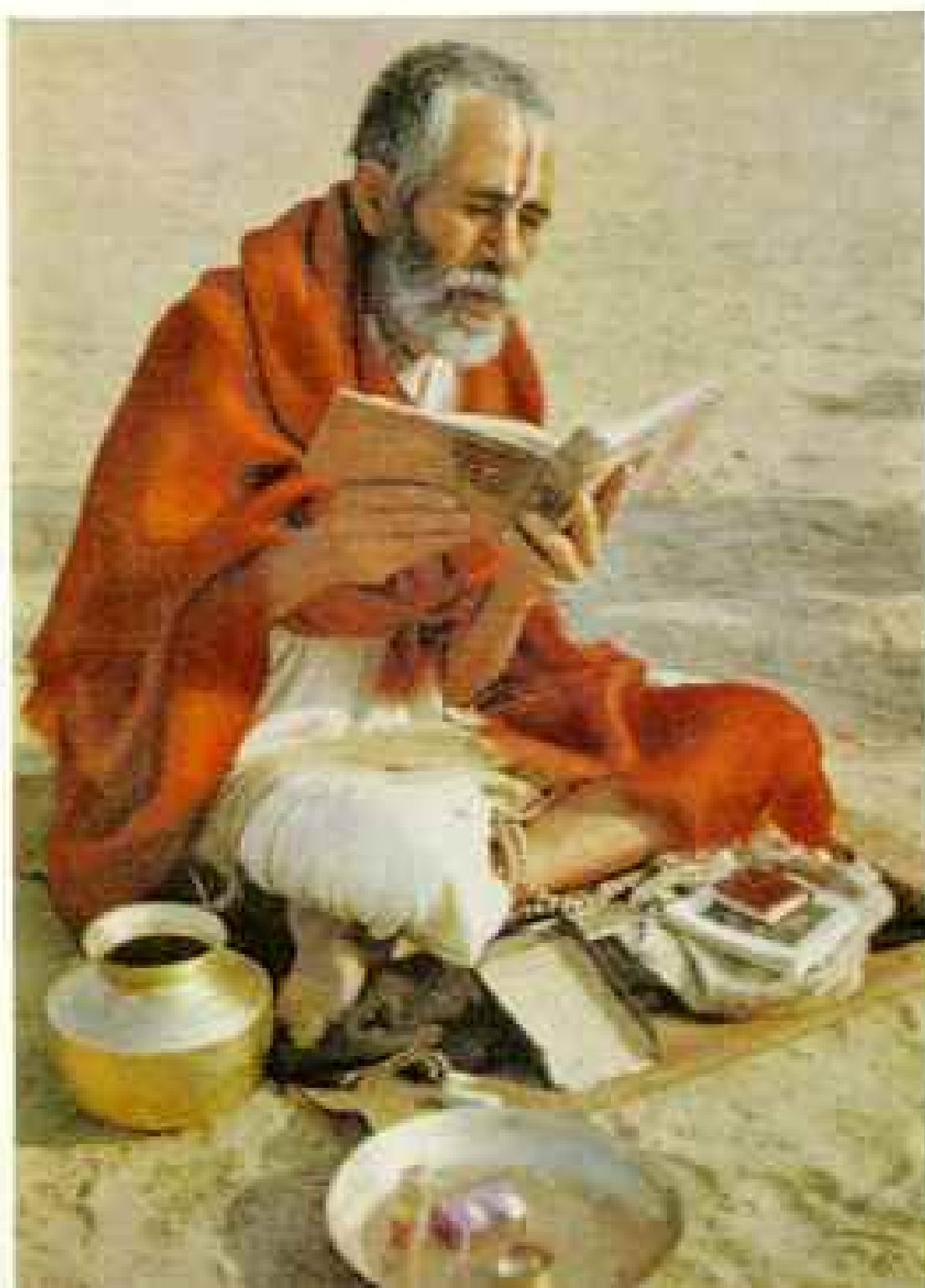
Packed tightly together on the broad sand bar between the two rivers were tents and thatched huts where pilgrims had set up camp for the month of the fair. Atop many of the huts waved bright pennants of all colors and symbols, so that friends and relatives could find their families or favorite priests. Over the whole area hung a pall of dust raised by the milling feet of an estimated 150,000 pilgrims.

Helen and I threaded our way toward the river between makeshift stalls where loops of ceremonial beads, clay images, sweets, and twisted balloons were sold. Beside a sacred dwarf cow wearing a mask of cowrie shells, pilgrims stood waiting to touch its tail to their foreheads and to drop a coin in the cup of its keeper. And congregated to one side was a host of barbers—to accommodate the orthodox Hindu men, for whom a shorn head is an essential preliminary to the ritual bath.

We paused, fascinated by a group of sadhus,

*(Continued on page 484)*





Reading scriptures, a worshiper at Allahabad prepares for a ritual bath. He uses beads to count the Hindu names for God; his brow bears the mark of Vishnu. A small volume at his knees, the epic Bhagavad-Gita, summarizes mystical utterances. Brass bowl holds water from the Ganges.

Hooded Hindu women, joined by Helen Schreider, scrub pots in the Ganges near Mirzapur. Indians, disregarding the silt and ashes that discolor the river, use its water for drinking, cooking, and washing. Pilgrims and villagers believe themselves immune to its impurities, but Frank Schreider suffered a fever and an ear infection after a single dip.

KODACHROME (LEFT) BY NATIONAL GEOGRAPHIC PHOTOGRAPHER VOLKHAR WENTZEL © N.G.S.



### Bundle-laden Pilgrims at Allahabad March to the Holy River

Allahabad occupies a tongue of land at the confluence of two sacred streams; the muddy Ganges and the blue Yamuna. A third, the mythical Sarasvati, is thought to flow underground.

At this spot Brahma, one of the Hindu trinity, performed a sacrifice. Devout Hindus know the city by its ancient name, Prayag—place of sacrifice.

Magh Mela, a religious festival, draws thousands of worshipers to the confluence each spring. There, beyond the loud speaker and fluttering pennants, they chant prayers and bathe in the water (following pages).

The Schreiders report they were the only foreigners among 150,000 pilgrims at this Magh Mela.

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KODACHROMES BY HELEN AND FRANK SCHREIDER





### Hindus on Foot and in Boats Tensely Await a Signal to Plunge Into the River

Celebrants at the Magh Mela converge on the spot where the Yamuna, flowing in from the west, empties into the Ganges. Some of Mahatma Gandhi's ashes were sprinkled onto the water here in 1948.

These pilgrims, crowding the shore at dawn, cast long shadows. Lines strung on poles restrain a premature advance into the water.

Every twelfth year, at a time chosen by astrologers, millions gather at this confluence for the Kumbh Mela, an even more holy occasion. At the appointed hour the multitude surges into the water. Hundreds died in the crush in 1954.

Ritual bathers, chanting hymns and reciting prayers, stand hip-deep. Total immersion conceals others close to the boats.





АКТИВНОСТЬ НАЦИОНАЛ-ОБОЗНАЧЕНИИ СОЦИТЕРА







EPHRAÏME © NATIONAL GEOGRAPHIC SOCIETY

Night closes in on *Tortuga's* floating campsite near Benares. Reaching Mirzapur, the authors found the Ganges deep enough to accommodate the jeep's three-foot draft. Here, as dusk silhouettes a boatman, Helen Schreider prepares the bunks. Rubber raft has been inflated for a visit ashore. Bamboo pole is used for soundings.

or holy men. Some were in a trance, their eyes rolled back in their sockets, milk white. Others slept obliviously on beds of thorns or with heads buried in the sand. One lay with his protruding tongue pierced by a long spike.

But with the appalling and the bizarre, there was beauty. It sparkled in the ever-present ritual flowers; in the rainbow of gossamer saris stretched to dry in the sun, in the graceful, flowing walk of the women as they went to bathe in the river and returned, their wet garments clinging to lithe, trim figures.

#### Ganges Too Shallow for *Tortuga*

At Allahabad we found the Ganges wide, but mostly too shallow for the jeep's three-foot draft. Except during the rainy season, the river for nearly half its course runs in knee-deep shallows, rapids, and an occasional pool. Months of driving were behind us, and we looked forward to getting our craft afloat, so we headed downstream for Mirzapur. Perhaps there we could embark in *Tortuga*.

A hundred and fifty years ago Mirzapur

had the dubious distinction of being a headquarters of a sect of stranglers, the Thugs, from which our English word is derived. Today it is the center for the largest hand-loomed rug industry in the world. These rugs, made in the villages by whole families of weavers, are typical of the cottage industries that are so important to India's economy (pages 486-7).

We called on Wilfred J. Oakley, director of Obectee Private Ltd., one of the firms that make Mirzapur's rugs. He was a jovial Englishman with a penchant for understatement: What he called his "bungalow" was a huge sprawling house set in a 10-acre garden, and the "simple food" he served was a delicious five-course dinner.

At breakfast the next morning he had another guest. "This is my partner, Mr. Hakim Uddin Khan," Mr. Oakley said. "When I came to India 34 years ago, he met me at the train. He's been coming for breakfast ever since."

"*Inshallah*—if God wills," Mr. Hakim replied.

While we ate, I brought up the subject of a place to launch *Tortuga*. Mr. Hakim thought a moment. "Yes," he said, "the river is deep enough here. And there's a place near my house where you can get in. Let me know when you wish to leave, and I'll make arrangements."

I didn't know what arrangements he had in mind, but we investigated the spot he suggested. The steep descent down a long flight of steps between temples was hardly an ideal slipway, but with the tires partly deflated, it would do.

#### Farewell for the Jeep Wallahs

The morning of our departure was bright and clear, and in the sun the Ganges sparkled a golden brown—what we could see of it beyond the mass of people that thronged the water's edge. Mr. Hakim's arrangements were well made: all of Mirzapur had been informed that the jeep wallahs were ready to leave. Taking advantage of the crowd, vendors had set up shop on the steps, and as we

bumped down to the water, a band struck up a march.

At the river's edge we made a last-minute check of the jeep and said goodbye to Mr. Oakley and Mr. Hakim. Then, with the crowd hushed expectantly, I eased *Tortuga* into the Ganges. When she didn't sink, they all broke into a cheer.

For several minutes we circled, checking the balance and testing the rudder action. I engaged the bilge pump, and from beneath the floor boards I heard that reassuring dry sucking sound that indicated there were no leaks. We headed close to shore, and, standing up in the open hatch, called out:

"We'll let you know when we reach Benares." As much for ourselves as for Mr. Hakim, Helen added softly, "Inshallah."

The first few hours on the Ganges brought back all the old qualms we had felt in *Tortuga's* predecessor in the surf of Costa Rica, among the reefs of the Caribbean, and in the currents of the Strait of Magellan. Yet there was something quieting about this lazy brown

Volunteers strain to free *Tortuga*, hub-deep in mire. Rolling ashore near Chunar, the jeep quickly sank to the hull. Pushing and hauling, a crew mustered by an English-speaking schoolteacher broke the mud's grip and refloated the vehicle.

ILLUSTRATIONS BY HELEN AND FRANK SCHAEFER © NATIONAL GEOGRAPHIC SOCIETY



## Miracle of Mirzapur: the art of rugs

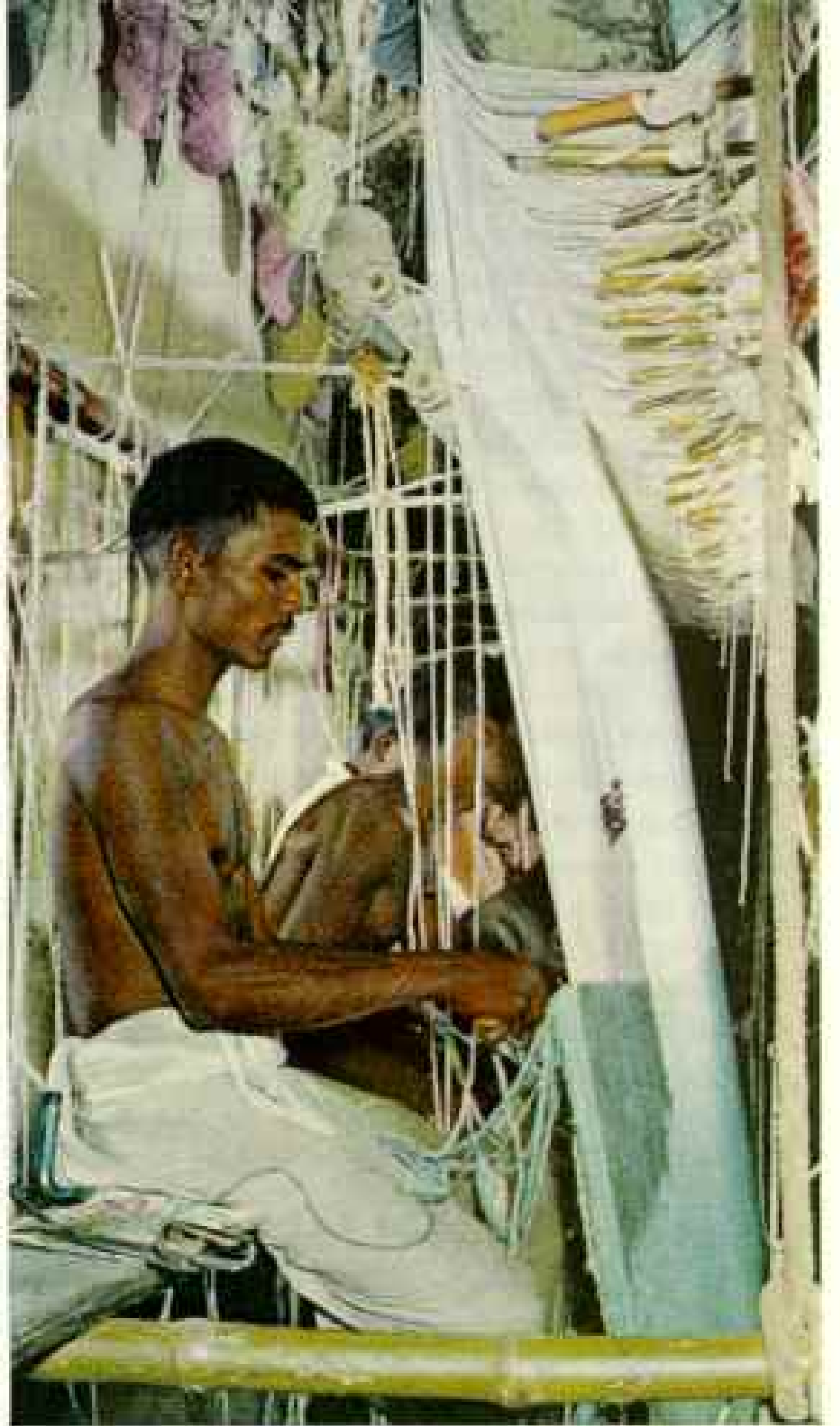
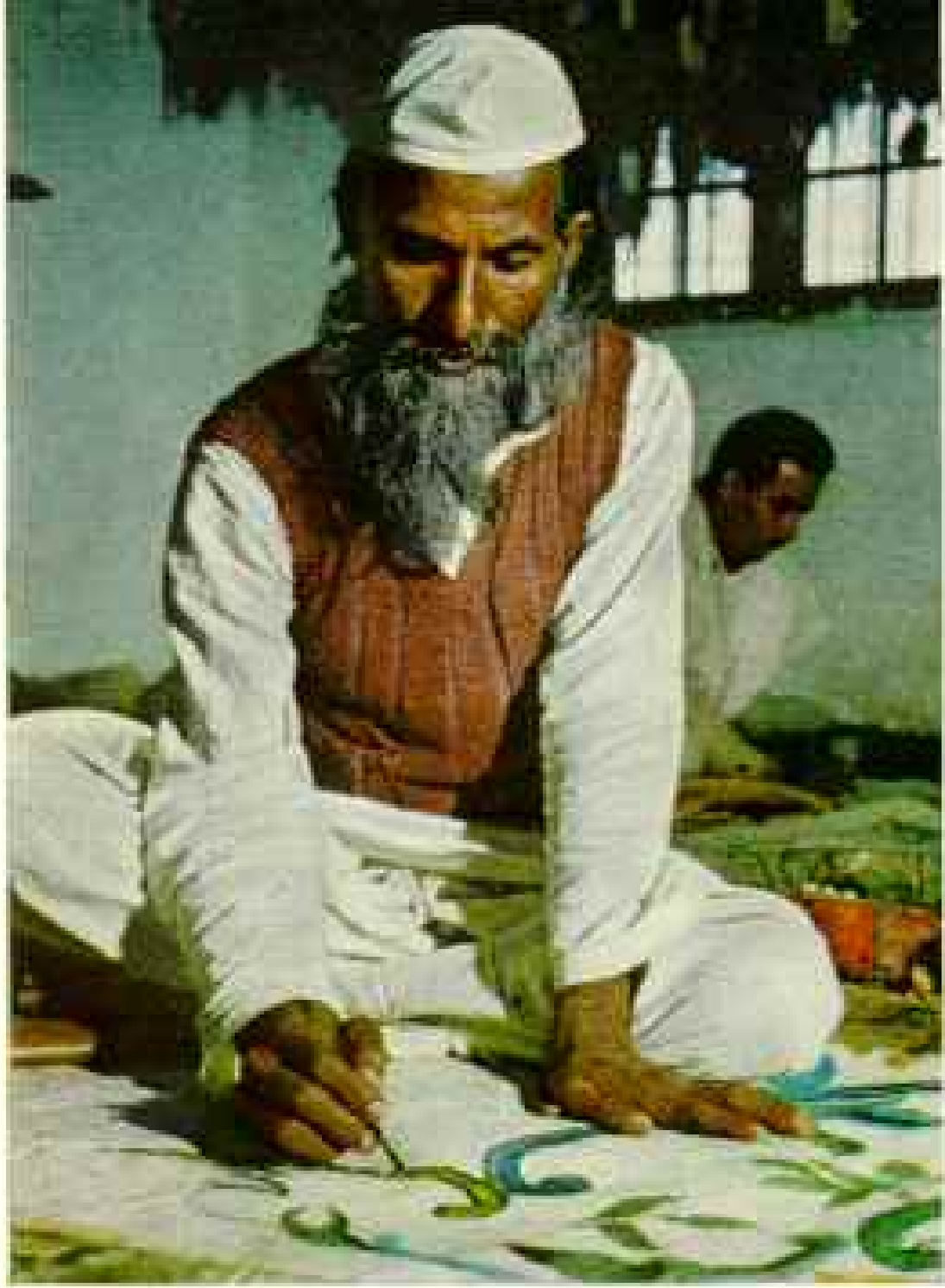
**A**KBAR, THE MOGUL EMPEROR, brought Persian weavers to India and installed their looms in his court; princes and nobles followed his example, and Indian carpet manufacture blossomed. The ancient art has survived a century of competition with machines and outlived a period when convicts turned out shoddy work in jails.

Today the Mirzapur area supports the world's largest hand-loomed rug industry. Sixty thousand weavers work in their homes from morning to dusk, women spinning yarn, men toiling at the looms, and children serving as apprentices. In all India hand-weaving of rugs and fabrics engages more than two million people. Spinners, dyers, merchants, salesmen, inspectors, carpenters, and smiths in turn depend on the weavers. Were India's looms to stop, every twentieth man would lose his daily wage.

A pattern (opposite) represents the first step. The designer may copy a design or draw a new one; weavers hang his chart above their loom. Two to six men sit at one loom, depending on the size of the rug. Shears trim the finished carpet. Finally, inspectors measure a magnificent rug (below) under the discerning eyes of the authors' friends, Wilfred J. Oakley and Hakim Uddin Khan (page 484).

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snake of a river and the lulling rhythm of the motor that soon dispelled our uneasiness.

As the miles flowed past in *Tortuga's* wake, we gained confidence. We watched with more interest the high-cut banks that formed our horizons, uncluttered save where peasants ran to the edge to stare or temple spires pierced the sky from some village nestled invisibly beyond the steep sides. Sari-clad women, balancing glimmering brass pots on their heads, moved like wraiths down the precipitous paths to the water's edge, and little brown boys blended with brown water as they scrubbed their buffaloes.

About dusk a boatload of camels crossed in front of us. They headed for a small cove in the bank. It was a ferry landing, and from the way the camels stepped ashore, it looked firm enough for the jeep. Amid astounded stares we surged up. As we camped for the night, a peacock outlined itself against the sky and added its catlike cry to the ever-present chorus of the jackals.

#### Channel Marked by Pots on Poles

At scattered intervals along the broadening river, white clay pots hung on poles to mark the shallows. Depending on these markers, we followed the deep channel downstream all the next day at a steady three knots. But sometimes the markers were missing, and then we scanned the water for ripples that might indicate shoals. At one place the river divided into several channels, and we searched with binoculars for the markers.

"There!" Helen cried. "In the water. It must have fallen from the pole."

We entered the marked channel, and I heard a gasp from Helen. She handed me the binoculars. What she had first thought was the marker was a human skull.

About halfway to Benares a huge fort loomed on a cliff to our right. This was Chunar, according to our map a fair-sized town. Ahead, the river was pocked with small whirlpools. Rather than navigate this stretch in the fading daylight, we decided to make camp. A few hundred yards below the town was what looked like a firm, gently sloping bank. Hitting it fast, we rolled up onto the shore. Before us stretched a black undulating mud flat. As I climbed from the jeep, the earth quivered like jelly beneath my feet; water filled my footprints. In a matter of seconds the jeep sank to the hull.

A crowd quickly collected from the town.

"Does anyone speak English?" I asked.

A young man in white stepped forward.

"Yes. I'm the schoolteacher here."

I asked him where we could hire some bullocks. He shook his head and said:

"Bullocks sink to their bellies in this ooze. But there are plenty of men here, and we can get some lumber from town."

With a long timber as a lever, a block of wood for a fulcrum, and a plank to keep the two from sinking, we had the jeep pried from the mud in half an hour and boards shoved beneath the wheels (page 485).

With 15 men pushing on the bow and that many more pulling on a rope lashed to the stern, I handled the controls, leaving Helen on shore to relay signals.

Gently I engaged the clutch, and with the men straining fore and aft, *Tortuga* eased backward. I pressed hard on the throttle, the jeep gathered momentum, the men scattered, and *Tortuga* slipped into the slow-moving river.

The teacher told me of a firm sandbank we had passed, so I swung *Tortuga* upstream and headed for that. As I shifted into second, the engine stalled. I tried low. It died again. I shouted: "The rope—I forgot the rope—it must be fouled in the propeller." Without power, I drifted helplessly.

Trying to forget the skull, the occasional bloated animal carcasses we had seen, and the sewer outfall below Chunar, I stripped and, knife in hand, dived under the jeep. Blindly I felt along the taut nylon rope to where it was snarled in a hard tangle around the propeller shaft. One loop at a time, surfacing for a quick breath in between, I sawed through the snarls. I don't know how long it took, but by the time the propeller was free it was almost dark. I was alone on the river.

#### *Tortuga* Causes a Stir in Chunar

Navigating by guess, I headed back for Chunar. Helen was waiting on the bank and guided me up a firm slope to a broad beach.

Martians in Times Square could cause no more excitement than *Tortuga* did in Chunar. From the moment we arrived, we were the hub of the town's activity. In relays they came—first the men, then children by the hundreds, finally the women, shyly peering from behind their saris (opposite). We were never alone.

Next morning we busied ourselves straightening up the jeep and checking for damage,



PHOTOGRAPHS BY NATIONAL GEOGRAPHIC SOCIETY

Electric razor fascinates villagers in Chunar. "Camping in the jeep," say the authors, "was like living in a goldfish bowl. Even as we slept, we could feel eyes straining through the windows, devouring every detail of this weird contraption that had dropped in."

*Tortuga's* dashboard doubles as a kitchen; countryfolk stare through the windshield. The Schreiders fitted the jeep with an alcohol stove, small sink, hunks, and lockers for clothes and canned goods. Shopping for food in bazaars, they often had to bargain in sign language.

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which proved to be only a dent in *Tortuga's* hull.

Later, as I returned from town with some fresh water, the crowd seemed to be staring with particular interest. Elbowing through the tight mass, I found Helen sitting stiffly in the seat. It was hot. But there she sat, cloaked in her wool shawl with all the windows closed. Gently I pulled the shawl from her face. "What's wrong?"

"Cover me up," she said. "I'm in purdah. I can't stand the staring any longer."

She was still that way when Suraj, the young teacher, rescued us half an hour later.

In Suraj's whitewashed mud house we chatted while his mother served curry with *dal*, yellow split peas, to us. After we had warmed to each other in conversation, Suraj leaned forward intently.

"I read in the newspapers," he said, "that many Americans believe that India should decide between East and West. But we feel our first obligation is to fight poverty.

"There are more than 550,000 villages in India just like the ones you've seen. Eighty percent of the people live in those villages, most without electricity or clean wells.

"Our population is increasing at the rate of five million a year. Unemployment is staggering. Those men hanging around your jeep weren't just loafing. They have no jobs.

"Illiteracy and tradition are holding us back. That man who helped you dig out the jeep yesterday—he didn't refuse the cigarette you offered because he was covered with mud or because he didn't smoke. He refused because you have no caste, and he's a Brahman. And my mother," he waved toward the

kitchen, "I saw her embrace your wife. But tonight she'll take a ritual bath. She fixed lunch for you, and it made her happy. But after you ate, she purified the plates in the fire. Tomorrow she'll fast. Why? She's a Brahman."

Suraj paused. "We feel we already have enough problems here in India without taking on the problems of the world."

Two days later *Tortuga* churned around the bend above Benares—Varanasi, as the Indians now call the city that was old long before the Buddha preached his first sermon here in 500 B.C. We had camped several miles upstream, and now as we neared Benares, the sun was still low in the east. The temples, palaces, and

REYNOLDS © R. C. S.



#### Dinah Interrupts a Demonstration of Helen's Motion-picture Camera

A seasoned sightseer, the dog accompanied the Schreiders on their 20,000-mile journey down the Pan-American Highway. In India her barks and growls terrified houseboys, discouraged trespassers, and warned of the encroachment of a herd of camels.

Mothers and children give Dinah their respectful attention at this gathering in a village between Mirzapur and Benares.

"Dinah's trips aboard *Tortuga* qualify her as a real sea dog," the Schreiders report. "She has traveled on almost every type of conveyance, from dog sled to elephant to Stratocruiser."

bathing ghats lining the left bank of the Ganges were aglow in the orange light of morning.

Benares is a holy city: Hindus believe that if they die here they will not suffer the trials of another incarnation. Many come to Benares to die, and among the sights of the city are the funeral pyres where bodies are cremated.

Months earlier, on our way to Hardwar, we had spent 10 days in Benares. Each morning we had watched the sun rise over the river, and came to know the priests who sat on the ghats.

Now they recognized us and signaled us to tie up by a partly submerged temple. Two of them climbed aboard and anointed our

foreheads with the red *tilak*, the Hindu gesture of welcome.

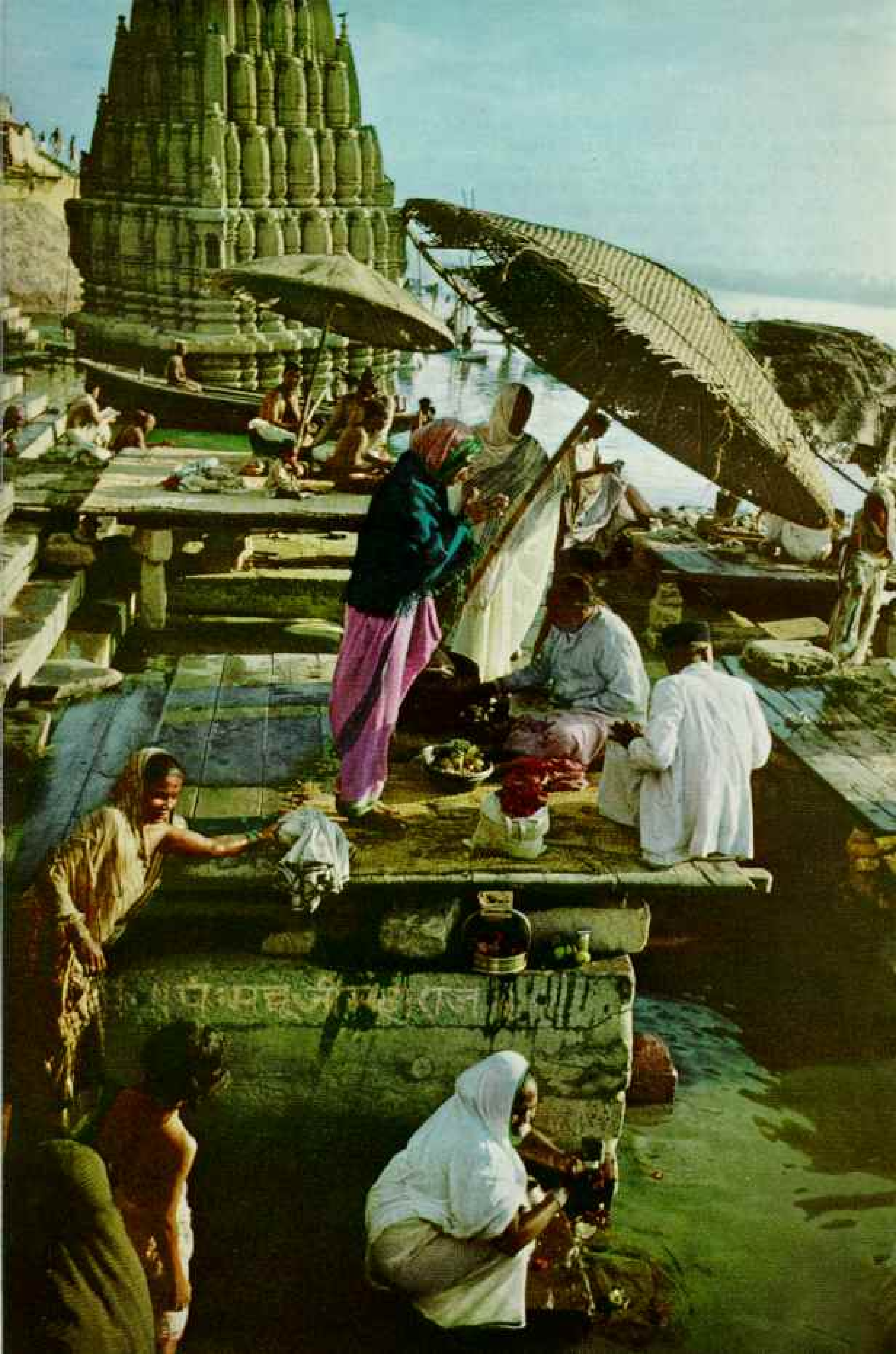
The streets of Benares were the same menagerie we remembered—caravans of camels, elephants, hordes of monkeys, and the same wandering cows with their exotic taste for the flowers Helen wore around her neck (page 497).

A city of a third of a million, Benares is a railroad and trade hub as well as one of India's seven most sacred Hindu centers. Centuries-old brasswork and jewelry-making dovetail with such modern industries as steel, chemicals, hosiery, and fountain pens. And Benares is famous for its hand-loomed silk saris and brocades.

*(Continued on page 496)*









Dodging small boats, Frank steers *Tortuga* toward a landing at Benares. Republican India, which encourages substitution of old geographical names for their anglicized versions; has restored the city's original name, Varanasi.

#### Palm-leaf Umbrellas Shelter Priests on a Bathing Ghat

A sunny afternoon at Benares provides a happy outing for pilgrims. A child plays at the water's edge. Woman at left finishes her bath; her companion dips up water for Hindu rituals. Worshiper with bowed head receives the blessing of the seated priest. The Ganges laps the base of a temple to Siva.

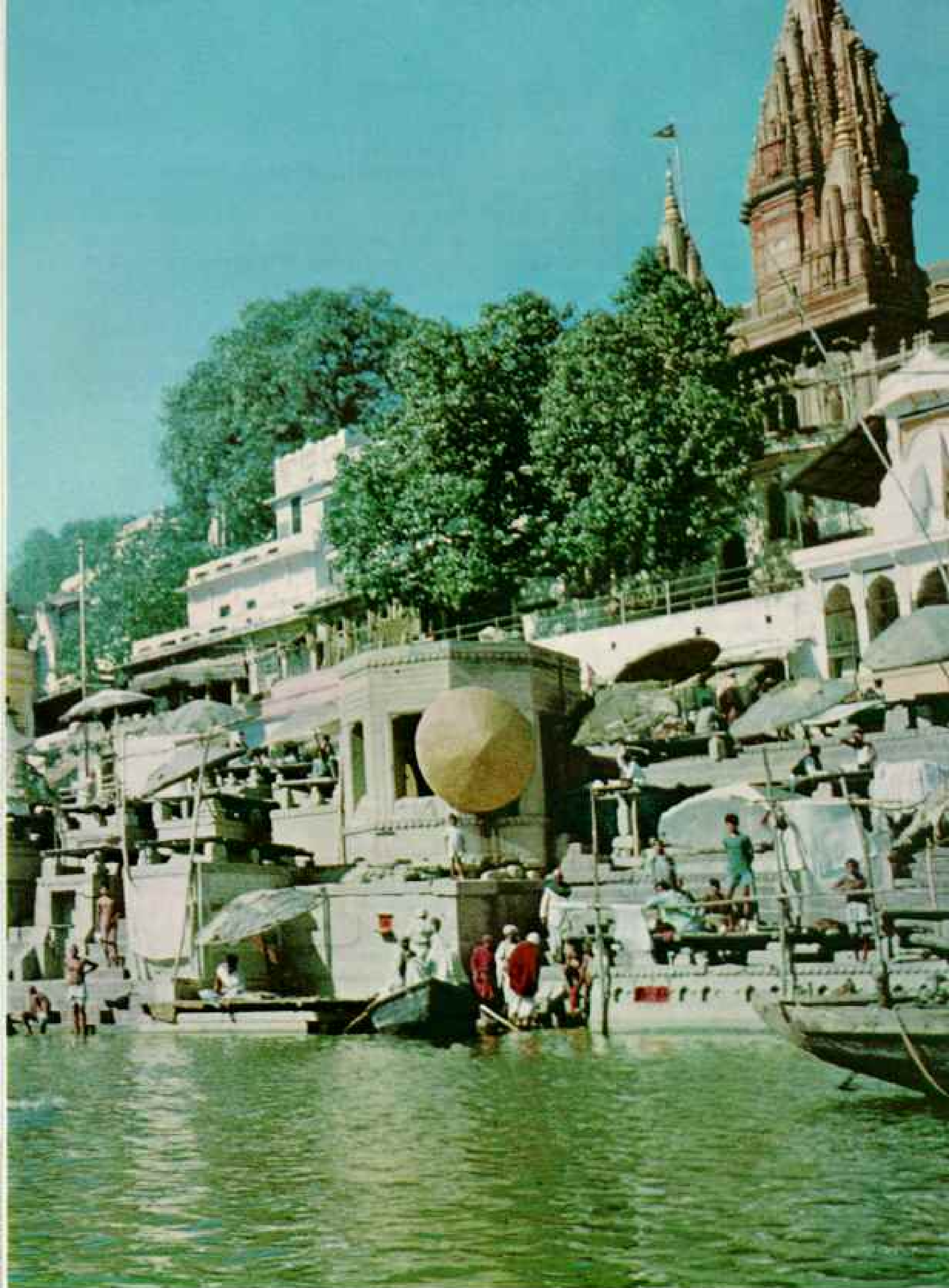
Long-haired sadhu smears himself with ashes. A bathing ghat at Benares provides his make-up table, the Ganges his mirror.

Forswearing worldly goods, Hindu holy men dedicate themselves to meditation and prayer. They wander across India, live by begging, and sleep where they please, even in public buildings. Some sadhus claim the ability to perform miracles.

REPRODUCED BY HELEN AND FRANK SCHNEIDER  
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KODAKARONE © NATIONAL GEOGRAPHIC SOCIETY

caste and low caste bathe side by side in the Ganges, for the holy river acknowledges no distinctions. In this view at Manikarnika Ghat,

palm-leaf umbrellas shade crowds from the hot Indian sun. The hazy smoke of a funeral pyre rises beyond the jeep.

From Benares we left the Ganges to drive to the little town of Buddh Gaya, south of Patna. There Helen and I stayed in a government inspection bungalow across the road from a carved stone temple with a tall, slender pyramid of a spire (page 447). For a country where Western-standard hotels are to be found only in large cities, these inspection bungalows serve a vital function. Spotted all over India in almost every town of any size, they are available at low rates to any tourist who makes advance reservations.

The temple across from us was crowded around the base with scores of stone stupas containing the relics of Buddhist saints. At one side was a venerable pipal tree, a descendant of the sacred Bo Tree under which Gautama became the Enlightened One; thus

Buddh Gaya is perhaps the principal Buddhist shrine in the world.

Fourteen-year-old Abdul, the cook's helper, showed us to our quarters in the bungalow. During our week's stay there, Abdul was our servant, our interpreter, and our ears. Every time a new group of pilgrims arrived from Tibet, Burma, Thailand, Indonesia, or Japan, we were the first to hear.

"Today, Tibetan *puja*," he said one morning when he knocked to awaken us as usual.

In this case his news was hardly necessary. Before dawn we had heard the deep-throated rumble of immense horns, like muffled thunder, as the 30-odd Tibetan monks in the monastery next door held services.

Until the Chinese Communists closed the border, thousands of Tibetan pilgrims came to

**Teeth bared**, a tethered mongoose challenges a cobra in Benares. The authors found the man eager to pit his pet against the snake, its natural enemy. When he unleashed it, the ferretlike animal invited a strike, then leaped nimbly out of mortal danger. Tiring after repeated thrusts, the serpent died in the mongoose's jaws.



Buddh Gaya each year, but now only a few hundred manage the journey. Each day while we were there, some straggled in, their triangular fur caps pushed back, their high fur boots rolled down, and their clothing exuding the smell of rancid ghee.

That evening we joined the monks and pilgrims under the pipal tree for the puja. Behind us, on tiered platforms about 50 feet away, literally thousands of tiny ghee lamps were being prepared. One by one the lamps were lighted, and as the pale-yellow light climbed higher and higher, the temple seemed to grow into the blue-black sky.

Accompanied by a fanfare of cymbals, horns, and drums, the monks chanted their passages, sprinkling rice and sipping from flasks of sanctified milk. Abruptly they

Chewing happily, a cow dines on Helen's marigold necklace. The cow nuzzled Helen in Benares. "When I whirled around," she reports, "the animal helped herself."



PHOTOGRAPH BY NATIONAL GEOGRAPHIC SOCIETY

finished their prayers; the crowd of pilgrims pressed in expectantly. Another fanfare, and with tumultuous shouts the pilgrims scrambled recklessly after the few coins mixed with the rice distributed by the monks.

Late one afternoon, shortly before we left Buddh Gaya, Abdul called me to the door. "Mussulman here, sahib," he said.

Abdul introduced a slender, wizened old man. In halting English the Moslem explained that the women of his family would like to see my mem-sahib. That seemed a reasonable request, so I called Helen. From behind the jeep stepped nine women. In their ground-length flowing *chaderis* with a window of lace for the eyes, they moved across the lawn like animated tents.

For several minutes they scrutinized Helen while she shifted restlessly from one foot to the other. I think they would have stared all day if the old man hadn't salaamed and hustled off his brood.

That evening Abdul informed us that a Moslem wedding was about to take place.

"You like to go?" he said. "I take you."

We liked, and with Abdul leading the way, we headed down a narrow alley toward the Moslem sector of town. Then Abdul stopped.

"Flashlight, sahib?" he asked. "Cobras sometimes sleep in streets. Don't want to step on one."

We returned for the flashlight.

By the time we arrived, the courtyard where the bride lived was ablaze with lights, but activity seemed at a standstill. Against the wall in one corner the groom sat glumly beneath his veil of flowers, while the imam, the community's religious leader, read to him the duties of a husband. Sitting around him on the ground were all the men of the village, and as we approached, one of them stood up. It was the old man who had brought his family to see us.

"Welcome," he said. "Come and sit next to the groom."

"Where's the bride?" I asked. "She's

Glowing prayer lamps glorify the Buddha at Buddh Gaya. A Tibetan lights the wicks beneath the Bo Tree, a descendant of the one under which Gautama became the Buddha.



Paced by swaying elephants, *Tortuga* rolls

in purdah," the old man answered. "No man can see her. But you can see her," he added, looking at Helen. He said something in Hindi, and Helen was led to a large heavy door. She slipped in quickly, but just as quickly was ushered out. The wedding feast was about to start.

On the ground two long rows of guests sat facing each other across a white cloth laden with steaming brass platters. Noisily they scooped rice and curry into their mouths with their fingers. Carefully observing the etiquette, we did the same, but with the first bite, tears streamed from our eyes, the backs of our knees began to perspire, and desperately we reached for the soothing milk curd. The red chili of Mexico was baby food by comparison.

When the food was gone, the guests started to leave. Confused, we asked when the wedding would take place.

"Why, it's over," said the old man. "They are married."

We learned later of the three essentials of a marriage under the laws of Islam: first, consent of the two principals; second, two witnesses; third, the giving of a dowry by the groom. (Divorce seldom occurs among



KODACHTORE (ARORE) AND PAPER BANUCHHORE © NATIONAL GEOGRAPHIC SOCIETY

along the Grand Trunk Road. "All castes and kinds of men move here," Kipling wrote

Indian Moslems; when it does, the procedure is incredibly complicated.)

As we returned to the bungalow, Abdul asked us how we had enjoyed the food.

"Delicious," I said, "though just a bit hotter than we're used to."

He laughed. "Wedding food always hot. Guests don't eat so much."

#### Side-wheelers Still Ply the Ganges

And now, after months of driving in the Ganges plain and floating on its brown water, we turned back to Calcutta. Most of this last leg was like the road we had traveled when we first set out on our trip to Hardwar. It led through a land of mango groves, of brown mud-walled villages set in fields of yellow mustard or purple linseed or green wheat, or sugar cane with tasseled tips that became flaming torches at sunset.

At Calcutta we hunted up Captain Killick for his promised look at a tidal bore.

"We have several hours before the bore strikes," the captain said as we boarded his diesel tug. "I thought ye might like to see a bit more of the river."

The tug belched black smoke and heaved into the channel. The tide was on the ebb,

and long wakes streamed from the mooring buoys. Slim country boats, shaped like arched needles and manned by lithe, muscular pilots, were swept along by the six-knot current, their sails puffed out into red balloons.

Moored to jetties along the shore were the ships of Captain Killick's company—shallow-draft side-paddlers such as those used in the early days on the Mississippi. Hundreds of dhoti-clad coolies moved along the gangways like human centipedes, carrying baskets of coal on their heads. This was fuel for the long haul down the Hooghly, through the backwaters at the mouths of the Ganges, and then up the Brahmaputra through East Pakistan to Assam in the Himalayas.

Many of the side-wheelers would return loaded with tea, of which Calcutta is one of the world's leading exporters.

Farther downstream, ships from all over the world were loading or discharging their freight.

"Before partition," Captain Killick was saying, "Bengal was one of the richest provinces in India. She had a virtual world monopoly on jute, the fine, soft, flaxen-colored jute, like the hair of an English country girl. Now, with the India-East Pakistan border slicing

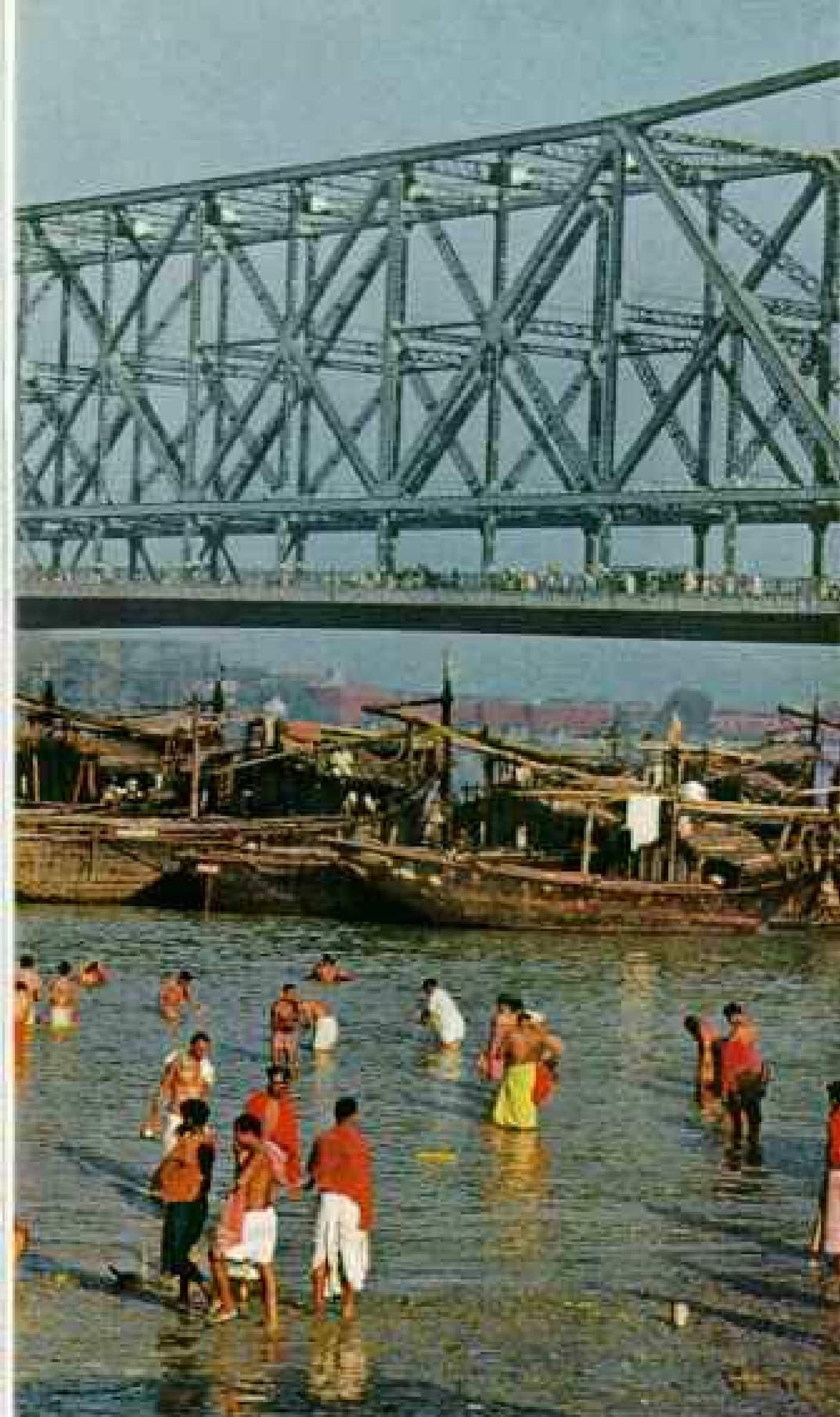




Howrah Bridge leaps the broad Hooghly between Calcutta and Howrah. Indians use the river for a bathtub; cargo carriers cluster offshore. The 1,500-foot main section makes Howrah Bridge one of the world's longest cantilever spans. The structure carries two trolley lines, a six-lane highway, and two footpaths (page 502).

Workmen who dug the foundations uncovered buried boats, cannons, coins, and anchors. Opened to traffic in 1943, the span replaced a rickety, 69-year-old pontoon bridge.

Knees and hands serve Calcutta masseurs. Hooghly River bathers, anointed with mustard-seed oil, stoically endure rib-crunching rub-downs.



MONOCHROMES BY BRIAN BARAK, MAGNUM (AROVE AND OPPOSITE) AND BELER AND FRANK SCHNEIDER © NATIONAL GEOGRAPHIC SOCIETY

through what was Bengal, Calcutta is cut off from the best jute fields."

He pointed to the neat cream-yellow jute mills that line both sides of the Hooghly above Calcutta. "We have the coal and most of the mills, and East Pakistan has the best jute, and the two governments are trying to work together, striving to make the best possible use of their potential."

#### Lower River Like a Huge Stage

The tug churned upstream, each bend in the river disclosing a different settlement. It was like a huge stage, its sets telling the history of European powers in India: the Danes at Serampore, the French at Chandernagore, the Dutch at Chinsura, the English at a port once known as Hooghly, and the Portuguese at Bandel.

"According to the local people," said the captain, "there's an image of a saint in the Bandel church that miraculously floated upstream against the current and landed there. If ye were to ask me, I'd say it looks like the prow of an old sailing ship, probably swept up by a bore. And speaking of bores, we'd better be heading back."

As the tug swung downstream, the captain pointed to the eddies swirling in the wake, and Helen and I saw that the tide had turned.

#### Image Maker Decorates a Sinister Goddess

Garlanded with stylized skulls, the statues represent Kali, goddess of death and destruction, who usually is shown with tongue extended. Each four-armed effigy tramples under-foot Time Eternal. A century ago a cult of Kali worshipers known as Thugs terrorized India by strangling and robbing travelers. The English word "thug" derives from these assassins.

Bengali Hindus still pay homage to the goddess by sacrificing animals to her and by tossing her image into the Hooghly.



Breasting the Hooghly at Journey's End,  
*Tortuga* Tours Calcutta's Busy Harbor

India's biggest city, Calcutta flourishes on iron ore, jute, tea, coal, and textiles. Situated 85 miles upstream from the Bay of Bengal, the port handles half the nation's sea-borne trade.

Tides rushing up the Hooghly's narrow estuary build up roaring bores powerful enough to dash small craft to pieces. A tidal bore that overflowed the river's banks in 1876 killed a hundred thousand Indians.

*Tortuga*, flying the Explorers Club flag, churns past the Port Authority Building, one of Calcutta's tallest.

Balloons bob above a busy footpath on Howrah Bridge. The span carries more than a hundred thousand pedestrians a day; entire families line the rail at dusk for a touch of cooling breeze from the distant sea.



Ships had already left the jetties and were moored in mid-channel. The country boats that were heading upstream were waiting for the bore to strike, hoping to catch the flood tide for a fast trip. Suddenly a strong south wind flashed in from the sea. Almost simultaneously the ships downstream gave three short blasts on their whistles. Bathers along the banks rushed for higher ground, scooping up children as they ran, and we saw an angry wall of brown water roaring up the channel, arching in the middle, sweeping at the shores, smashing at pilings, and throwing floating jetties in the air so that they danced like monkeys on a string.

While we held our position with the diesel, the country boats caught the crest and were gone amid a roaring pandemonium of surging, pulsating water. And then, as suddenly as it had come, it was gone, the wind died, the roar subsided, and two water buffaloes waded slowly into the stream to let the dying currents play over their sleek black hides.

Back in Calcutta, the chill of evening settled. Myriad weak flickers



PHOTOGRAPHS BY HELEN AND FRANK SCHNEIDER (ABOVE) AND BRIAN STARR, BARRON © R.L.S.

tried vainly to push back the darkness where thousands of homeless refugees from East Pakistan cooked their meager suppers on the sidewalks.

Again we felt the same emotional impact we had experienced when we had first arrived in Calcutta months earlier. And we remembered the words of Mr. M. Sham Singh, director of the Government of India Tourist Office in San Francisco.

At the time, seated comfortably in his plush office, his words meant little to us. But now, as we pushed our way through the swollen masses of humanity in the streets, stepping over sleeping forms on the sidewalk or pausing to let a sweating ricksha or pushcart wallah pass, Mr. Singh's words came back with scalpel sharpness.

"In Calcutta," he said, "you will see all the problems of India at once. Have compassion."

#### Goats Killed in Homage to Kali

A burst of firecrackers interrupted my thoughts. It was the week of Divali, which in Calcutta and West Bengal is devoted to the worship of Kali, the goddess who is paid homage with the sacrificial slaughter of goats.

In the narrow streets of the old section of Calcutta, processions were forming. Behind

bands accompanying the processions to the river, men jostled for the privilege of carrying the clay images of Kali. To Bengali Hindus, Kali is the eternal mother, to be worshiped with flowers, rice, and blood, and each year she is borne in effigy to the river.

We had watched these figures being made from lumps of clay by the hereditary guild of image makers (page 501).

It seemed that all of greater Calcutta's four million had gathered to honor Kali. One by one the images were carried into the river, each preceded by a shattering tattoo of drums. Knee-deep in water, chanting in low voices, the image bearers slowly circled seven times. Then, taking care that Kali should fall face up, they heaved her and dived after, trying to catch the last, especially auspicious, splash. And the image, the product of months of painstaking labor, sank slowly, drifting, and finally dissolving.

As we turned toward our hotel, a guide approached and began the usual patter.

"Show you Calcutta? Nimtola Ghat, Governor's Palace, Kalighat Temple, Indian Museum?"

Sensing he was getting nowhere, he offered his star attraction.

"Take you for a boat ride on the river?"

"Thanks," I said. "We've had one."





*Ages-old volcanic outbursts shaped  
a bizarre wonderland in Craters  
of the Moon National Monument*

## Man on the Moon in Idaho

By WILLIAM BELKNAP, JR.

*Photographs by the author*

**H**E HAD no antennas, no green scales, not even a plastic helmet or a space suit. Yet I distinctly heard him say:

"Telephone? Of course. My number is Craters of the Moon 2."

Under a little urging he confessed that his name was Floyd A. Henderson, that he held a degree in forest management from Utah State University, and that his hobby was wood carving. Nothing unearthly about *that*.

His domain, however, was straight out of science fiction. Mr. Henderson is Superintendent of Craters of the Moon National Monument in southern Idaho—in many ways the strangest 75 square miles on the North American Continent.

I could observe some of that weird lunar landscape through the picture window in Superintendent Henderson's living room.

Only half a mile away smooth cones

Loop Drive divides a lava field (right) from a cinder slope in Craters of the Moon National Monument, Idaho's outdoor museum of volcanism. Virtually unknown until 1921, Craters now attracts 140,000 visitors a year.

of reddish black rose hundreds of feet to the horizon. Three dark square monoliths stood like crumbling watchtowers in the middle distance (page 519).

The foreground was even more curious: A black sea of sharp-angled shapes, many as big as a man, looking as if they had been dug up and turned over by the spade of some tireless giant.

"All this is the result of volcanic activity over many thousands of years," Mr. Henderson said. "Just wait until you climb around out there. You'll find cones with jagged crater rims looking like scaled-down versions of those enormous pits you see in photographs of the moon—like the one we show in the museum in our visitor center (page 516). As far as we know, our most recent eruption happened about 1,600 years ago."

I asked for directions to the volcano, and Mr. Henderson smiled. "There really is no

single volcano here," he said. "We have something even more remarkable. We are sitting on top of a gigantic wound in the earth called the Great Rift. This is a series of fissures, at least 16 miles long, that have opened time and time again."

#### Lava Spouted From Many Outlets

He explained that as volcanic forces cracked the earth, lava oozed out of the Great Rift. Molten rock as hot as 2,000° F. flowed like thick sirup for a few yards or many miles. Mixed with it came gases that occasionally freed themselves in explosions as soon as the seething mass neared the surface. At other times gas forced fountains of fiery lava to spatter from the fissures.

So many eruptions occurred that geologists liken the whole Great Rift to a single elongated volcano, one that has no central orifice but a series of outlets.

"There have been bigger explosions elsewhere, of course, and more lava has poured out at other hot spots," Mr. Henderson went on. "But compactness is the special appeal of Craters of the Moon National Monument.

"This little patch along the Great Rift offers a rare chance to contemplate the awesome powers within our globe. You see, the concentration of volcanic phenomena here is matched in few other places in the world. And not all of those other places are so easily reached by car. You are lucky. Only forty years ago a trip through this area would have required a major expedition."

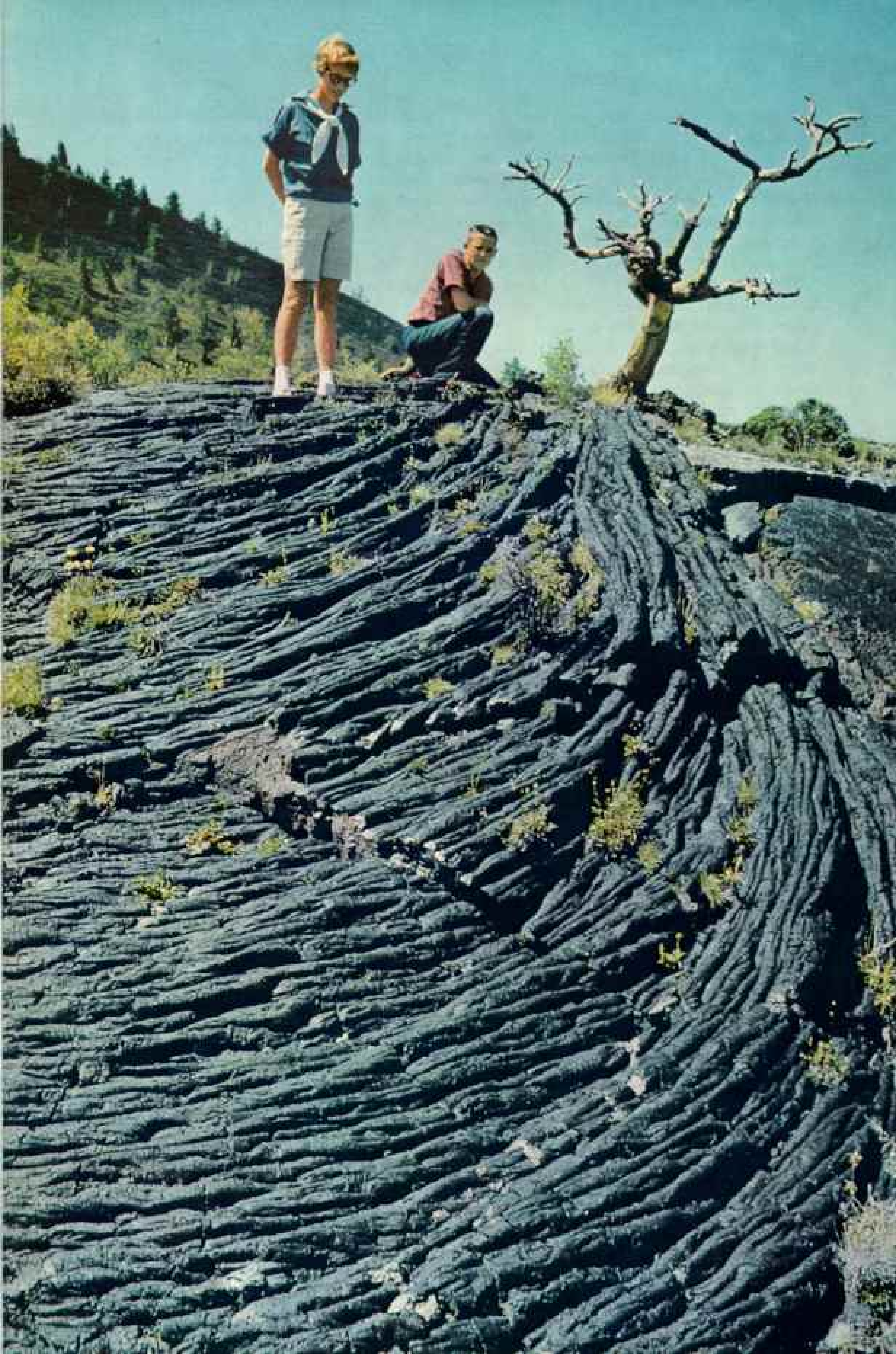
Getting here had been easy enough. We had driven across the Snake River Lava Plain

Wrinkled as a dried apple, a ropy river of pahoehoe smothers a hillside. This easy-to-walk-on lava differs from jagged aa which cuts shoes to ribbons. Both formations, which bear Hawaiian names, occur in the monument. Pahoehoe's pleats took shape when a lava flow's thin scum hardened like hot fudge poured from a pan.

Young Atlas, hoisting a chunk of lava, impresses friends with a strong man's feat. Actually he lifted his burden easily. Puffed up by gas, the volcanic froth has no more solidity than a sponge. Its weight: 35 pounds.



PHOTOGRAPHS BY WILLIAM SALAMAN, JR. © NATIONAL GEOGRAPHIC SOCIETY





and through the little town of Arco. To the north the brooding Pioneer Mountains and the Lost River Range climbed sharply (map, opposite). To the south a silent wilderness of lava and pale greenery blended into shimmering heat waves.

Then I saw a mass of black rocks rising from the plain, stretching like an enormous flattened-out coal pile as far as I could see. I sensed that something fearful, something cataclysmic had happened here.

My wife Fran and our lively teen-agers, Buzz and Loie, were studying a pamphlet about the monument. "Like walking on the moon," it read, above a picture of little men in fish-bowl helmets. Loie could hardly wait.

We had barely left Superintendent Henderson's house near the visitor center and driven to a parking spot along the Loop Drive, when we sighted an odd shape stirring in a depression in the lava rock. It looked brownish green and gave off clanking noises. Loie was

speechless. Closer approach revealed a husky, sunburned man in khaki, wearing a green canteen belt, who was cutting samples with a rock hammer. He was John Murtaugh, a young geologist from the University of Idaho, mapping the Great Rift lava flows under a grant from the National Park Service.

"This place is still full of questions," Murtaugh said. "For one thing, how many lava flows were there? Compared to other classic areas of volcanism—Iceland, Italy, Japan, Hawaii—Craters of the Moon gets little rain, only about 10 inches a year. And moisture initiates the breaking down of lava. Because there is so little rainfall here, some of the flows look deceptively fresh."

#### Minerals May Help Classify Flows

Murtaugh recalled that Dr. H. T. Stearns, a geologist who studied the area three decades ago, listed 27 flows in two discernible ages. Stearns surmised that there may have been a third age, the earliest.

"The older flows presumably were covered by later eruptions," Murtaugh said. "All the lava probably came from the same underground reservoir. But each of those three ages may have lasted a thousand years; in the intervals the composition of the magma may have changed. My samples will be tested to discover what minerals are present and in what proportions. Those proportions may differ and help us classify the flows."

But how long ago did the flows start, and when did they end?

"That's the toughest question of all," Murtaugh replied. To early ranchers the lava looked fresh. Charred tree trunks near by reinforced their idea that this flow must be very young, perhaps 100 years or less. But then came doubts: Had those trees been scorched by prairie fires, not lava?

"Now we know that the flow we're standing on is one of the youngest in the monument, and it is more than 1,600 years old," Murtaugh said. "Our evidence is right over there."

"Nonskid tire tracks" mark a molten river's passage through a forest some 1,600 years ago. Lava, igniting a fallen tree like a torch, retained the impression left by the shrinking sapwood. A visitor on the Blue Dragon Flow inspects the pattern, strikingly like that of a truck tire.

RESEARCHER © NATIONAL GEOGRAPHIC SOCIETY







1,500 years old now. This means that the lava here must be at least 1,650 years old, allowing time for the lava to cool and for soil to accumulate in a crack so a seed could take root."

Heaps of contorted clinkers don't sound inviting, but they make an attractive campground at Craters of the Moon. Tent and trailer spaces are smoothed between the lava flows, with scattered trees adding friendly touches of shade. The climate at 5,900 feet is pleasantly cool and dry.

#### Cinders Rise Like Dead Volcanoes

The biggest things around are the cinder cones. The fiery fountains that created them sprayed lava froth high into the air, where it congealed into pebble-sized molten particles that flew far and cooled before landing. These particles, called cinders even though they never burned, remained separate and are now piled in black, loose heaps, each heap looking like a dead volcano.

"Our largest cinder cone is 760 feet high," Peter Sanchez, a park ranger-naturalist, told us. "That means the fountain must have shot up about 1,000 feet."

Cones of another type, the spatter cones, grew out of less powerful fountains. Their lava flew more slowly and less far, and did not cool as much before landing. It came down in gummy blobs that stuck together. Hence the steep, craggy sides of the typical spatter cone. The biggest one we saw was about 50 feet high.

In some eruptions the magma did not shoot into the air at all, but welled out slowly, forming a solid, broad mound 30 to 50 feet high, called a lava dome. Elsewhere the lava had welled up, congealed on the surface, and then receded, leaving a hollow space; when the thin crust collapsed, it left pit craters, or "sinks," with jagged rims.

Pete showed us minor volcanic forms, too—called volcanic bombs.



### Summer Hikers Tote a Sled; There's Reason for Their Madness

"Visitors who saw our caravan miles from any visible snow considered us candidates for an asylum," says the author. "They had no way of knowing we were headed for an ice lake in Boy Scout Cave" (below).

"Propelled by a pair of geologist's picks, the sled worked well. We could have crawled across the ice but for two and a half inches of cold water lying on top. Hard hats saved our heads from scraping on needlelike lava stalactites."

Long ago, when a river of molten rock flowed here, the surface and sides cooled and crusted, and the lava drained out, leaving a large, tubular channel. Later an earthquake shattered sections of the roof, permitting access to the chambers.

REPRODUCED BY WILLIAM BELKNAP, JR. © NATIONAL GEOGRAPHIC SOCIETY



"Bits of liquid lava take various shapes," he said. "What that shape will be depends on how long the blob flies through the air, how solid it is to begin with, and possibly whether it rotates as it goes."

He pointed to two rounded chunks of lava, one four inches in diameter and the other nearly three feet.

"These pieces of lava were filled with gas, and a skin or crust formed as they flew through the air," Pete said. "As the gas expanded, the lava blobs swelled, and the skin cracked open. Now the cracked surface looks like the crust of French bread, and so we call formations like these bread-crust bombs. They are light because they are full of air spaces."

Then Pete pointed out some other odd-shaped bombs (page 518), ranging from the size of a grain of wheat to more than a dozen feet in length.

#### Tree Grows in a Crimson Crater

With Sarah and Susan Hurst, Buzz and Loie's new friends from the campground, we climbed the Big Craters one morning for a superb panoramic view. To the southeast we looked along the Great Rift at the four large spatter cones near by and Big Cinder Butte behind them.

Below us to the east the road was framed by wind-racked limber pines as it swept around Inferno Cone. Standing alone on the eastern horizon loomed Big Southern Butte (pages 514 and 524).

We had become so used to blacks and browns that the brilliant reds inside one of the Big Craters came as a surprise. Deep in its bowl a lone tree growing on a crimson mound drew the youngsters like a magnet.

As they leaped and slid down the steep cinders, we kept track of them by their trails of dust.

That evening I went back up the southernmost of the Big Craters by myself, to wait for

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**The Author:** A specialist on Western subjects, writer-photographer William Belknap, Jr., travels widely from his base at Boulder City, Nevada. Members will recall his "Nature Carves Fantasies in Bryce Canyon," in the NATIONAL GEOGRAPHIC, October, 1958.

the sun to set behind the Pioneer Mountains. Now and then a chipmunk scampered along with his tail in the air. A squadron of violet-green swallows circled in the Big Craters and was gone.

In the parking lot far below, a station wagon stopped and three children spilled out. At once they ran up the narrow path to a spatter cone. The parents followed, walking. The children hurried down one cone and up another, to peer inside. Then the father's voice carried up to me:

"Come on, we've got a lot more to drive yet!" Ten minutes after the family had arrived, it was on the road again.

A brown weasel popped up six feet from me, stopped to look me over, and made its way down without haste. After that, nothing stirred. It was almost an hour after sunset, and I descended to the parking lot.

The steep spatter cones and the gently curved cinder cones stood dark against the deep-blue firmament. Where there had been the laughter of children running ahead of their parents, there was now only silence, eerie yet peaceful. A single star flickered in the blue-black sky. That was the only motion anywhere.

This is indeed what one might find on the moon, I thought, and not just through a telescope.

#### Space Scientist Studies a Lunar Land

The following morning at the visitor center I found John Murtaugh listening intently to a man who pointed to moon features on the big photograph. He seemed to know the names of the craters, ranges, and "seas" on the moon as well as I know the streets in my neighborhood. He was Dr. Jack Green of the Aero-Space Laboratories of North American Aviation, Inc., an organization concerned with designing equipment for landings on the moon by instruments and, eventually, by men.

"If you are really interested in the moon, this is one of the best places in the world to visit," Dr. Green said. "There are two theories on the origin of moon craters. Most astronomers feel that they were caused chiefly by the impact of meteors. But some geologists, including me, think they are volcanic in origin,

#### Boy Scout Cave Provides a Cramped Rink for a Figure Skater

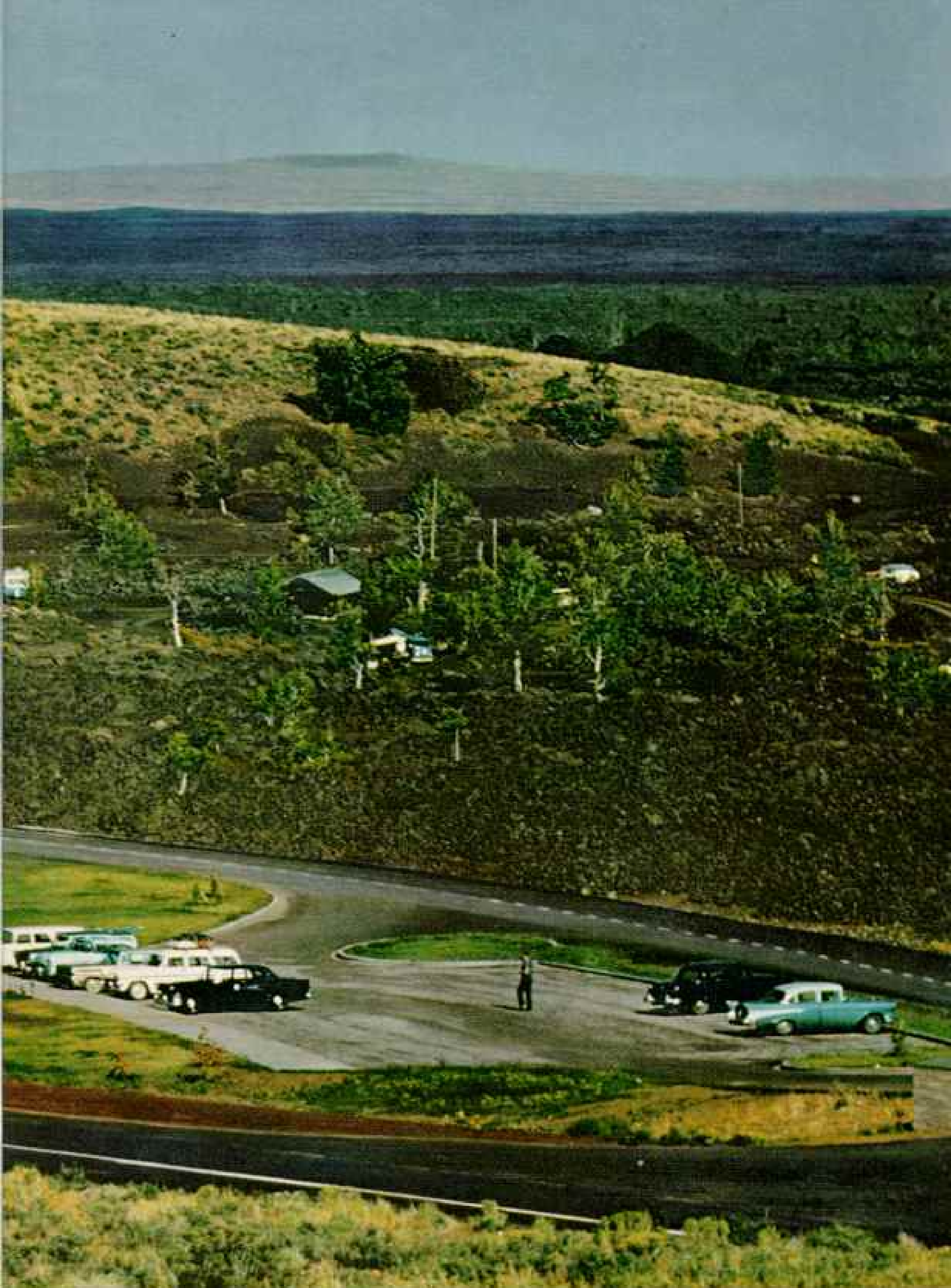
Ice festoons the ceiling and glazes the rocks. Sue Henderson, daughter of the monument's superintendent, takes to her skates on a June day. "Some of the grottoes are roomier," says the photographer, "but none is so spectacular."





Big Southern Butte, 27 Miles Away,  
Looms Above the New Visitor Center

Sentinel of the Snake River Lava Plain, the 7,576-foot mountain served as a landmark to fur trappers and stagecoaches. A volcanic cone rather



ERZACHEMWE © NATIONAL GEOGRAPHIC SOCIETY

than a mesa, it was born during an eruption ages ago. A campground laid amid brush and cinders stands across Loop Drive from the head-

quarters building. Coyotes, bobcats, and pack rats prowl the black lava flats; eagles, hawks, and bluebirds roost in the dwarf trees.





Telescope view of the moon reminds sightseers at the National Park Service's new visitor center of the monument's resemblance to a moonscape (compare page 518).

because the shapes of the craters we see through telescopes closely resemble the volcanic basins we call calderas. Those are the enormous round depressions that are most prominent.

"There are no calderas in Craters of the Moon National Monument," Dr. Green continued, "but many of the features here very closely resemble things we see in the dark areas of the moon—in the 'seas.'"

Dr. Green had climbed all over the monument and was enthusiastic.

"The features are especially interesting because they are comparatively recent and nearly as well preserved in this climate as we might expect to find them on the moon."

#### Park Chosen as Set for Horror Film

Another day I met a film producer who had permission from the National Park Service to make a movie at Craters of the Moon.

"The script calls for a monster, and this looks like the natural place for it," he said. "Where else can you find scenery so wild, so black, so bleak?"

Little did he suspect how full of healthy life Craters of the Moon really is. Flies buzz over the lava flows. Butterflies and bees

make the rounds of the many-colored wildflowers that bloom in June in the "cinder gardens" (pages 522-3).

"Nature shows special ingenuity here," Pete explained to me. "The dwarf buckwheat, for instance. Thousands of tiny hairs sprout on each leaf; these form dead-air spaces to conserve moisture that would otherwise evaporate. And if the wind blows a limber pine over, the shallow roots may bend with the fall and keep the tree alive."

One day Pete took us to the cave area, laced with a veritable subway system of lava tubes. These sprawling passages resulted when streams of hot lava formed firm crusts on their surfaces, much as ice forms on the surface of a stream. Underneath the crust the lava kept flowing; when all the liquid had drained away, empty tubes and caverns remained. Entrances are usually holes where the roof has fallen in.

These tubes extend downward only about 30 feet, but they vary greatly in size. I looked into one only two feet in diameter and walked through the biggest one: Indian Tunnel, measuring 100 feet across its floor, is 800 feet long. For a long time I stood on the floor of Great Owl Cavern, one of the world's

most perfectly formed lava tubes, and watched it curve gently into darkness, like a subway-tunnel turning.

"Take plenty of light when you go exploring in those caves," Pete warned. "A gasoline lantern and a flashlight plus a candle. And don't forget the matches!"

Once, after supper, we talked about an unmarked cave Buzz had spotted. Pete was immediately interested.

"Sounds like one I missed," he said. "Why don't we look into it? Tomorrow's my day off, and maybe Kent Henderson would like to go, too." Kent was Superintendent Henderson's 19-year-old son, a veteran of lava-tube explorations in Hawaii.

#### Tight Squeeze Leads to Secret Cavern

When we entered the cave next day, its walls sparkled with ice crystals. Clusters of lava stalactites hung from the ceiling like metallic icicles.

After a few hundred feet the cave seemed to end, but then the boys discovered a small opening leading on. Pete, a seasoned speleologist, felt we could get through. Pushing his hard hat and carbide lamp ahead, he wriggled and inched along until his boots vanished and the muffled scraping got fainter.

"Come on through!" we heard him call. "It opens into a big tube. This is terrific!"

Being skinny, Kent and Buzz had no trouble. But when I was halfway in, I wished I hadn't started.

"Don't get stuck, Bill—you're blocking our only exit," Pete called cheerfully.

With each move after that I could hear cloth ripping. When I finally stood up, my denim jacket was in sad shape.

Now the going was easier, though occasionally the ceiling still forced us down on our hands and knees. Following what we hoped was the main tube, we dropped markers at each fork. The lava on the floor of the cave

looked fresh enough to have flowed yesterday.

It was so cold that the moisture of our breath condensed into little clouds. Often we saw ice shining in deep cracks. I knew that the temperature outside, no more than 30 feet above us, was in the high eighties, and I wondered whether this midsummer ice might be caused by some mysterious refrigeration system in the lava.

"Air does it," Kent explained. "These lava tubes store up winter. The bubbles in the rock make it such a good insulator that the air stays cold indefinitely."

We walked on. "You know," Pete said, "cave distances are deceptive, but I'm sure we've gone more than 800 feet—the length of Indian Tunnel. If I'm right, that makes this the longest tunnel in the monument."

We had been underground three hours when we reached the end. The ceiling sloped down, and within 20 feet it met the floor. Pete got out his steel tape.

"Let's measure our way out," he suggested. "Kent, you and Buzz run the tape while I keep score. Bill can light the way."

PHOTOGRAPHS BY BILLIE BELKNAP, JR. © NATIONAL GEOGRAPHIC SOCIETY



"Finder please write," beseeches a 38-year-old message tucked in a tin can. Its author, the late R. W. Limbert of Boise, Idaho, explored the monument's rugged southern sector in June, 1921, and related his adventures in the March, 1924, NATIONAL GEOGRAPHIC. By coincidence, Mr. Belknap, also on GEOGRAPHIC assignment, unknowingly bedded down at Mr. Limbert's old campsite during a pack trip and discovered the can in a lava-boulder fireplace.



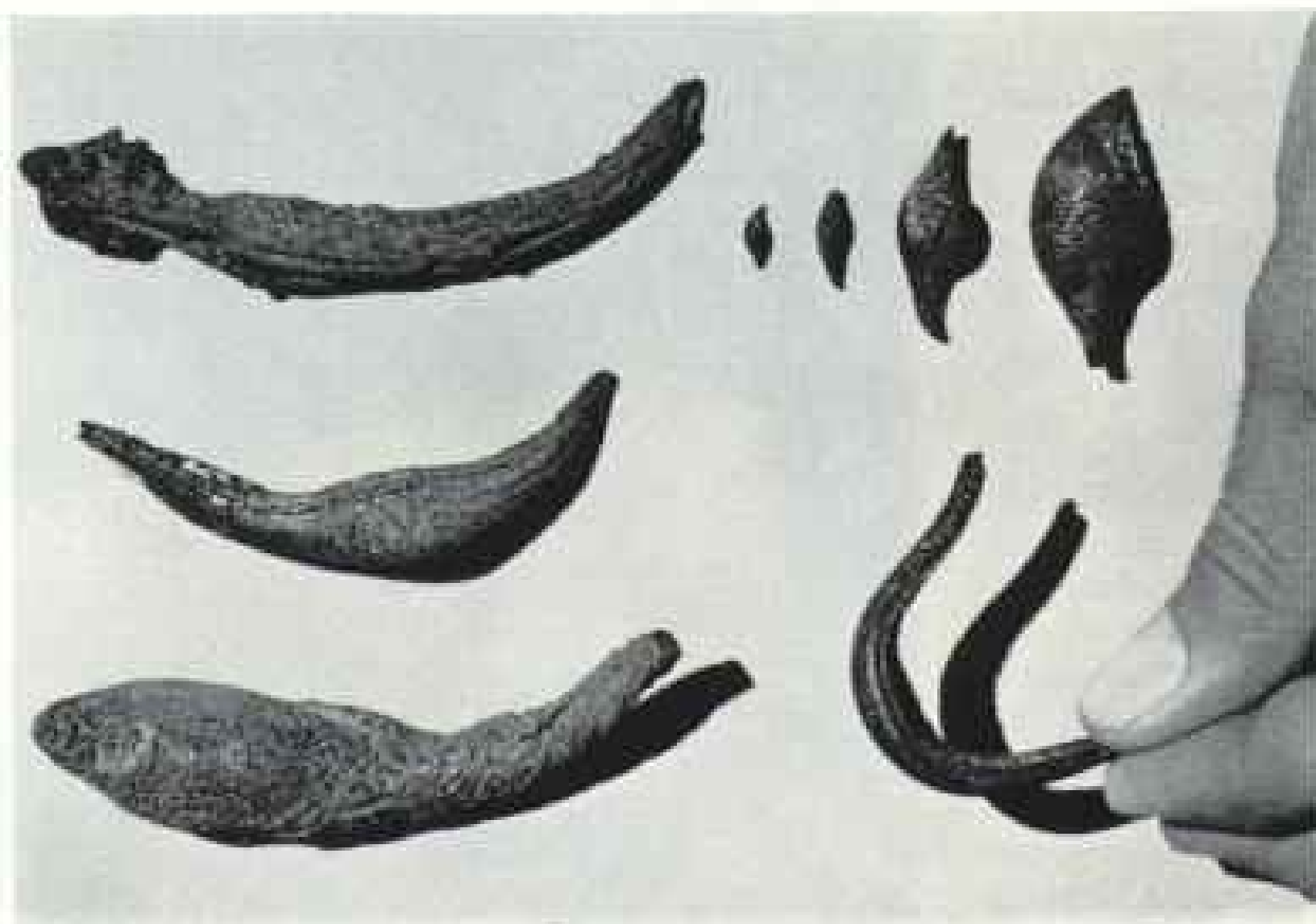
KODACHROME (AROUND) BY PETER T. WHITE, NATIONAL GEOGRAPHIC STAFF © N.G.S.

Spatter cones formed long ago suggest a moonscape (page 516). A lone limber pine casts its shadow on the cinder-slope wasteland at upper left. Footpaths at lower right snake alongside cones built by pulsing fountains of lava.

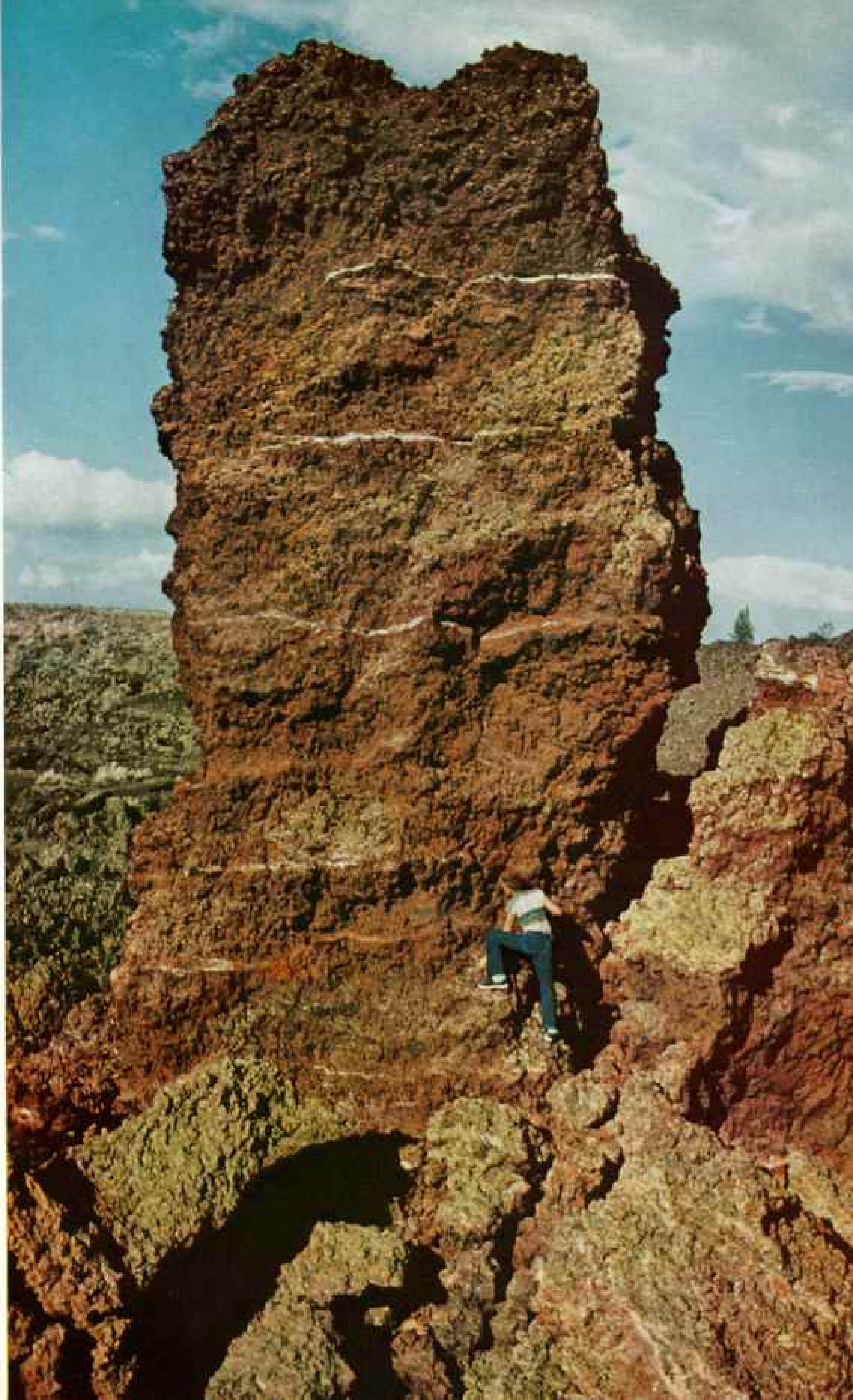
### Spawned by Fire, This Monolith Arrived on a Tide of Liquid Rock

When red-hot lava undermined a crater's cinder wall, this section floated like a chip. Hundreds of other once-floating islands, some 80 feet high, stud the monument.

KODACHROME (OPPOSITE) © NATIONAL GEOGRAPHIC SOCIETY



Fish-shaped lava bombs, molten lumps of basalt shot up from belching vents, took shape and hardened in mid-air. "Spindle bombs" may range in length from a quarter-inch to several feet. Some still retain their gracefully tapered tails.





WOLACHOWSKI © NATIONAL GEOGRAPHIC SOCIETY

### Clumps of wild dwarf buckwheat salt the pepper-black slopes of Paisley Cone.

By the time we had worked back to the entrance, the sky was dark. We huddled around while Pete added up the figures. "I make it 1,867 feet—a new record!" he announced.

When we drove into camp, the Hurst girls were having dinner with Fran and Loie. Buzz couldn't resist a little fun.

"Amazing," he told them, "that tunnel kept winding on and on, and we came out in Arco!"

"Twenty miles!" Sarah gasped, her eyes big.

"It was getting late," Buzz continued, "so we got a hamburger and started back."

Sarah rushed to spread the news. In a few minutes she returned with her father.

"What's this about a tunnel to Arco?" Bill Hurst wanted to know.

"Sarah, you and Buzz have just named a

cave," Pete said. "I have a feeling it'll be Arco Tunnel from now on."

Although you can see examples of nearly everything Craters of the Moon has to offer without leaving its roads and trails, anyone with an adventurous spirit and a pair of tough boots will find the southern half of the monument a fascinating challenge. Surveyors traversed it years ago, but today it is seldom visited. Bannock and Shoshoni Indians roamed the adjoining country before the first settlers moved in. With luck you can still find arrowheads of volcanic glass.

J. W. Powell and Arthur Ferris, two cattlemen from Arco, were among the first white settlers to venture into this lonely area; in the 1880's they explored it in the hope of find-

ing water for livestock. In 1901 a study was made for the U. S. Geological Survey by Israel C. Russell, one of the early trustees of the National Geographic Society. This and the detailed reports of Dr. Stearns, the geologist, and of R. W. Limbert, a hunter and taxidermist from Boise, Idaho, sparked widespread interest. President Coolidge proclaimed the national monument on May 2, 1924.

#### Retracing a Pioneer's Route

Pete showed me Limbert's article in the *NATIONAL GEOGRAPHIC*.<sup>\*</sup> His adventures fascinated me so much that I persuaded Pete and Kent to take a three-day back-packing trip with me, retracing Limbert's route into the monument's remote southern section. To help our preparations, Arco's flying minister, the Reverend Kenneth E. Pederson, gave us a preliminary look from his plane.

From the air the dark lava flows looked like cloud shadows on the desert. Though it was still cool, the little Stinson bucked violently as we crossed over the line where the great brownish-black lava scab meets the sagebrush plains.

Parts of the Great Rift looked as straight and distinct as dashed lines on a map; some of the fissures yawned at least 20 feet wide. Along this line rose spatter cones and cinder cones; some with chips knocked from their sides (map, page 509).

Little Prairie An Flow looked like a bottle of ink spilled on a green carpet. We looked for water and saw none, but in an hour we had picked a route. A paved road, Pete said, would take us within five miles of Echo Crater.

We left the visitor center next morning before sunrise. Where the road ended, we parked the car and shouldered our packs. As we passed Big Cinder Butte, yellow light bathed its 750-foot dome, and a breeze rustled the aspens on its northeastern slope.

Deer stood like statues watching us, and a golden eagle soared from a dead limber pine. An hour later we reached Trench Mortar Flat, where molten lava had inundated large trees, leaving clusters of cylindrical molds aimed skyward.

Here, in 1921, Limbert had writ-

ten: "The night we reached Echo Crater, [my companion's] feet had become so badly blistered that the pain of walking was almost unendurable." Their dog had to be carried.

I wondered how our feet would feel when we got back. But compared with Limbert's party, we were traveling comfortably. They faced the unknown with 55-pound packs; ours weighed 30, and we had an accurate map. Limbert hauled a cumbersome 5 by 7 camera and a tripod; I had a Leica in my jacket pocket. Their rifles were loaded for bear, while we settled for pocket knives.

Our map showed a water hole in one of the craters of Sheep Trail Butte, but from its rim we saw no sign of it. We scoured the bottom and were ready to give up, when Pete noticed an opening under a ledge. A pebble tossed in brought forth two startled swallows—and a gratifying splash. Digging away rocks, we enlarged it enough to crawl in and fill our canteens. Then we camped at the base of a

<sup>\*</sup> R. W. Limbert's report, "Among the 'Craters of the Moon': An Account of the First Expeditions Through the Remarkable Volcanic Lava Beds of Southern Idaho," did much to awaken public interest in this natural wonder. Craters was declared a national monument two months after the appearance of this article in the March, 1924, *NATIONAL GEOGRAPHIC*.

Dwarf buckwheat, in a close-up, tops a slope on Fissure Butte. Other herbs and shrubs brighten the wasteland.

REPRODUCED BY NATIONAL GEOGRAPHIC SOCIETY



cinder cone, where dead pines supplied plenty of firewood.

"It looks as if somebody camped here years ago," Pete observed. A semicircle of rocks, apparently piled up as a windbreak, became our kitchenette.

Next day we hiked to Vermilion Chasm, which Limbert had named. Its miniature spatter cones—four to six feet high—were built up of lava clots, their many colors suggesting the wax drippings on wine-bottle candlesticks.

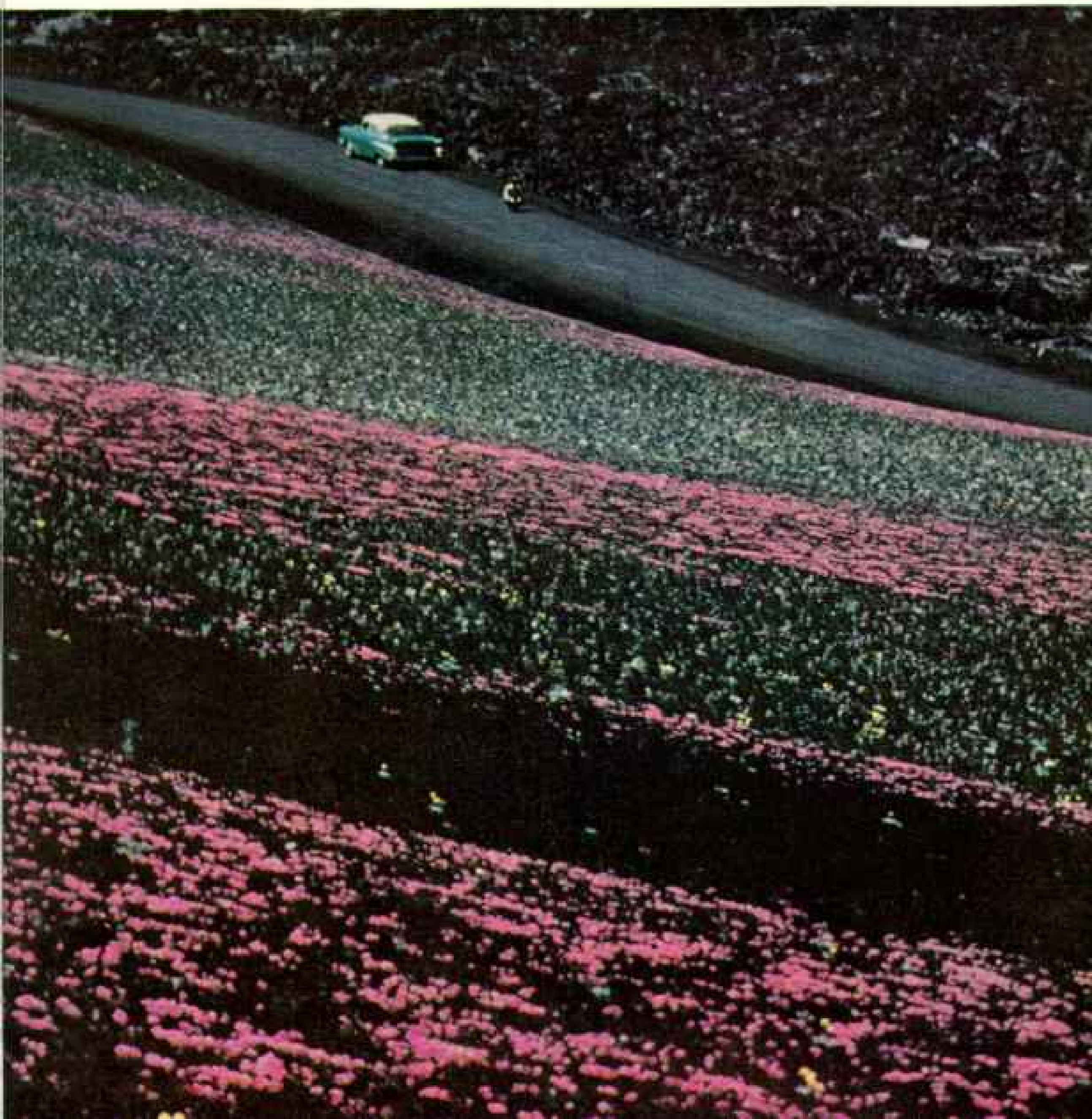
There are two distinct kinds of lava—painfully distinct, as I learned that day: pahoehoe and aa, Hawaiian words both,

meaning, in effect, friendly lava and unfriendly lava.

Pahoehoe is fun to walk on—billowing waves in a rolling sea of solidified lava (page 507). But aa is broken-up slag, jagged and spiny; a fall on it would be comparable to landing on a pile of broken crockery. A forbidding sea of aa lay across our route.

"If Limbert did it, I guess we can," Kent said. "At least we don't have a dog!"

We tested each step on the sun-baked fragments. In two hours we covered barely a mile. At last, on the rim of Two Point Butte, we stood and looked south over the miles of aa Limbert and his friend had crossed.



Flaming young leaves of bitterroot (*Lewisia rediviva*) push up through the cinders. June's hot sun will unfurl the flowers later (below).

Bitterroot in full glory (center) suggests a water lily. A large root of acrid taste gives the ground-hugging perennial its name.

Delicate monkeyflower (*Mimulus nanus*) was named for its fancied resemblance to a monkey's face. Two petals form the upper lip of the corolla; three the lower. Yellow spots pattern its throat.

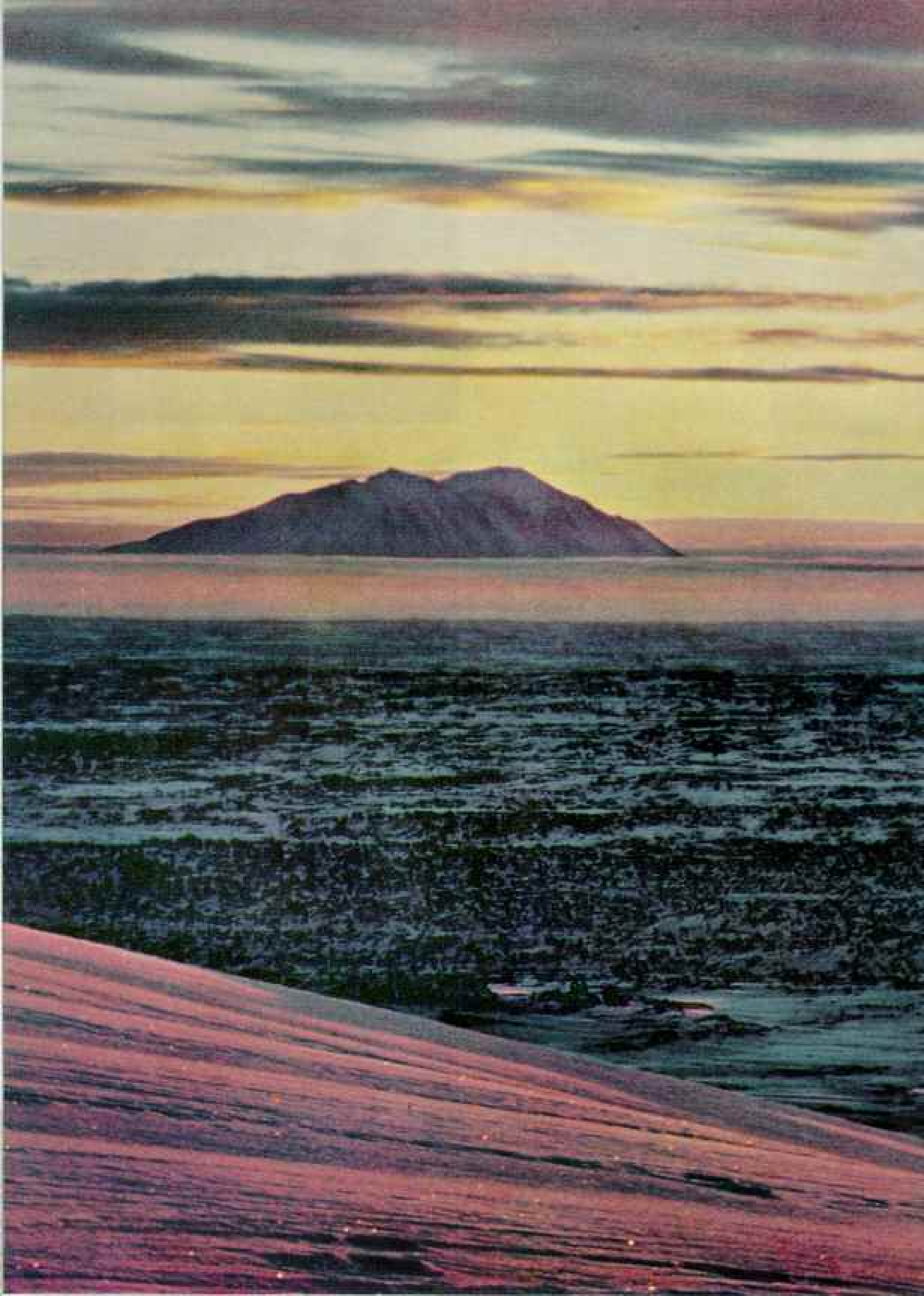


### cindery terraces

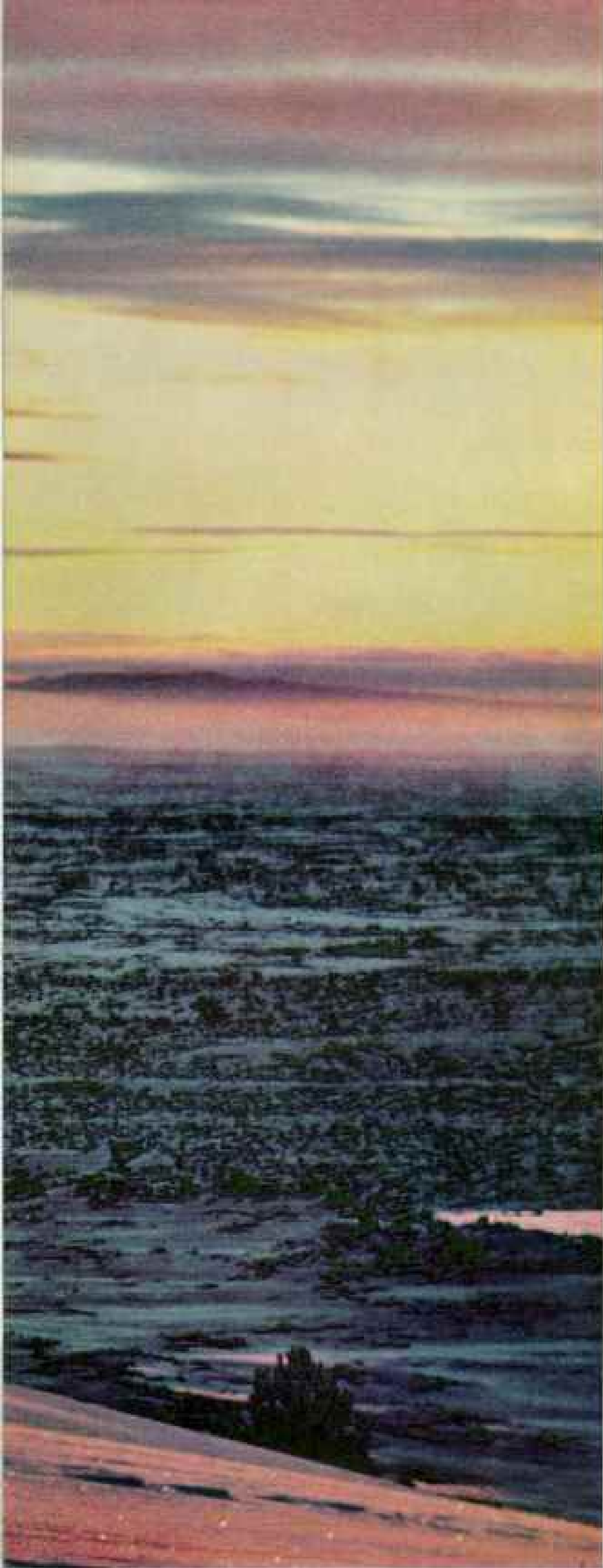
RESEARCHED BY WILLIAM DELERIP, JR. © NATIONAL GEOGRAPHIC SOCIETY







Big Southern Butte floats in a sea of cloud, and fresh snow dusts fields of black lava;



"They must have been rugged specimens," Pete reflected. "Think of scrambling for days over that stuff."

That night at our Sheep Trail Butte camp, I loosened a big rock to use as a table, and a rusty tin can rolled out. The top had been slashed with a knife.

Pete held a flashlight while I bent back the sharp points and shook an age-stained mailing tag into his hand. He read it, and an incredulous look spread over his face.

"What's the date today?" he asked.

Kent and I agreed it was June 18, 1959.

"Listen to this: 'Limbert and party camped here June 12 to 18, 1921. Finder please write.'"

For a moment no one spoke. The odds against finding this message had been staggering. And for us to have unearthed it while working on a sequel to Limbert's NATIONAL GEOGRAPHIC article—38 years later to the day—this was almost unbelievable!

In keeping with Limbert's request, we informed his widow, Margaret, who still lives in Boise, of our find.

#### Will the Rift Erupt Again?

For me, a great mystery remains about the Craters of the Moon: Is the Great Rift truly extinct?

Nobody can be certain. After all, Lassen Peak in California was called extinct before it erupted spectacularly in 1914. Craters of the Moon could also come to life again. In fact, one night in August, 1959, Superintendent Henderson thought it had.

"I was in bed when the house began to shake. I rushed outside and there was Lester McClanahan, our Supervisory Park Ranger, with his camera at the ready. As it turned out, what we felt was an earthquake centering near Yellowstone National Park about 200 miles away.\* McClanahan was glad it was a false alarm—his camera had no film in it."

"Weren't you glad, too?" I asked.

"No, I wasn't," Henderson said.

"I'd love to see this place erupt. I don't think any harm would be done. Cinders might scatter a few thousand feet, but there would be time to get out of the way of flowing lava. And we'd have something brand new to show here at the Craters of the Moon."

\* Yellowstone's earthquake is described in "The Night the Mountains Moved," by Samuel W. Matthews, NATIONAL GEOGRAPHIC, March, 1960.

# Rotterdam—Reborn

*Its heart burned out in World War II,  
Europe's greatest port has risen anew  
as a showcase of modern city planning*



# From Ruins

By HELEN HILL MILLER

*Photographs by JAMES BLAIR*

**A**LITTLE AFTER NOON on Tuesday, May 14, 1940, Adolf Hitler's bombers struck. Savagely, methodically, they rained fire on the rich and venerable heart of Rotterdam, the largest port in Europe.

Small blazes merged to form huge conflagrations. The bombing lasted less than an hour. But the fires continued through the night. The flames swept 642 acres of buildings, spreading through the beautiful old town like lava through a forest.

Next morning the whole center of Rotterdam was a desert.

The holocaust erased the dwellings of 24,978 families. Nine hundred people died. The downtown buildings left standing could be counted on the fingers of two hands.

## Monument Symbolizes City's Agony

It was hard to believe that the stricken city could ever recover. But 20 years and prodigies of work have effaced the horror. Like the legendary phoenix, Rotterdam in that time has sprung from its ashes as a larger, more handsome, and far more livable city than its predecessor ever was (map, page 534).

A symbol of the agony that generated the city's rebirth stands beside the harbor today, a conscious reminder to the people of the Netherlands of the suffering and loss they have put behind them. It is Ossip Zadkine's moving memorial, "May 1940," pictured at the left. The bronze figure turns in flight to look upward, arms aloft in a vain attempt to fend off the death hurtling from the skies. A hole in the breast symbolizes the heart having been ripped from the city.

But all around the tortured face and torn body I found a bright and bustling new Rotterdam going about its business in a fresh setting of steel and glass, brick and concrete. Newly widened and deepened waterways carry the sea-borne traffic that makes this Europe's leading port in cargo





Euromast, a torch-shaped tower, soars 370 feet above Rotterdam. After German bombers wiped out the city's core in the blitz of May, 1940, architects designed a metropolis with a spacious, airy complex as its heart. They reserved 70 percent of the central area for open spaces like this 57-acre park.

Here a cable car whisks sightseers above the massed blooms of a six-months-long flower show, the Floriade.

Crow's-nest restaurant (next page) caps the floodlighted shaft. Lower observation post, called "the Bridge," houses an exhibit of modern nautical instruments.



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tonnage, the world's greatest after New York.

Fittingly, when Queen Wilhelmina of the Netherlands came back to her country after five years of World War II exile, she bestowed on Rotterdam the right to use as its motto "*Sterker Door Strijd*"—"Stronger Through Struggle."

The visitor may first see Rotterdam and its busy river traffic from the deck of a transatlantic steamer of the Holland-America Line, or alight from a Sabena helicopter at the mid-town heliport. Or he may step out of an international train, as I did, into the gleaming, white-arched Central Station.

Whatever his approach, he is confronted with ranks of shiny buildings, all bandbox fresh in design, finish, and color. A few still wear cocoons of builders' scaffolds; great O's chalked on their windows remind workmen not to walk into the glass that wasn't there 10 minutes earlier.

#### Famous Windmill Survived the Blitz

When the German dive bombers had sheathed their swords of fire, a few of Rotterdam's central buildings still stood, raw and splintered like fractured bone ends. One wing of a hospital survived. So did the walls and tower of 548-year-old St. Lawrence's Church. Relatively undamaged were the city hall, the post office, and the stock exchange.\*

Close by, the old stone section of the Central Hotel was intact except for windows; the new part, built of wood, had vanished. I checked in at the Central, its lost wing still unreplaced, and talked with Mr. F. H. M. van den Meer, the grave, spare-framed man who stood behind the head porter's desk on that tragic afternoon in 1940, even as he stands there today.

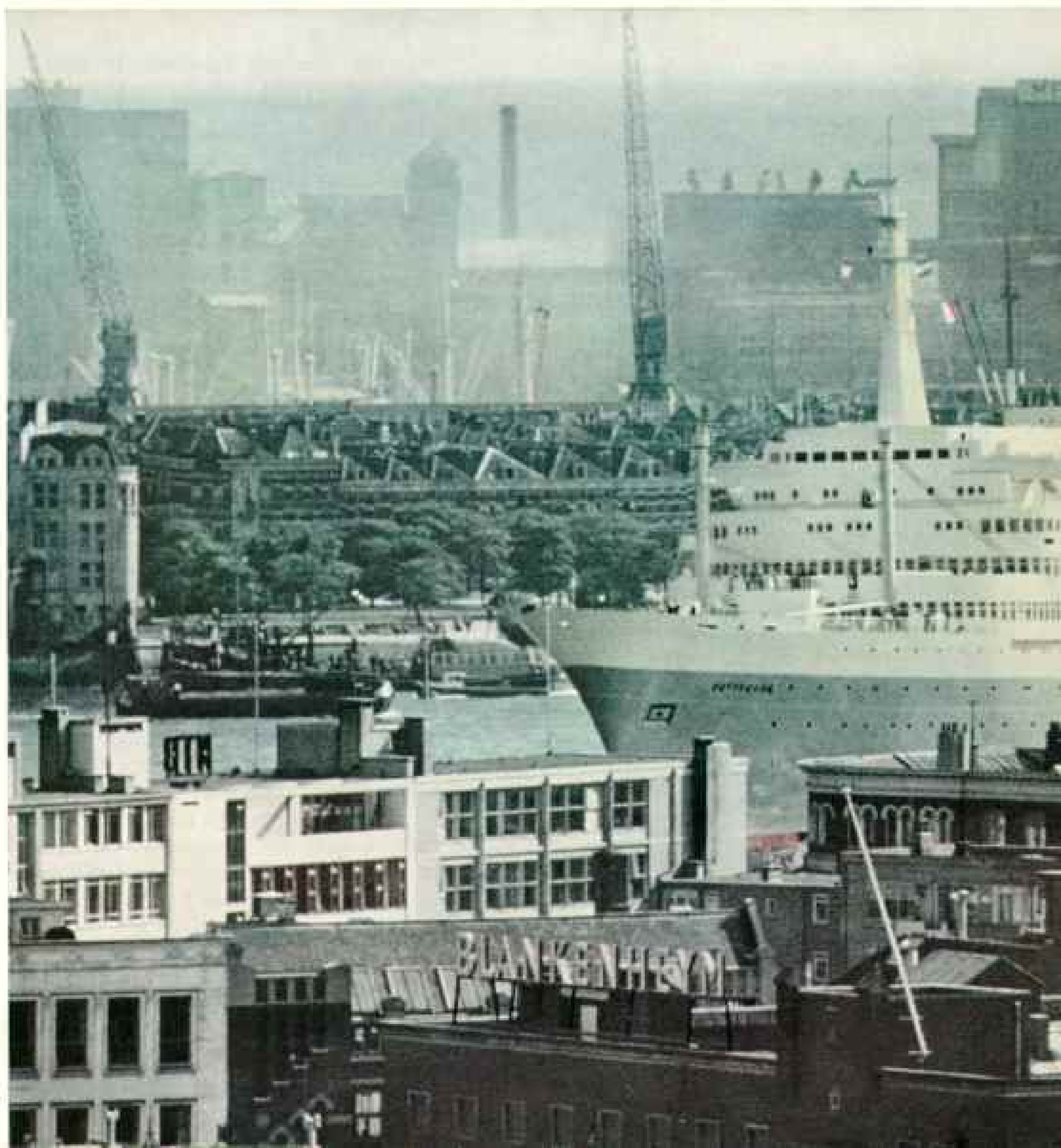
"Many of our guests left the hotel when war started," Mr. Van den Meer told me, "but about 60 stayed. We saved every one."

Most Rotterdammers have stories of their own escapes, their own particular fires. Ossip Zadkine's grim monument sums up for all of them the terror of those cruel days.

But this statue, and the crosses that mark spots throughout the city where individual patriots died, could not be erected until after the war. During the occupation the symbol of the nation's remembrance and resistance was a windmill known as "de Noord" (the

*(Continued on page 536)*

\* For an earlier account of devastation in the Netherlands, see "Holland Rises from War and Water," by Thomas R. Henry, NATIONAL GEOGRAPHIC, February, 1946.



**Diners Atop the Euromast Gaze Down on the World's Second Busiest Port**  
Only New York City surpasses Rotterdam in shipping tonnage. Yet the harbors, like so much of the Netherlands, are man-made. Docks lie 18 miles from the North Sea.

**Home From the Sea, S.S. Rotterdam Appears to Sail Across Dutch Rooftops**

Holland-America Line's new 38,650-ton flagship presents an unusual profile. Instead of conventional funnels, she carries tall diesel exhausts astern. A towering mast atop the bridge bristles with radar and other gear. Largest passenger ship built in the Netherlands, the 748-foot-long *Rotterdam* can carry 1,456 passengers in transatlantic service. On her maiden voyage she sailed into New York September 11, 1959, almost 350 years to the day after Henry Hudson arrived in the *Half Moon*. A telephoto lens catches the liner gliding past a warehouse area spiked with loading cranes.

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WINDMILL (BELOW) AND HIGH SPEED EXTRACTOR © NATIONAL GEOGRAPHIC SOCIETY







BEFORE  
MAY 14,  
1940

AFTER  
WAR'S  
END

ROYAL DUTCH AIRLINES



# Rotterdam, destroyed, rises anew

**F**LYING so low that horrified residents could see the black crosses of the Luftwaffe on their wings, German bombers roared in over Rotterdam on the afternoon of May 14, 1940. Forty fateful minutes later the planes were gone, and the city's heart had ceased to exist—the most terrifying example of concentrated bombing the world had yet known. The acrid odor of fire bombs filled the air as flames swept block after block. Blazing ruins marked the remains of 24,978 dwellings, 69 schools, 21 churches, and 4,280 shops, factories, and warehouses.

Even as the world mourned Rotterdam's tragedy, citizens were at work clearing away twisted girders, charred wood, and shattered brickwork. Within three weeks they laid out rough plans for rebuilding the city at war's end. Prewar Rotterdam, though colorful, had been built haphazardly, having many substandard dwellings and narrow, winding streets. Today's smart buildings present a symphony in concrete, glass, and stone.

These aerial views show the city's three faces: prewar, war, and postwar. Windmill at upper left survived miraculously in the scorched wilderness but burned 14 years later (page 537). Montage below locates its site. "To those who fell," says the inscription on the cross, one of several such streetside memorials to members of the Dutch underground.

SAME  
AREA  
TODAY





RODCHRORE BY HANSEN EIKER

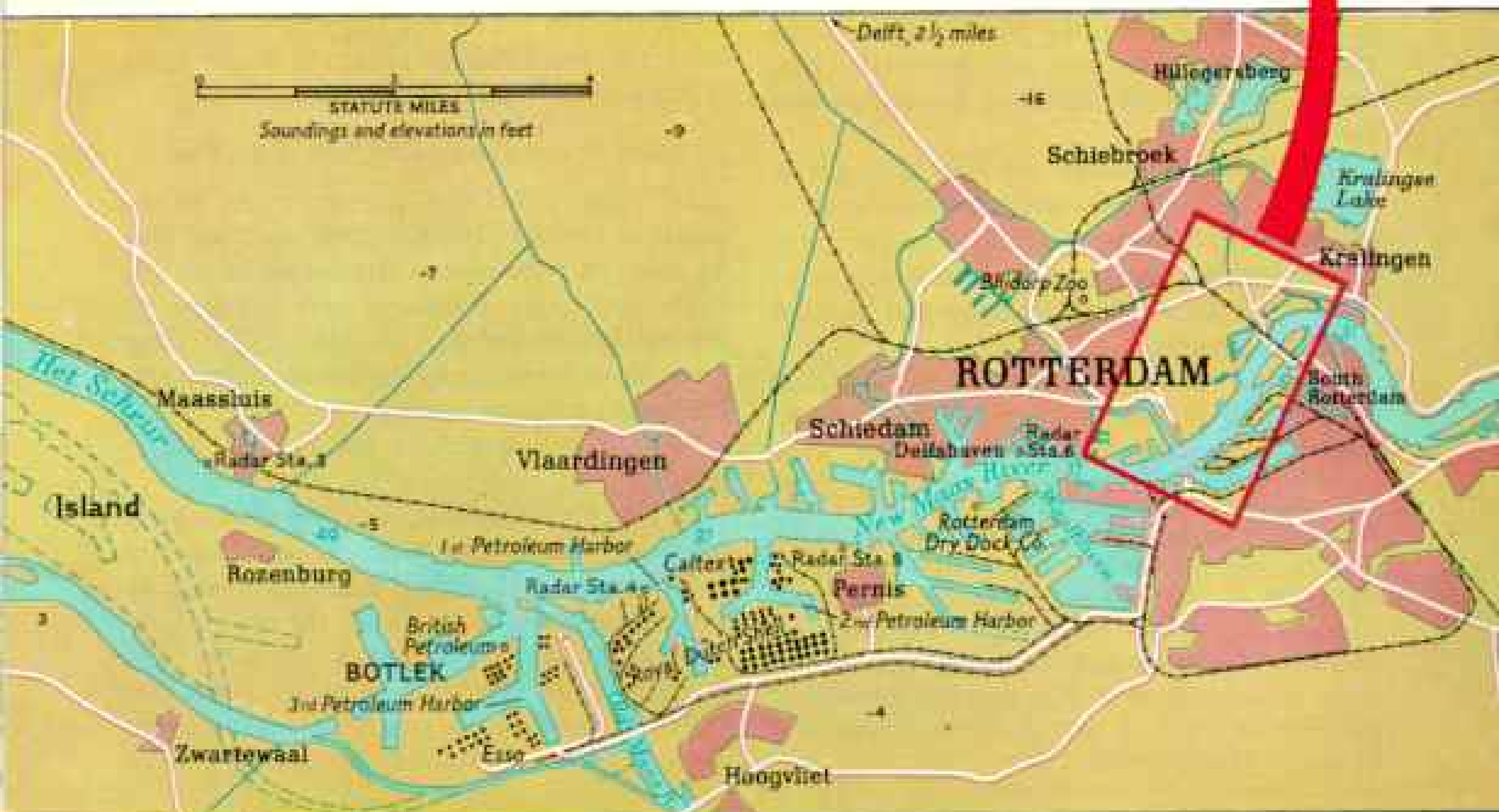
Port of Rotterdam Serves Europe's Six-nation Common Market

Viewed counterclockwise, maps and model show the city in ever-increasing scale. Europoort (below) is taking shape at the mouth of the New Waterway as a harbor for treaty-linked France,





West Germany, Italy, Belgium, Luxembourg, and the Netherlands; its docks will accommodate 100,000-ton tankers. Core of the city (above) represents area enclosed by the red rectangle below. Dr. Cornelis van Traa, genius of the city's reconstruction, inspects a model of the new mid-town section outlined by the larger rectangle.



North)—a wood and stone structure miraculously saved from the flames (opposite).

All through the hard and dreary days of German rule, people brought their grain to this mill and carried home not only flour for their daily bread but moral sustenance as well. For a sign put up there gave heart to Dutch resistance. It read:

*Through all storms, undisturbed,  
The sails of the mill have kept turning,  
God always has the last word. . . .*

#### Scorched Earth Gave Planners Freedom

How did Rotterdam recover from the shock of its destruction? Who laid the plans for restoration? I heard the extraordinary account of order brought out of chaos from the man who masterminded the rebuilding of the city.

Dr. Cornelis van Traa, head of the Municipal Town Planning and Reconstruction Department since 1946, works in the midst of a miniature city (page 534). His office is jammed with drawing boards and power saws, and with scale models of the several sections of the town. As we talked, he kept jumping up to illustrate a point on a block plan or to show a change—perhaps a street built over a filled canal—on a scale layout.

"Faster and faster, I am losing my children," he said, "but I'm not sad about it."

His "children" are the plans that surround him. He loses them first to the architects, and then to the builders who fix his designs in brick and concrete, the painters who spread gay color over the new structures, the gardeners who bed the brilliant flowers around them.

Dr. Van Traa showed me how his team of architects and planners have combined greater efficiency with modernization. Several separate railway stations used to serve Rotterdam; now most travelers by train come and go from a central structure.

Honking midday traffic once squeezed cyclists and pedestrians against the walls of mediievally narrow streets. Now six wide

arterial avenues bear wheeled vehicles. The tunnel under the New Maas River provides separate lanes for cars, cyclists, and pedestrians.

Crowded slums, some dating back to the Middle Ages, housed many of the 100,000 Rotterdammers who formerly lived in the central city. Today apartments are provided for only 20,000; the rest live in a ring of low-rent garden suburbs that offer space, air, and playgrounds for the young, apartments without steps for the old.

Careful zoning locates factory and office space in the most convenient relationship. Wholesale and retail firms have been regrouped to simplify the flow of goods.

"Four days after the 1940 bombing, a committee instructed the city architect, in whose office I was working, to prepare a new plan," Dr. Van Traa told me. "We still celebrate May 18 as Reconstruction Day."

The municipal government requisitioned all land in the demolished area to build a new city. The first plan was ready in three weeks.

During the first two years the tunnel under the river and the new zoo, both started before the war, were completed. Foundations went in for the imposing Rotterdamsche Bank and a few other permanent buildings.

"Then, in 1942, the Germans stopped all rebuilding," Dr. Van Traa said. "They began to ship Dutch workers away to forced labor in Germany."

"So what I am seeing," I commented, "didn't really get off the drawing board until after the war. You've done the whole thing in little more than a decade."

#### Open Space Dominates New City Plan

Dr. Van Traa drew my attention to the generous area of precious Rotterdam soil now set aside as open space. Almost three-fourths of the city today, compared with less than 45 percent before the war, is reserved for wider roads, open areas around buildings, more parking space, and more parks.

"People will live more happily this way," he said.

If Dr. Van Traa can properly be called a designing man, Miss Petra Beydals, curator of Rotterdam's Historical Museum, is equally a designing woman. In a way, the two complement each other. Van Traa's job is to build the new, Miss Beydals's to preserve the old.

She invited me to lunch in the museum, housed in what is probably Rotterdam's finest

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**The Author:** A wide-ranging journalist, Helen Hill Miller makes her home in Charlottesville, Virginia, and her working headquarters in Washington, D. C. A contributing editor of the *New Republic*, she reports frequently on United States affairs for the *Economist* of London. Mrs. Miller is the author of *George Mason: Constitutionalist*, published in 1938. A new work, on Greece, will be published in January, 1961.

### Fire in Peacetime Razes a Mill That Endured the Blitz

Medieval drawings show that a windmill called "de Noord" was a Rotterdam landmark at least five centuries ago. On the morning after the air raid, Rotterdammers could still see the mill, its sails untouched against the sky (page 532). During the occupation it became a symbol of the nation's resistance.

On a July night in 1954, fire of unknown origin destroyed the structure.

Miller Arie Kluit saved de Noord during the bombing raid by turning the sails to catch the wind. "Once they started to revolve, fire couldn't touch her," he recalls.

Mr. Kluit demonstrates how he turned the wheel. He now operates this mill near Rotterdam.



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NET BALLS WERE LAUNCHED AND RECOVERED BY JAMES BLAIR © NATIONAL GEOGRAPHIC SOCIETY





Balcony for every tenant creates a honeycomb effect in a towering apartment house in downtown Rotterdam. Frosted-glass panels provide privacy.

Of the 24,978 homes destroyed, only 20,000 are being rebuilt in the central section. The new quarter presents an orderly mixture of tall apartment and office buildings and two-story shops and residences. Architects made a clean break with the old style's solid rows of three- and four-story houses (page 545).





Older buildings get a face lifting to match Rotterdam's new look. Here masons repair a prewar structure in one of the city's many shipyards.

#### Tall Apartments Gleam With Tier Upon Tier of Lighted Windows

Three glowing slabs flank the Lijnbaan shopping center (page 547). This view from Central Station looks across an undeveloped area in the heart of the city.

RESEARCHED BY JAMES BLAIR | NATIONAL GEOGRAPHIC SOCIETY







PHOTOGRAPH BY BANGOR EBER © NATIONAL GEOGRAPHIC SOCIETY

Leapfroggers frolic on newly laid brick outside a modern department store.

surviving example of 17th-century domestic architecture. As the Schieland House, it was once the home of a merchant prince of that name.

Miss Beydals was slightly distracted, keeping an eye on museum workmen installing a gold and white salon interior, a treasure just acquired from the University of Nijmegen. Its overmantel, door frames, and window embrasures were exquisitely carved; a medallion framed an Italian painting in the ceiling.

She pointed through gardenside windows to a bronze statue of the 16th-century scholar Desiderius Erasmus. Through the war this likeness of one of Rotterdam's most famous sons had lain safely buried in a thick-walled brick vault.

Miss Beydals showed me a little bag with

silver beans in it. Most were silver all over; a few were black on one side.

"In the old days, each city council member used to put his hand in the bag and draw out a bean," she said. "Those holding black beans were promoted to a higher-ranking committee.

"Many of our prize exhibits"—she led me on from room to room—"date from the time of the guilds. All the people who made Rotterdam a great port had their guilds—big shippers, small shippers, longshoremen. Those silver shields on the wall were placed on the coffins of members during their funeral processions.

"These petit-point cushions are from the seats of the mighty in the city council hall. The silver tobacco holder came from the surgeons' guild. Etched glass beakers there belonged to the coopers."

No slave to the past, Miss Beydals welcomes fresh expression in her vacation art classes for school-age children, and the best of the youngsters' works are displayed temporarily in the museum.

"See, this child-artist comes from a sub-standard home. But look, his painting has the strength of a Van Gogh."

#### New City Cherishes Reminders of Past

As I walked away from the historical museum, I realized that in an all-new city like Rotterdam, the riches of the past became even more precious.

In the Prins Hendrik Maritime Museum I saw a superb collection of early maps and models of the Dutch ships that had made this small country a great world power. I spent quiet hours before the old masters and modern paintings in the Boymans-van Beuningen Museum, a gallery noted for its visiting exhibits.

Shaking myself back into the 20th century, I set out to get a consumer's-eye view of Rotterdam's new methods of marketing. I needed a bottle of ink; I could window-shop as I went after it.

I turned down the Coolsingel, the broad and breezy mid-town boulevard. Public buildings wall it, along with banks, restaurants, and insurance companies. Fine shops, big and little, flank it and its tributary streets. The three largest department stores stand a bit apart, each with its cluster of smaller specialty shops.

Business was brisk—the department store called the Beehive was humming appropriately—but I did not intend to buy my bottle of ink until I got to the famous Lijnbaan, or promenade, a shopper's paradise (page 547).

The Rotterdammer bent on buying can

stroll along the Lijnbaan's half mile of store frontage with never a thought to oncoming traffic, for vehicles are excluded. Overhangs fringing the two-story buildings shelter the walkways. At intervals canopied crossovers from one side to the other partition the street into a series of courts.

Down the center island of the promenade I walked, past dahlias and marigolds banked in geometric beds. The urge to buy was almost irresistible. Display windows were bright with blue-and-white tiles, vases, and pitchers of Delft ware. There were fine leather goods, smocked dresses for children, gleaming arrays of watches. Exercising considerable restraint, I bought my modest bottle of ink, then decided it was time for coffee.

Should I climb upstairs to the terrace cafe atop the pastry and confectionery shop? Its window held a sugary temptation of *petits fours*, *babas au rhum*, thin chocolates edged with orange and grapefruit peel, and square, hard coffee candies called *bopjes*.

Or should I sit at one of the small tables in the center of the Lijnbaan, where plate-glass screens hold off the wind but leave the eye free to rove? I settled for mid-promenade, and watched the neat, good-humored Rotterdammers stroll confidently through this new hub of their lovely little world.

Later I joined the rush-hour surge to the suburbs with the clerks from the stores, the workers from the docks, the typists from the offices. Many went home by bicycle or by motor scooter, but the bus I hopped aboard was nevertheless jam-packed.

I rode to the end of the line. Along the winding route we made frequent stops in new garden villages. Breadwinners dismounted a few steps from their doors. Children and dogs dashed out noisily in a fluster of homecoming.

Yet even with constant building, Rotterdam's postwar demand for housing has not been filled. "To get one of these apartments," a worker explained to me, "you first must have papers showing that you are employed in the city. Then you wait your turn. Even

though rents are controlled, they make a big hole in your earnings. We pay 22 guilders a week; I earn 70." (A guilder is currently worth some 26 cents, though its local buying power is about twice that amount.)

Suburban homes vary in style and price. The lake at Kralingen, northeast of the city, is white with sailboats on a summer afternoon. Bridle paths lace its bordering woods. There and to the northwest, by the lakes in the Hillegersberg district, modern homes cost up to 200,000 guilders (\$52,000); for row houses owners pay from 35,000 to 45,000 guilders.

These homes, of course, are exceptions; they accommodate the ranking families in the life of the city.



RECONSTRUCTION BY JAMES BLAIR © N.C.S.

Traffic leaps an avenue leading to the New Maas River tunnel, which links the city's southern and northern halves. View from Euromast overlooks new city hospital (right).

In-town apartments have big picture windows, rarely curtained. I remember, arriving in Rotterdam by rail after dark, looking out of the car at tier on tier of lighted windows (page 539). Each framed a bright picture of family life, scenes like those portrayed by such famous Dutch and Flemish masters as Vermeer and the Bruegels.

Children bent over homework, fathers relaxed with pipe and the *Algemeen Dagblad*, mothers sewed or arranged vases of bright flowers. I saw convivial groups enjoying parties, and one shamefaced towhead on the receiving end of what was clearly a class-A scolding from a Dutch uncle.

### City Stands on Invisible Stilts

Now you've seen Rotterdammers at home and in the shops, I said to myself, but not yet at work. So let's get down to business.

First I visited the Wholesalers' Building, where many firms carry on their trades under a single roof. Located near the Central Station, the structure has 1.3 million square feet of floor space; it is said to be the largest of its kind in modern Europe. An interior motor ramp allows about a third of the firms to enjoy truck delivery to their doors.

The glass display windows and cases around the ground floor gave a quick impression of what the merchandiser could buy here. The array of goods ranged from women's wool coats to undersea diving equipment; from a four-hour tape recorder to conveyer belts, casters, fork lifts; from roller skates to electric razors.

An observation deck on the roof gave me a dramatic panorama of the city. For the first time I could really see the sharp break between the city's modern buildings and its prewar architecture of white-trimmed red brick, gabled and dormered.

A remarkable feature of the Wholesalers' Building and of the huge Building Center across the street is that the hundreds of thousands of tons of these massive structures are supported on wood and concrete pilings driven through soft, mucky soil.

Mud, clay, sand, and silt, in fact, underlie all Rotterdam. Millions of pilings make this a town perched on hidden stilts; they are

driven down an average of about 50 feet to give sound support.

In the Building Center I saw a brilliantly staged exhibit of everything having to do with the construction trades, including a display of cartoons poking fun at the industry itself. I was especially amused by one that showed all the piles for the foundation of a large building neatly driven into place, except one. Around this, expectant workmen clustered; on top of it a stork had built a nest.

If the pile driver gets the Netherlands out of the mud, the dredge gets the mud out of the Netherlands. It was easy to see, cruising about the harbors of Rotterdam, how much muck and silt have been moved in carving out new channels and berthing space for ships.

With Mr. John A. Lebbink of the city hall staff as guide, I rode a launch through the busy harbors. Before we started, Mr. Lebbink spread a chart on the cabin table and gave me a briefing.

A look at his chart showed why Rotterdam is the busiest port on the Continent. It stands astride the New Maas River, 18 miles from the North Sea, with a channel dredged deep enough for all but the largest ocean-going ships. Inland, since the New Maas is a mouth of the Rhine, cargoes move by barge to Germany, Switzerland, and on through Europe's system of inland waterways.

### Harbors Serve Oil-thirsty Europe

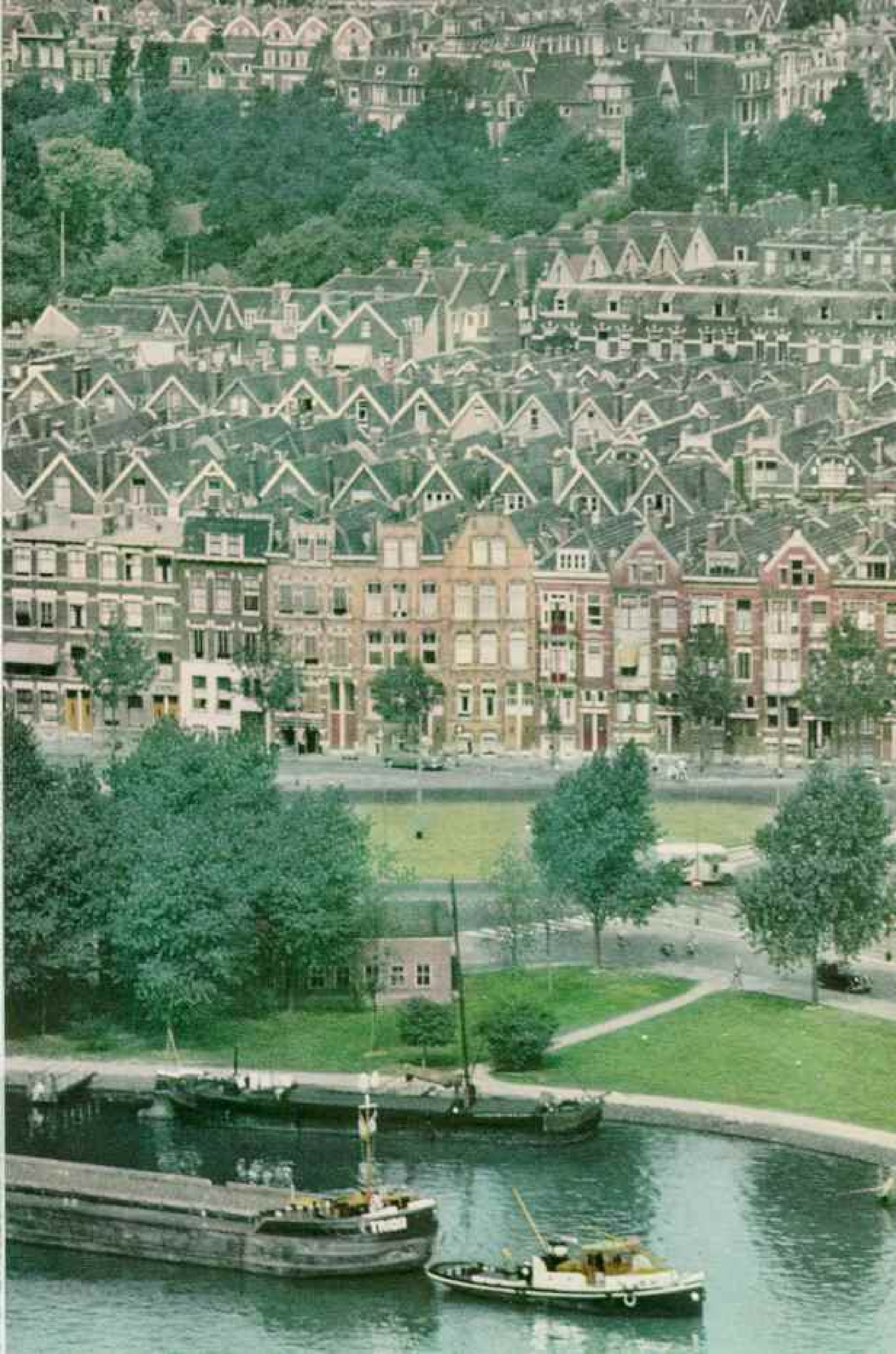
"Location is a big advantage," said Mr. Lebbink, "but we also specialize in harbor know-how. Shore-based radar guides ships in any weather. We transship cargo very fast, so shippers come here because we save them time, and time is money."

Bending over the map, he showed me where the various berths and anchorages lie, and what they are used for. In the early days Rotterdam handled chiefly bulk cargo—grain, wood, iron ore, coal, phosphates. Later it began to attract general merchandise—packaged goods—and that means merchant shipping that moves on fast, regular schedules.

Even before the war, commercial leaders realized that European industry would turn more and more to petroleum for fuel. Automobiles and trucks would be thirsty for gaso-

### Peak-roofed Row Houses Preserve the Flavor of Old Rotterdam

Towing a barge, a tug inches along one of the many canals that join the New Maas. Cargo from Rotterdam enters Europe by way of the Maas, Rhine, and Moselle Rivers.





NO EXTRACTING BY JAMES BLAIR



RODCHROME BY MARVIN KONER © H. G. S.



KONER



KONER



BLAIR



## Faces of Rotterdam



**T**WO MEN who played key roles in rebuilding the shattered city are shown at the top of the page opposite: Dr. Gerard van Walsum (left), the Burgemeester, and Dr. K. P. van der Mandele, head of the powerful Chamber of Commerce.

Citizens of every rank have benefited from the postwar trade boom, among them the businessman who talks to parrots in the new Blijdorp Zoo, the dockworker below him, and the jolly flower seller.

Happy Dutch children take pleasure in a new winter coat (opposite), a kitten (above), or a false beard and painted face for the Queen's birthday celebration on April 30, when Rotterdam takes on a carnival air.

REPRODUCED BY ILLUSTRATION © A. J. L.



line. So Rotterdam built first one, and now three, whole new petroleum harbors.

"And we're not through yet," said my guide. "Our latest development is Europoort, our gateway-to-Europe harbor down where the river goes into the North Sea, opposite the Hook of Holland. This port will handle much of the trade of the new six-nation European Economic Community.

"And add to this the need to provide stockpile areas for the iron ore starting to come from Labrador, Venezuela, and Africa. A new steel industry here is in the offing, too."

### Grain Barges Serve as Floating Homes

Now the launchman revved the engine, cast off, and steered into mid-channel. We nipped in and out of the chugging river traffic, ducking into basins that angle off from the main stream like fingers on a hand. We bounced in the wake of tugs, liners, rusty tramps, ferries, and barges, some towed, some self-propelled (page 548).

We saw a grain ship just in from Canada with six floating elevators tied up beside it. Barges flying German and Swiss flags clung alongside like ducklings, loading wheat for upriver ports. The elevators thrust long tubes down into the ship's hold, sucked the grain up, and poured it through other tubes into waiting barges.

On most of the motor-driven barges, skippers have their families aboard (page 552). Wives and children waved to us from their floating homes, bright with polished brass, the windows gay with potted geraniums.\* Even the peddlers are water-borne here; bumboats selling vegetables and fruit scooted through the confusion.

The skyline of the port of Rotterdam is a black fringe of moving cranes. From our water-bug's-eye view, they looked like the legs of huge spiders.

Downriver we passed once-independent settlements now merged with Rotterdam. Mr. Lebbink pointed out Delfshaven, the little town from which in 1620 a band of Pilgrims set out in the ship *Speedwell* to join *Mayflower* on a journey to the New World. The Dutch are proud of their contribution to the settling of America; a block-long street beside the old harbor remains exactly as it was when the voyage started.

Sights on the south side of the river kept my head swiveling. We passed the Rotter-

\* David S. Boyer reported on this floating population in "Paris to Antwerp with the Water Gypsies," NATIONAL GEOGRAPHIC, October, 1955.



Sculptor Mari Andriessen's memorial to the war dead stands in City Hall Square (above). The 80-foot fantasy in steel by Naum Gabo (opposite) dominates the Coolingsingel, Rotterdam's principal midtown boulevard.

#### No Wheeled Traffic Allowed: The Pedestrian Is King on the Lijnbaan

Twentieth-century version of the old market square, the Lijnbaan stretches more than half a mile through the heart of Rotterdam. Hailed when it opened seven years ago as Europe's Fifth Avenue, the pedestrian mall is a quality street of medium-sized specialty stores. It attracts customers from all parts of the Netherlands.

Wooden canopies protect shoppers from rain and snow. Cross-awnings divide the promenade into a series of paved courts beautified with flower beds and trees.

dam Dry Dock Company, which built the 38,650-ton, 1,456-passenger *Rotterdam*, the Holland-America Line's new flagship (page 530).

Another bend, and we came to Pernis and the beginning of the petroleum harbors. The huge drum of a gasoline storage tank rose beside some fishermen's huts. Three cows grazed near by.

Here were the giant storage cylinders owned by Royal Dutch Shell, British Petroleum, Esso, and Caltex. The new refineries are fed from ever-larger tankers—45,000-ton ships now, 70,000-tonners shortly. A new satellite city,

PHOTOGRAPHS BY NATIONAL GEOGRAPHIC SOCIETY



Hoogvliet, is rising to house 50,000 to 65,000 people.

"Rotterdam now refines between 22 million and 25 million tons of crude oil each year," said Mr. Lebbink.

We passed close to the dredge *Ahoj*, which was sucking up muck furiously, screening out sand, and spilling water back into the river. A scow received the sand.

"That is the stuff that is making Rozenburg Island," said Mr. Lebbink, and we bent over the map again. "There it is, the sandbank that's becoming Europoort."

In Dutch, the double *o* of Europoort suggests "gateway" rather than simply "harbor." Eventually, this \$150,000,000 installation will handle vessels of 70,000 to 100,000 tons. Steel







JAMES CLYDE

WARREN ROBERT





APPROACH BY MARVIN CONYER © N. C. P.



## The Busy Port

**R**OTTERDAM FOLK think of their town as "a port surrounded by a city." Endless tows of barges and lighters follow in the wake of river tugs. An immense complex of piers and docks stretches away into an infinity of cranes, masts, refineries, and a mesh of moving boats.

More than 20,000 vessels a year bring in some 70 million tons of merchandise. Most ships transfer cargoes to barges for shipment to river ports all over Europe. Modern harbor facilities accomplish the exchange in the shortest time possible; it takes only 10 hours to unload 8,000 tons of grain.

The telephone rarely stops ringing in the dockside office of Dr. Frans Posthuma (above), the port's managing director. Here he checks on loading operations aboard the liner *Statendam* (left) at the Holland-America Line docks.

Welders' torches blaze in the shipyard at upper left; the floating grab crane at center pours grain into a lighter, and painters refurbish a vessel.



mills, storage for coal, oil, and ores, and repair facilities for the largest ships are planned.

Rotterdamers hope Europoort, plus their present harbor, will make the city the world's largest port and the acknowledged entrance to the European Common Market, the six-nation coalition that is moving to unify the commerce of France, West Germany, Italy, Belgium, Luxembourg, and the Netherlands.

While Mr. Lebbink described it, we swung around and headed upriver. Catching his enthusiasm, I could already see in my mind's eye this commercial wonderland springing from the mud.

As we cruised upstream, we passed salt-stained vessels with the names of far-flung home ports on their sterns: Tokyo and Calcutta, Oslo and Istanbul, Piraeus and Liverpool, New York and Sydney.

Next day I stood at an upper window of a building in the Stieltjesstraat with white-haired, blue-eyed Dr. N. T. Koomans, for a quarter century director of the Rotterdam Municipal Port Authority. Dr. Koo-

mans, who has retired since I talked with him, was responsible for the handling of as much as 75 million tons of cargo a year.

"A berth for a seagoing vessel," said Dr. Koomans, answering my first question, "runs to a million guilders or more—\$260,000 in your money. For a smaller ship, it costs 100,000 to 500,000 guilders."

#### Radar Warns Port of Arrivals

I waved toward the milling river traffic: "How do they all know where they are going?"

"About two-thirds of the inbound ships report to a regular ship broker," Dr. Koomans answered. "If their usual spots happen to be taken, they radio their draft to the harbor master and ask for space at a mooring post called a dolphin.

"When an inbound cargo ship checks in at the Hook of Holland, the radar service there announces that she has entered the New Waterway and can be expected in Rotterdam at, say, four o'clock. This information comes



Bicycling commuters queue up at an entrance to the New Maas River tunnel. Stone façade on the opposite shore marks the tube's exit on the south side.

Begun as a public works project prior to World War II, the tunnel was completed only a few months before German occupation forces ordered a shutdown on all construction and started shipping Dutch workers to forced-labor camps.

Neither snow nor rain stops hardy Rotterdammers cycling home from work during the rush hour.



ARTH TALCROFT, WOODFIN

both to my office and to the ship broker's.

"Stevedoring companies are notified at once how many gangs of dockworkers will be needed," Dr. Koomans went on. "They have permanent staffs of their own, and they can call for more help from the pool where all dockers register.

"Since the war, we've had a labor shortage in Rotterdam. We're drawing in workers by bus from far out in the country."

Another day, to learn about the problems of business in Rotterdam, I kept an appointment at the local Chamber of Commerce.

In the Netherlands, unlike the United States, the 36 regional chambers of commerce are semigovernmental bodies, and the government of a city, in some instances, has to ask advice from the local chamber in matters relating to commerce. Furthermore, the chamber can offer the municipality proposals on its own initiative.

"Rotterdam's trade supplies more than half of all Dutch customs receipts," said Dr. F. W. T. Hunger, the bronzed former civil serv-

ant from Indonesia who is secretary-general of the Rotterdam chamber. "A large fraction of the national income-tax payments also are collected here."

Dr. Hunger keeps a sharp eye on the activities of rival ports like Antwerp, Amsterdam, and Hamburg.

"As the European Economic Community becomes a reality," he said, "we have to watch to see that we aren't outmaneuvered. We don't want any political shackles put on our development."

#### Talk With the "High and Noble Sir"

On returning to my hotel, I was greeted with a flutter of excitement. There was a message for me: I had an appointment next day with the Honorable Gerard E. van Walsum, *Burgemeester*, or mayor, of Rotterdam.

A city hall is a city hall, but the second floor of Rotterdam's, I discovered, has a flair for ceremony: The accepted salutation to the *burgemeester* is *de Hoogedelachtbare Heer*, a mouthful that means, literally,



"the high and noble sir, worthy of respect."

Even without the medallioned chain of office he wears on ceremonial occasions, Dr. Van Walsum, the courtly, imposing gentleman who came forward to meet me, has a touch of dignified authority about him rare among mayors anywhere (page 544).

It is, after all, Her Majesty the Queen who appoints the Netherlands' burgemeesters. And these gentlemen, in turn, preside over the town councils and aldermen.

#### Century Brings Eight-to-one Growth

I asked Dr. Van Walsum to tell me about the problems of governing so fast-growing an area as Rotterdam.

"The rate of change is very rapid," he replied. "A hundred years ago Rotterdam had only about 100,000 people; today we have about 750,000. Our growth started when Germany's Ruhr was industrialized in the mid-19th century, and we built the New Waterway to let big ships pass to and from the sea.

"Rotterdam has grown with its port. We say that in Amsterdam the city possesses a harbor, but in Rotterdam the harbor possesses a city.

"From the point of view of city government, our recent growth has caused many difficulties," Dr. Van Walsum told me. "All around us lie neighbor cities with their own independent life, and we think this is good. Yet Rotterdam now governs several areas that are not physically part of the city at all, and we have asked the national government for authority to annex the Botlek harbor region and the Europoort area.

"Certainly it is best to operate all our port facilities as a whole. But we want to develop coordinated municipal bodies rather than keep on with annexations."

When another visitor arrived for an appointment, the burgemeester suggested that we continue the conversation at dinner with Mrs. Van Walsum at the Châlet Suisse next evening.

Rotterdam takes easily to exhibitions. In 1950 an exhibit named simply "Ahoy" focused

on shipping. For that display, a model of a Swiss chalet was put up in the park. It has remained in use as a delightful restaurant.

Another exhibit, in 1955, was called "E," and featured energy. This past spring, the 57-acre park near the river became a colossal flower show, the Floriade. Princess Beatrix opened the festival and at the same time dedicated Rotterdam's new sightseeing column, the Euromast, which is crowned with a double-decker restaurant (pages 528 and 530).

When the mayor's long black limousine pulled up in front of my hotel next evening to whisk me to the Châlet Suisse, a small crowd of hotel staff surrounded me. They were rather like stable hands seeing their horse out of the paddock; the animal had been brushed and curried, but would its performance be satisfactory?

My introduction to the mayor had come from a friend of his college days, so we talked of scholastic life in our generation and as it is today. The burgemeester's older son, like our own, is a lawyer, while the two younger boys—the Van Walsums' in the United States, ours in Europe—have shown marked ingenuity in inexpensive travel between academic engagements.

#### Rotterdam Skipper Ties Up in Chicago

When the talk turned to the United States, I spoke of the St. Lawrence Seaway.\* The Van Walsums forecast great things for the new artery. Their enthusiastic interest was echoed on April 30, 1959, in dispatches announcing the arrival in Chicago of the *Prins Johan Willem Friso* of Rotterdam.

A reporter asked Captain Klein, skipper of the *Prins Johan*, how his trim diesel craft had managed to be the first deep-draft ocean vessel to reach Chicago.

"We have a motor," he replied with a laugh, dismissing as taken for granted that a Rotterdam sailor would get there first.

\*For a vivid account of this mighty shipping route, see "New St. Lawrence Seaway Opens the Great Lakes to the World," by Andrew H. Brown, NATIONAL GEOGRAPHIC, March, 1959.


#### Barge Folk, Europe's Water Gypsies, Enjoy a Congenial Life Afloat

More than 100,000 people live aboard the motor craft that shuttle cargo along the rivers and canals of the Netherlands, Belgium, France, and Germany. Awaiting orders in Rotterdam, these families berth close enough for deckside chats.

# Wild Animals OF NORTH AMERICA



NATIONAL GEOGRAPHIC SOCIETY



... a new volume in *The Society's*  
*Natural Science Library*

By MELVILLE BELL GROSVENOR

President and Editor,  
National Geographic Society

**O**F ALL THE ANIMALS, which is the smartest? Which can run the fastest? What mammal is the commonest, or the rarest? Just what is a mammal, anyway?

Such questions pop at parents daily from their youngsters. But, says a man who has answered thousands of posers about animals, these queries are also the most frequently asked by businessmen, teachers, farmers, outdoorsmen, crossword-puzzle addicts, and even scientists. The expert is Dr. A. Remington Kellogg, distinguished mammalogist and Director of the U. S. National Museum of the Smithsonian Institution.

Curiosity about animals is endless and touches people of all ages and in all walks of life. I can remember begging my father to read "just one more" wildlife story before bedtime. Children before me—and since—have done the same, eager in a thirst for knowledge.

#### New Book Gives the Answers

Now comes a new book to satisfy that need. It is with great pride that I announce publication of the latest volume in *The Society's Natural Science Library*.

*Wild Animals of North America* is a magnificent reference work, one that will answer almost any question you or your children can ask about North American mammals. It is also a delightful storybook for bedtime reading; in anecdotes and eyewitness tales it brings the wonderful world of animal life into your home.

Alaska brown bears feast on red, or sockeye, salmon on the colorful jacket of *The Society's* animal book. Staff artist Walter Weber found this mother and her cubs fishing for their lunch near Bristol Bay, on the Alaska Peninsula. Arizona bobcat (right) surveys his arid domain from the spiny tip of a saguaro.







KIDACHROME BY NATIONAL GEOGRAPHIC PHOTOGRAPHER BATES LITTLEVALES © N. G. S.

Orphan gray squirrel drinks milk diluted with water—a formula prepared by the young foster mother on the advice of Dr. A. Remington Kellogg, noted Smithsonian mammalogist. Whole milk can kill baby squirrels, the scientist points out. Born hairless, blind, and helpless, the young nurse six to eight weeks before trying solids.

In the chapter on seals, for example, you'll learn that naval scientists during World War II tried to use the animals to seek out unfriendly submarines. The chapter on deer describes their peculiar liking for such things as chewing gum, fried eggs, tapioca pudding, and wrapping paper. As for cats, you'll read about a trick reputedly practiced by the jaguar: Brazilian Indians say he lies on a tree branch over a pool, drooling saliva. When a fish leaps at this odd lure, a swipe of the jaguar's paw lands a fresh dinner.

The book's 400 pages—252 of them with full-color illustrations—contain material that makes it useful for the nature lover, the con-

servationist, the hunter, or the curious—man or woman, boy or girl.

Today when I watch a mole burrow across my lawn, or a rabbit double back in a field to elude my dog, I realize that my own lifelong interest in animals stems in large measure from The Society's earlier wild animal book, given to me as a boy by my father.

That book—still remembered as the finest of its time—has been out of print for years. But the new *Wild Animals of North America* is an even finer publishing achievement. It is bigger, better illustrated, more entertainingly written, brilliantly authoritative.

The first two chapters set a background for your understanding and enjoyment. They acquaint you with mammals in general and how they live, and sketch the way modern wildlife developed from prehistoric ancestors. Then 26 other lively chapters bring accounts of the main groups of mammals found north of the Mexican border, plus detailed biographies of 138 species.

The opening chapters are written by Dr. Kel-

Prepared as a special service for members of the National Geographic Society, *Wild Animals of North America* stands as a remarkable achievement by a team of scholar-adventurers. Artist Walter Weber, for example, traveled 137,000 miles on field trips for the volume's paintings alone. Text and color photographs likewise offer a wealth of hitherto unpublished material. Yet as a privilege of membership in The Society, you can buy *Wild Animals of North America* for only \$7.75—a fraction of the price such a work would command if offered in bookstores. Order only from the National Geographic Society, Department 52, 16th and M Streets, N. W., Washington 6, D. C.

logg. Authors of other chapters include leading scientists, biologists of the U. S. Fish and Wildlife Service, and curators of famous zoos.

More than 400 illustrations give you intimate animal close-ups—from half-inch-long babies in an opossum's pouch to the 1,500-pound Alaska brown bear, biggest carnivore on the continent. The paintings come from the brushes of such famous wildlife artists as Louis Agassiz Fuertes and the National Geographic Society's own Walter A. Weber.

*Wild Animals of North America* follows a carefully planned pattern, with sections on the hooved mammals, the meat eaters, the gnawing mammals, the ocean dwellers, and the survivors of very ancient orders—animals such as the armadillo, the opossum, and the shrew.

You'll find, I know, hours of educational delight in one of the finest nature books The Society has ever been privileged to offer—a volume that unfolds all the wonders of the animal world, yours to explore at will.



ERNEST P. WALKER

Flying squirrel leaps to the shoulder of its master, Ernest P. Walker, who contributes a chapter on this fascinating animal. Sleeping by day, flying squirrels cavort by night, gliding 50 yards or more on furry sails stretched between the legs. They respond readily to kindness. Mr. Walker, an authority on small animals, is the retired Assistant Director of the National Zoological Park, Washington, D. C.

Triplet bunnies nest in cupped hands. Their foreheads bear the white blaze often seen on cottontails. For survival in captivity, they demand gentleness and clean quarters.

VOUGHRINE ST. P., RICHARD BAXTER, NATIONAL GEOGRAPHIC STAFF © N. G. S.





*Hardy settlers have turned a grim penal colony into a Pacific paradise*

# *Bounty* Descendants Live on Remote Norfolk Island

By T. C. ROUGHLEY

*Illustrations by National Geographic photographer  
J. BAYLOR ROBERTS*

**T**HE DAY WAS WARM and clear on October 10, 1774, when Capt. James Cook, sailing in his famed ship *Resolution*, sighted a small island in the South Pacific. Rugged, precipitous, and uninhabited, it was clothed with a forest of tall pines and dense vegetation growing out of volcanic soil, deep and rich.

Cook had discovered one of the most beautiful islands in the world, but one destined to witness much misery. He called it Norfolk Island, in honor of a noted English family.

I went to that island to drink of its beauty and to see what the years had done to its double heritage as onetime penal colony for vicious criminals and home for descendants of the storied *Bounty* mutineers. For today even more progeny of those defiant British seamen and their Tahitian wives live on this island than on lonely Pitcairn.\*

Come to Norfolk, little altered from the time when Cook gazed on it, and you will see great basalt cliffs dipping sharply to the ocean. You will see vivid green hills undulating down to beaches of water-worn stones, where the breakers froth as they ceaselessly rush to engulf the shore. And you will see the great Norfolk Island pine trees, dominating the landscape at heights of nearly 150 feet.

Except for about a mile on the island's south shore, the whole coast is rugged, and nowhere is there a haven for ships. This

\* See "I Found the Bones of the *Bounty*," by Luis Marden, NATIONAL GEOGRAPHIC, December, 1957.

Ten Commandments carved on oak planks from H.M.S. *Bounty* remind Norfolk Islanders of the faith of a forebear, John Adams, last survivor of the *Bounty* mutineers who settled on Pitcairn Island, cut the letters; colonists carried the tablets to Norfolk a century ago. Mrs. Colin Buffett and daughter Alma inspect the panels, which also bear the Lord's Prayer.

lack has been a severe handicap to the island, but there also lies the root of its fascination. For, in a world of bustle and strife, life on Norfolk remains unhurried and peaceful.

There are no trains, no trams. No noise except the chattering of birds and the occasional purring of a motorcar. No income tax, not even a newspaper. There is a telephone system that operates only part time, though it is now being expanded.

The island is a 13-square-mile patch of green lying 900 miles off the east coast of Australia and about halfway between New Zealand and New Caledonia (pages 562-3). Its isolated location fitted it as a place of exile. From 1788 to 1855, except for a brief inter-

lude, it served as a penal colony. During much of that time its inmates were the worst types of offenders—usually those convicted of crimes committed while they were already serving sentences in the penal camps of New South Wales, Australia.

A British officer in 1847 described Norfolk Island as by nature "a paradise endowed with choicest gifts of climate, scenery and vegetable production; by art, society or policy a hell, disfigured by crime, loathsome vice and misery. . . . The clashing of irons, the dull echo of the lash, with execrations both loud and deep, make men's flesh creep and fill their minds with horror and despondency."

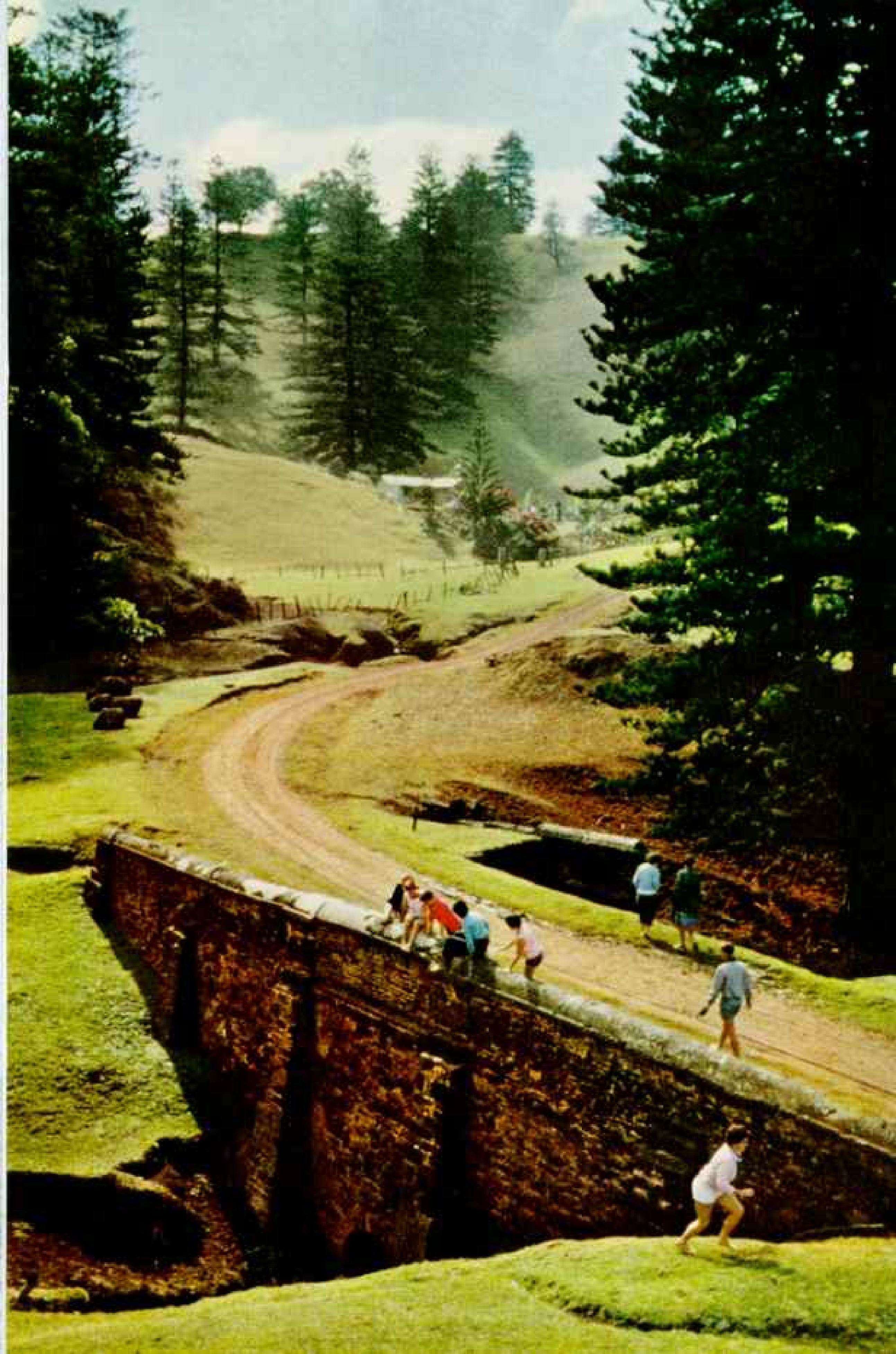
Said one official: "My object was to hold

**Bloody Bridge**, in an idyllic vale, calls to mind Norfolk's days as a penal colony. Prisoners building the span slew their guard, the islanders say, and concealed his body in the masonry; they were discovered and executed. Norfolk pines, unknown to the world until Capt. James Cook discovered the island in 1774, frame a homestead.

**Mutineer descendants** Larry Quintal, Marie McCoy, Joy Christian, and William Adams study a model of the ship that brought their ancestors to the Pacific. Fletcher Christian and 24 crewmates seized the original *Bounty* from Captain Bligh in 1789; later, Christian and a few followers burned it off Pitcairn.

REPRODUCED BY NATIONAL GEOGRAPHIC PHOTOGRAPHERS J. HAYLER ROBERTS © N.G.S.







# Norfolk Island



© N.G.S.

Nepean Island

Cascade  
Bay



Globe locates Norfolk, a 13-square-mile Australian Territory midway between New Zealand and New Caledonia.

#### Aerial View of a Lonely Island; "X" Marks Norfolk's Airstrip

Polynesians exploring the Pacific visited the volcanic island but did not settle. White men found Norfolk uninhabited and unspoiled, but soon made it an "ocean hell." Great Britain, populating Australia with convicts, began sending prisoners to Norfolk in 1788.

With the arrival of *Bounty* descendants in 1856, a deeply pious folk replaced the prison colony. Rising population had compelled them to leave even tinier Pitcairn, 3,800 miles east. Thus two small islands today shelter communities stemming from the sea's best-known mutiny.

In this view, a ridgetop road leads to Mount Bates and Mount Pitt, highest points on the island. Kingston, the government center, faces the only level beach along a shore of towering cliffs. A tip of uninhabited Nepean Island appears south of Point Hunter.



out that settlement as a place of the extremest punishment, short of death." Indeed, life to the convicts was so ghastly a nightmare that some committed crimes in order to find welcome relief in a sentence of death.

Grim evidence of this may be seen today in the island's cemetery. On a stroll among the tombstones I came upon this epitaph:

HERE LIES THE BODY OF JAMES SAYE WHO  
DIED JUNE 21 1842 AGED 35 YEARS  
*Stop Christian stop & meditate*  
*On this man's sad & awfull fate*  
*On Earth no more he breathes again*  
*He lied in hope but died in Pain*

I wondered about that curious last line.

Official accounts, I found, describe James Saye as one of a dozen prisoners, held aboard the brig *Governor Phillip*, who attempted to capture the vessel off Norfolk Island on June 21, 1842.

One version has it that Saye organized the

mutiny and then informed on his fellow conspirators in the hope of receiving a pardon. This double-dealing failed, however, for he was killed in the fighting.

He lied in hope but died in pain!

#### Bridge Recalls a Grisly Tale

From the cemetery it is only a short stroll along the road to Bloody Bridge, which spans a sparkling rivulet at the foot of hills, as peaceful and picturesque a setting as can be found on the island (page 561). Unlike the grim Bloody Tower in London, which looks its part, Bloody Bridge seemed not to fit its name in these idyllic surroundings.

I asked about its history. The story goes that the bridge was being built by a gang of convicts when one of them smashed a warder's skull with a shovel. To account for the blood, the convicts slaughtered a sheep on the spot; then they hacked apart the warder's body and concealed it in the masonry. But rain fell

#### Gallows Gate Saw the Last March of Convicts to Meet the Hangman

Mutinies and attacks against guards reflected the prisoners' wretched state. An official's wife wrote: "During the twelve months we were on the island 109 were shot by the sentries in self-defense, and 62 were bayoneted to death."

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REPRODUCED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER J. DARLON ROBERTS © N.G.S.

### Tahitian Cookery, Heritage of the Mutineers' Wives, Flavors Memus

Girlie Christian instructs her niece Brenda Randall in making *pilhi*. Brenda grates sweet potatoes on a *yabla*, a volcanic stone brought from Pitcairn. She will bake the pulp in the pan lined with banana leaves. Products of Norfolk's rich soil—chili peppers, annonas, bananas, "fruit-salad plant," and tomatoes—cover the table.

that night, and next morning blood was found oozing from the wall. The murderers, it is said, were executed for their crime.

The old convict settlement extended along the island's southern shore, where the hills slope gently to the sea (page 578). Some of the buildings now stand in ruins, but others remain in excellent repair, built of carved rock in fine colonial style by men who had nothing but time. The sturdiest house, surrounded by high walls, was not the jail; it housed the warders, and the walls were meant to keep the prisoners out.

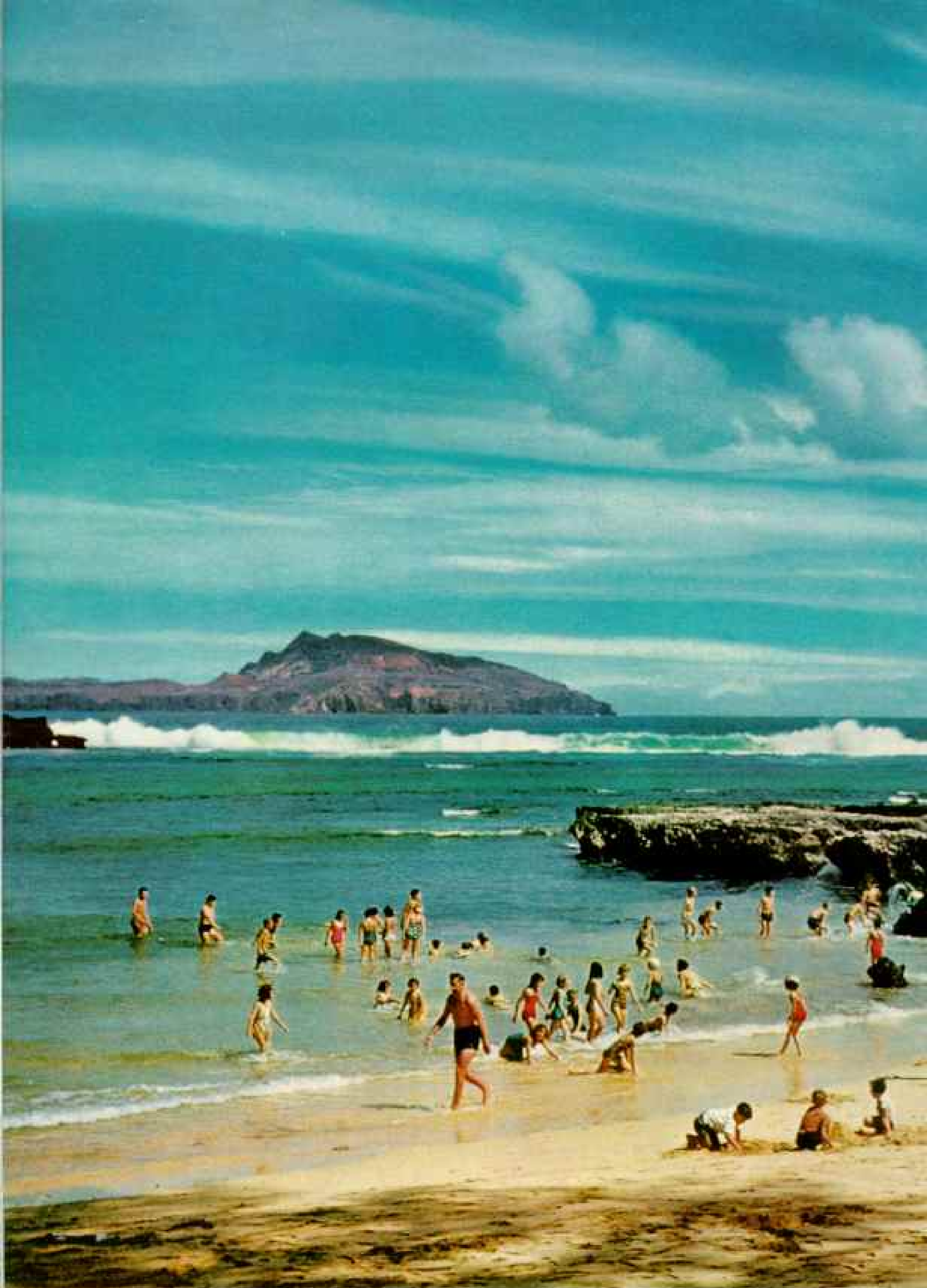
Those buildings today form the nucleus of Kingston, administrative headquarters of Norfolk Island, which is a Territory of the Commonwealth of Australia. Kingston's main street is Quality Row, where the garrison officers lived. Between Quality Row and the sea

lie Government House and administrative offices, a golf course, and a race track that takes shape on Easter Monday, the island's only race day.

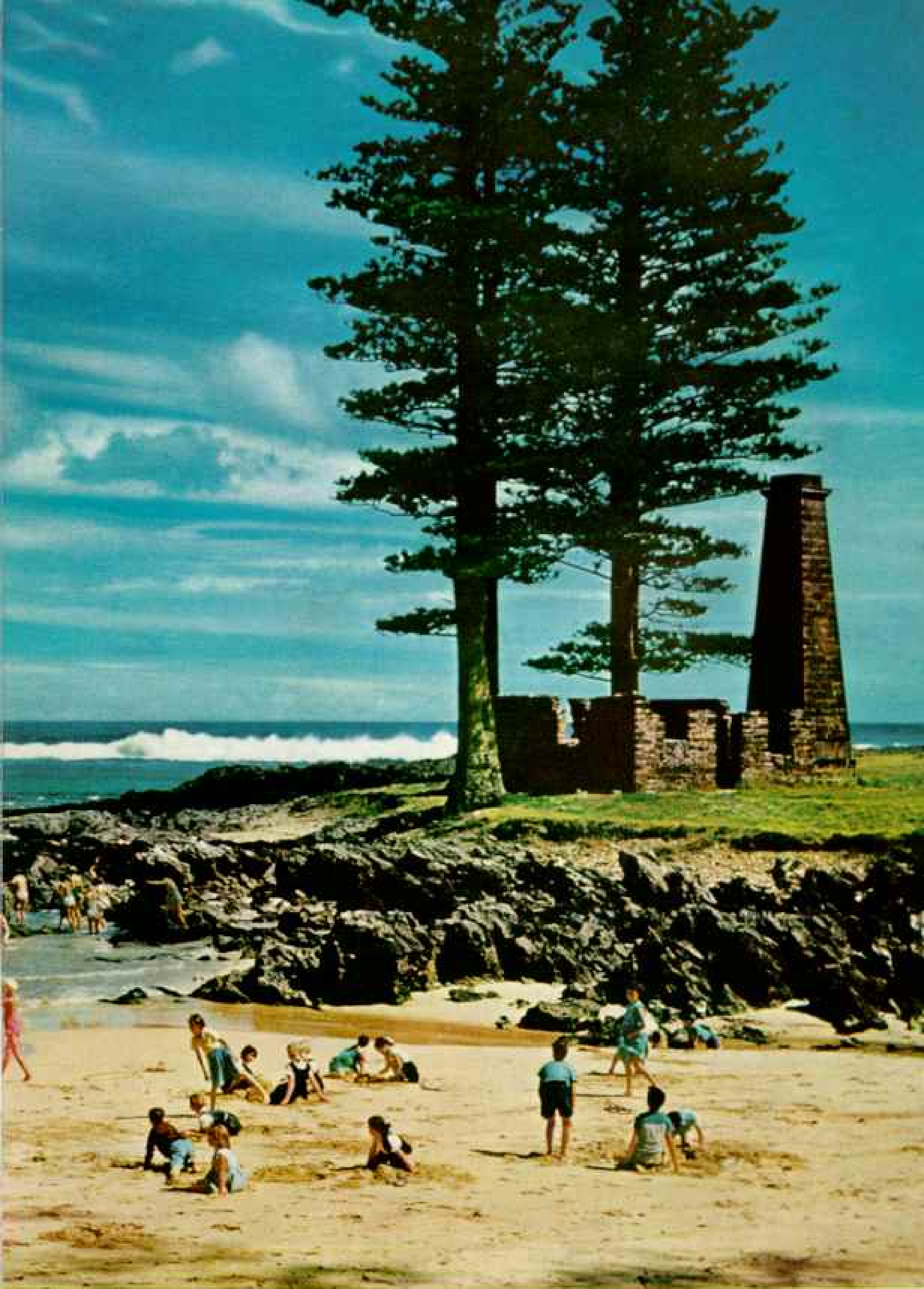
#### Few Islanders Live in the Capital

Kingston must be unique among capitals. Its population is only 21, mainly officials and clerks. And there isn't a single shop!

The rest of the island's population numbers some 1,000 souls, about half with forebears among the *Bounty* seamen. I talked with many of them about their ancestry; all were proud to be descended from mutineers who had the courage to defy a captain they considered an insufferable tyrant. From the lips of these descendants, I heard the story of how they happened to be on Norfolk Island and why they love to live there.



School children romp in surf and sand beside a grim ruin of the convict era.



© NATIONAL GEOGRAPHIC SOCIETY

Gauzy clouds overhang uninhabited Philip Island, 3½ miles across the Pacific

Convict mutinies weren't the only troubles that beset the authorities in penal-camp days. There were failures of supply ships to reach the island, periods of famine, difficulties of administration. Norfolk Island proved too costly to run as a prison camp; better to abandon it as such. Besides, there was need for a new haven for the mushrooming population of Pitcairn Island.

#### *Topaz Finds the Last Mutineer*

It was in 1789 that the *Bounty* mutineers cast Capt. William Bligh and 18 of his crew adrift in a provisioned boat and sailed to the Tubuai Islands, then to Tahiti. When Fletcher Christian, leader of the mutiny, took the *Bounty* on to Pitcairn in 1790, he was accompanied by eight of the mutineers, including a brawny seaman in his twenties named Alexander Smith. Each brought along a wife from Tahiti; there were also six Tahitian men, three more Tahitian women, and an infant girl.

Eighteen years later the American ship *Topaz* found on Pitcairn a handful of women and children and one man: seaman Smith, who was also known as John Adams. The other men were dead. Their graves have never been found.

Adams ran his peaceful little colony with such devotion to the Bible that all England was aroused to admiration, and Pitcairn became a byword for piety.

The Pitcairn population was augmented in 1823 when John Buffett and John Evans landed from a British whaler, and when George Humm Nobbs arrived from South America in 1828. Upon the death of John Adams a year later, Nobbs succeeded him as spiritual leader, a post he retained until his death on Norfolk in 1884.

By the time it was decided to abandon Norfolk Island as a penal colony, Pitcairn's population had grown to 193. That, colonial authorities decreed, was too large for the island's resources. So the convicts were cleared out, and on May 3, 1856, every soul on Pitcairn

was put aboard ship for Norfolk, 3,800 miles to the west.

It was, speaking charitably, a most unpleasant voyage.

"The moment the people got on board," wrote a ship's officer, "the sea-sickness began, and such terrible sea-sickness I have never witnessed . . . the women were more or less sick the whole passage."

On Sunday, June 8, they landed at Norfolk. The settlers held a thanksgiving service in a barrack room left by the convicts.

Within two years, 16 of the settlers became dissatisfied with their new home and returned to Pitcairn. Thirty more left in 1863. The rest stayed, and today the broad features and golden-olive skin tones of many Norfolk people reflect their partly Tahitian background. But, unlike the present Pitcairners, who have remained isolated, the Norfolk Islanders keep in touch with the mainland. They have intermingled with settlers from New Zealand and Australia, and their ways differ little from those of other English-speaking countries.

They speak English with no perceptible accent, but in their homes I heard them use a dialect brought by their ancestors from Pitcairn, a curious mixture of west-country English and Tahitian.

I found them a hospitable, happy, generous, and guileless people. Drive down the street, and everyone you pass—man, woman, or child—raises the right hand in salutation. They did this to me, a stranger among them, and it made me feel that I was among friends.

#### *Mr. Christian Pays a Fine*

I was in a taxicab one day when an islander on horseback waved.

"Do you know who that was?" my driver asked.

"No," I said, "but I'll bet I can guess his name in five tries."

The driver grinned. The horseman was a Quintal. He might have been a Christian, an Adams, a Young, or, like my cabbie, a McCoy. All are surnames borne by *Bounty* mutineers—and on the island today there are 27 families of Quintals, 24 Christians, 12 Adamsons, 6 McCoys, and 1 Young, besides 18 Buffetts, 11 Evanses, and 7 Nobbses.

The old Pitcairn names figure prominently in the island's annals. Thumbing through the journal of a chief magistrate, Frederick Young, I came across this entry:

"Feb. 12th, 1859. At sundown I went and

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**The Author:** With this story about Norfolk Island, T. C. Roughley returns to the pages of the NATIONAL GEOGRAPHIC for the first time in two decades. In 1940 he wrote for the magazine an account of the fantastic creatures inhabiting Australia's Great Barrier Reef, a subject on which he is a recognized authority.

Zoologist, author, and lecturer, Mr. Roughley served for many years as Superintendent of Fisheries for his native New South Wales.



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### Teen-ager Inspects Young Bananas Forming Under Protective Leaves

A blight that swept the Australian banana crop in the mid-1920's shot Norfolk prices skyward and turned islanders to large-scale cultivation. Depression years ruined the market, but virtually every home still grows a few stalks. Heather Hemus, a perky 15-year-old, impressed the author with her knowledge of race horses.

spoke to Driver Christian, having heard that he swore at his wife; he did not deny it, so I fined him five shillings."

Now five shillings was a lot of money in those days. Perhaps the crime loomed large because Driver Christian was the church's choirmaster.

#### *Bounty* Kettle Once Brewed Alcohol

At the administration building I admired a relic from the *Bounty*—a large copper kettle. Luis Marden, in his NATIONAL GEOGRAPHIC article on Pitcairn, told of meeting Floyd McCoy, one of the mutineers' descendants, who visited Norfolk and wanted to return this kettle to Pitcairn. In mutineer days William McCoy distilled alcohol in it from the roots of the *ti* plant.

"That kettle can cook no brews now," said

Hervey Brooke Christian, great-grandson of the *Bounty's* Fletcher Christian, who was showing me around. "Look at the pieces wrenched away from the sides. I'm afraid the souvenir hunters ruined it."

I knew Hervey Christian was one of the island's old-timers—a fine musician who for many years had played the organ at All Saints' Church. I asked how old he was.

"I'm 84," he said. "But I don't feel it."

"Would you play the organ for me?"

"I can't play it now," he answered sadly. "This peg leg won't let me. I lost my leg about two years ago—I was working on the Kingston pier, and a heavy crane fell on it."

With some persuasion I got Hervey to walk the hundred yards to the church with me and pose at the organ while I photographed him.

He fingered the keys a moment, and then



Norfolk's oldest store, founded in 1886, preserves a cracker-barrel atmosphere;



Kit Donkin, behind the counter, faces Friday's shopping rush.



yielded to impulse. Muted strains of Handel's "Largo" floated from the organ pipes. Hervey's eyes looked far beyond the sheets of music in front of him, memory-roaming back to the days when his music held the congregation enthralled. Suddenly he stopped playing. His hands dropped to his lap, his head drooped in sadness, and tears filled his eyes.

The poignancy had been too much for him, and I felt guilty of a crime against this dear old man.

#### Girlie Grates a "Tatie" on a *Yahlo*

My interest in the *Bounty's* copper kettle led Hervey to take me to visit Mrs. Herbert Bailey, nee Clara Henrietta Christian. She showed me two wooden panels on which the Ten Commandments and the Lord's Prayer had been cut with a penknife (page 558). This carving was the handiwork of the remarkable John Adams, the mutineer who became a man of God in one of the strangest twists of South Seas history.

Charles Adams proudly let me handle a china mug that had come down from his ancestor, probably from the *Bounty*. It was lusterware, obviously old. And in a courtyard I inspected a weathered cannon brought to Norfolk by the Pitcairners. Presumably it once roared from the deck of Bligh's ship.

Charles Adams asked me, "Have you ever seen a *yahlo*?"

"What's that?" I asked.

"A flat stone to grate sweet potatoes for a dish called *pilhi*. We have several on the island, and they all came from Pitcairn. I think Girlie Christian has one. She might do some grating for you—if she can spare the time from her horses. She almost lives on a horse."

I called on Girlie. From the stories told me about her riding exploits, I expected to meet a dashing Amazon in her twenties.

Dashing she was, but long past her twenties. She was 64.

"Why did they name you Girlie?" I asked.

"Because I wasn't a boy," she said.

So I asked about the *yahlo*. Girlie vanished into the kitchen and returned with a flat, rectangular piece of volcanic rock about a foot long and half as wide. It was heavily pitted.

I asked if she still used it for grating *kumaras*. *Kumara* is the widely used Maori word for sweet potatoes.

"Of course," she said, "but in our homes we call them 'sweet taties,' not *kumaras*. Or-

dinary potatoes we call 'Irish taties.' Stay for dinner with us and I'll make you some island dishes."

I needed no second invitation. Girlie got to work at once, assisted by her pretty niece Brenda (page 565). Placing the *yahlo* on the table, Girlie rubbed the tatie back and forth until it was frazzled to a pulp. "When this is baked we call it *pilhi*," she said. "We bake it in a banana leaf, to keep it moist and to improve the flavor."

Next she grated some green bananas. "I'll make you a *mudda* from this."

Into a saucepan she poured milk and water in equal parts and brought it to a boil on the stove. Then she added the grated banana and boiled the mixture 20 minutes, until it had the consistency of a pudding.

Girlie also made a banana *pilhi*. This time she used ripe bananas, which she mashed with a fork. She added flour and baked it all in a shallow tin, like a pie.

At dinner I did masterly work on oversized helpings of *pilhi* and *mudda*.

"Really good," I said. "How would you say that in your Pitcairn language?"

"Ess goodun," replied Brenda. Then she said, "I glade you's a'come to see ucklun. We go fishen morla?"

I looked puzzled, so Girlie translated: "I'm glad you came to see us. Would you like to go fishing with us tomorrow?" I said yes.

"No," Girlie corrected. "You say 'I gwen'—I'll go."

#### Trumpeters Bite Eight at a Time

Fish abound around Norfolk, especially the trumpeter *Lethrinus chrysostomus* (page 574). It weighs as much as 20 pounds and bites so freely that Norfolk fishermen bait as many as eight hooks on a single line, and often haul up a fish on each hook. Yet commercial fishing is difficult because the island lacks a sheltered anchorage.

Boats can be launched from only two piers, one jutting into the sea from the north shore in Cascade Bay, and the other from the south at Kingston. The boats, powered by light five-horsepower engines, seldom exceed 18 feet in length, because they must be lowered and raised by cranes. Calm weather is essential. Until dawn the fishermen don't know whether they'll go out or not.

I did my fishing from the rocks. The first time I went I was surprised at the number of islanders there, too.

**From Downy Nestling to Fledged Parent,  
the Boatswain Bird Squawks Lustily**

The red-tailed tropic-bird owes its nautical nickname to long, narrow tail feathers that remind sailors of a marlinespike. It ranges warm areas of the Pacific and Indian Oceans. On Norfolk it nests in crevices of lofty cliffs, with which the island abounds.

The island's bird life includes the fairy tern, which lays eggs on bare branches of Norfolk pines. Usually the terns choose a limb with a small depression; some credulous watchers believe they glue the eggs to the wood.

**Girl Guides**, teetering on the sprawling roots of a wild fig tree, seek a glimpse of the raucous but shy rosella parrot. Crimson-bodied and blue-winged, the birds apparently came to Norfolk from Australia. Another import, the California quail, provides sport and food. The tree bears a gummy, inedible fruit.



PHOTOGRAPHS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER J. DAVID HERRING © N. G. S.





Talking with fishermen, I frequently heard about the "dream fish." Eat this fish, they declared, and you'll have nightmares.

"The small ones don't affect me," one of the islanders said, "but once I had a big one for supper. I spent that night on an operating table, with the surgeon doing one operation after another—always cutting through a new and expensive suit I had just purchased. I kept shouting to my wife for help, but she ignored me. When I awoke and upbraided her for not answering my calls, she said I hadn't uttered a word."

#### Fish Brings Science-fiction Dream

Joe Roberts, a calm NATIONAL GEOGRAPHIC photographer, who usually doesn't dream at all, wanted to try some dream fish. Leo McCoy caught one for him, and the chef at the Paradise Hotel, Lober Christian, broiled it and served it with tatties and stewed pumpkin.

The guests at the hotel admired Joe's courage as he ate. Next morning, when he strolled into the dining room, everybody looked at him eagerly. Joe glowed. "It was pure science fiction," he said. "I saw a new kind of car, steered with a stick like a plane. And then I was taking pictures of a monument to mark man's first trip into space."

I took a scientific look at these stimulating marine vertebrates because my life's work is zoology, especially studying sea life around Australia.\*

The dream fish, I found, is the species *Kyphosus fuscus*, and is closely related to the silver drummer caught off New South Wales. Another relative is known in the United States as the rudder fish.

How does this fish bring on dreams? I surmised two possibilities. First, people who expect to dream may likely do so. Second, a mild poison in the fish may affect the digestive system. After all, we know that some tropical fish become poisonous at certain seasons as a result of their own diet.

To cap my investigation, I ate a dream-fish supper myself. I found it tasty, but strong flavored, like mackerel. I told myself not to dream. But no. I dreamed I was at a

party where everybody was nude and the band played "Yes, we have no pajamas."

Every other weekend planes from Australia and New Zealand arrive at Norfolk. Each plane brings a dozen or so vacationists, but they hardly disturb Norfolk's tranquillity. The knowledge that they must stay at least two weeks, until the next plane, discourages tourists from the frantic rushing about they are likely to do elsewhere. Norfolk's pleasures are leisurely.

There are placid island tours "by open truck," as the Tourist Bureau advertises, "with padded seats." At night there may be a game of housie, which resembles the American game called bingo, at sixpence a card, or a dance for visitors.

Tourists lucky enough to be there on Easter Monday can see the Norfolk races. Normally the track is hard to tell from the golf course it surrounds, but on race day tall marker pegs are put up to guide the jockeys. You can place bets for two shillings or five shillings through a man called the "totalizer." When I was there, the totalizer was the local bank manager.

#### Heather's Tips Pay Off

While looking at the list of horses, I glimpsed Heather Hemus, whom I had met on her father's farm (page 569).

"What do you know for this race?" I asked. "Kim's a certainty," she said.

"But he's carrying 12 stone 1 pound [169 pounds]."

"It won't bother him," she said. "He's a big horse."

I put two shillings on Kim. It was a close finish, but with Leo Evans on his back, Kim won. I collected six shillings and decided to follow Heather's tips.

"Peggy will win the second race," she said. Sure enough, Ron Nobbs brought her in first, netting me another two shillings.

\* Mr. Roughley's article on the Great Barrier Reef, "Where Nature Runs Riot," appeared in the NATIONAL GEOGRAPHIC for June, 1940. See also "On Australia's Coral Ramparts," by Paul A. Zahl, January, 1937.

#### Hungry Trumpeter Fish, Eager to Bite, Land on a Norfolk Pier

Island fishermen must haul in their catch quickly lest the snared prey dive and cut the lines on razor-sharp coral. The fish are taken on many-hooked lines, often several at a time. Australians of the Great Barrier Reef area know the species (*Lethrinus chrysostomus*) as the sweet-lip emperor. Norfolk waters also yield salmon, kingfish, and snapper. Fred Quintal, the fisherman, bears a famous *Bounty* name.



Another big annual event is "Bounty Day," anniversary of the June 8, 1856, arrival of the Pitcairners on Norfolk.

"We've always had a procession of descendants of the mutineers, dressed in naval uniforms," the administrator told me. "Now the other islanders also march along, in costumes of the time when the Pitcairners landed here."

They parade to the cemetery and then to Government House, where they sing two sacred songs, one of them composed by Charles Driver Christian—he of the five-shilling fine.

Gayest part of the day comes with luncheon. The islanders spread tablecloths end to end along a wall of the old convict barracks and sit on the grass, feasting on mountains of

island specialties. Dishes pass from tablecloth to tablecloth. Then comes a cricket match—Bounty vs. All-Comers.

Cricket isn't the only sport to keep the islanders active. They bowl, enjoy tennis, and golf on the nine-hole course at Kingston. A convict ruin forms one wall of the clubhouse.

Because the island is so small, the golf course also serves as pasture. Barbed wire keeps grazing cattle from the greens, and the players enter over a stile.

For food the islanders rely on their fertile fields and on livestock descended from cattle, sheep, and pigs left on Norfolk for the Pitcairn colonists. Norfolk has grown various crops for export, but unpredictable world trade has not favored them as nature has.

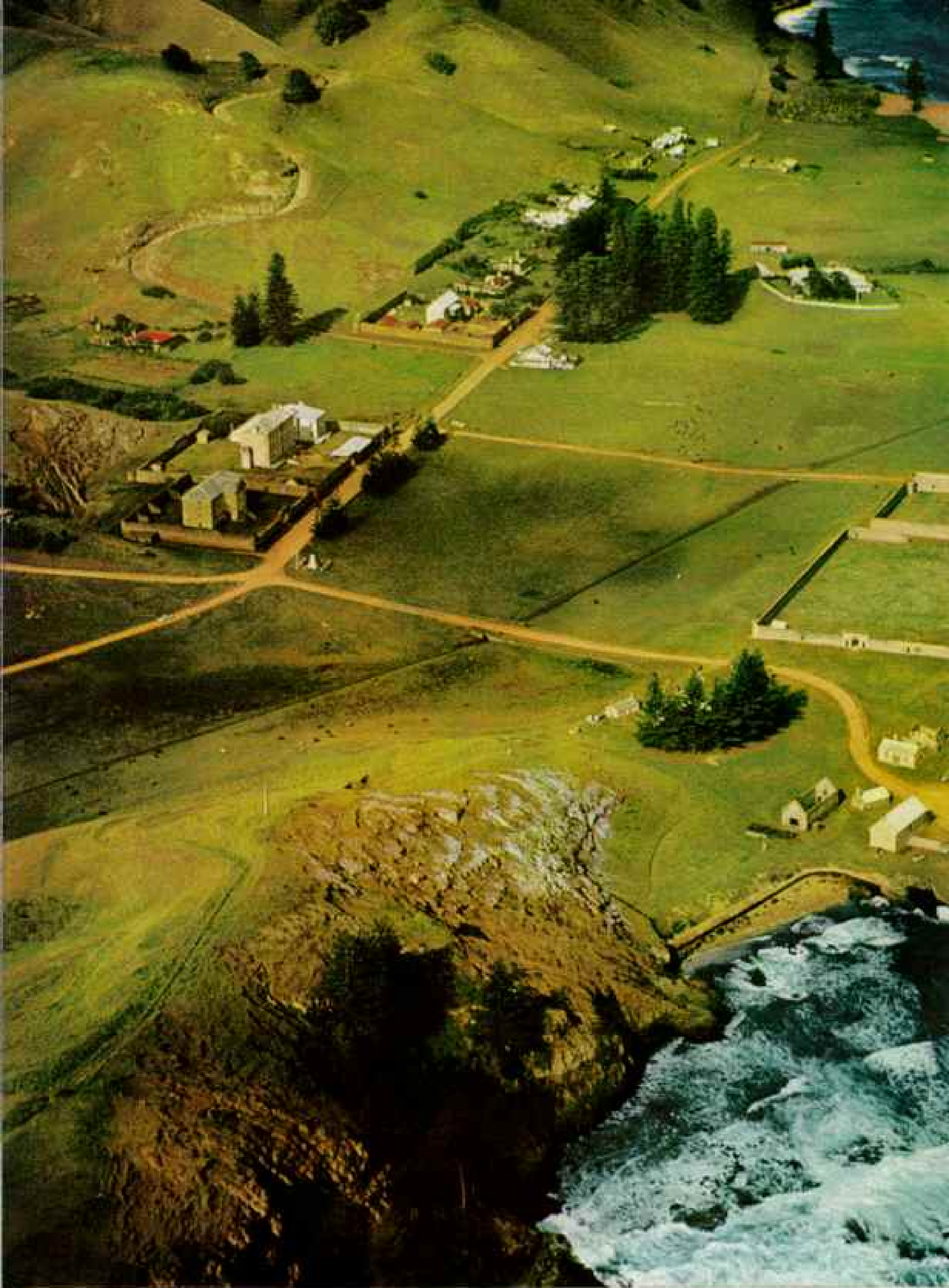
#### Bobbing in the Swells, a Boat Loads Bean Seed, Norfolk's Money Crop

As laden trucks approach Cascade jetty, islanders guide the bags into the tender for transfer to a ship. Australian farmers will use the blight-free seed.

Women sort beans best, their husbands contend, because they have nimbler fingers; men do all the field work. Mrs. David Buffett, who can grade seven bushels a day, culls broken and discolored beans. Her son Boyd wrestles a Teddy bear.

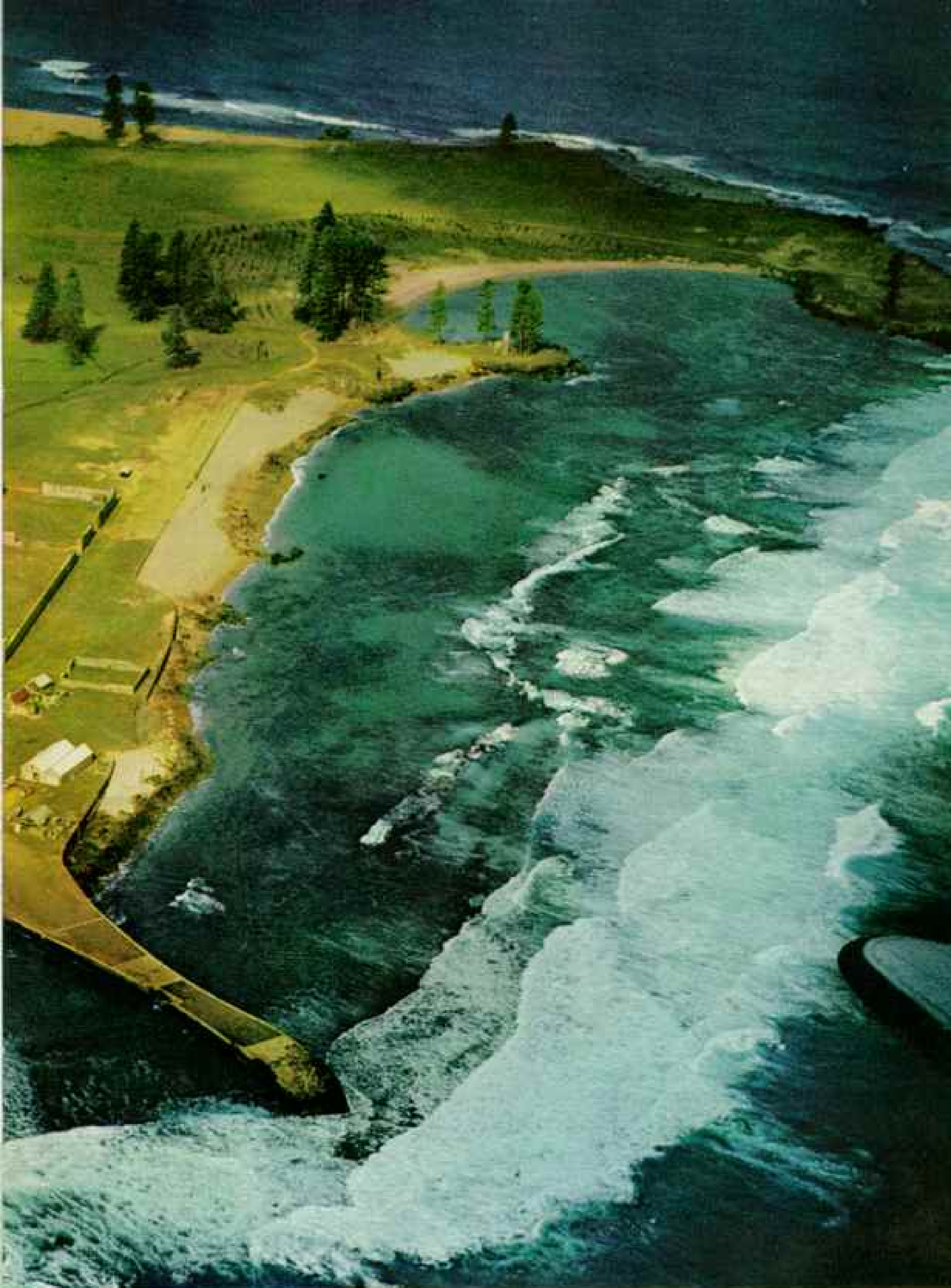
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Kingston's Streets and Stone Buildings  
Survive From Penal-colony Times

Walled prison compounds and auxiliary buildings, some of them now roofless, front Sydney Bay. Pine seedlings in upper right face Emily



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Bay and the islanders' beach (page 566). Administrative offices line Quality Row, onetime home of prison officials. Government House

stands across the street, facing the clump of pines. Staff photographer Roberts took the Kodachrome from a Royal Australian Air Force plane.



"First we tried coffee," explained Ray Nobbs, a graduate of Hawkesbury Agricultural College in New South Wales.

"Then a blight attacked the banana trees in Australia, and banana prices rose; so our people pulled up the coffee trees and planted bananas. When the depression came, prices sank so low we gave up that crop, too."

#### Beans Shelled Under Truck Wheels

The islanders turned to growing French beans for seed. They also sent to Sydney citrus fruits, guava jelly, and passion-fruit pulp. World War II and its shipping restrictions brought another collapse.

"Since then we've stuck to bean seed, for sale in Australia," Ray said.

The beans are sowed in spring—that is, in early September—and harvested in December and January. Men pull up the plants and throw them on a long strip of coarse sacking. A truck drives back and forth, crushing the pods; the matting yields sufficiently so that most of the seeds remain undamaged.

After shelling, the seeds are trucked to a cliff top where there are strong updrafts. A man stands on the back of the truck and pours the seeds into a barrel on the ground. As they fall, the wind blows away much of the chaff and debris.

Women's swift fingers sort the good, light-colored seeds from the dark, the undersized, and the damaged ones (page 577).

Recently a mechanical harvester and winnowing machine arrived, but no machine is in sight to relieve those nimble-fingered ladies. One told me that in a single day she handled enough seeds to fill seven bushel bags.

"How many seeds in a bag?" I asked.

"Oh," she said, "it seems like a million."

And then there's whaling. In longboats Norfolk's men used to go out after the humpback whales that come north from the Antarctic in May or June to mate in tropical waters.

"The skipper was the harpooner," recalled Cobbie Robinson, more properly Enoch Cob-

croft Robinson, Member of the Order of the British Empire (opposite). Now 85, he was busy laying new floor boards on his veranda when I talked to him. He had gone after his first humpback at 14, and kept at whaling until the beginning of World War II, with a couple of years out for service in the Boer War.

"When we killed a whale, we rowed back to shore, towing the whale behind us. Sometimes it took 20 hours to get in. To relieve the monotony, we sang hymns as we rowed. We'd wait until the tide was high to pull him on the beach, and then we'd always sing the doxology—'Praise God, from whom all blessings flow!'"

"You ought to talk to Brassie Adams," he added. "He's our whale-oil tester."

#### Brassie Listens for the Sizzle

Brassie turned out to be a weathered sea dog of 79, a great-grandson of the pious John Adams. I asked how he got his name.

"When I was young, I got a job on a cable ship and told my friends I was to be a senior officer," he replied. "They found out that all I did was clean the brass, so they called me Brassie. But I got to be the best tester on the island."

I looked blank.

"Well, we boiled the blubber until most of the oil had come away," he said. "Then I'd spit into it, to see if it sizzled right."

I looked blanker still. Brassie smiled.

"If the oil wasn't cooked long enough, it would get too thick when it cooled. If it was cooked too long, it got a dark color. Either way, we got a lower price for it. I could always tell when it sizzled exactly right."

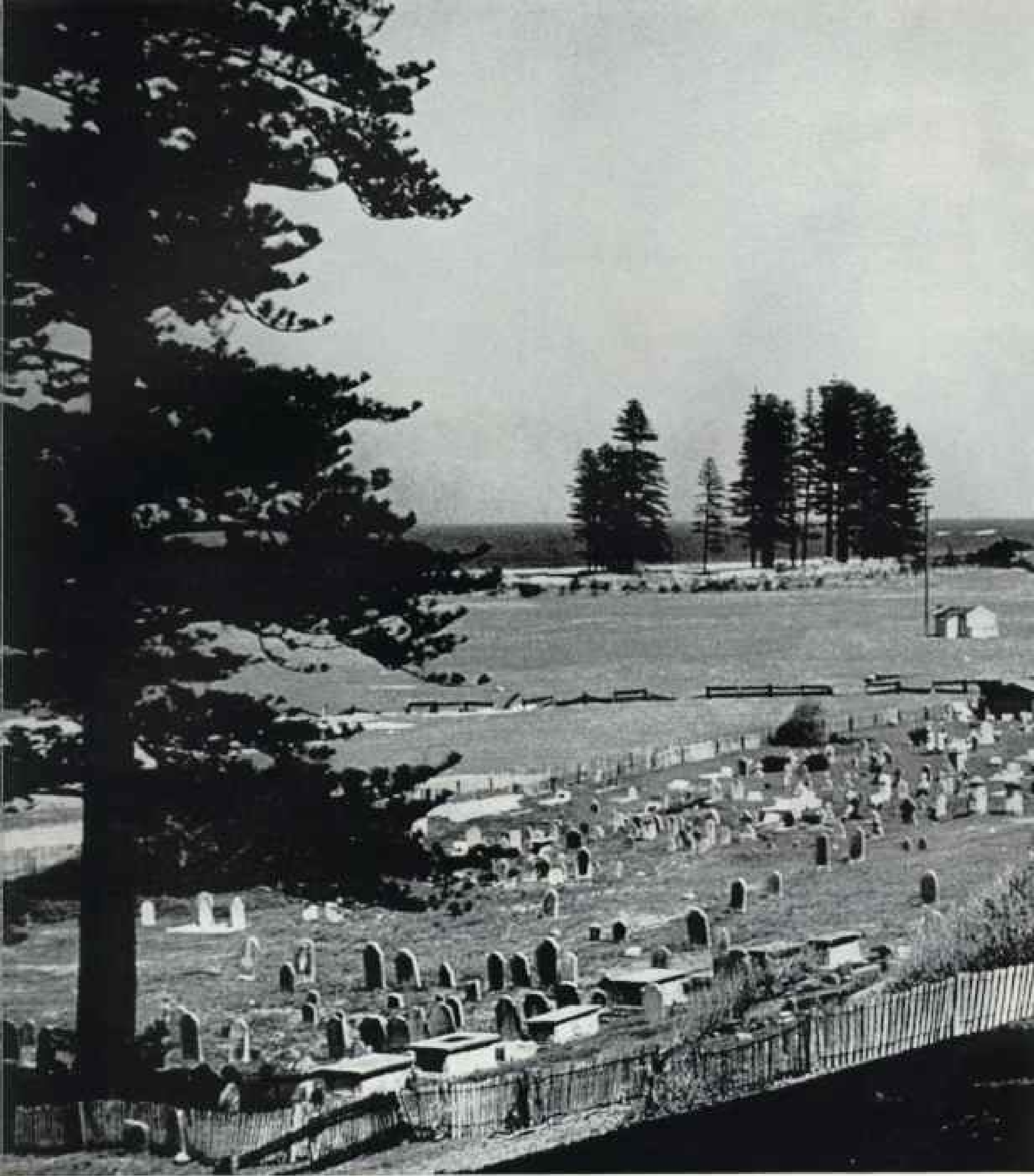
Brassie died shortly after I saw him, but he had already witnessed the great change in Norfolk whaling. Now a motor ship with harpoon guns bags 170 whales a year—a quota set by the government. A modern plant brings to the north shore the clank of winches, the hiss of steam, and the bustle of the flensers.

#### Retired Whaler and His Wife Reminisce Over the Family Bible

Enoch Cobcroft Robinson, born on Norfolk 85 years ago, went whaling at the age of 14 and fought in the Boer War. Mrs. Robinson, 90, is the island's oldest female descendant of the Pitcairn colony. Uncle Cobbie, as he is called, still farms; his wife often plays hymns on the piano.

Baby bathes in a pan by the light of a kerosene pressure lamp. About half the island homes lack plumbing, and few have electricity. The Beverley McCoys, of *Bounty* descent, cook on a stove set in the fireplace.





**"Blind-your-eyes," a Wind-blown Tree,  
Helped Convicts Escape Grueling Toil**

Another inroad on tranquillity is the automobile. When the first one arrived in 1919, the islanders refused to unload it. But the authorities got it ashore anyhow. The first time it was used, the island's cattle and horses bolted. So a decree was issued that the car

To gain a respite, some prisoners blinded themselves temporarily with blistering sap from the ground-bugging growth, also called milky man-

would be allowed on the roads only two days a week. Moreover, the owner was required to nail a notice to the "Tree of Knowledge," a bulletin-board pine in the center of the island, stating exactly when and where the vehicle was to be driven.



grove. On a sward dotted by Norfolk pines, felons, soldiers, and settlers rest together in the island cemetery. As in penal-colony times,

burial is free. Headstone at left, outside consecrated ground, marks a grave said to contain convicts who slew their guard at Bloody Bridge.

Now some 300 vehicles operate on the island, and the cattle treat them with the contempt they deserve.

Occasionally new settlers arrive, chiefly retired people from Australia and New Zealand who have read glowing praise for the

beauties of Norfolk. "An emerald in the aquamarine sea," one visitor reported. James A. Michener, in *Tales of the South Pacific*, called it "a speck under the forefinger of God."

Norfolk usually welcomes new residents but guards its right to decide who may stay.

"What happens to somebody you don't want?" I asked an official.

"Within three years we can give him a dictation test in any language we choose. If he doesn't pass, he's got to go."

No entry restrictions, on the other hand, faced the Church of England's Melanesian Mission, which obtained 99 acres free in 1866. From this Pacific headquarters devoted men brought Christianity to the Solomons and the New Hebrides. For half a century the Bishops of Melanesia lived on Norfolk; in 1920 they moved to the Solomons.

#### Police Chief Wears Many Hats

One afternoon I dropped in on Charlie Buffett, then the island's ranking official when the administrator was away. "Actually my title is secretary to the administrator," Charlie said. "Come to the office tomorrow and I'll intro-

duce you to the most titled man on Norfolk."

He turned out to be Howard Farnsworth, sent from Canberra to be Norfolk's one-man police force. "There are so few crimes here that I've taken on other jobs to keep busy," he said. "I'm the forest ranger, bailiff, poundkeeper, and inspector of health. I am also the testing officer for driving licenses, and inspector of guesthouses, weights, and noxious weeds. Not many of those, either, I'm glad to say."

Charlie and I walked down Quality Row and then on past grazing cattle to enjoy the sun on the green fields. All was so peaceful that I turned to Charlie and said, "Running this place must be like administering paradise."

He nodded. And the thought occurred to me that this Pacific paradise even has an advantage over the Biblical one. That Eden had at least one snake. Norfolk Island has none.

#### Barbed Wire Keeps Cows off the Greens of a Nine-hole Golf Course

Players, who step up a stile to enter the green, open a new golfing season despite misty skies. Government House, the administrator's mansion, lies in the background.

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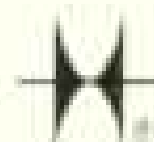
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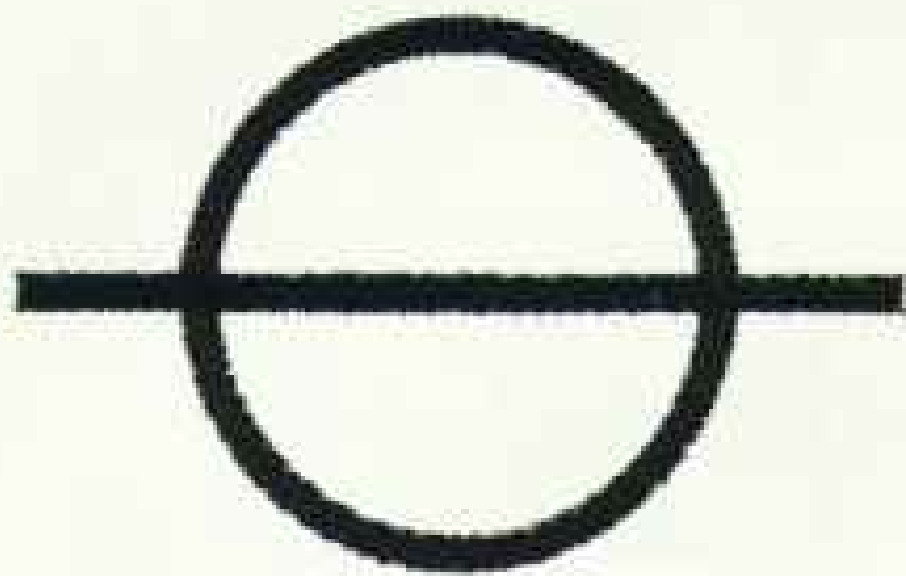
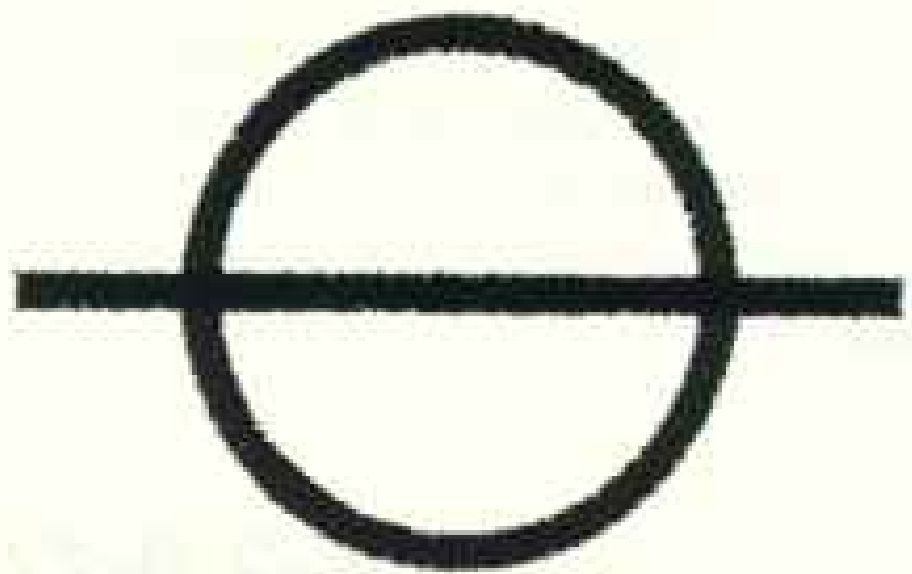


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## MAXIM FOR CURATORS: A BIRD IN THE HAND IS WORTH QUITE A FEW OUT ON THE LAKE

The jacketed gentleman with the triumphant smile is William G. Conway, Curator of Birds of the New York Zoological Park. The pink-hued passenger under his arm goes by the name of James.

The James's flamingo is a high-living, salt-water-drinking bird whose ancestors disappeared from the gaze of naturalists half a century ago. Reports of rediscovery sent Bill Conway and GEOGRAPHIC photographer Bates Littlehales high into the Bolivian Andes. There, nearly three miles up on an icy, vermilion-rippled lake, the party captured the long-lost James's flamingo and its rare cousin, the Andean flamingo (below).

Prepare for a GEOGRAPHIC treat in a future issue, when Mr. Conway will tell you the story. You may share this typically engrossing adventure, and many more, with your friends, too. Use the form below to nominate them for membership in the National Geographic Society.



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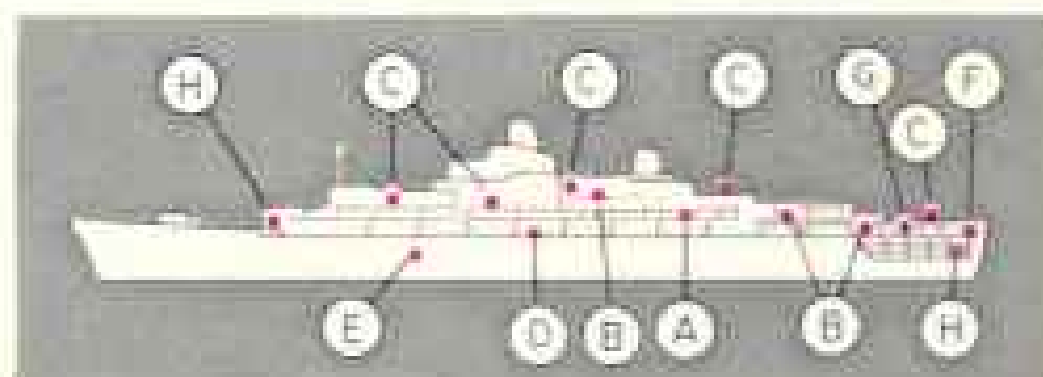
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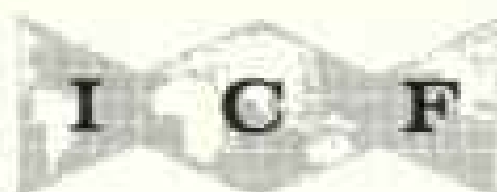
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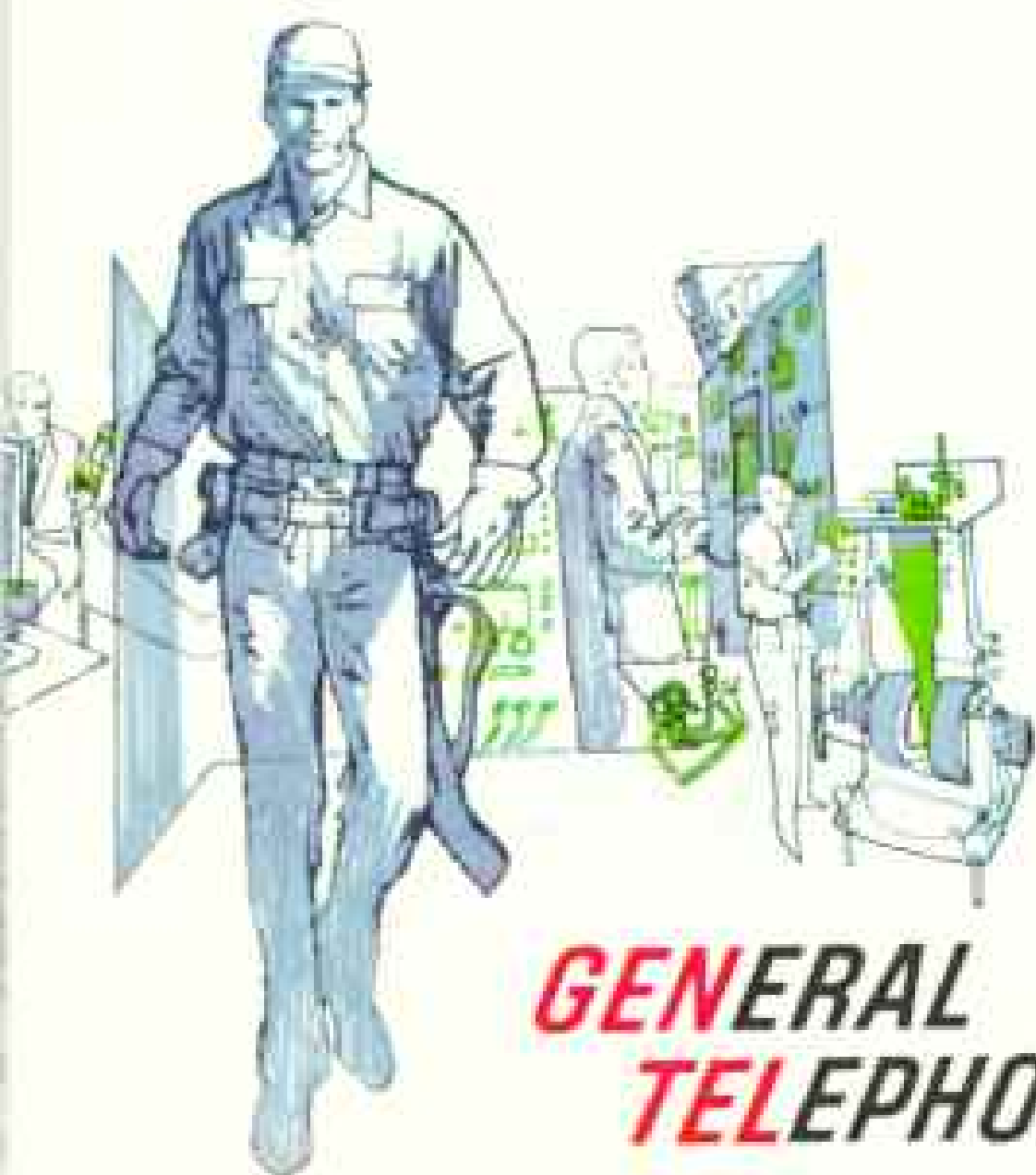
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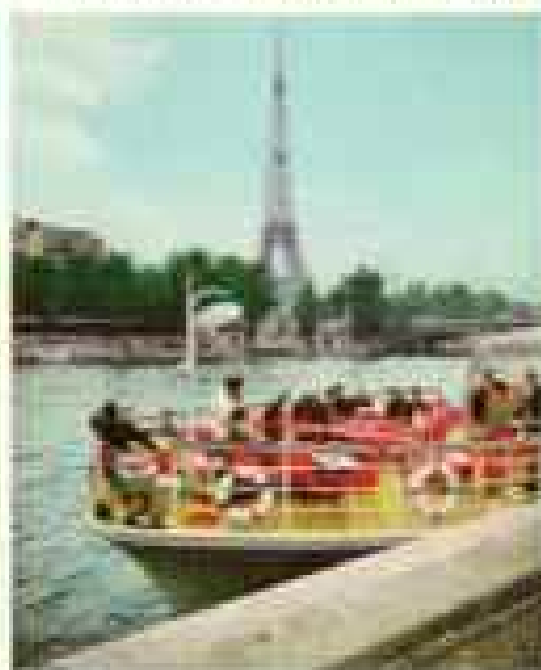
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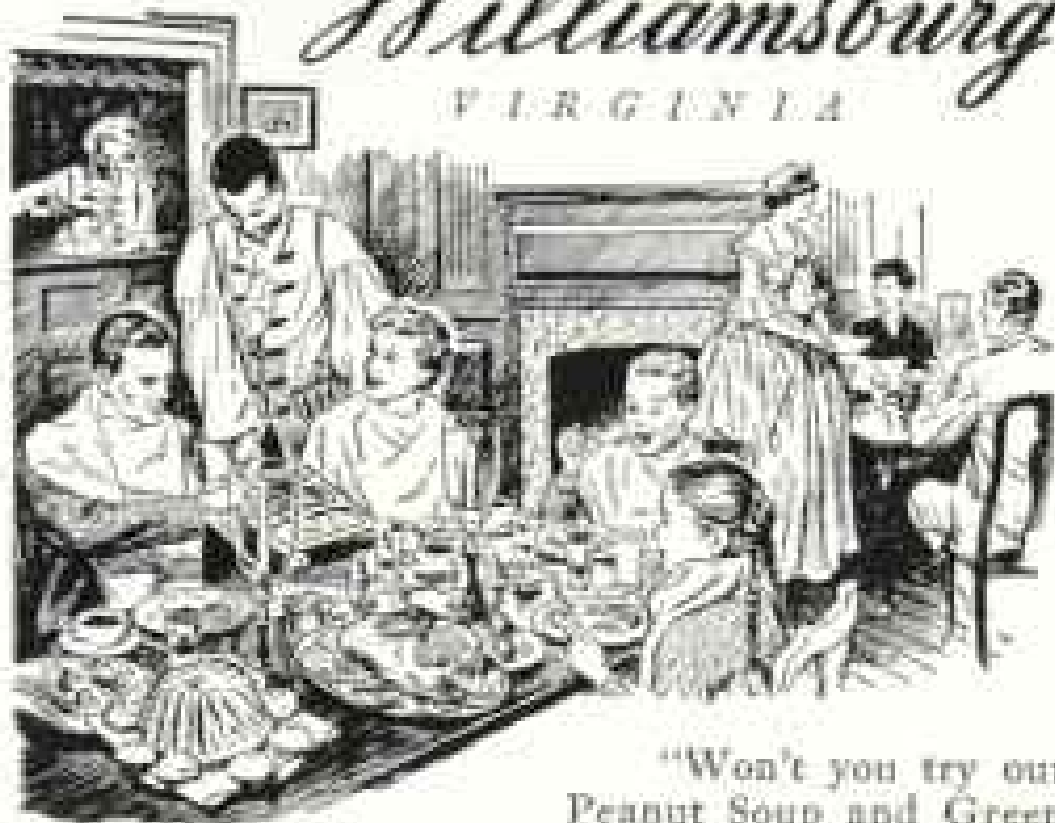


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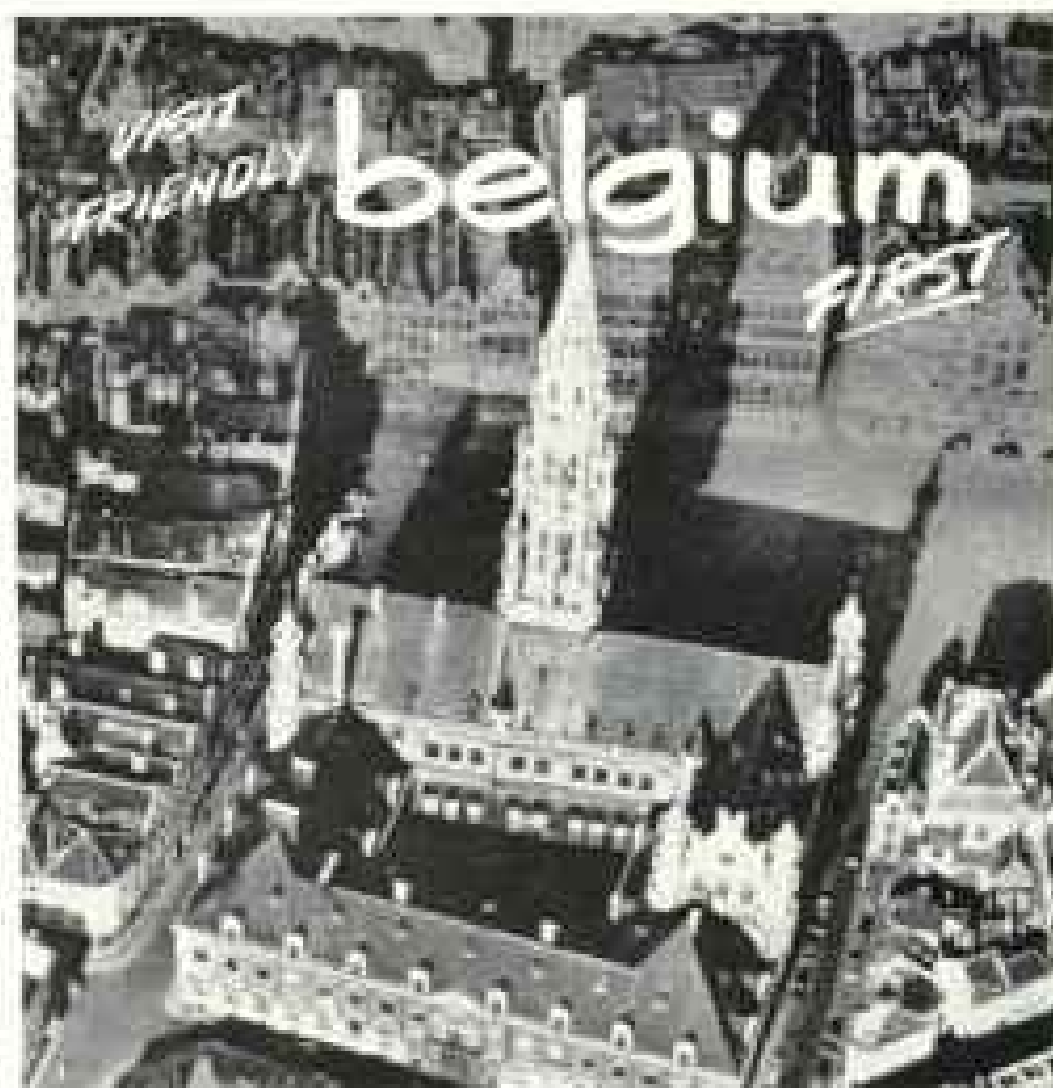


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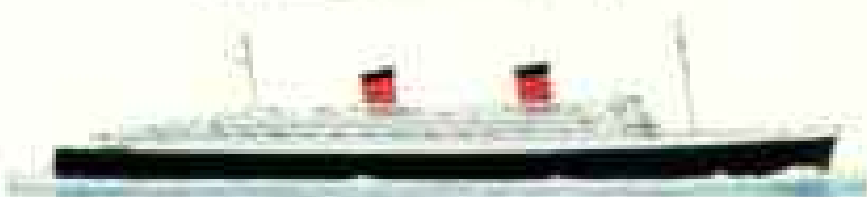
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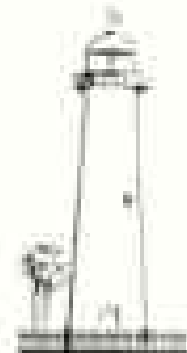
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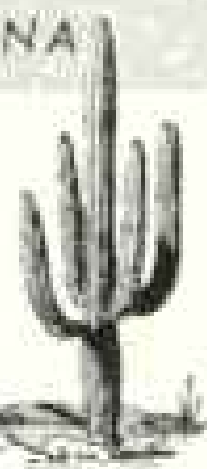
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# STRESS

## STRESS: HOW DOES IT AFFECT YOUR BODY?

Stress—physical, mental or emotional—can be either good or bad for you.

In fact, a normal amount of stress is actually a good thing. For example, when you're "keyed-up" over an interesting or challenging job, you may do your work more effectively. But prolonged or intense stress—caused by too much work or worry or anxiety—can threaten health.

That's because continued stress upsets some of the body's chemical processes. In particular, severe or persistent stress causes overactivity of certain glands. If this glandular overactivity is continually triggered by stress, it may upset almost every system of the body.

All of us should recognize the threat of undue stress and tension. Its importance is made plain by the fact that so many people who seek medical attention today have ailments brought about or

made worse by prolonged emotional stress—too much worry, anxiety or tension.

If you find that it's difficult to relax, "take things easy," or get a good night's sleep, chances are you're under too much stress. Here are some ways to help you handle your tensions:

**When your work load** seems overwhelming, remember that some things can almost always be set aside until later. Concentrate on one particular job. That way your work will go faster and you'll be under less strain.

**When tense and upset**, try physical activity. It helps relieve tenseness so that you can come back and tackle irritating problems more calmly.

**Talk out your troubles**—with someone you trust. Getting things "off your chest" prevents a lot of emotional stewing.

**Have regular medical check-ups.** If you keep physically fit, you'll be able to take stress and handle tensions more easily.

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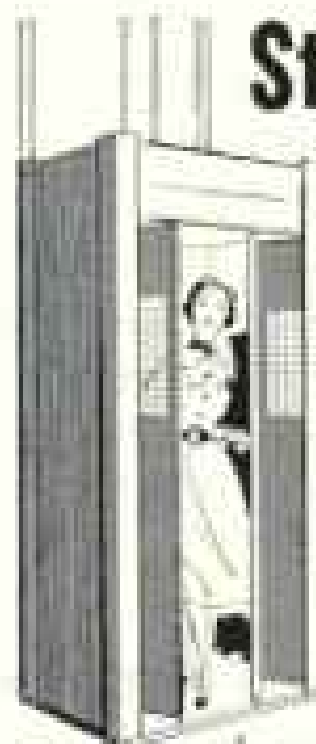


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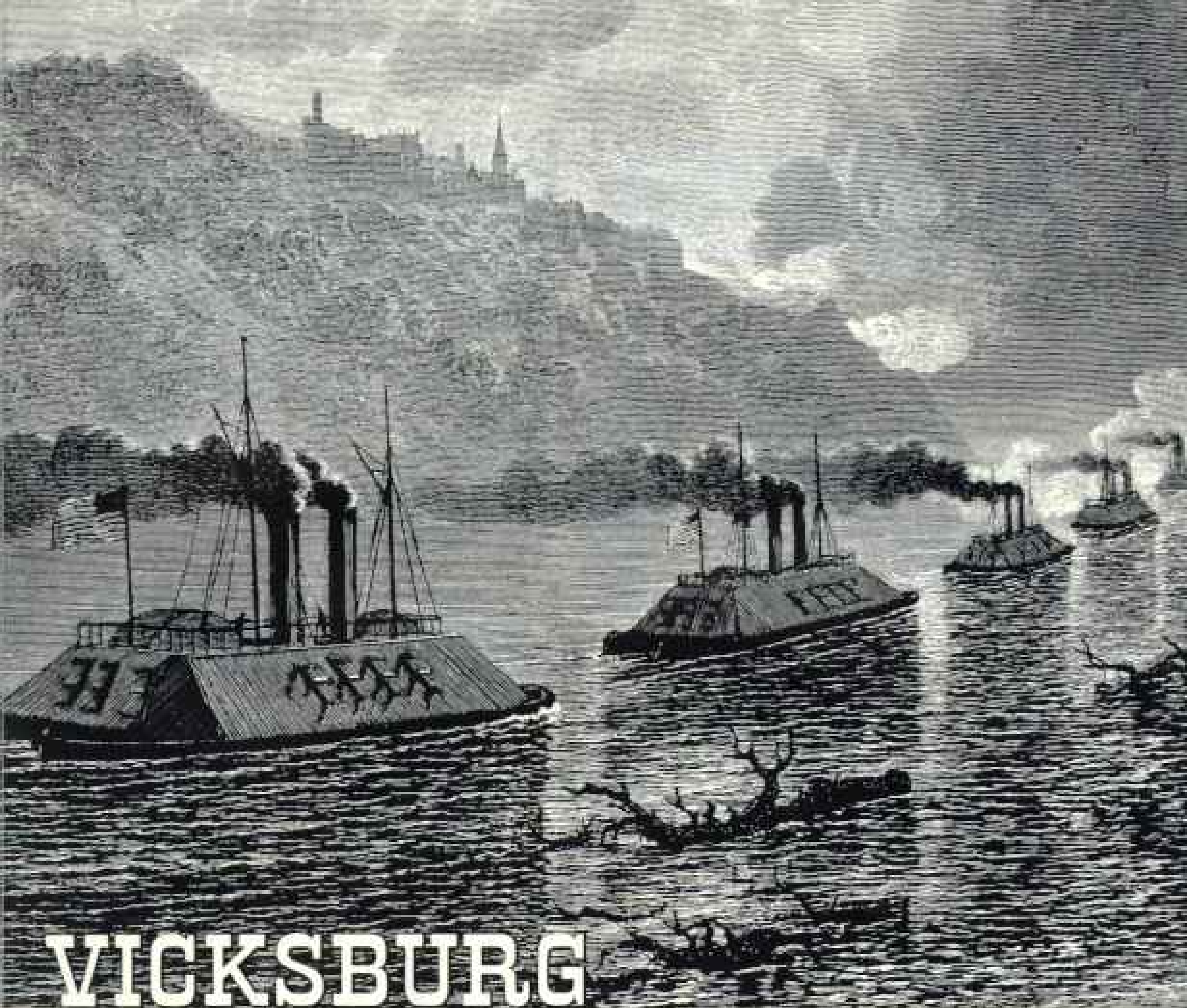
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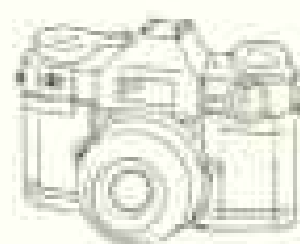


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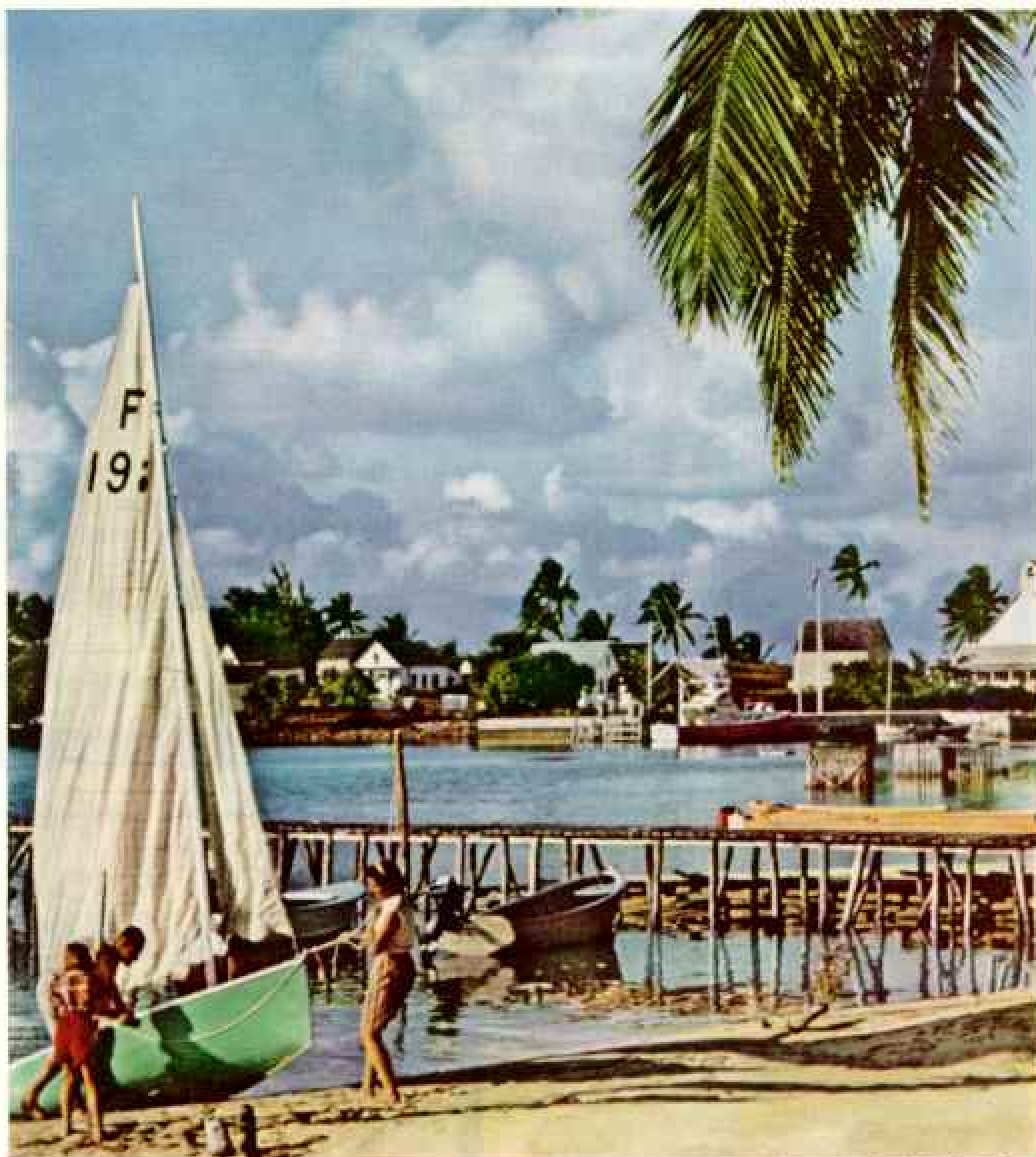
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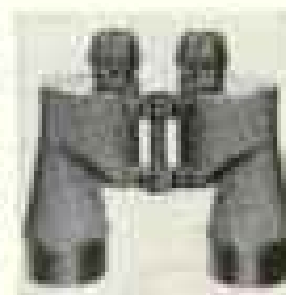
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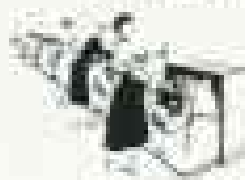
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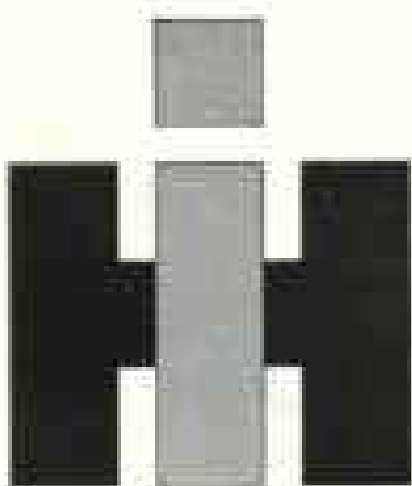
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