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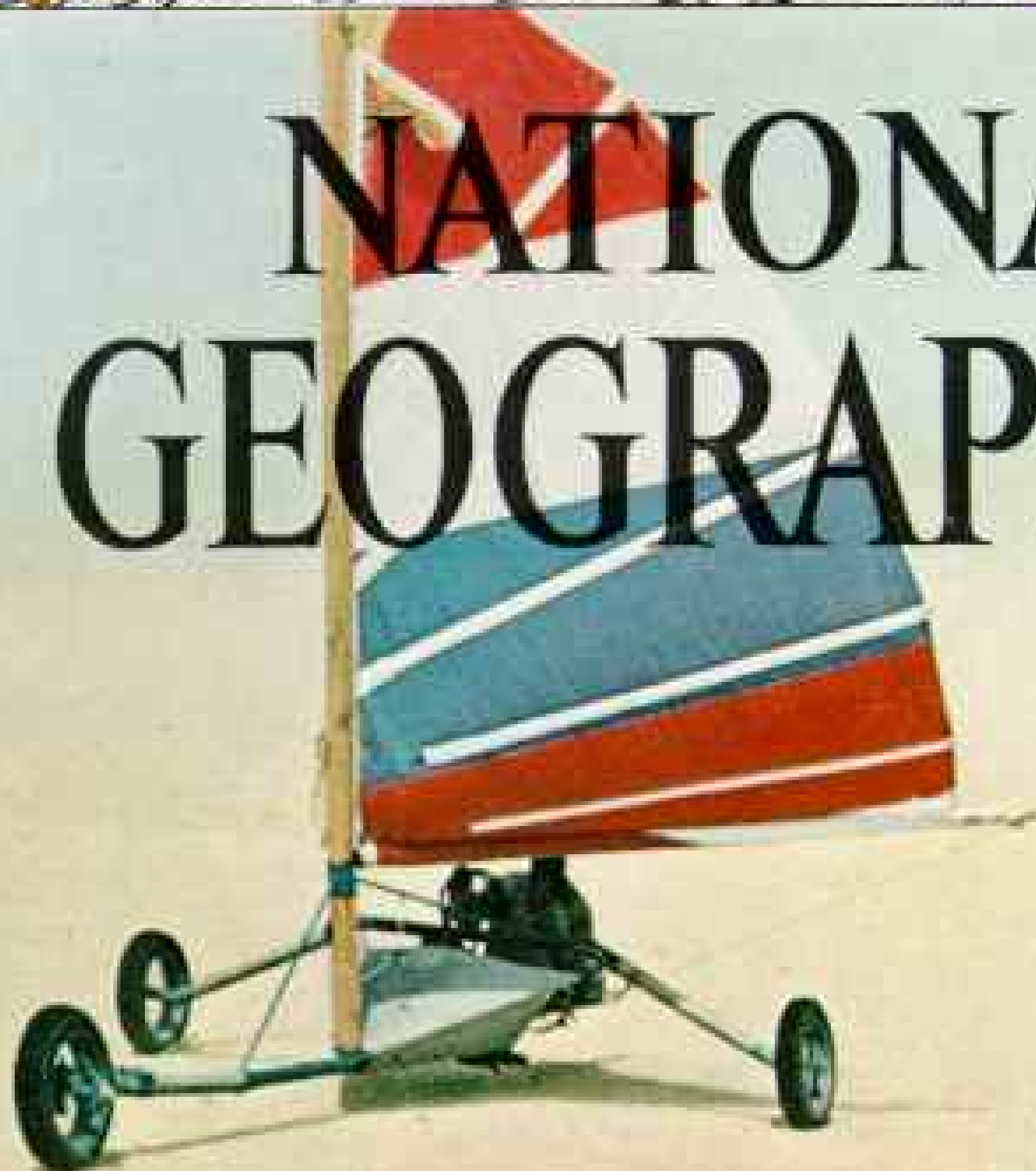
VOL. 132, NO. 5 NOVEMBER, 1967

NATIONAL GEOGRAPHIC



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

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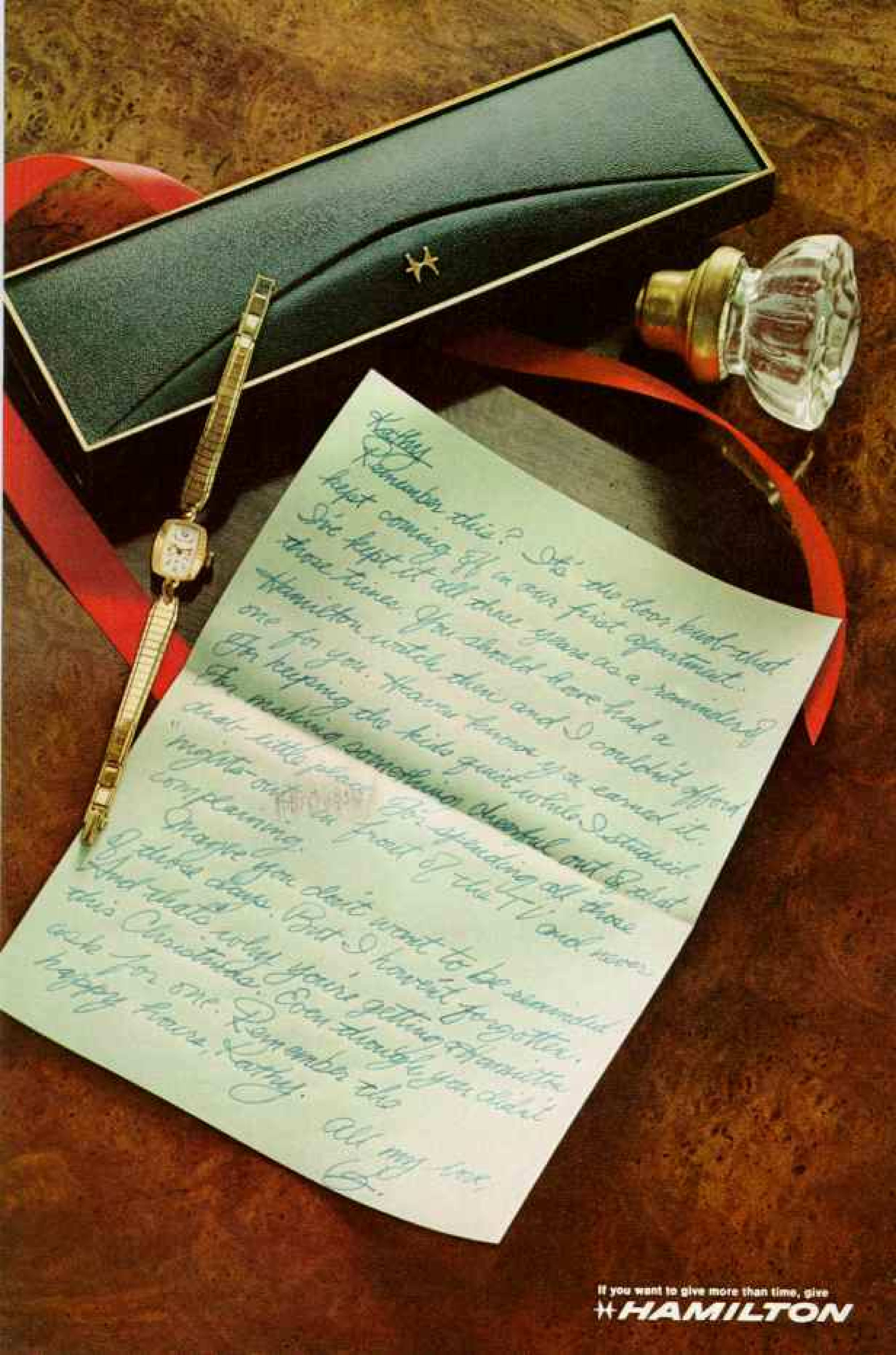
Kathy
Remember this? It's the door knob that
kept coming off in our first apartment.
I've kept it all these years as a reminder of
those times. You should have had a
Hamilton watch then and I couldn't afford
one for you. Heaven knows you earned it.
For keeping the kids quiet while I studied.
For making something cheerful out of that
drab little place. For spending all those
nights-out in front of the TV and never
complaining.
Maybe you don't want to be reminded
of those days. But I haven't forgotten.
And that's why you're getting a Hamilton
this Christmas. Even though you didn't
ask for one. Remember the
happy hours, Kathy.
All my love
J.
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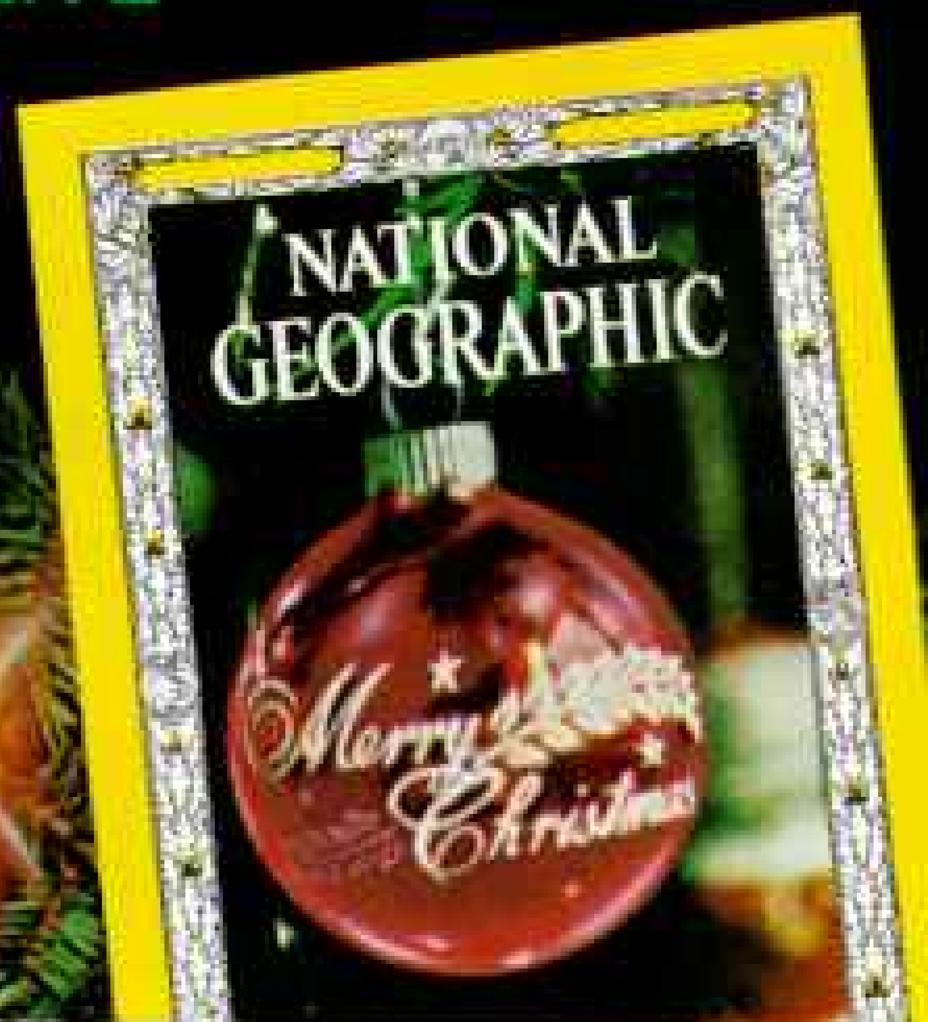

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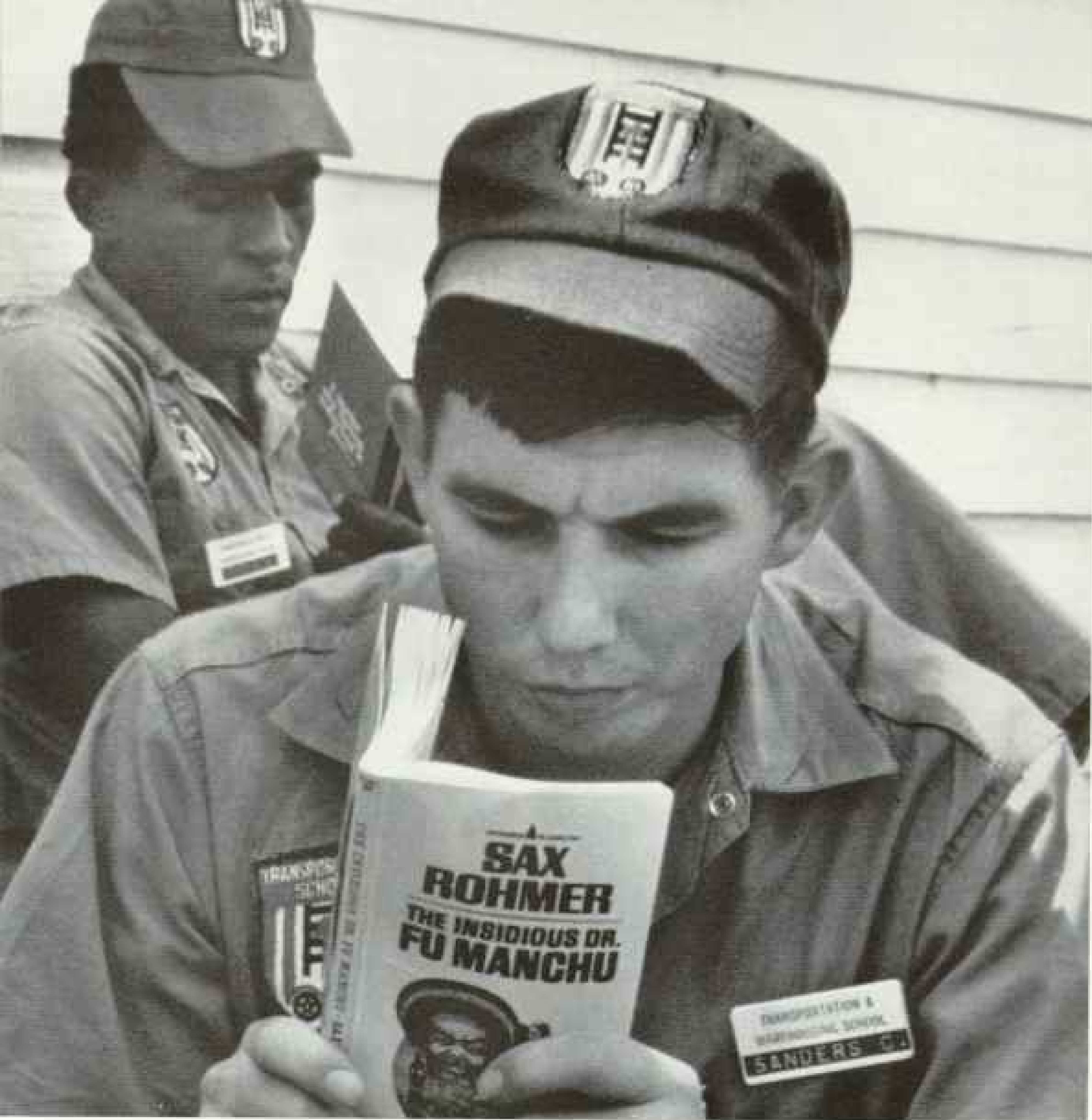

He's not exactly reading Shakespeare. But at least he's reading.

Hamlet just won't turn him on. Dr. Fu Manchu will. And to a guy who never read a book before in his life—any book—it's a start.

He's a Corpsman at the Kilmer Job Corps Center in New Jersey and like most other Corpsmen, he's a school dropout. The problem: how to get these boys to start reading and writing so that their mental skills match the job skills they're learning.

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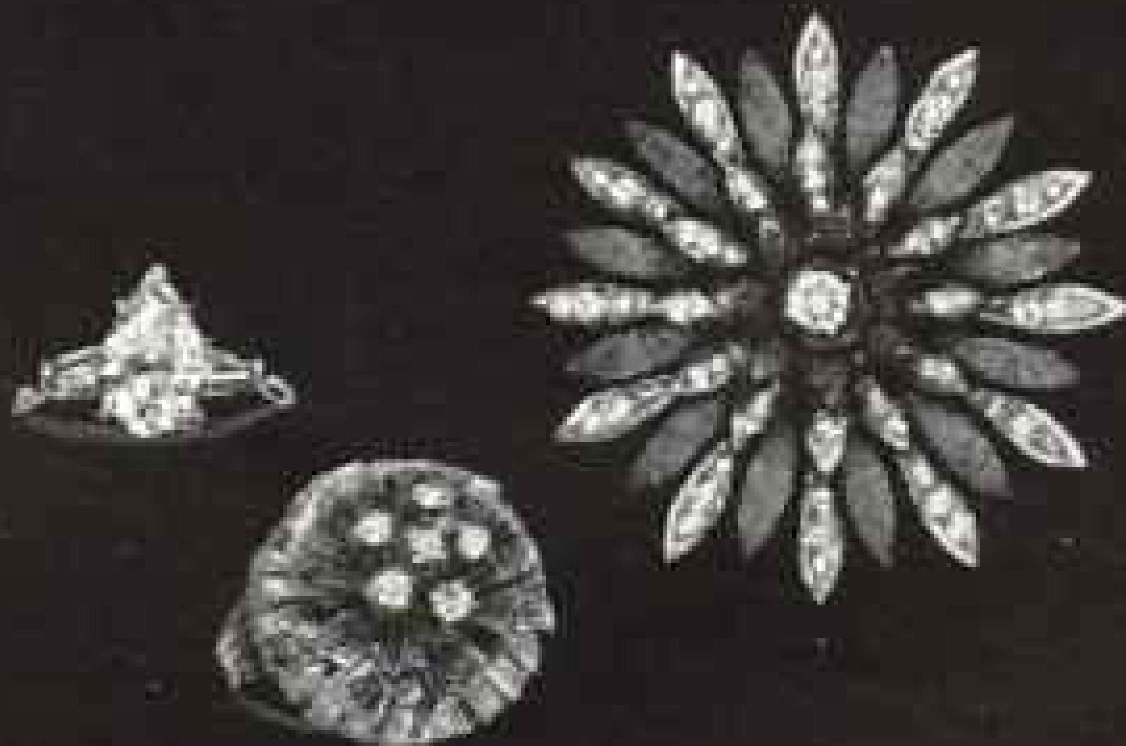

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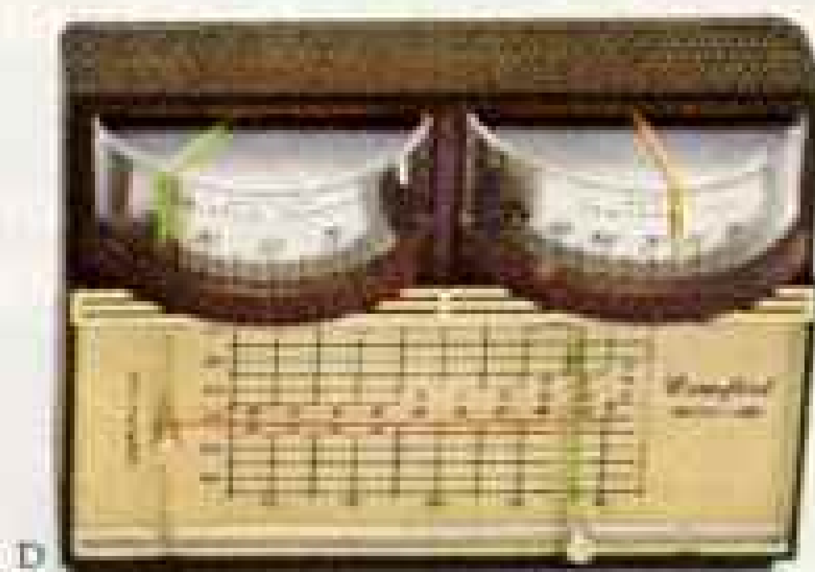
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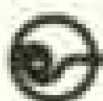
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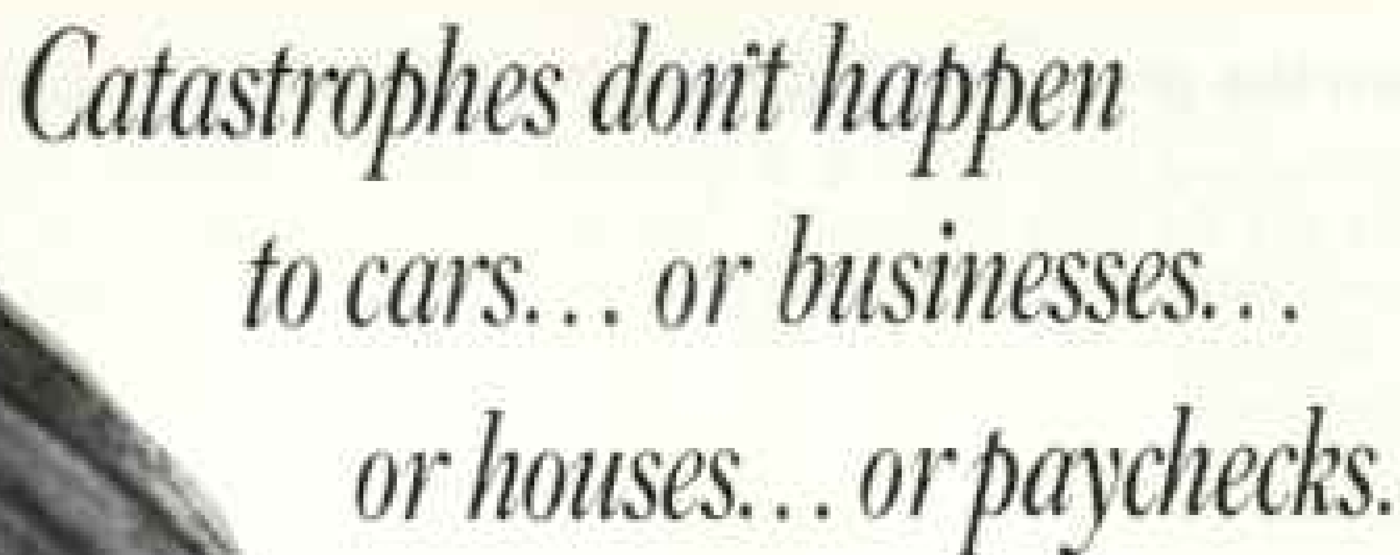

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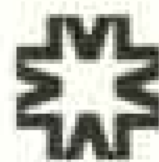

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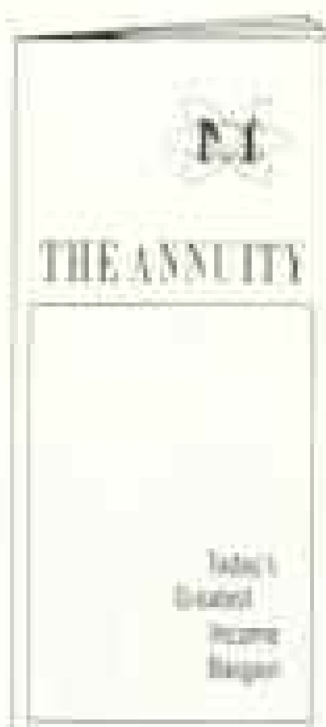

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New South Wales

THE STATE THAT CRADLED AUSTRALIA

By HOWELL WALKER

Assistant Editor

Photographs by DAVID MOORE, Black Star

I SAW THE PAINTING in a house at Broken Hill, a mining town 570 miles west of Sydney. It showed a miner sitting in the warm light of a summer afternoon before going to work on the late shift. Stunning color and bold composition dramatized the simple scene signed "Pro Hart."

"Who is Pro Hart?" I asked my host.

"A mine worker here in Broken Hill. Want to meet him?"

So we went to the home of Kevin Hart, nicknamed Pro because his friends thought of him as "Professor," for reasons not entirely clear to Hart himself. A chunky man in his thirties, he looked more like a wrestler than an artist—or a professor. And his house seemed more like a rambling studio than a dwelling: pictures everywhere, finished and unfinished (pages 630-31).

"This one is almost finished," Pro Hart explained, "except for the ants. I must add them. I like ants. I like insects. They give life to paintings, you know."

EKTACHROME © N.G.S.

Native and newcomer: Unlike her pet rock wallaby—born in New South Wales—11-year-old Dawn Landi spent the first half of her life in the United States. She and her family settled in Australia's most populous state in 1962, when her father, an entomologist, joined the swelling tide of immigrants to the southern continent.

It was past midnight, and Pro, not long off the late shift, sank heavily into a big chair. His wife Raylee brought us tea and sandwiches. Stirring his cup perfunctorily, Pro stared at one of the incomplete paintings.

"This art business is crowding in on me. Too many commitments in Sydney and Melbourne," he said, "and now somebody wants one of my larger paintings to hang in the Australian Embassy in Washington. I'll probably have to give up the mine work, and that would be a pity because mining takes my mind off painting."

Like Pro Hart, the state of New South Wales leads two entirely different lives. And, as with Pro Hart, the story of this duality begins at Broken Hill (map, page 599).

EKTACHROMES BY JANE MARSTON (OPPOSITE) AND DAVID MOORE, BLACK STAR © N.G.S.

Faces mirroring their expectations of life in the land down under, passengers crowd the rail of the liner *Galileo Galilei* in Sydney Harbour. White-haired Italian immigrant anticipates a joyous reunion with relatives and friends who preceded her.

Inching into Sydney Cove, the cruise ship *Canberra* arrives from London laden with visitors. She will berth in the shadow of an unfinished 50-story commercial tower, the Commonwealth's tallest building, in the heart of the capital of New South Wales.

Until a local boundary rider named Charles Rasp discovered, in 1883, an outcrop of perhaps the richest silver-lead-zinc lode in the world, Australia had existed primarily by farming. Rasp's discovery at Broken Hill started, in effect, the country's double life—industrial as well as pastoral.

Factories Challenge the Role of Sheep

Over in Sydney, the state capital, as far from Broken Hill as Washington, D. C., is from Chicago, I talked with the Premier of New South Wales.

"It is still substantially true that Australia rides on the sheep's back, but our dependence upon wool is lessening," the Honourable Robin William Askin explained (page 598).

"The stepping up of manufacturing largely accounts for the trend," the Premier said. "And as long as we keep on going this way, we will need more and more people to work in the factories; also, we'll require more money. For these reasons we're pushing ahead with an intensive immigration program, and we're looking increasingly to America for capital.

"Mind you," he hastily interrupted himself, "I am, to quote our former Prime Minister Sir Robert Menzies, 'British to the boot heels.' But now we must turn to the United States for practical purposes . . . and for defense. That's why we have troops in Viet Nam."

He went on to say, "We have no poor people in New South Wales. Nor any very rich people. Ours is a classless society. That's why we ride in the front seat of a taxi."

I rode beside Sydney cab drivers because I liked to talk to them. But I also liked to walk along the streets that followed early bullock-cart tracks—especially those around Sydney Cove, where the city was born (page 602).

Into this cove in 1788, then heavily wooded and lightly inhabited by naked, dark-skinned aborigines, sailed the First Fleet under Capt. Arthur Phillip, bringing from Britain the first European settlers of Australia.

Nearly 18 years earlier and not far south

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of Sydney, Capt. James Cook, commanding H.M.S. *Endeavour*, had sailed into what he called Botany Bay, in an area he later claimed for George III as New South Wales. Proceeding northward along the coast, Cook passed —without entering—the entrance to Sydney Harbour, described by Captain Phillip as "the finest . . . in the world, in which a thousand sail of the line may ride in the most perfect security."

The bulk of Sydney's early settlers arrived as convicts, some of them shipped to this distant land for such a minor offense as stealing prayer books. Sufficient punishment in itself, the voyage under sail took at least four months—wretched months of misery and despair. Even worse were the hopeless years of detention in a penal colony on an inhospitable continent thousands of miles from nowhere.

By 1830 criticism of the objectionable practice was widespread. Transportation of convicts to New South Wales ceased in the 1840's. Australia entered the civilized world.

Progress Threatens to Engulf the Past

It is astounding what the nation has accomplished since the First Fleet put in to Sydney. Still more remarkable are its achievements in just the past few years.*

Of course, the relentless surge of modern construction all too regrettably obliterates admirable links with history. But through persistent efforts of the National Trust of Australia, an organization dedicated to the preservation and restoration of historic buildings, the city retains some—but not nearly enough—of its colonial charm. The trust has managed to save handsome reminders of the Georgian period, and even entire blocks of Victorian row houses, their balconies adorned with lashings of wrought-iron lacery (page 605).

Impressive new buildings, like the 25-story headquarters of the Australian Mutual Provident Society, oldest and largest life insurance company in the nation, are gradually forming a skyscraping wall around Sydney Cove. Here, at the city's very front door, giant liners dock, ferries fuss about, and the metropolitan subway breaks out onto elevated tracks beneath an auto expressway—somewhat like New York, Chicago, and San Francisco all in one.

But I really think Sydney is more like San Francisco—at once gay and businesslike, always exciting and refreshing. Carefree as sea swallows, clean-lined sailboats sweep across the deep-blue reaches, weaving among colliers and freighters. The agreeable confusion reminds me that Sydney works in an everlasting holiday atmosphere. A splendid setting and gentle climate are responsible for this happy paradox.

With its cove-scalloped harbor, nearby ocean beaches, and ubiquitous playing fields, Sydney epitomizes Australia's love of sport. The nation's yachtsmen, swimmers, runners, golfers, and tennis players rank among the best in the world. Horse racing, lawn bowling, cricket, rugby, surfing are all as much a part of Sydney life as sleeping, eating, and commuting to jobs that interfere with play.

One of my own pastimes is harbor-watching. Amid the constant come and go at this

*Native son Alan Villiers described "Australia: Vigorous Young Nation in the South Sea," NATIONAL GEOGRAPHIC, September, 1963.

KODACHROME BY DAVID MOORE, BLACK STAR © N.G.S.

Ruddy complexions of sportsmen, appropriate in a country where hundreds of thousands hie to the beaches on a summer day, mark these bewigged barristers crossing Sydney's St. James Road. Their costumes and their protocol in the courts on Macquarie Street reflect the nation's long link with British tradition. Some Australian citizens still speak of the British Isles as home.

But year by year the culture of the continent, and especially that of the senior state, New South Wales, acquires more indigenous overtones. Migrants from Europe—more than a million since World War II—have helped spark interest in the arts, and the large and growing urban middle class depends less and less on London as an arbiter of taste and style. Australian life today takes flavor from Italian, Californian, and even Japanese influences, and blends them all into a whole.

main gateway of the continent, a singular project at the entrance of Sydney Cove steals the show. This is the Opera House, begun in 1959 and still under construction (pages 608-9). It's also under the eloquent fire of architects, politicians, and the public—all at odds over aesthetics, technicalities, delays, and costs. It probably won't reach completion until the early 1970's; nevertheless the shell-like structure already melts into the harbor scene, blending with the spectacle of racing 18-footers, their generous spinnakers filled in the brisk northeasterly.

"The building is not, factually speaking, an opera house," explained Victor Friedlander, the public relations officer for the project. "Seven performing halls will seat about 6,500 and house a variety of entertainment—operas, symphony concerts, choral and solo recitals, drama, ballet, exhibitions, lectures, and international conferences.

"There are," he continued, "three good reasons for the Opera House: first, to provide encouragement and development of local talent in the musical and performing arts; second, to attract good overseas artists; third, to provide a unique tourist attraction."

Estimated final cost of the Opera House—56 million dollars, to be raised entirely by public lotteries. An exquisite gamble. But a risk, I'd guess, only one city in Australia would take. Good luck to you, Sydney.

Not far from the Opera House, Gothic-revival Government House presents a solid contrast to its airy neighbor. Here is the residence of the governor—Queen Elizabeth's

representative and the chief of state of New South Wales. But, unlike a governor in the United States, he in no way enters into politics.

His Excellency Sir Arthur Roden Cutler, V.C., K.C.M.G., C.B.E., K.St.J., was sitting at a desk in his office when an aide showed me in. I bowed. The governor rose and, walking with a slight limp, approached to shake hands. I had forgotten how tall he was—well over six feet and well-proportioned.

Crutches Reflect Differing Fortunes

"We've each gone a bit grayer since our last meeting," he said.

He referred to a dinner in Sydney 24 years earlier, when both of us appeared on crutches. A lieutenant in the Australian Army during World War II, Cutler had lost a leg in the Middle East. In that war, however, he won the Victoria Cross, Britain's highest award "For Valour." I, on the other hand, had broken a leg in a bicycle accident in Darwin and also received a pair of crutches—for clumsiness.

His Excellency invited me to sit down; the aide offered me a cigarette; a butler served black coffee.

"Now, as to what's happening in New South Wales," said Sir Roden, "you might consider the development of cities, industries, roads, and bridges. Above all, regard the attitude of the people: They are confident that they themselves should and can develop.

"New South Wales continues to be *the* industrial state of Australia. But now it is preparing for serious competition from the other Australian states—competition based largely on foreign trade. To meet this threat, Newcastle [70 miles north of Sydney on the New South Wales coast] is developing its port for overseas shipping, which is today more important than coastal trade. Of course this doesn't mean we're forgetting the domestic market."

Sir Roden spoke of New South Wales's upswing in agricultural production since World War II, largely the result of mechanization, advanced techniques, pasture improvement. "And for our produce," he added, "we are constantly seeking more markets. We've increased trade with New Zealand, and we're looking still farther afield—mainly toward Asian markets."

World port and commercial center of two and a third million people (more than half the population of the entire state), Sydney stands as Australia's No. 1 city. But until you take to the air in a helicopter, you can hardly grasp its industrial spread over some of

Mustering a mob of yearling ewes, a "jackaroo," or apprentice stockman, drives them toward a paddock on Hazeldean Station near Cooma. Aberdeen Angus cattle graze the hillside.

New South Wales produces 40 percent of Australia's wool, but the nation that for decades has "ridden on the sheep's back" depends less and less on wool as manufacturing increases.

KODACHROME © N.G.S.

the loveliest and most salubrious real estate on earth (page 603).

For an entire morning I floated above the Sydney area in a copter. Besides pilot Noel Dodwell, I had two companions in flight, Tom Crawford, the state authority on industrial plant location, and Ern Jefferay, an engineer of the Department of Main Roads, who knows the regional highways, byways, and expressways as well as he knows his road home.

While we drifted southward, Tom pointed out diverse industries: chemicals, paper, explosives, glassware, textiles, metal products, motor vehicles, pharmaceutical items, candy. Ern interrupted to indicate a possible route for a cross-country expressway to serve the rapidly growing southwestern suburbs. We flew around Botany Bay, and I looked down on enormous oil tanks dwarfing the obelisk that marks the spot where Captain Cook made his historic landing in 1770.

I saw factories for radio and television, aircraft, sewing thread, elevators and escalators, polyurethane foam and rubber, earthmoving equipment, cosmetics. . . .

By this time we had swung around to the north and approached the upper, or western, reaches of Sydney Harbour. The pilot headed east, straight down the middle of this magnificent inland waterway. But Ern saw to it that we made a jog for a closer look at the uncommonly graceful Gladesville Bridge, with the world's longest concrete-arch span—1,000 feet. Then we came to the more familiar Sydney Harbour Bridge that arches from the city's front door to the North Shore (page 604).

This gigantic "coat hanger"—as the bridge is called by all but prideful Sydneysiders—leads to another expressway being constructed through rugged terrain to Newcastle.

Familiar Specter Haunts the Outback

The pilot took us over Sydney University and its many modern structures sprouting around the original Gothic-style halls. And he circled twice above the extensive campus of the University of New South Wales, still a-building (page 605).

We passed Randwick Racecourse and found a dark multitude outside a church beyond the turf.

"Darby Munro's funeral," Noel explained. "One of our most famous jockeys, you know. O.K. to land now? Not much fuel left."

I had just seen a city bursting at the boundaries with industry—a city of affluence and growth and promise that utterly belied conditions in outback areas of New South Wales. For, at the time of my visit, a drought gripped much of the huge state.

Drought has raised its desiccated head all too often in the history of outback New South Wales. It can devastate certain areas of the state while not seriously affecting others. Why? Mainly because Australia's Great Dividing Range lies within 100 miles of the coast. Prevailing winds drop the bulk of their moisture on the seaward slopes (map, opposite).

The farther west one goes from the Great Dividing Range, the less the rainfall. Far-western New South Wales, for example, receives an annual average of only 8 inches as against 47 for Sydney. Farmers in regions of the empty rain gauge must depend on the inland river systems, of which there are few of consequence. Elsewhere, bravely mapped watercourses amount to little more than fickle trickles. The most reliable rivers flow through the south, where large-scale irrigation schemes save the country in prolonged dry seasons.

As for the rest of the state west of the mountains, let's look first at a station not far

EKTACHROME BY DAVID MOORE, BLACK STAR © N.G.S.

"I want to make this the best state to live in, work in, and invest in," declares the Honourable Robin William Askin, Premier and Treasurer of New South Wales since 1965. Dedicated to keeping inner Sydney "free, green, and airy," he envisions new low-income housing on the outskirts with rentals comparable to those in Europe.

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NEW SOUTH WALES

BIG AS TEXAS AND VIRGINIA combined, Australia's oldest state leads the nation in population, industry, agriculture, and volume of shipping.

Capt. James Cook discovered and named New South Wales in 1770, claiming it as a British possession. But not until 1788 did the first settlers arrive to lay the foundations of Sydney, now the largest city on the continent.

The state's varied landscape includes Australia's highest mountains, magnificent beaches, tall timber, and sweeping plains.

AREA: 309,433 sq. mi.; fourth largest state. **POPULATION:** 4,193,000; majority of British stock; remainder mostly continental European; 6 of every 7 people live in urban districts. **ECONOMY:** Mining—coal, silver-lead-zinc; steelmaking; manufacturing; agriculture. **MAJOR CITIES:** Sydney (pop. 2,300,000), capital, principal port; Newcastle (pop. 220,000), steel, port; Wollongong and Port Kembla (combined pop. 146,000), coal, steel.

from Moree, about 320 miles northwest of Sydney. The ranch belongs to Graeme Anderson, who had invited me to stay a few days. In good times his 6,000 acres carry 6,000 Corriedale sheep and 200 Hereford cattle. But the drought had reduced these animal numbers. No rain. No grass.

The cattle had taken to eating the lower branches of myall trees. The sheep wandered about hungrily, finding nothing. How under the monotonous sun could they stay alive from one bone-dry day to the next? Not all could, of course; bleaching skeletons here and there told of their pathetic end.

Drought-plagued Rancher Ponders an Agonizing Question

"Makes me feel guilty, seeing sheep trying to find feed that just doesn't exist," said Graeme, a heavy-shouldered man with gray hair and a pointed nose that looked capable of smelling weather two shires away. "Until a year ago I had surplus feed in storage. Now I'm in trouble, with winter coming on."

Squinting against the aggressive glare, Graeme said: "From March into November last year I spent $32,000 on feeding sheep and cattle. That worked out at 1,000 a week. [An Australian dollar equals $1.12 U. S.] I would have been better off financially if I'd shot all my sheep—or sold them—at the very beginning of the drought. Haven't had a rain that's done any good for the past 14 months."

So Graeme stands on his veranda, gazing far out across the rainless, sun-cruel land. And he asks himself aloud—but quietly—"What are we going to do?"

I don't think he expects to find an answer. There is no answer—yet. I stand beside him, momentarily distracted by shrieking white cockatoos against the all-blue sky. I wish I could do something. There is nothing to say.

While the outback looks skyward for its salvation, industrial Sydney looks in exactly the opposite direction. As a matter

Gallant challenger for the 116-year-old America's Cup, *Dame Pattie* beats to weather off Sydney Heads. There the Australian craft prepared for the yachting classic that she lost to *Intrepid* in four straight races last September in Rhode Island Sound. The sloop carried a computer to help her sail her fastest—the first cup contender so equipped.

Trimming sail, four crewmen wind coffee-grinder winches. At the wheel, skipper Jock Sturrock steers the sleek 65-footer, named for the wife of Australia's former Prime Minister, Sir Robert Menzies.

Passion for sailing blooms early in Australia: a summer scene on Collaroy Beach.

Battling the breakers, a crew pulls seaward in a race at the annual surf carnival of Sydney's Manly Life Saving Club. The lifeguard rivals the kangaroo as a national symbol in this swim-mad land. Some 25,000 active and reserve guards—all volunteers—save 5,000 bathers each summer.

EKTACHROME (OPPOSITE) BY DAVID BERG; KODACHROMES BY JANE MARSTON (ABOVE) AND DAVID MOORE, BLACK STAR © N.G.S.

of geological fact, the city is sitting right on top of its power: good black coal in rich seams that reach 120 miles from Newcastle on the north to Wollongong on the south. Hence the saying that New South Wales's initials stand for Newcastle, Sydney, and Wollongong.

I drove down the coal route to Wollongong and adjacent Port Kembla. Nearby collieries have helped Australian Iron & Steel Proprietary Ltd. turn Port Kembla into the nation's chief steelmaker. The mammoth plant produces four million tons a year (pages 606-7). But the figures that come to life for me tell that postwar migrants from 35 different countries make up almost half the total labor force of 18,800 at Port Kembla.

Steel works and coal mines look much the same the world over, I suppose. In the Wollongong-Port Kembla area, however, mills and mines operate within a rivet's toss of the blue Pacific, where the lowest-paid laborers have homes on or near a sweep of golden beach; where surf outsings the daylong, nightlong din of industry; where sea breezes dispel the heat and the fumes and the smoke.

I went into the steel works and watched Austrian-born Rudy Bochdal on his job as assistant pit foreman of Open Hearth No. 2. When he finished his shift at 3:23 p.m., I talked with him. His thin light hair and soot-lined face made him appear older than his 28 years. Though powerfully built, he spoke softly.

Rudy came to Australia in 1955, worked in a coal mine for two years, then joined A. I. & S. at Port Kembla. In 1961 he married an Australian schoolteacher. He was naturalized the following year.

I wanted to see where he and his wife lived.

"Good," said Rudy. "Could you come this evening at eight?"

He welcomed me at the gate in front of a neat, white, one-story house. Inside I met his wife and four-year-old daughter Julie Ann.

ENGRAVING COURTESY THE MITCHELL LIBRARY, SYDNEY; KODACHROME BY DAVID MOORE, BLACK STAR © N.G.S.

Cove that cradled a city: On a summer's day in January, 1788, Australia's first colonists sailed into this little bay and established a settlement named for Lord Sydney, Britain's Home Secretary. The engraving depicts the future capital of New South Wales in 1804, starting its long climb to the skyscraper-studded city of today (right).

Felicitous wedding of water and land evokes the admiration of all who see it. Sydney Cove (above) lies just to the right of Harbour Bridge and next door to horseshoe-shaped Farm Cove.

They had been watching television in the living room. We all kept on half watching television, half talking.

Rudy, with the help of an Austrian friend, had built the house during a vacation. Until it was finished, the Bochdal family occupied the garage built by Rudy alone. Now the garage housed a Volkswagen.

"Do you care for a drink?" Mrs. Bochdal asked, and her husband rose to get it.

He returned with three glasses of sweet apple cider, saying, "We don't use much alcohol. We keep a little vodka, but seldom touch it. Oh, I like a beer now and then with my mates—two perhaps—that's enough."

Immigrant Voices No Regrets

The Bochdals took me on a tour of their incredibly spick-and-span house. From the living room we moved through the dining room to the kitchen (equipped with all modern appliances), laundry, three bedrooms, and a bathroom. Mrs. Bochdal, patently proud of it all, was proudest of the kitchen.

"But I had to teach her to cook," said Rudy.

Of Rudy Bochdal's conversation that evening, I remember best how he said with unmistakable sincerity, "I have no complaints" —no regrets at all about immigrating to Australia. "Some day I might take my family back to Austria—but only for a visit, though."

From Port Kembla I continued south, the road winding between blue bays with white-sand beaches and dairy country so lush and green it seemed a continent away from the drought just over the tall-timbered hills.

A man I met at the town of Nowra took me to see the district's network of drainage channels, engineered in the interest of flood mitigation. And a mill making 150 different kinds of fine paper—for Bibles, bank checks, cigarettes—is here because it requires 3,600,000 gallons of fresh water a day.

On my way south to a place named Eden I stopped at Ulladulla. The secretary of the local fishermen's cooperative told me that 20 boats, 18 of them owned and operated by Italian immigrants, worked out of this port. Mostly they caught flathead, morwong, John Dory, snapper, shark, and yellowfin tuna.

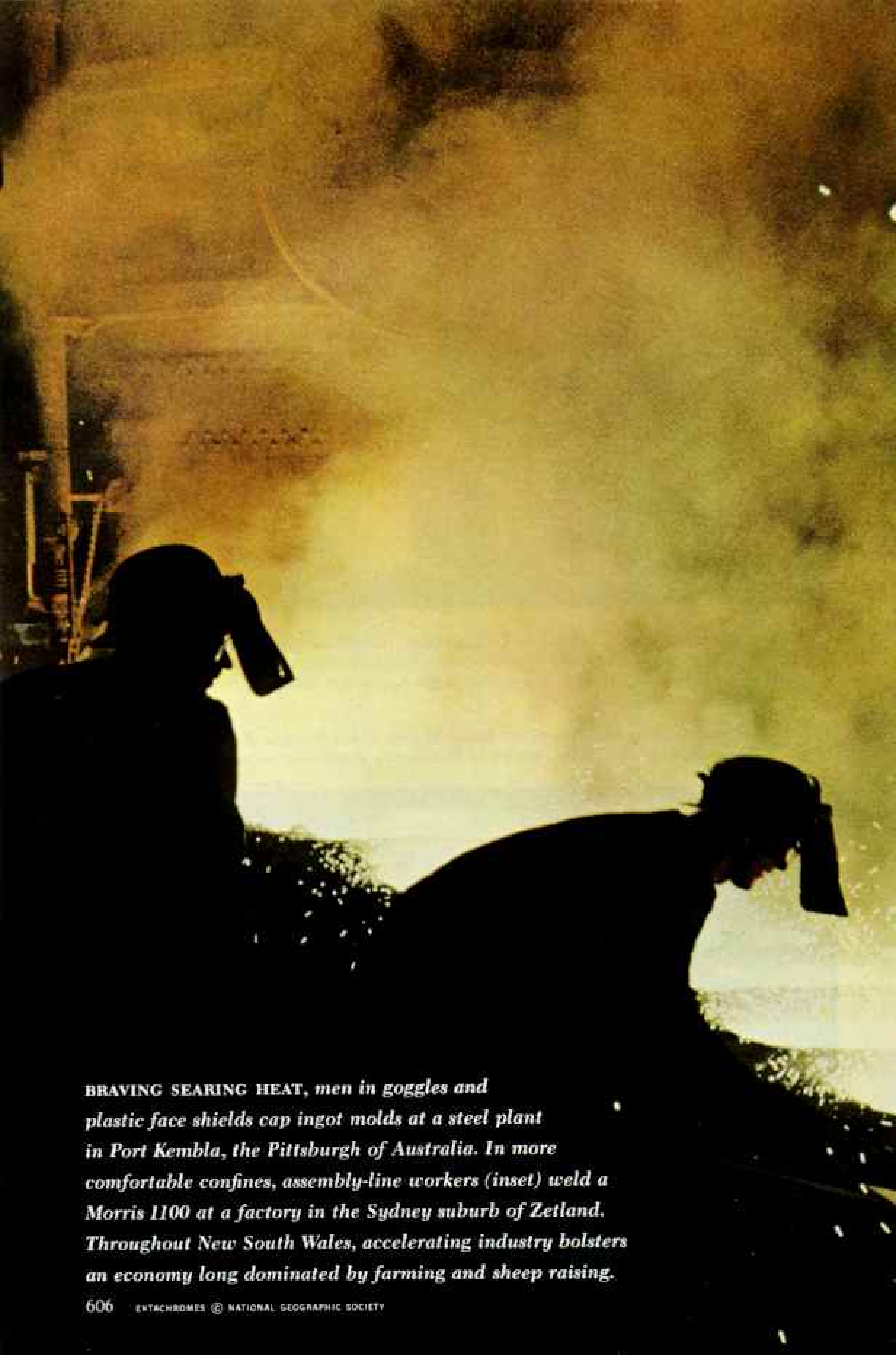
"The coat hanger," as visitors call Sydney's busy Harbour Bridge, carries an average 108,000 vehicles daily between the halves of a metropolis divided by water. Six lanes handle northbound traffic at evening rush hour, while two at right serve southbound motorists. Morning reverses the flow.

KODACHROME © N.G.S.

Revamped Victorian row houses terrace Ormond Street in the Paddington section of Sydney, a close-to-downtown district recently turned fashionable. Property values skyrocketed when artists and architects moved in and applied bright hues to the façades.

Education explosion crowds the domed Student Union Building at the University of New South Wales in the Sydney suburb of Kensington. Enrollment exceeded 11,000 last term.

EKTACHROMES BY DAVID MOORE, BLACK STAR © N.G.S.



BRAVING SEARING HEAT, *men in goggles and plastic face shields cap ingot molds at a steel plant in Port Kembla, the Pittsburgh of Australia. In more comfortable confines, assembly-line workers (inset) weld a Morris 1100 at a factory in the Sydney suburb of Zetland. Throughout New South Wales, accelerating industry bolsters an economy long dominated by farming and sheep raising.*

 EKTACHROMES © NATIONAL GEOGRAPHIC SOCIETY

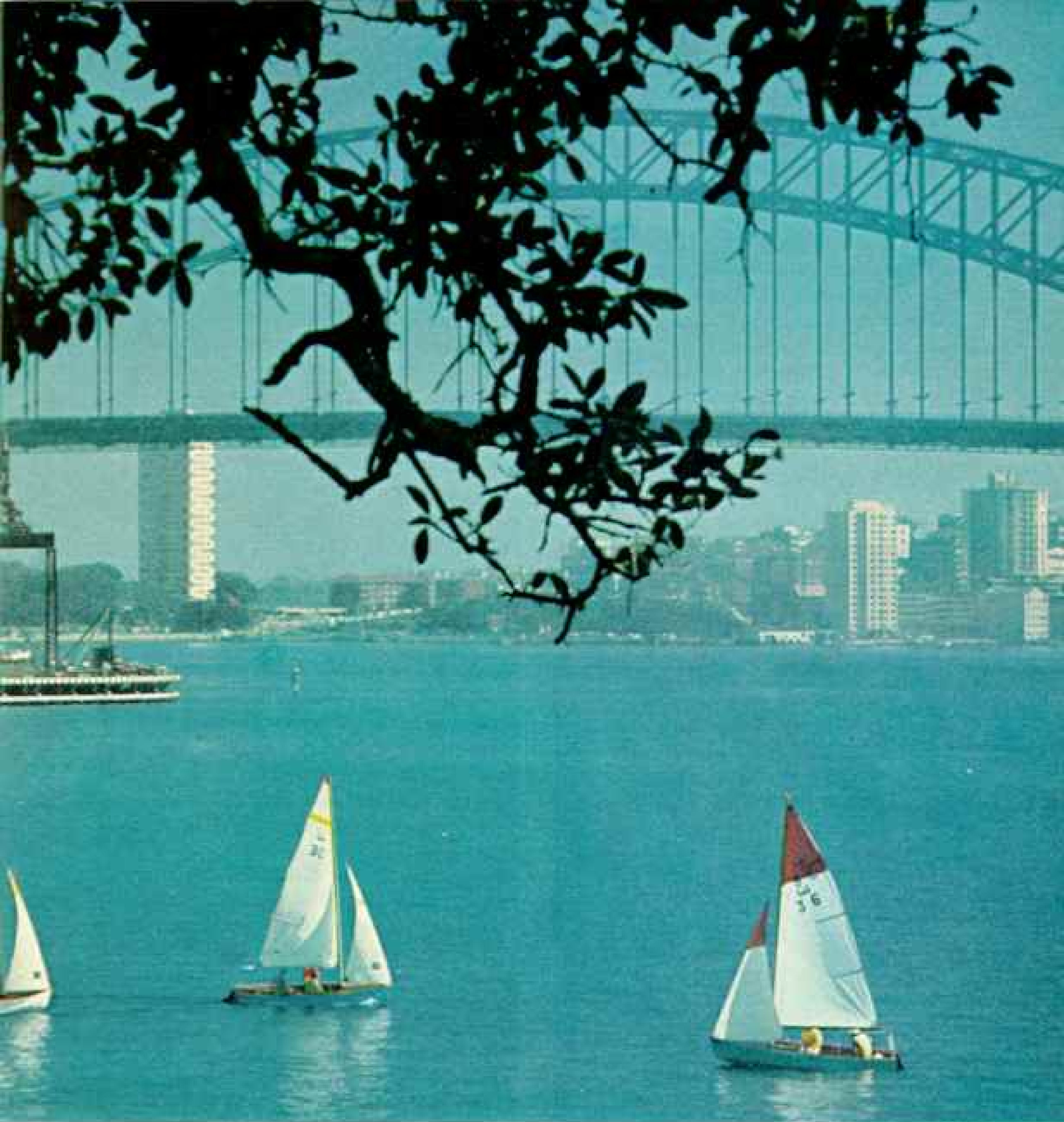
Sails of concrete atop the new Sydney Opera House echo shapes of a dinghy fleet gliding across Farm Cove. Originally planned for completion in 1963 at a cost of $8,000,000, the spectacular structure on Bennelong Point may not be finished for another

More fish reach the Sydney market from Ulladulla than from anywhere else except Eden, southernmost port of New South Wales. But then Eden has twice as many fishing boats. Eden also has a whaling history and a museum to prove it, a fish cannery, and a modest but warmhearted hotel proudly named Australasia, where the proprietor invited me to his family table in the dining room.

Eden tempted me to linger among its genial people, who made me an honorary member of the Fishermen's Recreation Club "for the period of one month." But I still had the north coast of New South Wales to visit.

Rather than retrace my south coast route, I struck inland, heading for the Great Dividing Range. The road climbed and wound through misty eucalyptus woods, dripping with the rains that keep the eastern flanks of the mountains lush and green. Streams, tumbling over mossy boulders, raced each other down to the sea. A lyrebird minced across the road and disappeared in dense wet bush.

My way led up into the Snowy Mountains.



EKTACHROMES BY DAVID BOEL © N.G.S.

five years and will cost at least seven times that much. Public lotteries will pay for it. Danish architect Jørn Utzon's design expresses the Australian's love of the sea while dramatizing the peninsular site above sparkling yacht-spangled water near the Harbour Bridge.

They form the highest part of the Great Dividing Range, culminating in 7,310-foot Mount Kosciusko. Covered with snow for half the year, these highlands offer ski slopes vaster than Switzerland's (page 618). Better still, the area encourages the Snowy Mountains Hydro-electric Authority (thankfully abbreviated to SMA) to push on with one of the world's largest civil engineering jobs.

Before SMA went to work in 1949, much of the runoff from these heights rushed wastefully eastward and southward to the sea. Now, trapped at high altitudes and diverted inland through long tunnels, the waters will generate nearly 4,000,000 kilowatts on their way to irrigate 1,000 square miles of dry land.

That sounds all too simple for a program not due for completion until 1975 at a cost of nearly $900,000,000. Actually the project embraces about 3,000 square miles of rough upland and involves the construction of an ever-growing mileage of access roads in virgin wilderness, 15 large dams, a hundred miles of tunnels, 10 power stations, and more than 80

miles of aqueducts to catch any streams that might otherwise escape (pages 622-3).

At one dam—283 feet high and 817 feet long—I noticed a trickle of water listlessly issuing from a small pipe in a bank of the vast reservoir.

"What's the meaning of that dribble?" I asked a man of the Snowy Mountains.

"Well," he said, "there's a little stream out there on the wrong side of the dam, and SMA doesn't want it to get away."

In Cooma, headquarters of SMA, I met Sir William Hudson. Recently retired as commissioner, he directed the project from the very outset.

"It's been my life, my work, and my recreation," said Sir William, a slender gray-haired man comfortably dressed in a gabardine suit and a blue tie that matched his eyes. "One of the features of the scheme has been the absence of industrial troubles. In fact, there's an esprit de corps among our 6,000 workers—and two-thirds of them are postwar immigrants. The integration of New Australians and Old has been remarkably smooth. All in all, I think the immigrants have made a great and good difference to Australia.*"

So, too, has SMA made a great and good difference to Australia, especially to the arid interior of New South Wales, as I would find.

Canberra's Site a Compromise

Just now I'm supposed to be making my way to the north coast. But no sooner do I come down out of the Snowy Mountains than Canberra traps me in its merry-go-round of concentric avenues. Here is the seat of the Commonwealth and the country's largest inland city. Laid out on a sheep run in the early 1900's, this nation's capital already has a population of more than 100,000. It will most likely reach 250,000 within the next 15 years.

Politically, Canberra occupies Australian Capital Territory—somewhat as Washington does the District of Columbia (map, page 599). Geographically, the A.C.T. lies approximately midway between Sydney and Melbourne, yet entirely within the boundaries of New South Wales. It is where it is because it represents a compromise between Sydney and Melbourne, capital of the neighboring state of Victoria. Although both cities coveted the prestige of the Federal Parliament, they agreed that neither would have it.

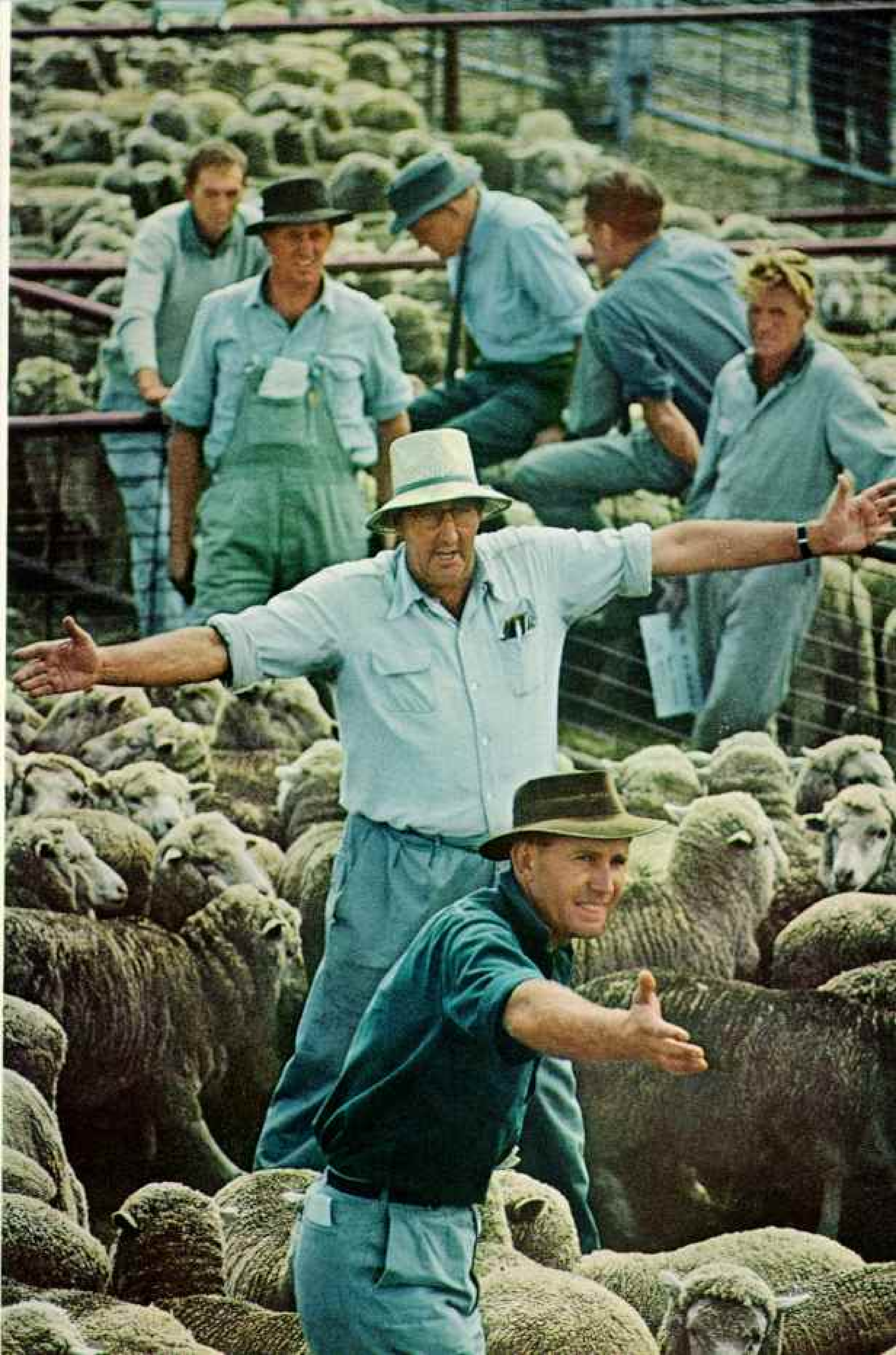
As Canberra grows, it fills out the blueprint drawn by a Chicago architect, the late Walter Burley Griffin. In round terms, the layout revolves about two main centers: Capital Hill and City Hill, originally separated by a wide, shallow valley with a little river running

*See the author's "The Making of a New Australia," NATIONAL GEOGRAPHIC, February, 1956.

KODACHROMES BY DAVID MOORE, BLACK STAR © N.G.S.

Folds of fleece bib Merinos at the 67th annual Sydney Sheep Show. Handlers prop up their entries for examination during judging for the coveted Stonehaven Cup. A Merino ram may weigh as much as 200 pounds and yield 16 pounds of high-quality wool.

Neither golden tongues of auctioneers nor their "giving-it-away" gestures succeed in pushing up prices of Merinos at the sale yards in Cooma during last year's drought.



KODACHROMES © N.G.S.

Chain saw gnaws at a giant in Kerewong State Forest. Heron's Creek Timber Mills, one of the continent's largest hardwood producers, will slice the huge blackbutt *(Eucalyptus pilularis)* into boards, perhaps for the mines at Broken Hill or for export to Japan. Australia grows several hundred species of eucalyptus, some 40 of which yield lumber noted for strength and durability.

Twin poles defeat a thrashing tuna as commercial fishermen team to boat the big southern bluefin. They work the waters off Bermagui, a village made famous in the 1930's by American writer-sportsman Zane Grey.

Steel-fingered cotton picker dumps its load into a gin-bound trailer after harvesting more than two bales an acre on the Glencoe farm at Wee Waa. Two Californians pioneered cotton growing in this northeast section of New South Wales in 1961; the area produced two-thirds of the nation's crop last year, earning $13,000,000.

along it. Below Capital Hill stands Parliament House, the focal point of Canberra.

If Capital Hill were dropped like a big stone into a big pond, the resultant ripples would describe the avenues and streets that surround it. Here federal buildings and foreign embassies seem to multiply daily, just as the City Hill district grows up and out from the new civic center. Suburbs sprout everywhere almost overnight.

What really holds it all together is manmade Lake Burley Griffin, which in 1964 filled the valley between Capital Hill and City Hill. Two handsome bridges span the water, and thousands of trees and shrubs introduced from just about everywhere in the world enhance the shores (pages 620-21).

On the north shore stands a massive edifice, at once stimulating and sobering: the Australian War Memorial—a splendid tribute to splendid men and women. To visit its vast halls is to be reminded of the heroic role this young nation has played in the Old World's

KODACHROME BY THELMA G. DUFTON © N.G.S.

major conflicts. The sacrifice and sadness, the honor and the glory of those who went to war live with the grim yet telling relics that leave one embittered, proud, and moist eyed. Here is a hall of memory . . . lest we forget.

Nearby soars a 258-foot shaft crowned with an eagle—Australia's appreciation of U. S. friendship in World War II.

Australia's friendly attitude toward other nations—and vice versa—pervades the Institute of Advanced Studies at Canberra's Australian National University, attended by postgraduate students from all over the world. I spoke, for instance, with Patrick Ohadike of Nigeria. How did he happen to come to Canberra?

In flawless English and with scholarly logic, he gave his reasons as if answering an exam question: "There is an excellent department of demography at this university, which offered me a three-year scholarship. Also, I was impressed by an Australian professor I had met in Ghana."

Ohadike leaned back in his chair. The serious expression on his ebony face gave way to a wide smile, revealing the whitest teeth I've ever seen. "I like it here," he said. "It's quiet."

If Ohadike wished to remain permanently in Australia, could he? Perhaps. Though normally limiting immigration to people of European stock, the government will make exceptions and admit non-Europeans likely to contribute to the welfare of the nation.

Two Countries Team for Science

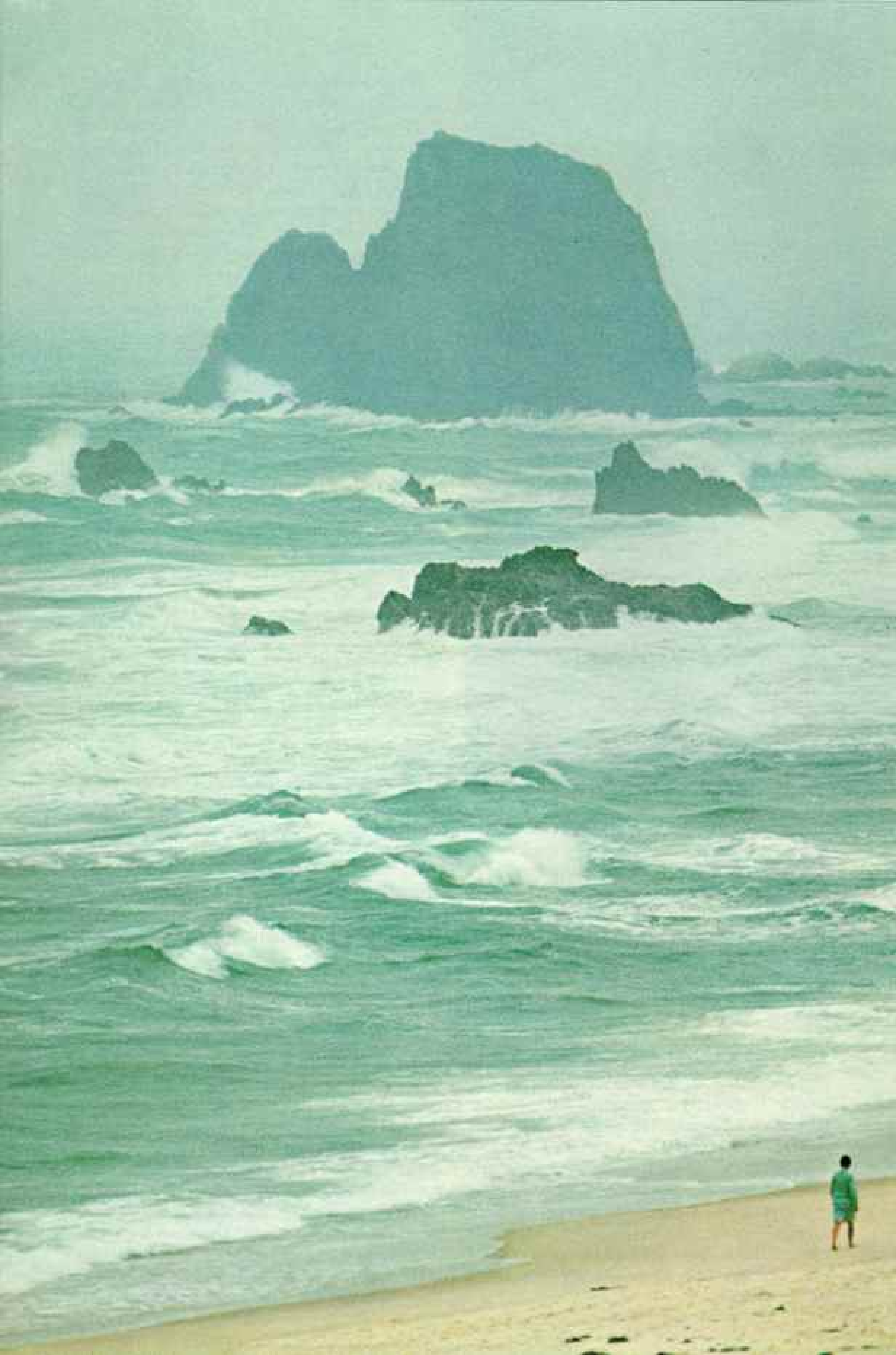
The even quieter outlying areas, I found, had attracted space researchers and radio astronomers. Seeking to escape radio interference from electrical machinery, Australia and the United States teamed to build a deep-space tracking station at Tidbinbilla, in a lonely valley 26 miles southwest of Canberra. The base, where U. S. and Australian flags fly side by side, went to work in February, 1965, tracking Mariner IV on its way to Mars.

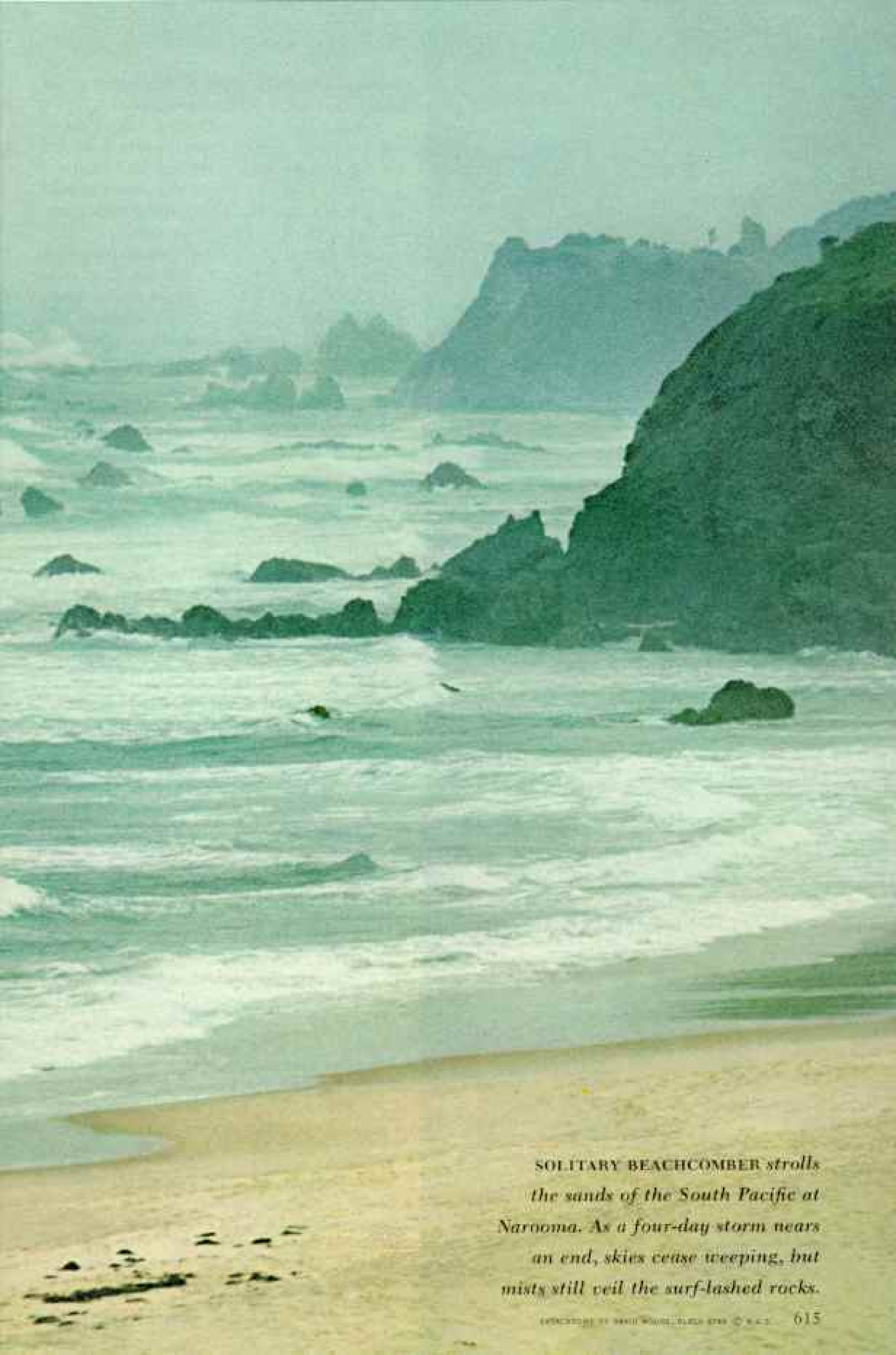
Twenty miles away, at Orroral Valley, I saw a link in the world-wide chain of facilities that form the Space Tracking and Data Acquisition Network (STADAN) of the U. S. The sign at the entrance told me that this station, like Tidbinbilla, was "Established and directed by the Australian Department of Supply on behalf of the United States National Aeronautics and Space Administration." At the time of my visit, Orroral was tracking 36 satellites (page 621).

Another international team project—in this case, the work of Cornell and Sydney Universities—takes the form of a giant metal cross at Molonglo Radio Observatory, 20 miles east of Canberra. Each arm of the fantastic structure, lying horizontally on pasture land, measures a mile. Known as the Mills Cross, this ambitious electronic array is a radio telescope for mapping the heavens, concentrating on the supernovae—giant stars in their explosive death throes.

The cross, 670 tons of steel framework and 12 acres of fine wire mesh, meant little more to me at first than it did to the rose-breasted cockatoos that flapped and squawked about this unlikely intrusion on pastoral simplicity.

I learned, however, that the cross, named after its Australian inventor, Professor Bernard Y. Mills, can detect cosmic noise with a combination of sensitivity, resolution, and speed unequaled by any other astrophysical instrument in the world. During a five-year survey of the entire southern sky—one of its main tasks—it will, astronomers hope, unravel many of the mysteries of galactic radio





SOLITARY BEACHCOMBER *strolls the sands of the South Pacific at Narooma. As a four-day storm nears an end, skies cease weeping, but mists still veil the surf-lashed rocks.*

sources, especially those so important to an understanding of stellar evolution.

Along an earthbound milky way, I drove north through rich dairying country. I skirted the western suburbs of Sydney and returned to the coast at Newcastle, the state's second largest city and Australia's third major seaport after Sydney and Melbourne.

Until Port Kembla forged ahead following World War II, Newcastle led the country in steel production. Here spread massive works of the nation's biggest business—Broken Hill Proprietary Company Limited, of which the plant at Port Kembla is a powerful subsidiary.

Newcastle grew up near a coast blessed with generous beaches providing a scintillating contrast to the grim silhouette of industrial chimneys. In fact, the outlook from my seaside motel could easily fool one into thinking this was a coastal resort 200 miles—not just a couple—from the nearest blast furnace.

Derek Mendl, a friend of a Sydney friend of mine, turned up to introduce me to Newcastle. Mendl had come from England thirty years ago—"for a three-month visit, you know." To me he still seemed more like an Oxford don than a Newcastle insurance man.

"Would you like to meet the lord mayor?" he asked.

"Thanks, but I'm not going to be here very long," I said, believing a city hall appointment had to be made days in advance.

According to Mendl's law—the law of Derek Mendl, that is—anything could be done on the spur of the moment. He picked up the telephone, and in half an hour we were in the office of the Right Worshipful the Lord Mayor Douglas McDougall, who talked easily and intimately of his city, as you or I might speak of our garden and how it grows.

From the shelves behind his desk he pulled out a large book about Newcastle and, before presenting it to me, inscribed on the title page:

WITH COMPLIMENTS
DOUG MCDOUGALL
LORD MAYOR

When I said goodbye to the Right Worshipful the Lord Mayor, I nearly called him Doug.

At Port Stephens, 25 miles north of Newcastle, I watched monsterlike machinery

Water freshens the valley of the Murray River, edging the Snowy Mountains between New South Wales and Victoria. Main stream of the continent's largest river system, the Murray nurtures truck gardens, vineyards, citrus groves, and lush pastures.

EKTACHROME © N.G.S.

gouging the dunes for rutile—titanium dioxide. Mineral sands from Australian beaches provide virtually 100 percent of the non-Communist world's supply of natural rutile.

In its unrefined state rutile can look like fine black caviar, although it feels like sand. It is used in making white pigment for paint, in coatings for electric welding rods, and in textiles, chemicals, and enamels. It is also an ore from which titanium can be extracted. This metal has become an indispensable component of supersonic aircraft, missiles, and space capsules because of its lightness and toughness at the high temperatures associated with high-speed flight.

As the *Sydney Morning Herald* commented, "Strange to think that this industry is probably the only one in Australia which already has one of its products on the moon."

Rutile Miners Cover Their Tracks

Harold Sloane, manager of mineral-sand operations near a place delightfully named Lemon Tree Passage, told me that giant earthmoving equipment strips clean the surface of the area to be mined, then excavates an artificial pond in which a dredge goes to work, feeding the slurry through a big pipe to a concentrating plant floating close by.

But what about the havoc caused by the exploitation of these natural shores?

"The restoration of the land torn up by this mining," said Sloane, "is a most important phase of the project. In fact, it's a condition of the lease. After leveling the ground, we'll replace whatever topsoil we disturbed, then plant grass and trees. Actually, we intend to leave the land in better shape for human use than we found it."

As Sloane and I slogged past a soggy stockpile at the site, he told me that trucks haul the concentrate to a dry-treatment plant near Newcastle for further refining and shipment. Most of the rutile goes to the United States.

Long before rutile mining came to these shores, oyster farming took hold in the well-sheltered bays of Port Stephens, one of the areas that make New South Wales the greatest center of oyster cultivation in the Southern Hemisphere. I saw miles of racks resembling

Drought reddens the plains of western New South Wales. Normally the Darling River, a major tributary of the Murray, waters Tilpilly homestead, but during the 1966 drought the river's lower reaches all but dried up, and the land withered.

EKTACHROME © N.G.S.

Kicking up powder snow with high-speed turns, eight skiers—oops, seven—skim the slopes of 7,310-foot Mount Kosciusko, the continent's highest peak. The Snowy Mountains, remarkably free of avalanches and ravines, lure increasing numbers of sportsmen.

Touch of the Tyrol: Alpine ski instructor, like many Austrians, Germans, and Swiss, comes to Australia to teach at a Snowy resort during the European summer.

KODACHROMES BY DAVID MOORE, BLACK STAR (OPPOSITE), AND HELMUT GRITSCHER © N.G.S.

latticework causeways reaching to infinity across the broad water.

For a cruise among the farms and a lesson in oyster culture, Ronald Anlezark, an inspector of fisheries, invited me aboard his launch. Stage one, I learned, involved the laying out of rows of 6-foot-long, 1-inch-thick sticks for cultching the spat.

Cultching the spat? Yes, that's an oysterman's way of referring to the attachment of free-swimming oyster larvae to the sticks.

Several months later the farmers transfer their sticks to maturing "paddocks" in more-brackish water. There the oysters grow to marketable size in three to four years.

The launch eased past banks of racks to the dock of Melbourne Oyster Supply. We found the company chairman, Stan Phillips, tinkering with a power lawn mower outside his modern brick bungalow. He pushed the machine into a three-car garage, then asked us to come into his comfortable house. Oyster farming, I deduced, has its rewards.

"For 50 years," Phillips told me, "we've been shipping our oysters to Melbourne."

He markets a million dozen yearly, and I wondered why in Melbourne, which is 560 miles farther away than Sydney.

"Because," Phillips said, "just about all the other farmers along the coast of New South Wales supply the Sydney market."

Vermonter Tries the Banana Business

Even if the highway north from Port Stephens fails to hug the coast everywhere, it still amounts to what I'd call a scenic drive. It penetrates magnificent timber stands, runs through neat, quiet towns like Taree, and dares not bypass Port Macquarie, which sparkles in the sun beside a yellow-white beach with an exciting surf.

Farther along I entered the banana belt at Coffs Harbour and met John Landi. Born in Vermont, 45-year-old Landi first came to Australia in 1962 as an entomologist.

"I was looking specifically for a bean pod borer," he told me. "You know, *Etiella zinckenella.* This pest had been causing trouble in the States, and I wanted to see how Australia was holding it down."

"Well, what did you find?" I asked.

"Only one borer, and dead at that," he said. "But I got to see something of New South Wales. Liked it so much around Coffs Harbour I decided to give up bugs and go into bananas. Bought 10 acres to start with. Now we have 30 acres, 20 planted in bananas; they average 400 bushels per acre [page 626].

"It's been a rough go, though," he admitted. "We've had to put a lot of money into the property."

"Who's 'we'?" I asked.

"My partner John Enevoldson and I."

Landi had brought his wife and three children to Australia with him (page 591).

"Do you plan to stay in Australia?" I asked.

"Oh, yes," he said in such a way that I realized I'd asked a foolish question.

Through pineapple plantations and sugar-cane fields and rutile mines, I followed the semitropical coast to the Queensland border. From here I went southwest to the foothills of the Great Dividing Range and abruptly broke into a far sterner region known as New England. And indeed this rock-strewn, rolling part of the state, with its colleges, private schools, and village churches on tree-lined streets, reminded me of America's own New England.

West of the mountains the country leveled off at Tamworth, on the edge of an intensive wheat-growing district in normal times. But, because of the current drought, the bottom of the state's bread basket had dropped out; the plains lay barren in forlorn unfulfillment. Wheat production for 1965-66 fell to 40 million bushels from 150 million for the previous season.

Then I turned a corner as I might turn a page of a book to a new chapter—another story, in fact. Recrossing the mountains, I plunged into the Hunter River Valley's vineyards at harvest time, when grape pickers thank heaven it *doesn't* rain. As for hail....

Man-made lake meanders through Canberra, the Washington, D. C., of Australia. Laid out in 1913 according to plans drawn by American architect Walter Burley Griffin, the federal capital takes shape around City Hill with its circular civic center and Capital Hill (not shown), site of Parliament House. Causeway at left leads to a bridge linking the two districts.

EKTACHROME (LOWER LEFT) AND KODACHROMES BY DAVID MOORE, BLACK STAR © N.G.S.

Flags of two nations fly side by side at Orroral Valley space-tracking station, a joint scientific venture of Australia and the United States. Parabolic antenna 85 feet wide monitors orbiting unmanned observatories, the same vital function performed at other Australian stations for manned U. S. flights.

Glowing with curiosity, young twins in Canberra's Royal Australian Mint peer at photographs of wildlife portrayed on newly struck coins. In February, 1966, the nation began a two-year transition from pounds, shillings, and pence to decimal currency. A platypus swims on the reverse side of the 20-cent piece at far left. Lyrebird spreads its plumes on the 10-cent coin. Kangaroo and emu hold Australia's coat of arms on the half dollar. Frilled lizard decorates the 2-cent piece, and the feather-tail glider, a flying possum, poises on the 1-cent coin at extreme right. Profile of Queen Elizabeth II adorns obverse sides.

Today the Murrumbidgee and Murray bring New South Wales and Victoria a year-round supply of irrigation water—double the volume available prior to the project. Arid land in South Australia, more than 300 miles west of the Snowy Mountains, also benefits from the scheme

Tunnels tap man-made lakes, channeling the waters through hydroelectric power stations and feeding the westward-flowing Murrumbidgee and Murray Rivers. Transmission lines distribute electricity for industry

SNOWY MOUNTAINS PROJECT WATERS THE WEST AND POWERS THE EAST

DRAWN BY BETTY CLONINGER · GEOGRAPHIC ART DIVISION © NATIONAL GEOGRAPHIC SOCIETY

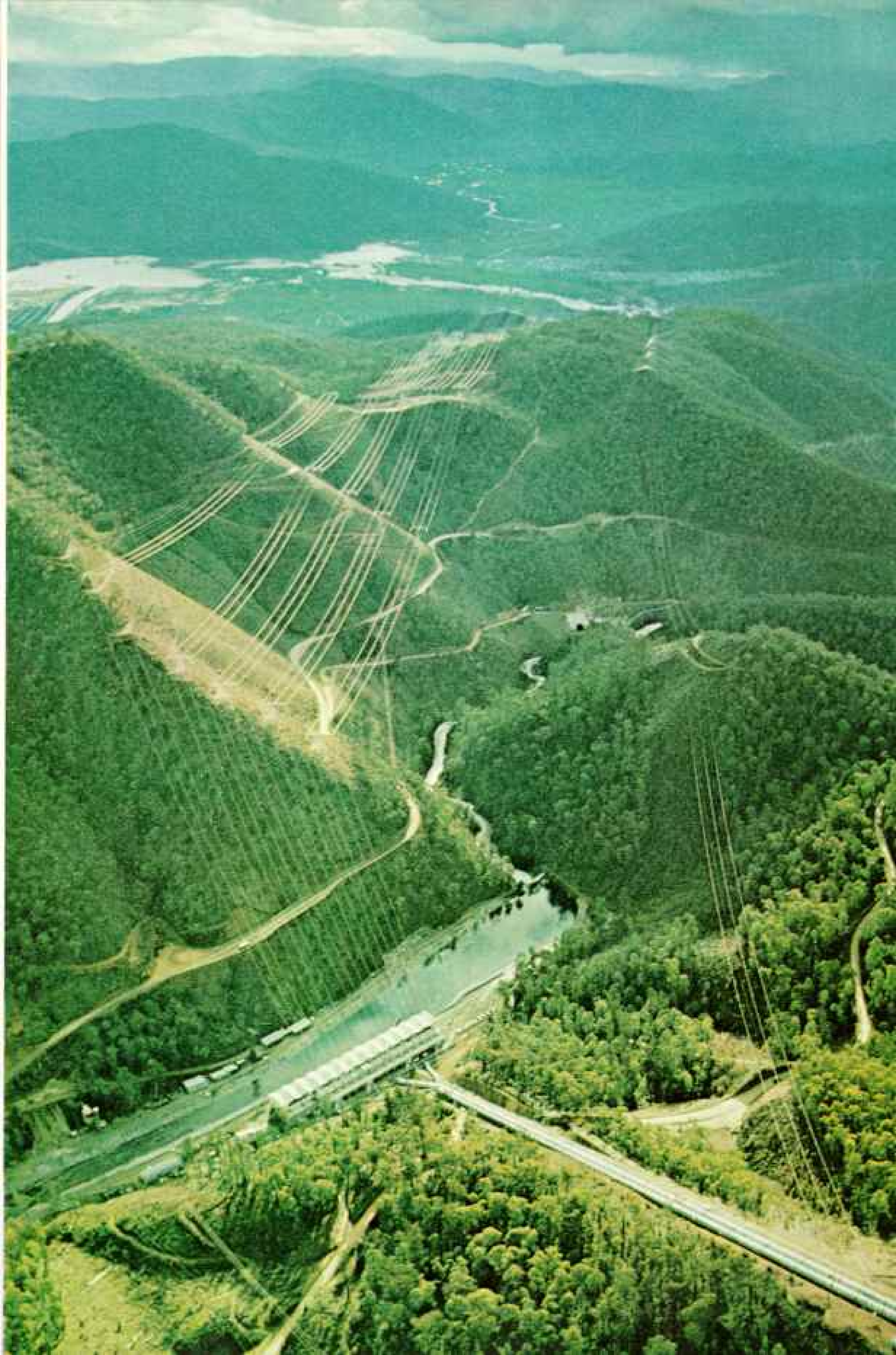
Most ambitious project in the Southern Hemisphere, the Snowy Mountains scheme embraces 15 dams and 100 miles of tunnels. Begun in 1949 and due for completion by 1975, the nearly $900,000,000 undertaking captures once-wasted waters of rivers flowing south and east, and diverts them westward to the thirsty interior.

Like squat robots, generators line Tumut I power station, 1,200 feet underground. Windows at right frame bedrock, through which builders had to drill. One of four Snowy Mountains plants now in production, Tumut I has a peak-load capacity of 320,000 kilowatts.

EKTACHROMES © N.G.S.

Cobweb of cables climbs the hills above Murray I power plant and loops westward to the switching station at Khancoban. Through the mile-long, high-tensile-steel pipelines in foreground, water gushes down to the generators.

The magnitude of the Snowy Mountains scheme beggars the imagination. A lake created by one dam—Eucumbene—stores almost nine times the volume of water in Sydney Harbour. Tunneling through rock established a new world's record—five miles in 370 working days.



EKTACHROME BY DAVID MOORE, BLACK STAR © N.G.S.

Murray Tyrrell, manager of Tyrrell Vineyards Pty. Ltd., uses rockets to dissipate hail in threatening storms.

"About those rockets," said Murray, who at 40 looked more like a researcher in the south stacks of a college library than a vintner. "The theory is that discharging silver iodide among dust particles in the clouds prevents ice from forming; hence, no hail."

One of many viticulturists in the Hunter Valley, Tyrrell plants 90 acres. His 1966 wine output: 14,800 gallons of red, 10,300 of white.

But Please Don't Call It Burgundy

"Until the early 1950's," he told me, "we didn't sell much wine."

"Then," I guessed, "postwar immigration of wine-loving Europeans put you in business?"

"No," said Murray, "it wasn't that. Just a growing sophistication. After the war, Australians traveled more widely than ever before, and they developed a taste for wine."

Beer—excellent beer—is still the national drink. But wine has become increasingly popular. What's more, this nation takes pride and pleasure in its own vineyards. For example:

"Please don't call that red wine a Burgundy," said a wine grower. "It's a Hunter River dry red—an Australian wine."

On a far larger scale than the Hunter Valley, the Murrumbidgee Irrigation Areas in south-central New South Wales grow grapes and make wine. The state's biggest irrigation project, MIA also produces other fruits, including citrus, and half of Australia's total rice production of 170,000 tons a year.

In a small plane piloted by 25-year-old Greg Searls, I flew over the 450,000-acre patchwork of blue, green, and yellow that is the MIA—blue for canals, green for vineyards and orchards, yellow for ripening rice. Two market towns, Griffith and Leeton, floated like little islands in this sea of fertility.

We landed at Griffith and drove to Wes Kircut's farm. Wes was harvesting 120 acres of rice. He'd get about three tons per acre.

"This year," Wes said, "I sowed half the acreage by plane, and it took only two hours. Ground sowing the other half took three days."

No doubt about it, the small plane is a boon to rural New South Wales—a mechanical advantage not only for farmers but for travelers like me, wanting to see as much of this big state as possible in a limited time.

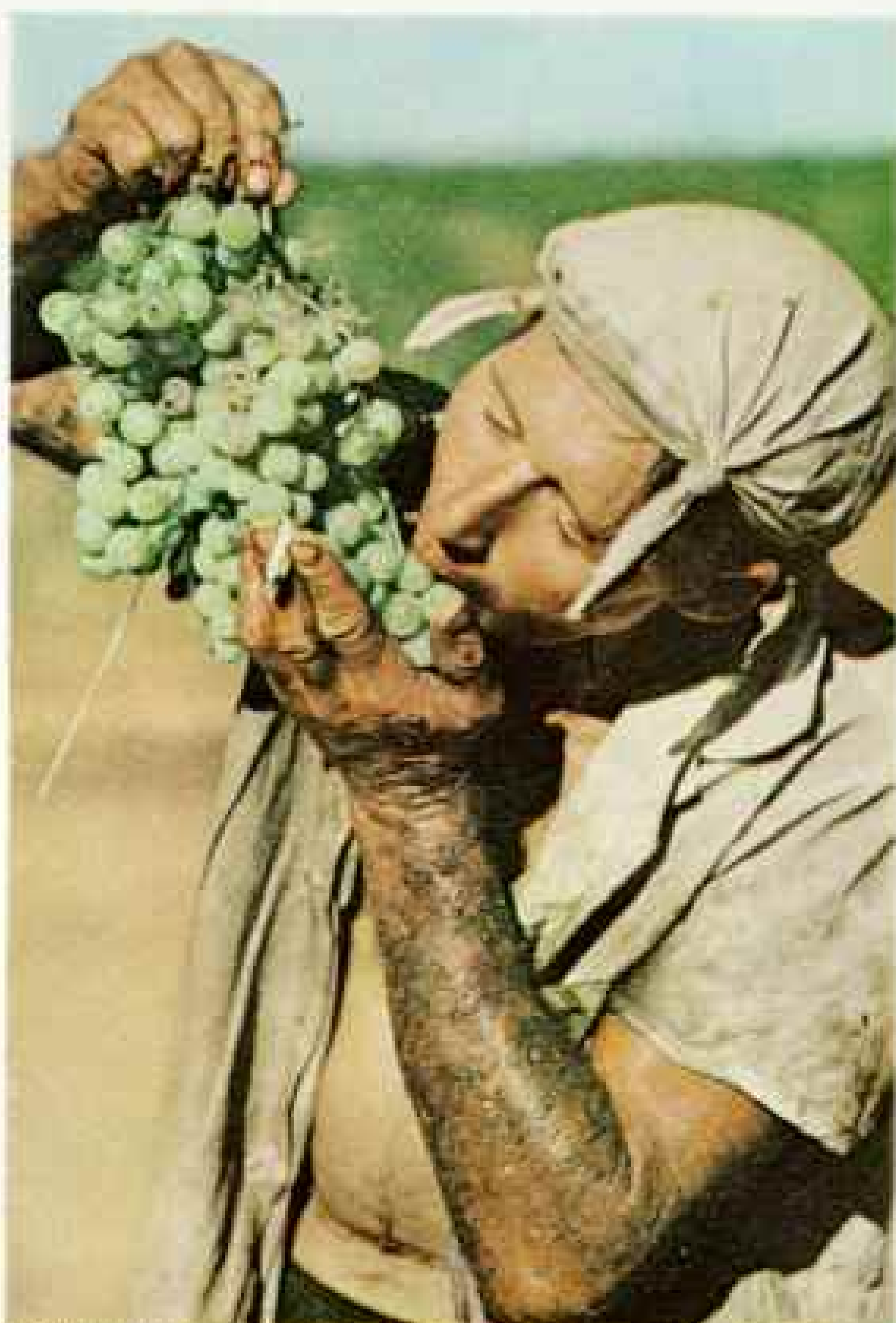
Bounty from the vine

WINE MAKING in Australia dates from the day of the nation's founding. Even as Capt. Arthur Phillip raised the Union Jack over Sydney Cove, vines came ashore from his ship for planting at nearby Farm Cove. But the industry that today produces 45 million gallons a year owes far more to James Busby, a Scotsman. Between 1824 and 1831 he collected 20,000 cuttings from Europe and distributed them to growers in New South Wales. Vineyards now cover thousands of acres in the "Sunshine Continent." Australians drink up most of the production but still export to some 50 overseas markets, with the United Kingdom the largest customer.

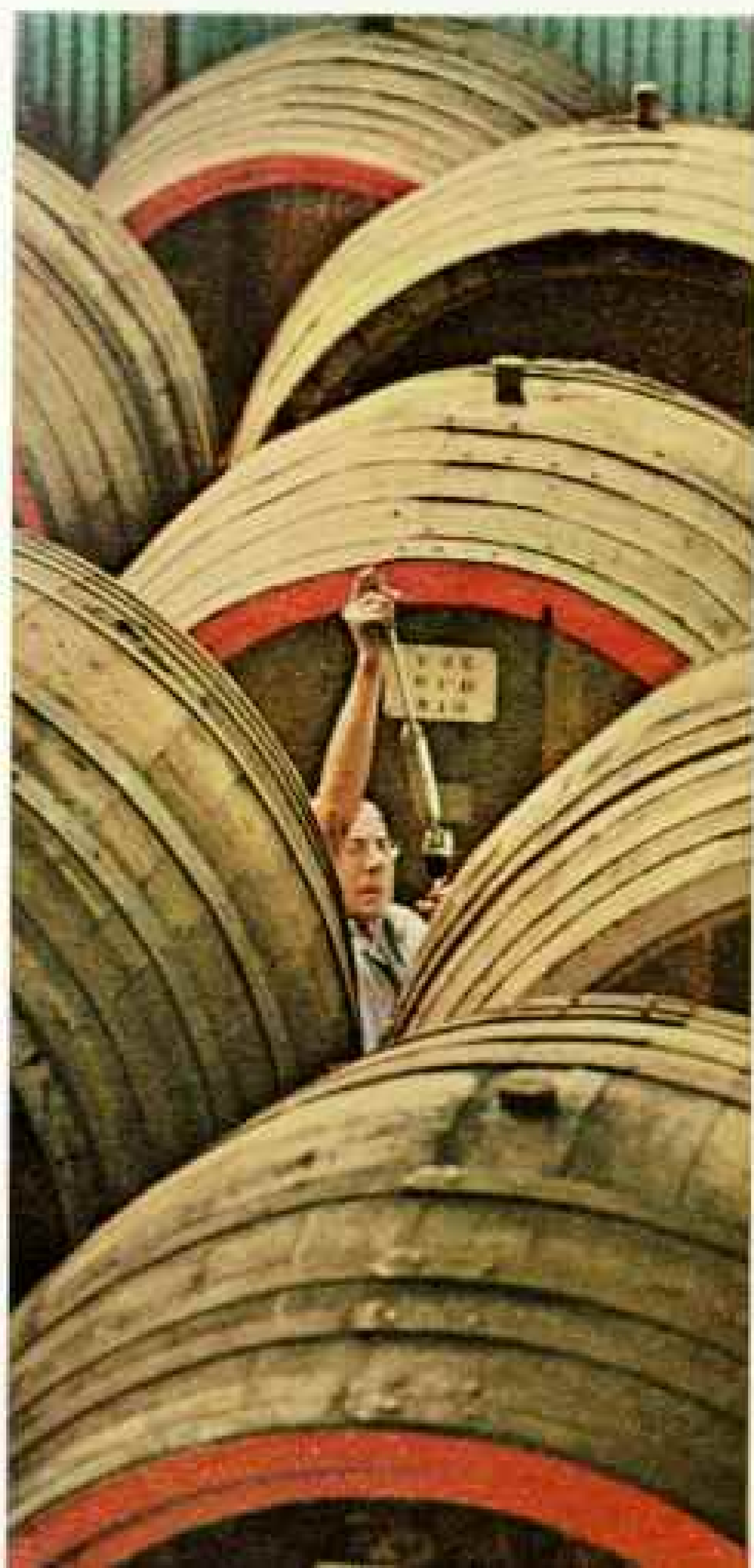
Pressing grape skins, workers at a winery in the Hunter Valley extract remaining juice to add color and tannin to fermenting wines.

Picker's reward: a feast of grapes in a vineyard near Griffith, a market town in the Murrumbidgee Irrigation Areas.

Tapping a huge cask of maturing claret, a veteran sampler checks its development in the cellars.



EKTACHROME (LEFT) BY DAVID BEAL, KODACHROME BY DAVID MOORE, BLACK STAR © N.G.S.



That's why I planned to fly with Greg Searls around the hinterland of New South Wales, moving more or less clockwise from Griffith.

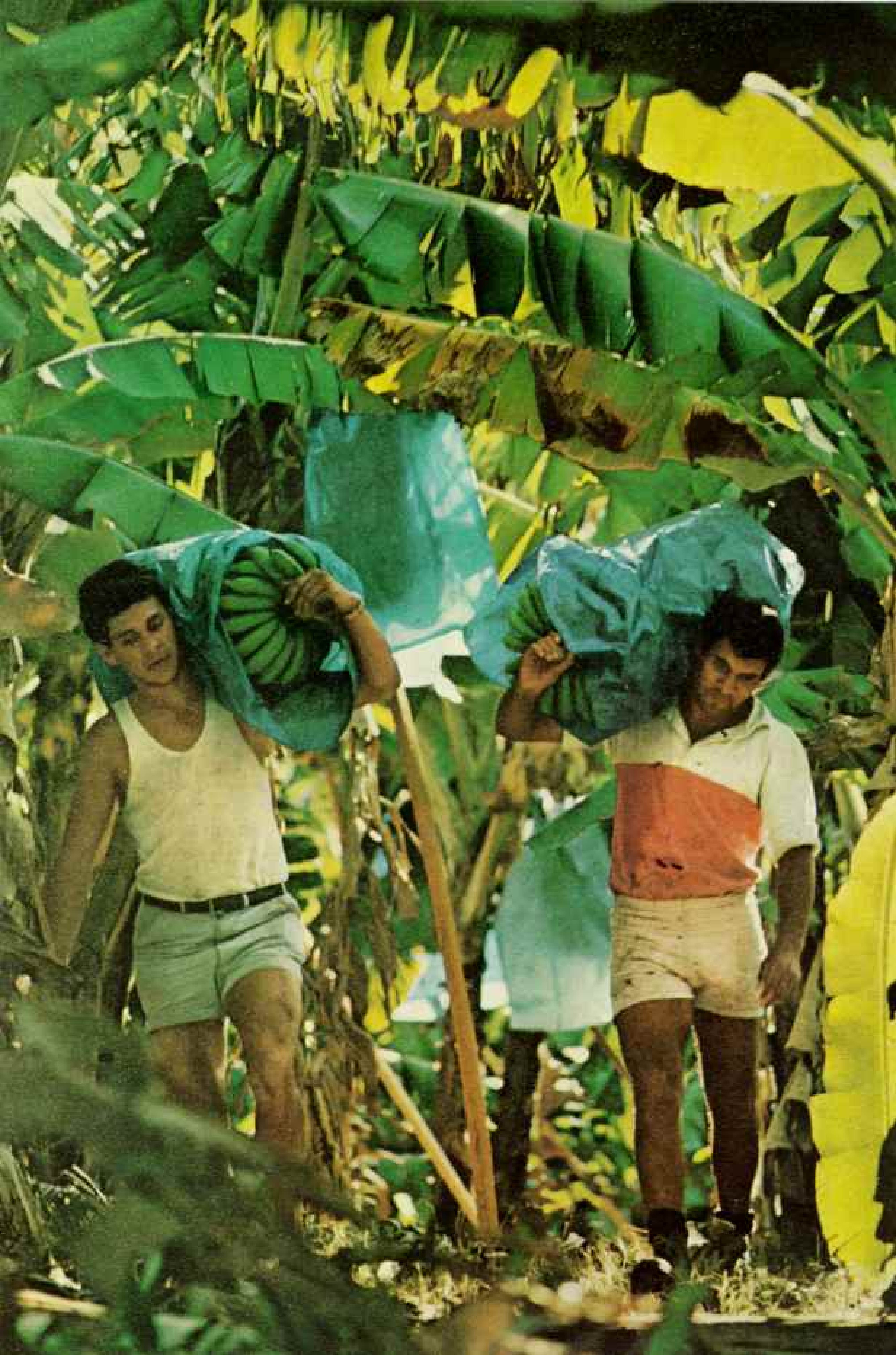
Farther west along the Murrumbidgee River, we came down at the town of Hay and met John Dale, a stock and station agent.

"Ever heard of Uardry?" he asked, pronouncing it "wardry" and referring to a Merino sheepbreeding farm in the district.

John fished in his pocket, pulled out a shilling, and pointed to a ram's head stamped on one side. "That's 'Uardry 0.1'—lambed in 1930 and grand champion of the Sydney Sheep Show in 1932."

On and off for years I'd been looking at—without really seeing—this ram's head on the Australian shilling. And now that Australia was switching to the decimal system, "Uardry 0.1" would go the way of obsolete currency—a collector's item, to phrase a coin.

At Uardry, one of the pleasantest properties you could find in New South Wales, we were welcomed by Rowand Jameson, the manager. He invited us into the white clapboard, century-old homestead that rambled under a lot of red tin roof amid trees and gardens beside the Murrumbidgee. It was a



warm day, and the cold lager he offered us slipped down like liquid air conditioning.

"We run about 20,000 breeding animals—all Merinos—on 83,000 acres," said Jameson, a tall, hefty man in his sixties. "At present we're irrigating 1,500 acres."

As Jameson drove us around the property, I noticed that Uardry kept its silos filled, and I thought sadly of Graeme Anderson's empty feed bins in the drought-scourged north. But then Uardry had a handy river that will always remain a river, thanks to SMA.

Craters Lie Where Maps Show Blue

In the plane, Greg and I followed the Murrumbidgee to its confluence with the Murray River, the natural boundary between New South Wales and Victoria. Back in the 1890's, water from the Murray had transformed the scrub and sand in the southwest corner of New South Wales into a green paradise of orchards and vineyards. Here was a textbook example of what irrigation can do for drought-prone country.

But once we left the irrigated region and headed north, we saw nothing but pastures of desperation. In normal years this district gets no more than ten inches of rain. And as we flew over the infinite aridity, I noted down: "Flat, flat land—colorless or neutral gray-brown at best. Square mile after square mile of nearly featureless sun-baked plain."

We passed what most maps persist in showing as pretty blue lakes. To me, they looked rather like huge shallow craters: hot, salt-dry, and blistery as scorched paint. Lakes, yes, of incomparable desolation.

Then, like a mirage, Broken Hill and the ragged eminence that gave this town its name cracked the dreadful monotony of the uncompromising landscape. As if to convince himself and me that it really was there, Greg circled the "Silver City," and I saw the works of four mining companies that probe the rich silver-lead-zinc lode. Of Broken Hill's 30,000 residents, 5,000 work in the mines.

Soon after landing, I arranged to go underground. In a miner's outfit, lamp and all, I dropped 3,520 feet into a mine to watch the drilling. A husky blond fellow named Ronald Moore talked with me during a respite.

"I prefer work underground," he said. "No weather worries. No temperature troubles—not too hot, never cold; it's always the same down here. And no glare like there is from the sun on top."

Good type, Ronald Moore. His strong, well-molded face seemed a natural for "portrait of a miner"—by an artist like Pro Hart.

Pro Hart first got interested in drawing at the age of seven, when he was receiving his education through correspondence school. Many outback children still study by mail, supplemented by the School of the Air, which has a base at Broken Hill.

Just as the School of the Air serves children living too far away to attend conventional schools, the Broken Hill Radio Control station of the Royal Flying Doctor Service meets the medical needs of way-outback people (page 630).* Two doctors stay in 24-hour radio touch with patients dotted around 350,000 square miles of the great Australian loneliness. In an emergency, a doctor flies to the scene, gives treatment, and, if necessary, brings the patient back to the Broken Hill hospital in an ambulance plane.

Lone Scientist Suffers Snakebite

I called at the home of flying doctor Graham A. Ambrose, who lives on a street named Iodide. He told me that clinical flights made up the bulk of the work and the two doctors together averaged 12 flights a week, three to four of which would be emergencies.

"Not so long ago," Dr. Ambrose said, "we got a call from an American astronomer at an isolated observatory on Mount McKinlay, about 175 miles west of Broken Hill. He'd been bitten on the foot by a snake—a tiger snake as I recall.

"Weather conditions were so bad at the time we couldn't fly to him. We told him what to do and insisted that he stay in radio touch with us. Next day he didn't report, and we couldn't raise him. So we sent out a rescue party on foot.

"He was still alive all right, but in pain. He got carried away with his astronomical observations and hadn't bothered to keep in touch with us. The rescue party had to carry

*Alan Villiers wrote of the work of these remarkable services in "'The Alice' in Australia's Wonderland," NATIONAL GEOGRAPHIC, February, 1966.

Bananas wear beneficial blue on McCauley's Head Plantation near Coffs Harbour. Plastic bags covering the stems of fruit guard against hail and wind and trap the sun's infrared rays to hasten maturing, increasing production by as much as 25 percent. American entomologist John Landi planted this grove, and he and a partner now raise 22,000 plants on 20 acres—a large plantation for New South Wales.

EKTACHROME BY DAVID MOORE, BLACK STAR © N.G.S.

him, against his will, down that mountain to have his foot properly looked after."

The town of Bourke appeared as an oasis after all the desperate country we'd flown over. It lay neat and green as a cabbage patch, straddling the Darling River, 300 miles north-east of Broken Hill. The river, flowing from a well-watered corner of Queensland, proved a blessing to this drought-surrounded but irrigation-conscious community.

We looked down on healthy orange groves and verdant lawns and playing fields and a municipal swimming pool reflecting the blue of the sky. The refreshing isle of 3,350 people indulged in an extravagant display of unlimited sprinklers and garden hoses that streamed like fountains.

"Thanks to the river," said Shire Clerk Bob Reynolds, who met us at the airfield, "Bourke has the largest per capita water consumption of any town in New South Wales—up to 720 gallons a day. Care for a beer?"

At the pub, men of Bourke drank beer, as Australians have always drunk beer. But the usual lightheartedness was missing; the funny stories didn't flow with the brew. Men spoke of the drought and of little else.

"I've lost between 16,000 and 17,000 head," said one grazier whose property carried 40,000 sheep in happier times.

Lightning Ridge, an hour's flight northeast of Bourke, looked more the recipient of bombings than of the bolt credited with giving the place its name. Holes by the hundred pocked the area where opal diggers, using picks and shovels and buckets and winches, delved for a living with mixed reward.

Only the day before Greg and I arrived, many of the Ridge's 1,350 people had attended and celebrated a wedding; we landed on what was obviously "the morning after." It happened to be a Sunday.

Opal-minded resident Arthur Blackwell was at the airport to bid us welcome and provide escort into town. Putting first things first, he drove us straight to the pub named Digger's Rest. Sunday notwithstanding, we found quite a party going on there.

The town of Lightning Ridge consists of a main street flanked by a hotel, post office, store, and a number of jumbled humpies, or dwellings, that impressed me as makeshift masterpieces of ingenuity—remarkable adaptations of scrap metal, lumber, stone, concrete, canvas, and empty beer bottles.

Even more casual were the miners' shanties, of all shapes and sizes seemingly scattered at random over opal fields.

"Anyone," said Arthur Blackwell, "Eskimo or Australian, can build a house and dig a

DAVID MOORE, BLACK STAR © N.G.S.

Dust, daughter of drought, seeps through closed doors and windows at Maghera Station near Bourke and coats floors and furnishings. Bob Davey, sweeping his shearers' quarters, wages a losing fight with the red enemy.

Death stalks a land devastated by the 1966 drought: Cairo Station west of Cobar. A sheep lies half buried beside a trough of artesian-well water too salty for irrigation. Owner Laurie Wetzel lost all but 40 of 5,000 sheep.

Bold brush of artist-mine worker Kevin "Pro" Hart captures the mood of Broken Hill (right).

Flight for life: The Royal Flying Doctor Service speeds a desperately ill outbacker to the Broken Hill hospital. Dr. Graham A. Ambrose uses a portable foot-operated machine to remove fluid from the patient's throat.

"Good morning!" Broken Hill principal Margaret Morris opens the School of the Air. Her 130 pupils are sprinkled across a "classroom" embracing 500,000 square miles of outback New South Wales, Queensland, and South Australia.

mine wherever he wishes at Lightning Ridge."

"No formalities about staking claims and that sort of business?" I asked.

"Nup. Not really," Blackwell said.

It all seemed so carefree that I later checked the matter out with the New South Wales Minister for Lands and Mines, and he said, "The formalities of taking up leases may or may not be observed."

That's Lightning Ridge, all right.

Windlass Marks an Active Mine

The vast majority of the world's opals come from Australia, and some of the best are mined at Lightning Ridge. They range from the size of a pea to the palm of an average hand. Their value varies according to beauty and weight—from $4 a carat upward. An unusually fine stone brings $5,000 or more.

Blackwell took me out to the diggings that honeycomb the district. We saw few men at work. Not because this was a Sunday, I gathered, but because of the wedding celebration the day before.

PAINTING COURTESY NORTH BROKEN HILL LIMITED, NEW SOUTH WALES

Monday. Almost time to go underground. But first the miner must wash and dry a shirt, a chore neglected on his free Sunday. In the distance rise the shaft heads at Broken Hill; the fifth largest city in New South Wales sprawls near one of the richest silver-lead-zinc lodes in the world. Painter Pro Hart still works in the mines, but the success of his art soon may persuade him to spend full time at the easel (pages 591 and 627).

A typical mine shaft, excavated with pick and shovel, sinks about 50 feet (next page). Some shafts go down 100 feet. Anything deeper than that rarely pays off. Indeed, countless mines never pay off and are simply abandoned. When you see a windlass at the head of a shaft, you know it's still in business. The windlass raises bucketloads of "opal dirt." But there may be many, many buckets for each opal found.

Arthur Blackwell, one of the more enterprising miners at Lightning Ridge, cuts and polishes his own opals and occasionally processes some for friends. He showed me a workshop at the rear of his house, where we found four-year-old daughter Liz. She in turn introduced me to her kitten, Miao.

"Only cat in the world that can pronounce its own name," said Blackwell.

A short hop to the southeast took us to Narrabri. Cotton got its start in this area in 1961, when two Americans from California planted and irrigated 65 acres near the Namoi River at a place named Wee Waa. Thanks to these pioneers—Frank C. Hadley and Paul D. Kahl—cotton growing has become a surprisingly successful industry of New South Wales. The Namoi Valley alone produces 15,000 tons, a good two-thirds of all Australia-grown cotton.

We reached the plantation of Hadley and Kahl at the busiest season—picking time. Frank Hadley, a wiry man in his forties, accompanied us to the fields, where huge mechanical pickers moved like stately ships on a vast, white-frothed sea (page 612).

"We're working 1,700 acres this year," Frank said. "Expect to get close to two bales an acre."

"How did you happen to select this particular region for farming?" I asked.

"Well, we needed water for irrigation, and here's the Namoi River," he said.

Both Hadley and Kahl had brought their families to Australia. They had built homes for themselves as well as houses for some of their 25 permanent employees.

Frank summed up how well settled he and

his partner were when he said, "A friend in the States wrote us the other day. The address on the envelope was 'Hadley and Kahl, Cotton Pickers Beyond The Black Stump, Australia.' And the letter arrived all right."

In Australian parlance "the black stump" marks the edge of land cleared by burning. Beyond that, you're pioneering.

Mountains Defeated the Early Settlers

At the town of Parkes, last stop on our clockwise flight, I said goodbye to Greg Searls and the plane. I hired a car for a leisurely drive over the Blue Mountains, which rise more than 4,000 feet above sea level.

For the first quarter of a century of colonial history, the mountains hemmed in the settlers at Sydney. No scouting party could find a way through the cliff-walled barrier until 1813, when three determined explorers—Gregory Blaxland, William C. Wentworth, and Lt. William Lawson—blazed the trail that led to Australia's earliest gold fields and to some of the state's richest grazing country. The hard-won trail became the nation's most historic road—the Great Western Highway. It linked Sydney and Bathurst, founded in 1815 as the continent's first inland town.

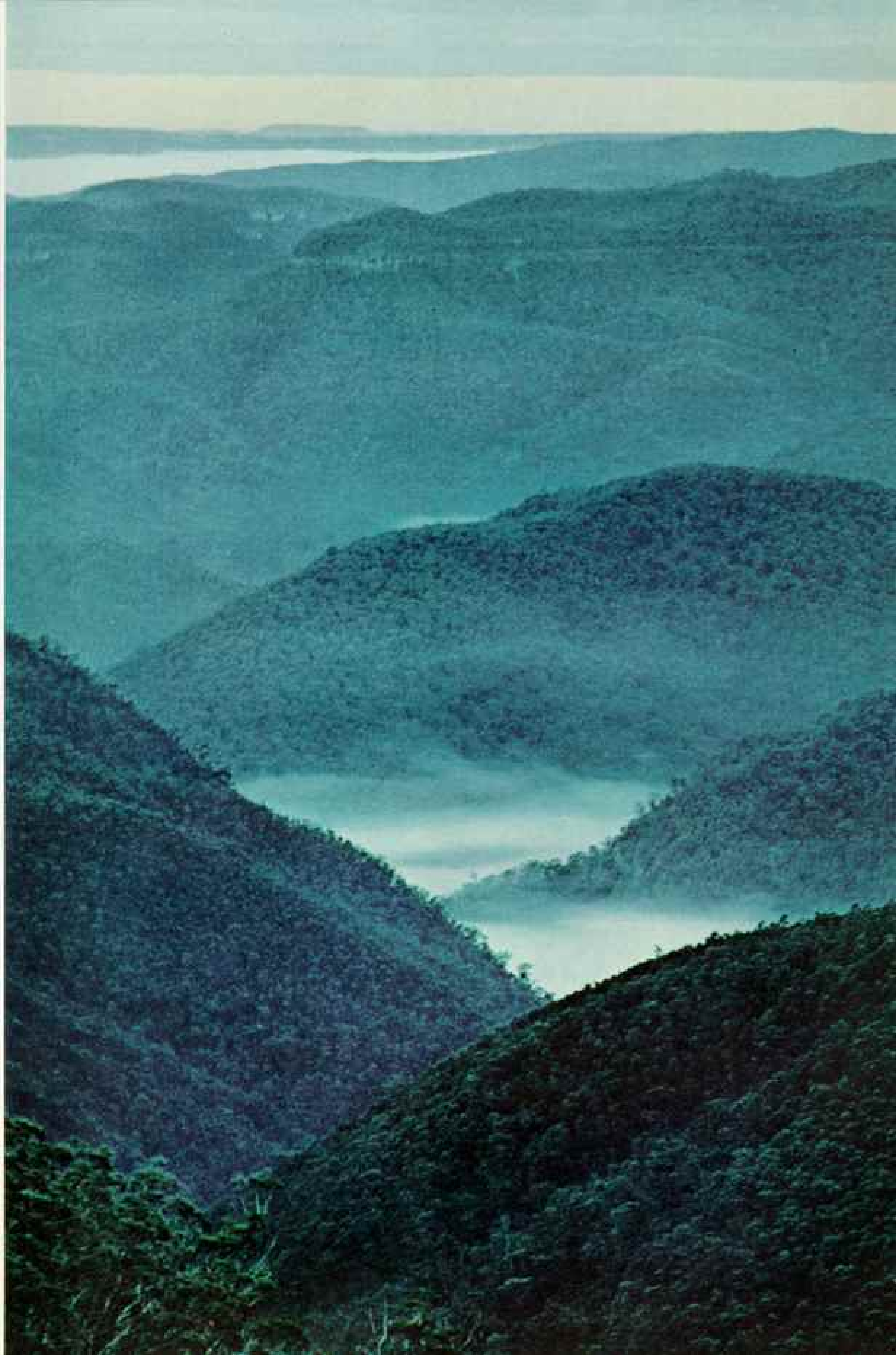
I found Bathurst efficiently and attractively laid out around a big mistake that seemed not to matter in the least. The courthouse, erected in 1880, was supposedly intended for another Bathurst—the one in Gambia, West Africa. But, because of a slight slip at the Colonial Architect's office in London, the plans for the Victorian Baroque building came to Bathurst, New South Wales. Never having been to Gambia, I couldn't judge which town's loss was the other's gain.

Whatever the aesthetic merit of the courthouse, no one could dispute the natural beauty of the Blue Mountains. Old Greg Blaxland's party figured that the only way to cross them was to get up on the long high ridges; trying to penetrate the valleys that dead-ended at cliffs got you nowhere. As a result, when you drive Blaxland's route, your best views are down—not up—hundreds of feet straight down into the wild, bush-clad gullies and wide valleys with tall, thick

Gouging out opal-bearing clay, bearded Russ Wilson works the Walk-in Mine at Lightning Ridge. He may be within inches of a fortune, yet unaware of it. At Lightning Ridge opals occur in the form of nodules, or "nobbies," and often resemble olives in size and shape. Black opals, dazzling as a tropic midnight sky, command the highest prices, $5,000 or more. Stones like the one being polished below sell for about $40.

KODACHROME (RIGHT) AND EKTACHROMES BY DAVID MOORE, BLACK STAR © N.G.S.

Mists of dawn pool deep valleys in the Kanagra Walls region of the Blue Mountains, favored haunt of bushwalkers. Named for the haze that perpetually shrouds its heights and valleys, the wooded sandstone range rises only 65 miles west of Sydney. Many who work in the capital live in this area and commute daily.



stands of eucalyptus that defied the hardiest explorers (previous page).

I drove down into Sydney amid all the excitement of the annual Royal Easter Show. The ten-day affair is lavishly staged by the Royal Agricultural Society of New South Wales, an organization "dedicated to the development of the agricultural, pastoral, viticultural, horticultural, mineral and industrial resources of the State."

Wandering around the 70-acre showground, I witnessed the showing and selling of some of the best-bred livestock in the world. I saw magnificent exhibits of flowers, fruits, vegetables, arts and crafts. There were wood-chopping contests and wool-shearing demonstrations. One huge hall displayed coal-mining techniques; another, the latest achievements in electronics.

The Royal Easter Show, more effectively than any other occasion, brings countryfolk and cityfolk together in a huge welding of pride in New South Wales. Thousands come to see what their land and people produce.

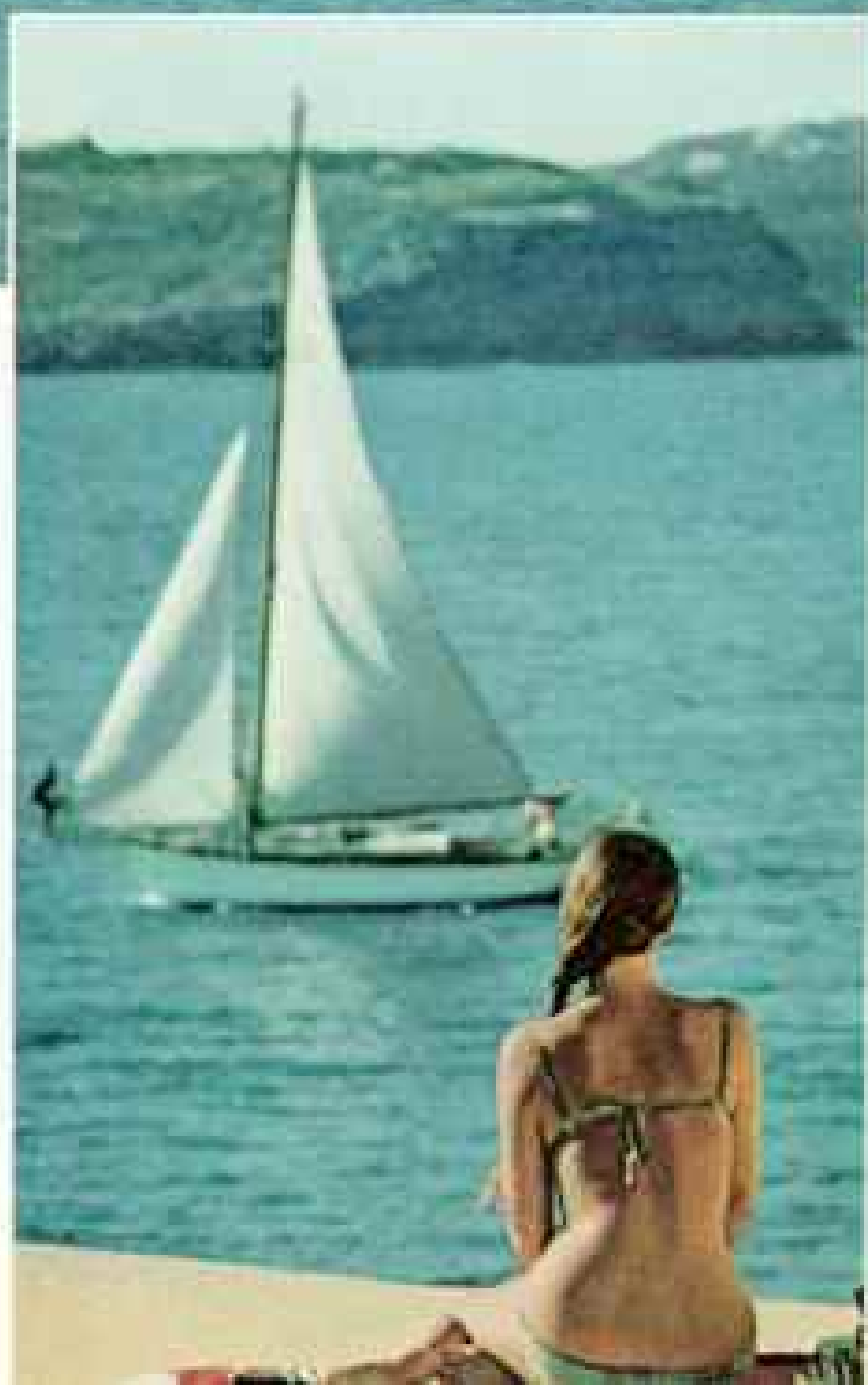
Along with them I admire the ingenuity and variety and plenty. But beyond all this, I see in New South Wales the epitome of Australia. The enterprising state has just about everything the rest of the continent has. And, like the nation it cradled, it leads two lives as different from each other as the city and the outback.

THE END

EKTACHROME (ABOVE) AND KODACHROME BY JANE MARSTON © N.G.S.

"Roughest race in the world," veteran yachtsmen call the 735-mile run from Sydney to Hobart, Tasmania. Hundreds of spectator boats make the start a nightmare. As the competitors jockey for position, they must also dodge ferries and freighters.

Once they reach the open ocean, skippers know that they will get a blow somewhere on the course, usually a fierce one in Bass Strait, between Tasmania and the mainland.



Down to the sea in ships, but for one who has none there is always the sun and the fun of watching the sloops go by.

Yellowstone Wildlife in Winter

Article and photographs by
WILLIAM ALBERT ALLARD

OVER THE RIDGE and across the creek the buffalo thundered. Belly-deep in midwinter snow, the lead bull had guided his herd of 80 in wild flight across four miles of rugged terrain. Strung out in single file, the great beasts crashed through icy creek waters and patches of lodgepole pine.

Now the chase was nearing its end and the hunters were closing in. But on this hunt there would be no trophies. Our mission was to trap and check the herd, part of the program of research

CHARGING THROUGH *a veil of white, as in a prehistoric cave painting sprung to life, a herd of buffalo plows through heavy snow. In the ermine splendor of winter, bison, elk, bighorn sheep, antelope, and deer still wander the virgin wilderness of Yellowstone National Park as they did when only the red man shared their domain.*

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

and population control conducted here by the National Park Service.

The pursuit had begun one crystal-clear January morning on a snow-covered field at Mammoth Hot Springs, Wyoming, headquarters of Yellowstone National Park. Two helicopters poised there for take-off. Park Service wildlife scientists rode in helicopter No. 1, and I sat in the other with pilot Robert Schellinger.

"Helicopter two . . . helicopter two . . . this is helicopter one."

"Go ahead, one," replied my pilot, and helicopter one came on again. "We'll try Hayden Valley. Maybe we can get a big herd moving."

The pilots applied power, and both craft lifted off.

Reflecting on the mechanical aids at our command, I thought this a strange way to pursue the magnificent animals that once, in vast herds, darkened the western plains. But perhaps I was still under the spell of a frontiersman named Osborne Russell.

In his *Journal of a Trapper,* covering 1834-43, he wrote: "If Kings Princes Nobles and Gentlemen can derive so much sport and Pleasure as they boast of in chasing a fox or simple hare . . . what pleasure can the Rocky Mountain hunter be expected to derive in running with a well trained horse such a noble and stately animal as the Bison?"

Buffalo Hunt—Twentieth-century Style

As we skimmed along at 500 feet, the mountainous Yellowstone panorama spread out before our eyes like a rumpled quilt, with towering pines and deep snow forming a pattern of green and white. This was the winter wilderness that few Yellowstone visitors see.

In Hayden Valley we hoped to find buffalo and drive them toward a trap built along Nez Perce Creek. There blood tests would be given to detect brucellosis, a contagious disease that causes certain animals—especially cattle, swine, and goats—to abort their young. Diseased and surplus animals would be removed from the herd, and a few would be neckbanded to facilitate studies of bison movements.

We were almost to Hayden Valley when I saw four bull elk grazing in a snowy meadow. At the sound of our approach they dashed for the shelter of heavy timber.

"They're getting a little spooky," Bob said as the elk disappeared into the pine. "Each year the animals seem to get a little wiser and flush faster at the sound of a helicopter."

Our attention was drawn from the elk by the sight of the other helicopter veering sharply down. Following its lead, we were soon at treetop level over an open ridge.

"There they are!" Bob shouted. I saw the buffalo at the same time—about 80 shaggy beasts flecking the white ridge with brown.

For a moment they stood fast. Several pawed at the ground and lowered their heads as if threatening to charge the noisy intruders. Suddenly one swung into a gallop, and in an instant the others followed. In single file the herd rolled across the ridge. Pounding hoofs kicked up clouds of powdery snow.

"We have to keep them from splitting up and getting into the timber,"

(Continued on page 640)

Sure-footed nomads, cow elk cross steam-plumed Lower Geyser Basin without getting scalded. In winter many of the beasts forage around thermal regions where steam warms the air and keeps snow to a minimum. Trappers of old, fearful of breaking through ice into hot springs, followed elk tracks when threading such treacherous terrain. "The treading of our horses," wrote one mountain man, "sounded like travelling on a plank platform . . . whilst the hot water and steam were spouting and hissing around us. . . ." KODACHROME © N.G.S.

Roam Yellowstone with scientists tracking grizzlies by radio

Drugged bears surrender blood samples and tooth prints. Red collar carries an automatic transmitter for radio tracking.

KODACHROMES (ABOVE AND OVERLEAF) BY FRANK AND JOHN CRAIGHEAD © N.G.S.

YOU WATCH a half-grown grizzly, 500 pounds of claw and muscle, as he lies immobilized by a harmless anesthetic. Scientists examine him and take measurements. Suddenly the "helpless" bear roars to life and the scientists scatter, lucky to escape unharmed.

A huge grizzly sow—wily and elusive as a woodland shadow—becomes the world's first instrumented bear. Following signals beeped from a tiny radio transmitter hung around her neck, you track her to a place no man has ever followed a grizzly before: her winter den.

These moments of adventure and discovery will come to you on Wednesday evening, November 1, when the National Geographic Society presents "Grizzly!"—first in its 1967-68 series of hour-long color specials.

Roaming the high country of Yellowstone with Frank and John Craighead, brothers and eminent scientists, you will seek out *Ursus horribilis*. Since the early 1800's man has hunted this formidable creature with rifles, crowded his domain, and now driven him to the edge of extinction. The Craigheads also use guns, but their bullets are drug-filled darts and they aim not to kill but to gather knowledge that may save the grizzly from vanishing forever.

You will watch the scientists and their students as they work to learn how long a grizzly lives, how much land he needs, his weight, pulse, blood chemistry. Their studies even include analysis of the mother's milk. Such facts will provide the basis for a grizzly conservation program—insurance that future generations of Americans can thrill to the sight of this great wilderness bear.

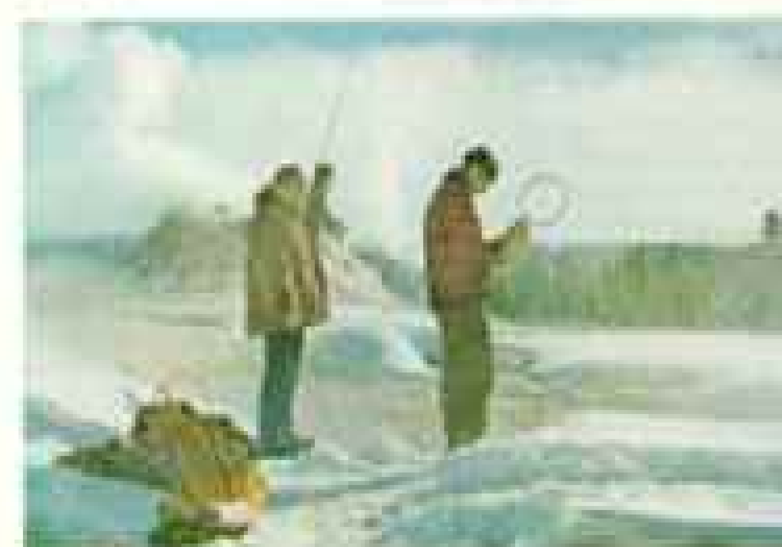
Produced by your Society in association with David L. Wolper and narrated by Alexander Scourby, this CBS program is sponsored by Encyclopaedia Britannica, Inc., and Aetna Life & Casualty.

KODACHROME BY LANCE CRAIGHEAD

Leaping to safety, Dr. John Craighead abandons his camera when a yearling awakens early from a knockout shot. Vision still foggy, she charges sounds.

Quarter-ton sow ambles along a creek at sunset. The Craigheads' continuing study can help save the vanishing grizzly.

Beside a geyser cone in Yellowstone National Park, researchers test radio gear that leads them to hidden dens of bears.



EKTACHROME (BELOW) AND KODACHROME BY FRANK AND JOHN CRAIGHEAD

TEAR OUT THE ATTACHED PAGE as your reminder to view "Grizzly!"—first in the Society's 1967-68 television series.

Bob explained, as we dived quickly to head off a cow and a calf that seemed determined to leave the trail. By now I had slid back a helicopter window. Bitter-cold blasts whipped my face and hands as I photographed the galloping bison.

The drive was only ten minutes old when I noticed the buffalo were running with their tongues hanging out. Steam billowed from their nostrils. They couldn't go much farther at this pace, I thought. Surely they would drop from exhaustion. Yet they seemed to be running harder. Bob sensed my concern.

"They'll run like that forever," he said. "Their endurance will amaze you."

It did. The four-mile drive had included several creek crossings (pages 642-4). When we left the buffalo, still ten miles from the trap, they looked tired but able to hit the trail again. They could rest now; we would drive them on into the trap on another day.

Tribesmen Banished, but Game Survives

Flying back to Mammoth Hot Springs, we passed over rolling hills and meadows laced with trails of elk, buffalo, bighorn sheep, and deer. Long before the winter of 1807, when trapper John Colter explored this country, the abundance of game had made Yellowstone a natural hunting ground for great Indian nations. First came the Shoshoni and Bannock, and later the Crow, Nez Percé, and Flathead, to fill their bellies and lodges with meat and hides.

In 1877, five years after Yellowstone became our first national park, the Nez Percé hunted the area for the last time, as Chief Joseph led them on an ill-fated retreat from U. S. Cavalry. Troops finally caught up with the Indians in Montana near the Canadian border, well beyond the park confines, and defeated them in battle. Chief Joseph and other survivors were sent to a reservation.

Today, thanks to an enlightened wildlife-management program, Yellowstone shelters a variety of game, much as when Indians and mountain men drifted through the wilderness. A good share of the credit belongs to former Superintendent Lemuel A. (Lon) Garrison and to Robert E. Howe, for ten years Yellowstone's park biologist. Recently Bob became superintendent of Sitka and Glacier Bay National Monuments in Alaska.

I visited with Bob in Yellowstone after returning from the morning's buffalo drive. Over coffee he briefed me on the goals of the management program.

"The National Park Service's objective," he said, "is simply to keep the park as natural as possible. We aim to have a representation of each wildlife species that existed in Yellowstone when the mountain men first arrived."

The wolf, Bob said, is the only original predator no longer found in Yellowstone.

"We realize now that we were too hard on the wolves and mountain lions in the early days," he said. "We hope eventually to reintroduce wolves into the park. But Yellowstone is surrounded by ranching country, and bringing back these predators would be a matter of serious concern to ranchers."

Mountain lions are occasionally reported in the park, and coyotes are abundant.

"Coyotes are no real threat to the big game herds," Bob said. "An elk or buffalo is more than a match for a coyote, and nature protects the calves. Like the young of all wild creatures, an elk or buffalo calf gives off almost no scent. A coyote could pass within ten feet of a newborn elk and not know it was there."

Aspen Threatened by Browsing Elk

Grazing competition between species has been a major problem in Yellowstone. To maintain the park's natural state, the vegetation must also be protected. In the early years animals could easily move into unpopulated areas outside the park for winter food. Now, as more people come to ranch or farm, the park's animals—especially its herds of elk—find winter forage increasingly scarce.

Elk wreak havoc upon aspen trees, devouring their young shoots. With no regrowth from seedlings, the colorful aspen could vanish from the park.

(Continued on page 647)

Badge of maturity, 12-tined antlers crown a lordly bull elk in Yellowstone; they serve also as formidable weapons (page 651). Breaking through snow to find food, this bull has added a white mask to his face and frosting to his antlers. Once held in check by wolves and mountain lions, the area's elk today lack natural enemies. At present the park shelters about 6,000, plus an additional 4,000 in summer, when Yellowstone's high pastures attract animals from neighboring wilds. To maintain proper balance with bighorn sheep, antelope, and deer populations, rangers must occasionally reduce the elk herd so that lack of food does not endanger all.

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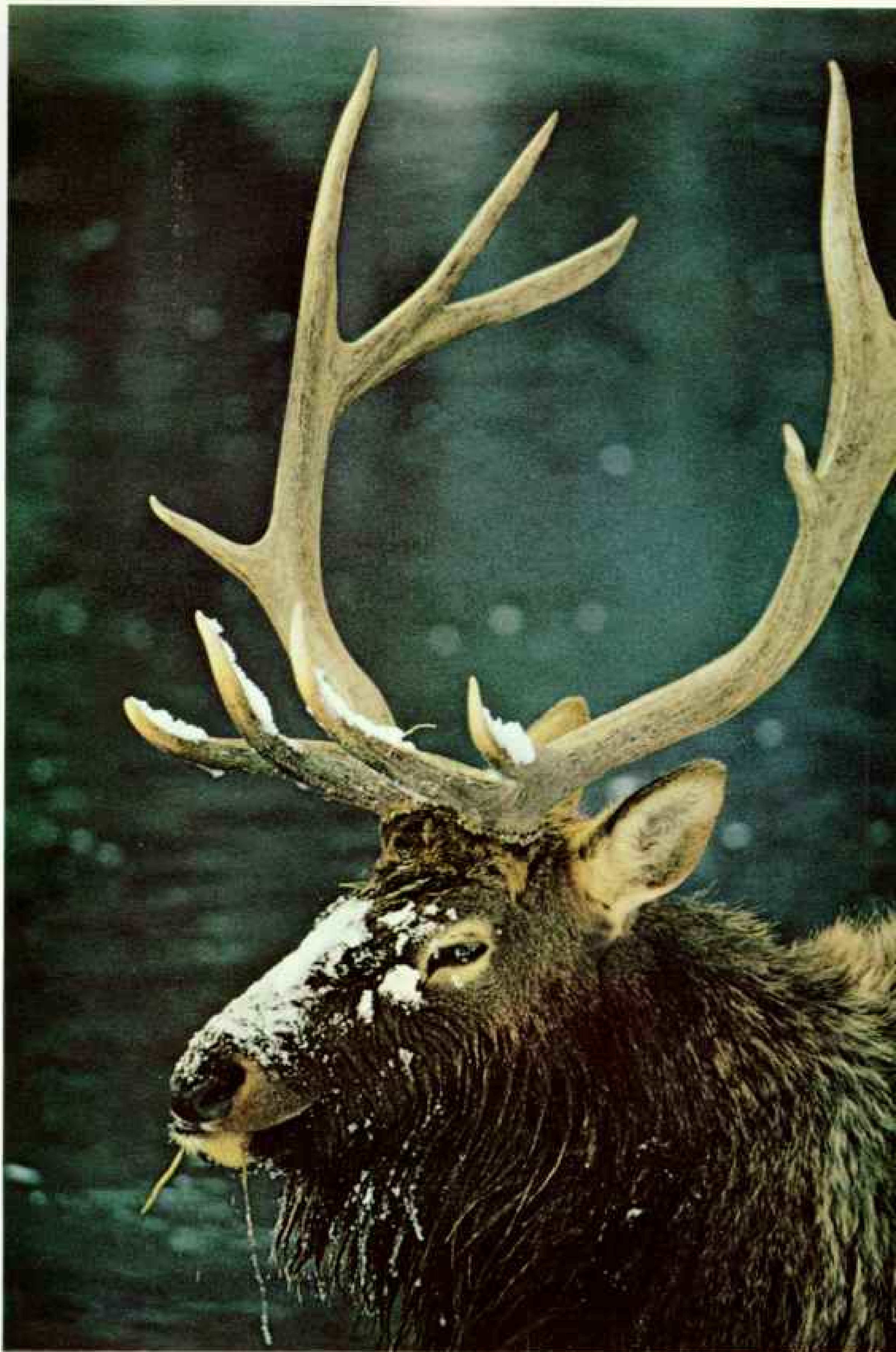


KODACHROME BY WILLIAM ALBERT ALLARD © N.G.S.

America's first national park and wildlife refuge, Yellowstone helped save major game animals from extinction. After golden leaves fall from the aspen and winter's first heavy blanket of snow covers the park, most grazing animals begin to herd together. They drift down in groups from the mountains to congregate in the park's river valleys and thermal areas.

Like a freight train on the move, bison herded by a helicopter rush along Alum Creek toward the Nez Perce Creek buffalo trap for tagging and testing (pages 652-3). Before the wanton slaughter for hides, meat, and sport in the 1800's, bison numbered 60 million. By 1889 fewer than 1,300 survived. Yellowstone today protects 400 of North America's total of 23,000. EKTACHROME © N.G.S.

OPPOSITE PAGE FOLDS OUT

"We manage some animals indirectly," Bob continued. "Take those in the Mount Everts area, for instance. It's the primary winter range for some of our 300 bighorn sheep—but mule deer, elk, and antelope also graze there. If we think the elk competition is too great for the sheep, we manage the sheep indirectly by removing the elk. If we should find deer and antelope in a range struggle, we would probably remove deer because we have fewer antelope—about 200—and they are restricted to a much smaller area of the park."

Of the elk rounded up and trapped during the 1966-67 winter, 1,105 were shipped to federal and state agencies and private landowners. Others were released wearing bright-colored neck bands that would aid in the study of their movements within the park (page 652).

Bull Elk Guards Herd's Flanks and Rear

I left Bob's office with an invitation to fly on an elk roundup at dawn the next day. It was still dark when we took off, the helicopter rotors shattering the morning calm. I rode again with Bob Schellinger, while William Barmore, assistant park biologist, went with pilot Elwood (Swede) Nelson.

As the sky lightened, the horizon was broken by milky columns of steam rising from the hot springs. In the distance the magnificent Teton Range appeared high above the south approach to the park.

We found the elk herd quickly. Bob and Swede dipped low to round up about 100 head for the drive to the trap. Elk will scatter faster and farther than buffalo, and each move by Bob and Swede became a demonstration of their skill as pilots. Keeping the animals in control, maintaining safe distance between helicopters, and avoiding a deadly brush with the treetops demanded steady concentration and instant reflexes.

Some elk had reached timber. Bob dropped to just above the pines, and as we hovered noisily, the downdraft of rotors and resulting whirlwind of snow frightened the animals out into the open.

It was a short drive of about two or three miles, and soon we were within sight of the trap, hidden in an aspen grove. Seeking an escape, the elk ran

"King of the blizzard." Thus in 1899 naturalist Col. Charles J. (Buffalo) Jones crowned the bison. "His robe is a 'solid comfort' when the wintry blasts howl."

Breath smoking from their nostrils, buffalo move through rump-deep snow. Terrifying must have been the sight for hunters caught in a stampede. "Like a cyclone in its fury," wrote Jones. "Irresistible as an avalanche," said another, fortunate enough to have survived the onslaught.

KODACHROME BY WILLIAM ALBERT ALLARD © N.G.S.

directly into the timber enclosed by the trap fence. Most of the herd were cows and calves. A handsome bull with huge jutting antlers trailed behind. As is typical of elk, deer, and buffalo, the dutiful old man posted himself as a rear guard while the ladies led the way.

With the elk in the trap, Swede landed near the grove so that Bill Barmore could run to close the trap gate. Next day most of the animals would be loaded into trucks and shipped to areas far from the park.

If the winter is extremely mild, elk tend to scatter in small groups across the high country, where roundups by helicopter are not possible. Then some must be shot to reduce herds and thus avert starvation.

Visitors Drawn by Winter Beauty

As we headed for home, Bob took a few detours to give me a better over-all view of the Yellowstone wilderness.

On Hellroaring Mountain we watched a bighorn ram (pages 654-5) run pell-mell along a snow-rimmed crag. Wheeling south, we passed over Old Faithful just as it erupted (page 656), then crossed Pitchstone Plateau to the edge of the park and over the icy lid of Jackson Lake, sprawled beneath the Tetons.

Coming back, we spotted elk amid steaming geysers bordering the Firehole

Friendly tanks invade the park. Tourist facilities in West Yellowstone and Mammoth Hot Springs offer snowmobile rides along Yellowstone's unplowed roads. Tractor treads carry the vehicles down the Firehole Canyon Road (left). Open rooftops (below) give visitors an unobstructed view of snowy slopes and animal herds. Sightseers pausing at the Firehole River (right) watch elk wade the icy stream.

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

River (page 639). Along the Lower Geyser Basin we waved at sightseers standing beside the tanklike snowmobiles that had brought them in over the snowbound road from West Yellowstone (preceding pages).

Except for winding roads and scattered visitor and ranger facilities, 90 percent of Yellowstone's 3,472 square miles remains in the wilderness condition in which it was discovered. Until recently the park had seen few winter visitors; rangers and maintenance crews had it pretty much to themselves.

The day is perhaps not far off when large numbers of visitors, bundled up in snowmobiles, will see much more of the park's winter beauty. When that day comes, fleets of steel-treaded half-tracks will rumble across a land that once knew only the snowshoes of Indians and trappers.

Crusty Snow Defeats the Bison

Later that week I drove out to the Nez Perce Creek buffalo trap, where the herd from Hayden Valley finally had been corralled. From the main trap the bison were driven into a long chute. Then, singly, they were urged into "squeeze chutes," narrow stalls with steel bars to prevent the tossing of horned heads or other dangerous movements.

While a researcher attached identification

Wary scavenger, a Slough Creek coyote dines on elk—a banquet compared to his usual meal of small rodents. Though considered a pest by ranchers, coyotes help rid the park of carrion.

tags to the animals' ears, a veterinarian tested for brucellosis. Bison that reacted positively, as well as surplus animals, would be destroyed. After calves were vaccinated, the herd would be set free once more.

As the taggers and testers did their work, I talked to them about the buffalo. It is a tougher, more adaptable animal than I had thought, comfortably adjusting to almost any condition except deep, crusty snow. When its food supply lies under a white mantle, it burrows with head swaying from side to side, brushing away the snow from the grass.

I had done some background reading on brucellosis, the disease that affects 23 percent of Yellowstone's 400 buffalo. It is caused by the bacteria *Brucella,* named for the British bacteriologist Sir David Bruce, who identified it in 1887.

Bruce's find came after he was sent to investigate the illness, sometimes fatal, of many British soldiers and sailors serving at Malta and elsewhere in the Mediterranean. The victims had drunk the milk of infected goats, and the disease that felled them was known for many years as "Malta fever," or "Mediterranean fever."

Brucellosis is widely known also as Bang's disease, after Dr. Bernhard Bang of Denmark, who isolated a closely related bacterium

Armed and edgy, bull elk spring to battle. Most polygamous of American deer, a mighty bull may lead a herd of 60 cows during the fall mating season, but he must stand ready to defeat all rivals.

KODACHROMES © N.G.S.

Ribbon necklace adorns a young cow elk, one of 1,500 tagged by park rangers to study elk movements. Graduate students supervised by Drs. John and Frank Craighead have made more than 5,500 sightings of the tagged animals in a five-year period. The Craigheads also attach tiny radio transmitters to elk, black bears, and grizzlies to trace their travels and learn pulse and body temperature. This pioneering project, supported by your Society, is one of many wildlife programs being carried on in Yellowstone's outdoor laboratory.

Helicopter cowboys round up bison. The chopper chases them to a trap concealed in the trees, first step in removing surplus and diseased animals. Tests for brucellosis help protect cattle on nearby ranches.

in cattle ten years after Bruce's discovery.

Malta fever now is called undulant fever, and humans contract it by drinking unpasteurized milk from contaminated cows or goats, or by direct contact with infected animals. Since nobody drinks buffalo milk, the main concern of Yellowstone officials is to cooperate with the Department of Agriculture in keeping brucellosis from spreading from the park bison herd to cattle on adjacent lands.

Treatment for the ailment in man is available, but so far there is no cure for animals. I learned that a partially effective vaccine for cattle is in regular use, and I wondered about the other hoofed animals. I put the question to a wildlife biologist:

"Aren't elk, antelope, deer, bighorn sheep, and moose also subject to brucellosis?"

"Those animals are much less gregarious at calving time than buffalo," he replied. "When the disease is conquered in buffalo, the effect on other wildlife, even now comparatively slight, is expected to die out."

As for undulant fever in man, it too, I

learned, has virtually ceased to be a problem in the United States. In the old days, before pasteurization of milk was a routine practice, the Nation counted many thousands of cases annually; the total for as recent a year as 1947 was more than 6,000.

Since then, with state and federal health authorities cooperating, the annual incidence of undulant fever has fallen off dramatically. In 1966 the U. S. Public Health Service recorded fewer than 300 cases. Most were contracted from swine rather than cattle, and the victims were principally packing-house workers, farmers, or veterinarians who had direct contact with infected animals or diseased blood or tissue.

Bison Herd Grew From Only 20 Head

Yellowstone's present buffalo herd owes its existence largely to a conservation campaign initiated around the turn of the century. By that time indiscriminate slaughter by poachers had left the park with about twenty bison, where once there had been thousands.

Acrobat of the Rockies, the bighorn sheep scales seemingly impossible pinnacles. "The fearful heights from which it jumps and the small points on which it alights without slipping or missing its footing is astonishing," wrote trapper Osborne Russell, who crisscrossed the Yellowstone region from 1834 to 1843. Lewis and Clark found the nimble animals "too shy to be shot."

Rams in their prime live a bachelor life, except during rutting season. Then they may batter each other senseless for possession of a harem of ewes.

Near Hellroaring Mountain a bighorn seems to sprout from the side of a cliff (left). In the park some 300 of these wild sheep roam free from the danger of man, who elsewhere seeks the curving horns for trophies. Here only disease, winter's shortage of food, and an occasional mountain lion threaten their existence.

Gamboling in the snow, a bighorn ram crosses ski tracks on the flats near the Yellowstone River.

In 1902, with a $15,000 appropriation from Congress, the park obtained 18 female bison from the Pablo-Allard herd on the Flathead Indian Reservation in Montana, and three bulls from the ranch of Col. Charles Goodnight in the Texas Panhandle. This action has been recorded as the first real effort to preserve and perpetuate the species *Bison bison*.

A century or more ago, an estimated 60 million buffalo roamed North America. In the two decades following the Civil War, most were slaughtered, so that by 1889 the species was facing extinction. Today there are about 12,000 in the United States, 11,000 in Canada.

Coyotes Feast on Fallen Giants

During my winter visit to Yellowstone I found I could keep abreast of gossip about wildlife and other matters by frequenting the restaurant of the Town Motel in Gardiner, Montana, at the park's north gate. There one evening I encountered Dr. Paul Holcomb, a Department of Agriculture veterinarian working with the Park Service on brucellosis control. He had heard that I was hoping to make night photographs of coyotes feeding.

"You'd better get right out to the Slough Creek trap," he said. "We lost a couple of elk out there today. They were injured and had to be destroyed. You can count on plenty of coyotes tonight."

I hurriedly packed sandwiches and coffee into the car and headed for Slough Creek (map, page 642). A big mule deer's startling leap across the icy road 40 feet in front of me highlighted the 30-mile drive. Soon I turned off the main road, weaving and bumping along a plowed path to the elk trap, a mile back in the hills.

Doc Holcomb had been right when he said there would be plenty of coyotes on the scene. As I drove within sight of the trap, a dozen pairs of eyes blazed yellow in the glare of the headlights, then vanished into the moonless night. The elk carcasses stood out against snow already trampled with coyote tracks.

It was almost midnight when I had set up my electronic-flash units near the carcasses and returned to the car, 15 yards away.

Only a minute or two slipped by before my vigil was interrupted by one of the most spine-tingling—yet beautiful—sounds of the wild. Coyotes were calling out of the darkness. Each piercing cry reached out to me. Cold and mournful, the indescribable sound reached its peak, then blended with the night.

KODACHROMES BY WILLIAM ALBERT ALLARD © N.G.S.

"In generations to come," says Old Man Coyote in a Flathead Indian tale, "this place... will be a treasure of the people." True to his prophecy, more than two million visited Yellowstone in 1966. A favorite sight, Old Faithful, left, steams beside the Firehole River. Visitor and ranger facilities wear snow caps; to the north sparkle distant Montana peaks.

On ski patrol, Ranger Gary Brown (below) surveys the region around his home (above) to observe wildlife activity and determine snow conditions.

EKTACHROME (UPPER) AND KODACHROMES © N.G.S.

For the remainder of the evening I would be an uninvited guest at dinner.

The cries of the coyotes grew closer... closer. Then they stopped, and the air was still. Camera in hand, I huddled in the car and waited. I felt I was not alone. They were probably all around me, sitting on their haunches, waiting. The presence of my car would not frighten them; they were familiar with man scent around the elk trap. But I must not move. The slightest movement would send them slinking off into the brush.

Nocturnal Diners Finally Arrive

Snow was falling gently now as I peered into the darkness. Suddenly, what had appeared to be a still, dark object became a shadow crossing the open snow. Then another . . . and another. I slowly aimed the camera, released the shutter, and a brilliant burst of light revealed a sleek coyote straddling his meal (page 650) while several others watched from a few yards away.

The electronic flash did not seem to disturb them, so I quietly continued making pictures. Perhaps they had become accustomed to the constant beam of a miner's

Speedsters rocket across the snow. Pronghorns, popularly called antelope, will race anything—including helicopters. They can run 50 miles an hour for a stretch and cruise easily at 30.

"It takes a mighty good greyhound to catch a mighty poor antelope," said a Kansan to Buffalo Jones. Buff-and-cream coats blend with Yellowstone's shrub and snow terrain in a frieze of frozen motion.

KODACHROMES BY WILLIAM ALBERT ALLARD © N.G.S.

headlamp I wore to assist me in focusing.

Although there was well over a thousand pounds of meat for the taking, only one or two coyotes at a time would come in to feed. The others had to wait their turns. Any attempt to slip in for a quick bite brought a snarling, hair-bristling attack from those already eating.

Ordinarily the waiting coyotes would have been much more daring and bold in their hunger. However, it was an unusually mild winter and small game and field mice, the normal coyote diet, were plentiful. Tonight the scavengers were fat and patient.

Dawn brought my work to a halt. My presence was too obvious now, and the coyotes retreated. Most of the meal was still untouched, but I knew that with my departure the coyotes would return and finish their feast. By evening only skeletons would remain.

Driving away from Slough Creek, I saw a lone coyote trotting across a hilltop toward the elk trap. In the somber morning light I imagined he might be heading for the remnants of a Shoshoni buffalo hunt—were it not for the droning reality of my 20th-century automobile engine.

Ranger Families Hold Ski Frolic

Shortly before leaving Yellowstone, I spent several days with Ranger Gary Brown and his family. I had passed their cabin many times while cruising the Northeast Entrance Road along the Lamar River (page 657).

We met at a Saturday ski outing for park employees and their families on a gentle slope at Undine Falls, east of Mammoth Hot Springs. The children competed in downhill races and the parents had a contest of their own—an obstacle race with each contestant wearing one ski and one snowshoe while climbing over hay bales, under tarpaulins, and through automobile tires.

Winter brings a slower pace for the rangers. If they're not working on a roundup, they help build and repair equipment and patrol the roads for snowbound cars. The road from Mammoth Hot Springs to Cooke City remains open to the public in winter.

Gary also makes two- and three-day ski patrols to count wildlife. During these trips he stays overnight in well-stocked patrol cabins spaced ten to twelve miles apart in the back country.

Nature's Plan Survives in the Park

On a Monday I accompanied Gary on a patrol to Trout Lake, a quarter of a mile off the Northeast Entrance Road. Gary clamped on his skis, but I stuck to snowshoes.

We flushed a big bull buffalo from the timber on our way in. On our return Soda Butte Creek was busy with chattering ducks.

Heading home, we saw the carcass of a young buffalo lying in the snow across the creek. Too weak to keep up with the herd, she had fallen behind and died.

"I'd better check her for our researchers," Gary said, and he crossed some ice to examine the carcass. He returned with two eartags.

It was getting late. Far off on a sage-dotted flat, four coyotes waited for nightfall, when they would feed on the fallen buffalo.

That evening I thought of something park biologist Bob Howe had said weeks earlier:

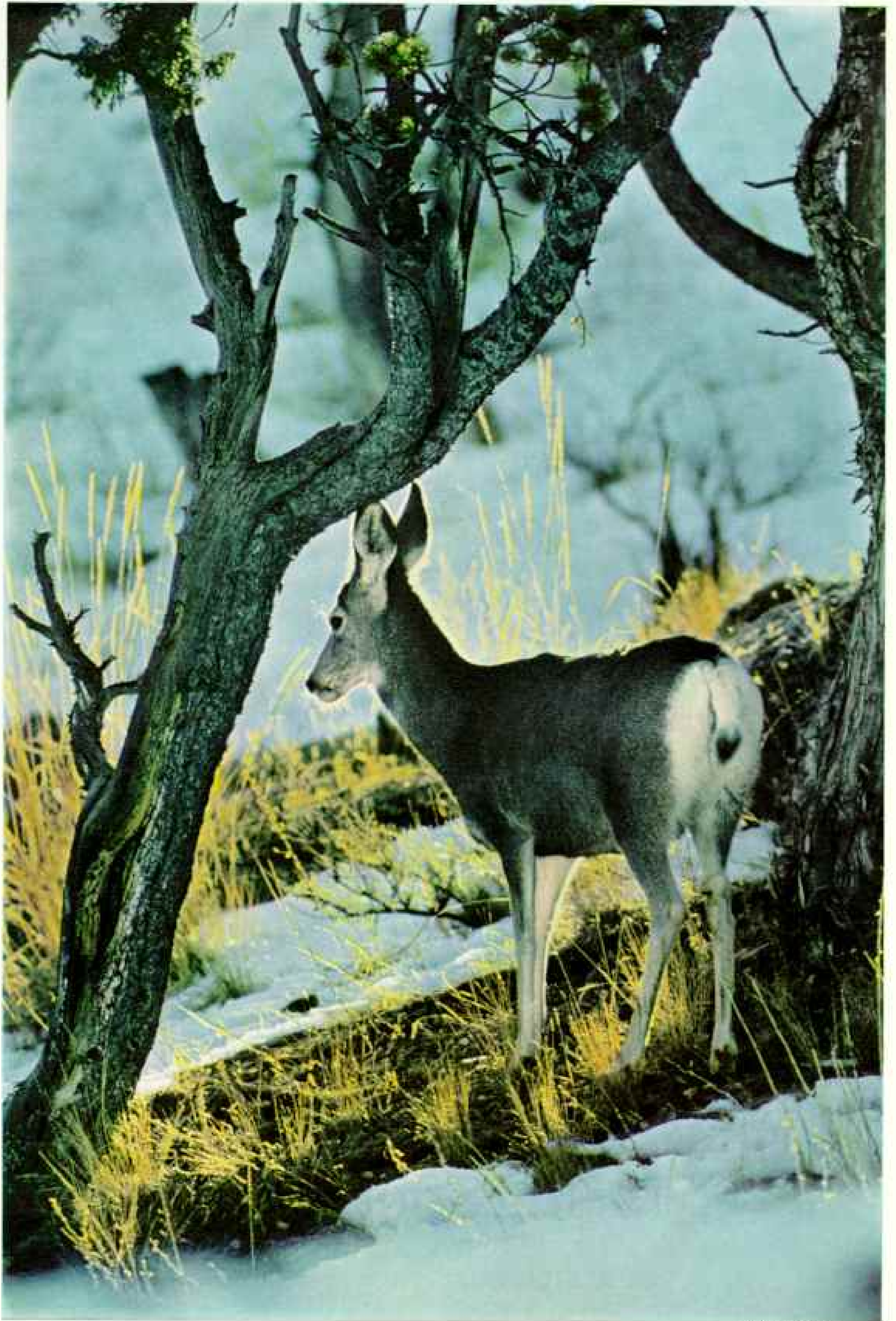
"Many people think of wild animals as being either good or bad. But in nature that isn't true. And it isn't true in our national parks. Here everything lives on something else, everything has its place—and that's the way nature planned it."

In Yellowstone I had witnessed the Park Service's dedicated efforts to preserve the magnificence of a rugged country and its wild inhabitants. Perhaps it was this magnificence that trapper Osborne Russell wanted to record in his journal as he gazed upon the Yellowstone wilderness more than a century ago—"I almost wished I could spend the remainder of my days in a place like this where happiness and contentment seemed to reign in wild romantic splendor. . . ."

It's that kind of country. THE END

For additional articles on Yellowstone Park and its wildlife, see *National Geographic Index 1947-1963*, and *1964-66 Supplement.*

Shy and silent stands a mule deer doe, scanning the scene for danger before venturing out to feed. Black-tipped tail and large ears help distinguish this species from the eastern white-tailed deer. To her and her human guests belongs Yellowstone's grandeur, a glory that evoked poetry even from tough mountain men. "Adieu ye hoary icy mantled towers . . ." wrote Osborne Russell, "Ye rugged mounts ye vales ye streams and trees, To you a hunter bids his last farewell."



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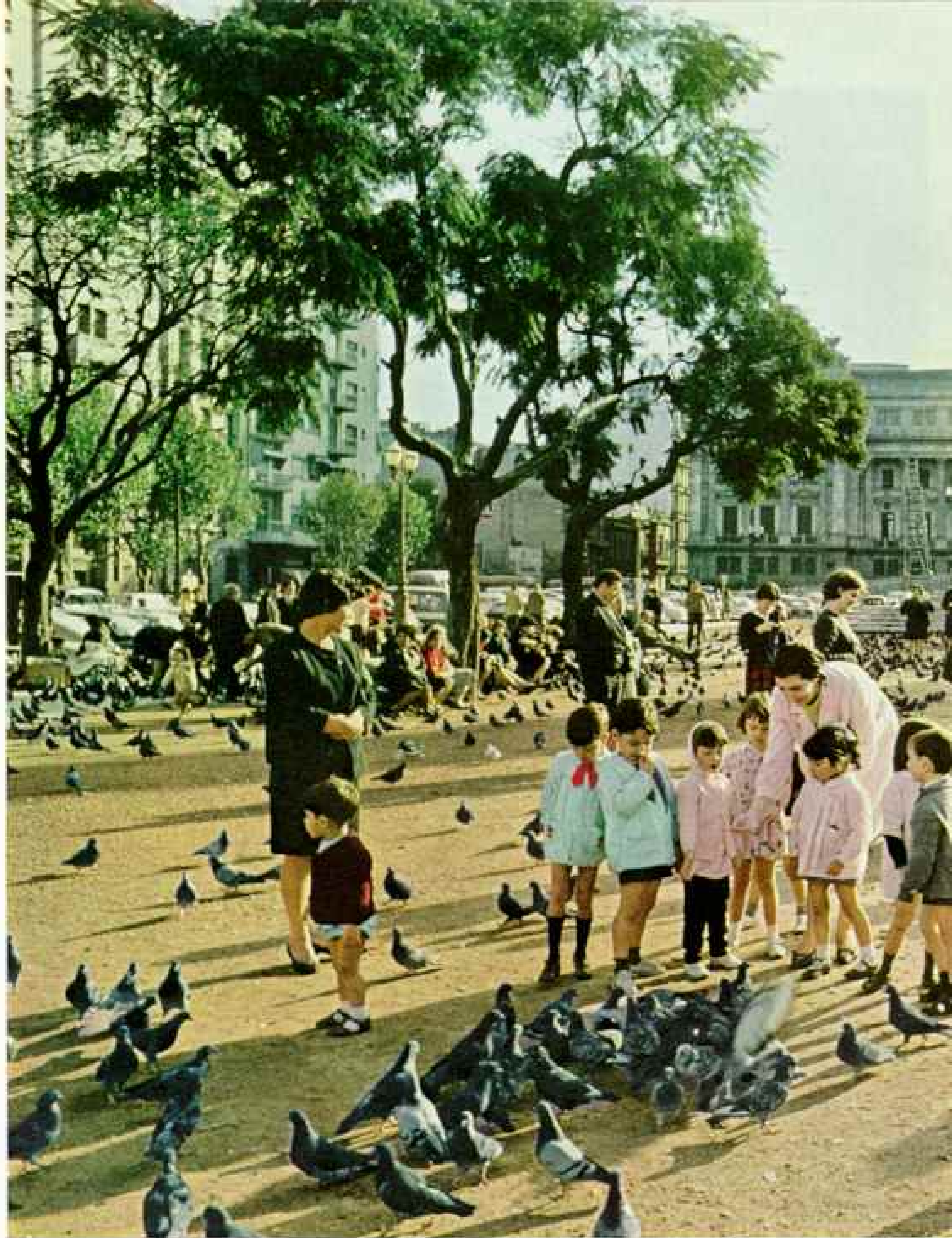

Buenos Aires, Argentina's Melting-pot Metropolis

By JULES B. BILLARD *Photographs by* WINFIELD PARKS
Both National Geographic Staff

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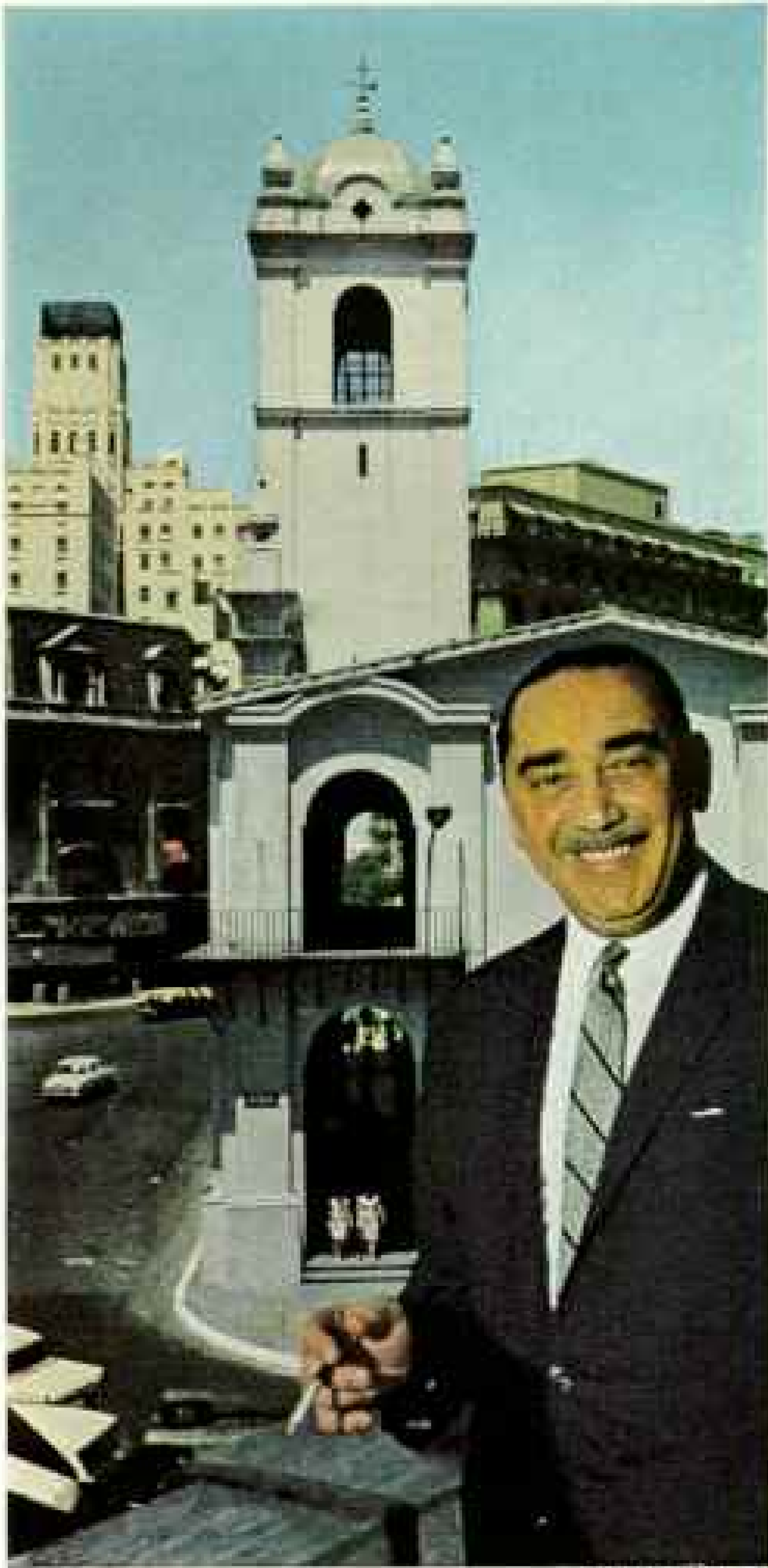
Slim-domed capitol of Argentina towers above the Plaza del Congreso with its flocks of young people and pigeons. One Argentine in three finds a home in "B. A.," the throbbing South American colossus on the banks of the Río de la Plata.

WATERS OF THE RÍO DE LA PLATA, heavy with mud washed down from South America's heart, lap lion-colored against the grassy banks and moss-crusted concrete that shape the waterfront of Buenos Aires. But on a lazy February evening in the Argentine summer, when the moon is full and couples edge the parapets of Costanera Drive with twinned silhouettes, those waters take on a magic sheen. They shine in the moonlight with a luster that reflects the estuary's name, River of Silver.

Such a setting seems obvious inspiration for a song. Yet no ballad about the Río de la Plata exists. The Mississippi, the



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Dynamic mayor, Eugenio F. Schettini stands before the Cabildo—the colonial town hall. From its balcony on May 25, 1810, Argentines proclaimed defiance of Spanish rule. Mayor Schettini, appointed in July, 1966, by the military regime of Lt. Gen. Juan Carlos Onganía, resigned last September after a dispute with the administration.

Danube, the Volga—stream after stream has its memorialization in song. But not the broad watercourse formed where the Paraná and Uruguay Rivers join, and on whose pancake-flat southern shore sprawls the capital of Argentina, with its suburbs the biggest city on the continent.

Why no song? I stopped to ask the question at one of the innumerable record shops dotting Buenos Aires—shops blaring noisy evidence that music and gaiety still complexion the city that gave birth to the tango.

The shopkeeper looked at me in amazement. "Why?" he exclaimed. "Who knows? Perhaps because we Argentines are more interested in wine and women than in water."

In sense of humor, and in other ways, the *porteños*, as residents of the port city call themselves, are a lot like people of the United States. Remarkable similarities shape their heritages. Argentina fought for independence from a European power. It repulsed a British invasion. It brought order to frontier lands through Indian wars. It had waves of immigration that resulted in a cross-fertilization of cultures and ethnic strains.*

Take the employees of my hotel, for example. Manolo, the elevator operator, was born in Spain's Canary Islands. Salvatore and Enzo, barmen, came from Italy. Poppe-Milius, the concierge, had roots in Belgium. Of all the waiters, only three were Argentine-born.

Walk the streets of Buenos Aires, and the mingling of blonds, brunets, and redheads reminds you of a city in the United States, or perhaps Europe. Scan store signs, and you sense the varied backgrounds: Gath & Chaves, Harrod's, Peuser, Yamamoto. Thumb a telephone book, and such names as Lafitte, Lazzeri, Lefcovich, Lopez, and Lynch pop out.

Facts Justify Porteños' Civic Pride

Greater Buenos Aires is the biggest Spanish-speaking city in the world. But its people can be called Spanish only in the same way a New Yorker can be called English—in unity of language, but not a lot more.

The modern Buenos Airean assimilates the best from his heritage and marks it with his exclusive stamp. He has confidence in his talents and prides himself on his individualism.

That pride sometimes takes unexpected tacks. My friend Nicolás Rubió, a transplanted Spaniard and producer of engravings and art films, summed up one of them. He was telling me about carnival time.

"If a Buenos Aires resident puts on a costume," he said, "it will be that of Batman, Superman, a knight, or a grandee. But seldom will it be that of a clown, or a monkey, or a ludicrous character. For that would result in *papelón*—the fear of being laughed at. And his pride couldn't stand it."

The porteño believes himself the pivot around which Buenos Aires wheels, and his city the center of the nation and all that is truly important in the world. And he can cite facts to make a pretty good case for it.

Buenos Aires, with its suburbs, sits on the banks of the Río de la Plata as a rough half circle whose radius measures some 18 miles.

*See "Argentina: Young Giant of the Far South," by Jean and Franc Shor, GEOGRAPHIC, March, 1958.

Three million Argentines crowd into the Federal District, giving B. A. third place among South America's cities, after São Paulo and Rio de Janeiro. But another 4,000,000 suburbanites cluster outside city limits, making greater Buenos Aires the continent's largest metropolis. The Pan American Highway System, traversing mountains, jungle, and pampas, connects the city with neighboring capitals.

Here live 30 percent of the Argentine people. Within this metropolitan area lies the 70-square-mile city proper, a federal district much like Washington, D. C.

Few cities so dominate a country as does this sparkling "Paris of South America." Fifty-five percent of the nation's imports and 40 percent of its exports funnel across Buenos Aires docks. Railroads and highways radiate from the city to tap the countryside. Within the metropolitan area hum half the nation's industrial plants, employing three-fifths of all its workers and producing seven-tenths of all its products (pages 672-3).

Yet with all this dominance have come problems. I was introduced to some of them in a chat with Eugenio F. Schettini, energetic mayor of the city (opposite). A retired army colonel, he was appointed by the military regime now governing Argentina.

"Buenos Aires," he told me over morning coffee as we sat on a leather sofa in his office, "has the multiple problems of a big city, and a port city, and a city which in the working

"Paris of South America," Buenos Aires paves the pampas with boulevards and

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

plazas. World's ships, left, tie up at the doorsteps of half the nation's industries.

day must absorb a crush of commuters that increases its population by half. Three million people live in the Federal District; for the metropolitan area the population totals seven million. We have the problems of a tremendous housing shortage, of food distribution, of movement of goods, of social assistance, street lighting, traffic. . . ."

I had had firsthand experience with the last two items. Riding pell-mell down a murky street one night with a taxi driver who seemed determined to set some cross-town record, I timorously asked why he didn't turn on his headlights.

"Oh," he replied, "everybody here is courteous and uses only parking lights. Regular headlights would blind the other drivers."

"But how can you see?" I protested.

"It's easy. Our streets are well lighted at night," he said proudly.

I looked at the puny halos cast by low-wattage bulbs at occasional street corners, gritted my teeth, and hung on. At every intersection, motorists play a game of bluff, the more steely nerved barging through, inches short of collision.

At a lunch one day I asked Alberto Medus, a jovial career man in the Argentine diplomatic service, how it happens that so relatively few smashups occur.

"It's simple," he said. "The foreign-made car gives way to the American-type because

it's bigger. And the American car yields to the bigger *colectivo*—bus. The colectivo yields to the truck. But when two trucks arrive at a corner together, *choque!*—crash! Neither driver is willing to yield."

Curbside parking in downtown Buenos Aires is madness, too. "You find a place that's maybe too short for your car," Señor Medus explained, "so you just push the line of cars in front with your bumper, and the line of cars behind, until you can jockey your way in. Nobody sets brakes; to do that and walk away leaving your automobile locked is, well, unsportsmanlike.

"Of course," he added, "you want to avoid parking at the spot nearest the corner. You might come back from your errand to find that your car has been pushed out into the intersection and hauled away by the police."

The number of automobiles crowding the capital's streets has grown phenomenally in the past decade. U. S.-linked plants established since 1955 include Kaiser, Chrysler, Ford, and General Motors.

EKTACHROMES © N.G.S.

Two find quiet in a curtained *confitería*, the combination tearoom and cafe that can be found in every downtown block. Early each evening the confiterias fill with patrons nibbling tidbits called *platitos* that tide them over until dinnertime—seldom before 9 p.m. and often at 12 in night-loving B. A.

To appease the appetites of a gourmet city, hampers of bread board a van bound for cafes and stores.

These, plus affiliates of European manufacturers, have swelled production from 6,391 units a year to 194,000.

I talked about the industry with Douglas B. Kitterman, President of Ford Motor Argentina, in the company's sparkling new factory on the outskirts of Buenos Aires.

"No longer are automobile plants here just assembly lines putting together U. S.-manufactured parts," he said. "The law calls for a yearly increase in the use of Argentine components; right now the industry is turning out cars that are 95 percent locally made."

Automobile executives are being locally made, too. Managers and foremen who came from the United States when postwar plants were established are teaching their skills to Argentines, then returning home. Ford, for example, two years ago had 130 *norteamericanos* on its staff. "Today we have 28, and our objective by 1970 is to have only four," Mr. Kitterman said.

Thus automobile manufacture is giving Argentina—one of the most industrialized nations in South America—a double boost: new companies supplying parts, and new additions to middle-income jobs. Unlike most Latin-American countries, Argentina has relatively small strata of the very rich and of the very poor, but a large middle class.

Autos Spoil a Concessionaire's Trade

The industry is having unexpected effects on the economy, too. I found out about one when I spent a Sunday afternoon at a bathing beach called El Águila. It stretches along the hard mudbanks of the Río de la Plata in a suburb of Buenos Aires. Here taxi drivers, hotel porters, clerks, secretaries, and their families come in cars to picnic, sun, or swim.

"They come in their cars, and that's the trouble," the concessionaire of the beach's little sandwich stand told me. "It used to be they'd ride the train and the colectivo that runs from the station. Then they couldn't carry much with them. Now they load their cars at home with food and everything. I don't sell much any more."

Easing the crush of the city's automobile traffic has one heroic solution: widen streets and create new cross-city arterials. "But that would mean tearing down houses and apartments, and already greater Buenos Aires has a deficit of close to one million dwelling units," architect Máximo A. Vázquez Llona told me. As director of the Municipal Housing Commission, he heads the city's efforts to cope with its No. 1 problem.

"And what a problem it is," he said. "If the building industry could double its present construction rate, it still would take 20 years to wipe out the deficit. Inflation—averaging 35 percent annually over the past few years—adds to our difficulties."

Horse Cars Survive as Slum Dwellings

I had seen the city's skyline pierced with concrete skeletons of half-finished buildings—wooden scaffolding graying and ironwork rusting under the Argentine sun. Construction companies and cooperative groups that started them found their capital outpaced by rising costs. But new housing does go up, and the city has launched some important projects. One of them: the Parque Almirante Brown development (pages 688-9).

"It is rising on Federal District land that a few years ago was a garbage dump and a mosquito-ridden swamp which flooded every time it rained," Señor Vázquez Llona said. "Today, 25½ miles of storm sewers drain the project. Two artificial lakes form a reservoir for floodwaters and provide a recreation area. Three million cubic yards of earth have been moved to fill the lowlands.

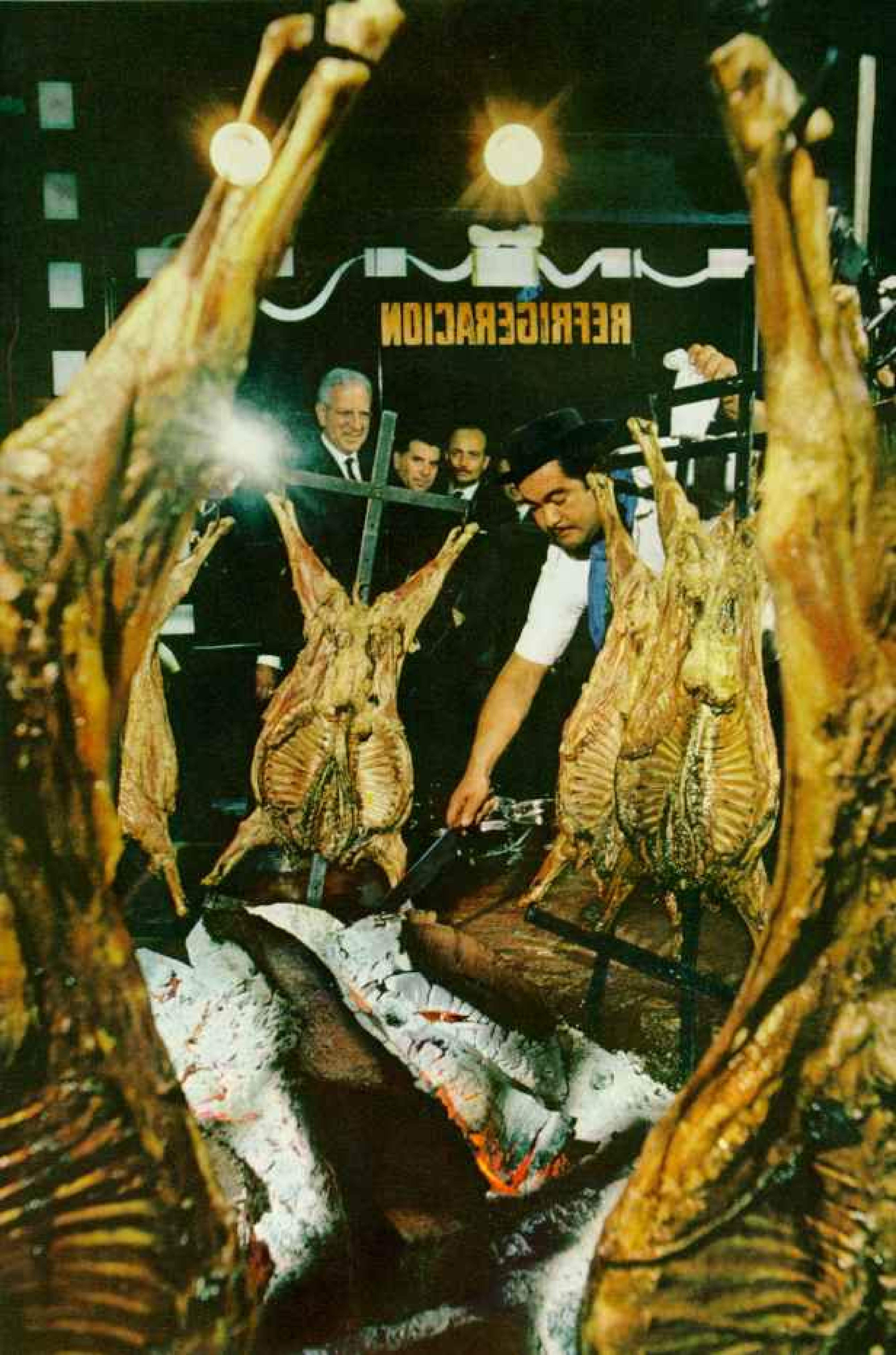
"Here we are building 1,700 apartment units and have land for 50,000 more. Along with them will rise stores, schools, churches, parks, playgrounds, and sports facilities."

Another housing development—Ciudad General Belgrano—also takes strides toward eliminating the city's eyesores, its *villas miserias*. There are 33 in Buenos Aires, slum districts where people crowd into shacks built of tin, cardboard, crates, even the old bodies of horse-drawn street cars. A single water faucet may serve as a town pump for 50 families. A stench rises from the few privies.

But television antennas poke above the shacks, and studies indicate that some 80

Colossal cookout in a showcase kitchen: Stirring coals of hard quebracho wood, a gaucho chef at La Estancia browns a circle of spread-eagled lambs in an *asado*—a barbecue. Strollers pause appreciatively beyond a sign that attests to the restaurant's air conditioning. Consuming almost twice as much meat as U. S. citizens, Argentines dine with such gusto that foreigners call their nation the "land of the stretched belt."

KODACHROME © N.G.S.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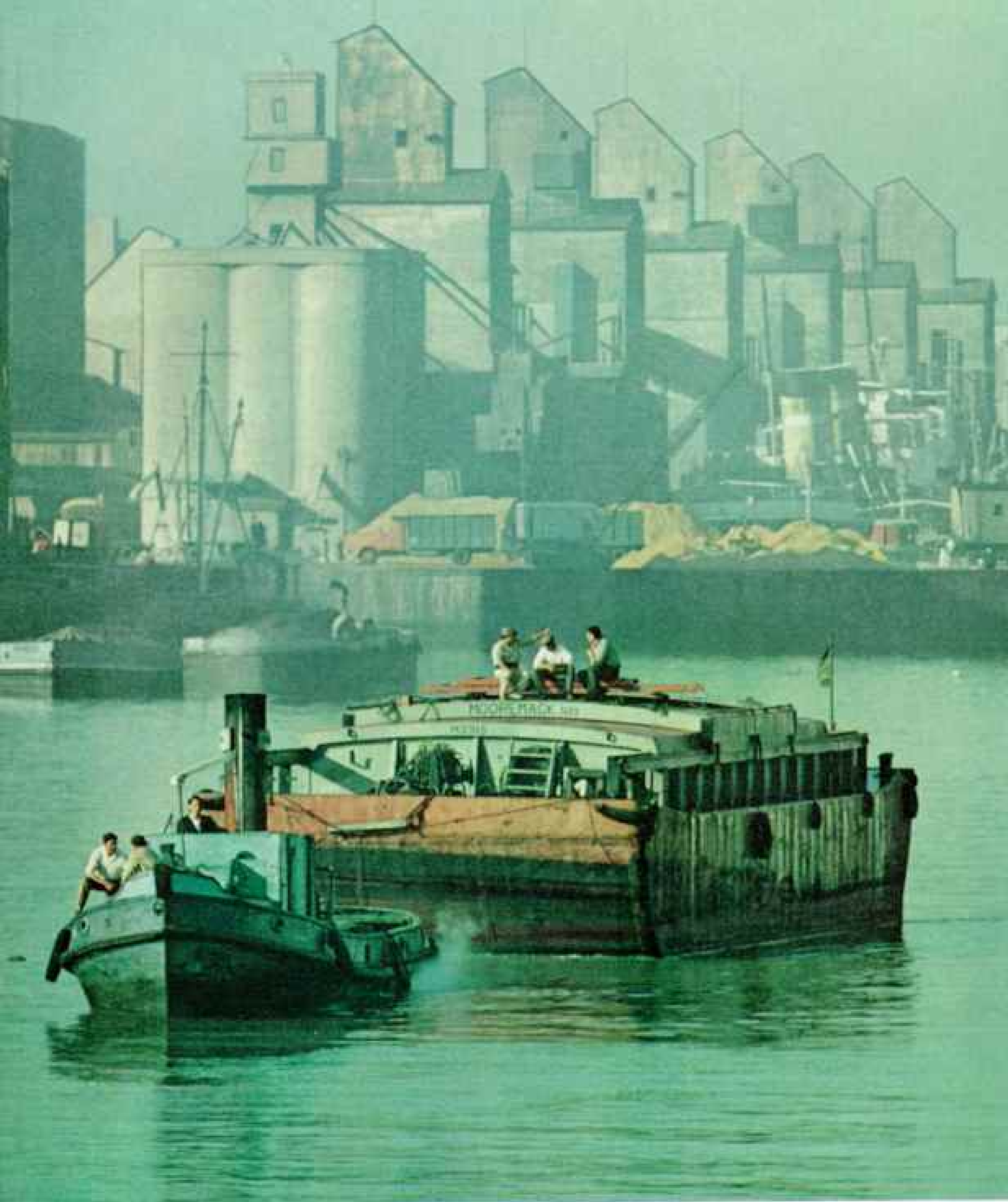


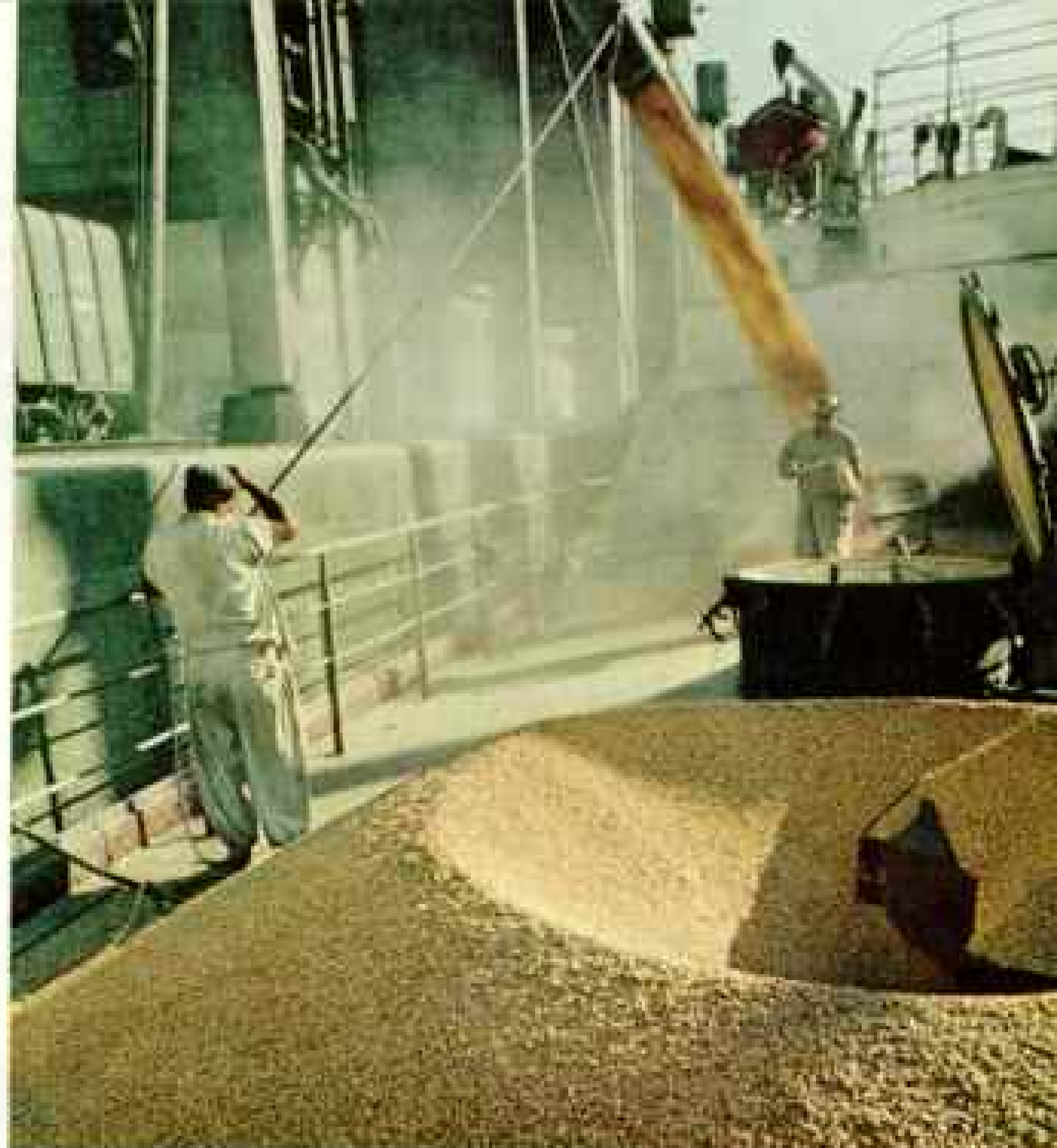
percent of the families earn enough to buy modern homes from the government in this low-cost housing project, scheduled for completion in 1970.

By the Almirante Brown development wanders a rivulet with a melodious name, the Riachuelo. Where it empties into the Río de la Plata, Pedro de Mendoza landed in 1536.

Cortés conquered Mexico with 500 men; Pizarro took Peru with even fewer. But Mendoza, with 14 ships and a force of 2,650, couldn't make his conquest stick in the face of repeated crop failures and attacks by Querandí Indians. In five years the garrison was reduced to eating rats, snakes, hides, and even shoes. It was finally abandoned.

Four decades later, in 1580, Juan de Garay established a permanent settlement at the site. Mendoza had named the place Buenos Aires, perhaps, as legend has it, because one

Broad-beamed belle of the waterways, a barge trails her tug up the placid Rio de la Plata beneath a squad of grain elevators. Rivers, railroads, and highways pour their traffic into the city, feeding a vast port that ships 40 percent of all Argentine exports and gives the people of Buenos Aires their name, *porteños*. Only constant, costly dredging keeps channels free of choking silt.



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Like bulging cocoons, chilled sides of beef swing from truck to ship. In a land where both cattle and sheep outnumber people, enormous tonnages of lamb, mutton, and beef cross the piers for European and other buyers.

Crater of golden corn (top) rims the hatch of a grain ship; trimmers train a chute on another hold. Freighters plying the broad estuary take on not only the bounty of the rich interior but also B. A.'s expanding manufactures: textiles, cement, flour, ceramics, chemicals, and vegetable oils.

of his captains exclaimed, "How good the air is!" but more likely in a sailor's homage to Nuestra Señora del Buen Aire. Garay expanded the name to "City of the Holy Trinity, Port of Our Lady of the Fair Winds." And Buenos Aires—fair winds—it has remained.

The port dozed as an adobe village for two centuries. Then half-wild herds, descended from horses left behind by Mendoza and cattle that had escaped from Garay, became the underpinning of an awakening city's economy, its politics, and its way of life. Independence and national consolidation came in the early 1800's. The port burgeoned as a funnel between the markets of Europe and the riches of the pampas stretching from the city's back door.

Beef Brought the World to B. A.'s Docks

Buenos Aires has to be counted an unlikely spot for one of the world's great ports. Sitting 150 miles from the ocean, it owes its importance to a constant battle against the silt of the Paraná and lesser rivers.

When Juan de Solís discovered the estuary in 1516 and when Mendoza and Garay came, the seven-to-ten-foot depths around the Riachuelo posed no problem for the shallow-draft Spanish ships. Not until 1876, when a French refrigerated vessel took to Europe a dozen sides of fresh Argentine beef to prove such shipment possible—and thereby changed the Argentine economy—did Buenos Aires blossom as a port. In the 1890's concrete docks and basins transformed the waterfront, and dredges cut a channel that let ocean-going ships tie up on shore. The *dragas* —dredges—have been working ever since.

With Federico A. Prestien I caught a tugboat ride out to Draga No. 252-C, pride of the municipality's 32-dredge fleet. Señor Prestien leads a dual life—professor at the mammoth University of Buenos Aires and engineer with the Ministry of Public Works, whose jurisdiction includes channel maintenance.

For hours I roamed the draga's 289-foot length. I peered into quarters where the 28-man crew sleeps on foam-rubber mattresses, plumbed the engine room where sparkling machinery spoke of the pride the men have in their ship, and talked with the youthful skipper, José Martín Iglesias.

"That line of buoys just off our starboard bow marks the edge of the passage we are cutting," he said. "That other line 30 yards to port sets off the opposite limit." I could see the twin rows of buoys trail off into the distance; 20 miles away the channel meets the estuary's natural deeps.

The skipper said: "Underneath us a scoop sucks up mud and sand. Every 25 minutes the bins in the ship's hold get full, and we steam off to a waste area to dump the load."

Hour after hour, day after day, the dredges ply this dull routine. Buenos Aires spends millions of pesos a year to dredge 25 million cubic yards of silt from its harbor channels. But the expenditure pays, for in 1965, a typical year, 1,755 ships from foreign ports sailed the

Menagerie of furs—all of Argentine origin—captures a customer. Rumpled wraps of costly vicuña spread amid pelts of spotted jaguar, striped skunk, and a tawny puma, complete with the huge cat's snarling head. Furs and leather goods rank high both as exports and as tourist purchases.

suctioned path, carrying 6,956,000 tons of goods to feed the city's economy.

I watched that shipping one day from an unusual vantage point. With Teva Comi, who parlayed a girlhood interest in her city's historic spots into a tourist-agency job as one of Buenos Aires' most knowledgeable guides, I went to the Palacio del Congreso Nacional, the Argentine capitol building. We walked its corridors and galleries, rich with gilt and marble. We visited chambers where—until a military coup in June, 1966—Argentine senators and deputies sat in a constitutional system patterned after that of the United States. And we climbed a dark, corkscrew staircase inside its dome.

Hector Barone, the capitol page whose flashlight outlined the iron steps, said there were 267 of them. I could have sworn there were 2,000. Thick with the grime of infrequent use, they wound dizzyingly upward until we reached a little doorway opening out on a narrow walkway around the top.

My queasiness disappeared with the glory of the view. Sunlight glinted from ships in the broad Río de la Plata, where specks on the horizon indicated Uruguay's shore 30 miles away. Beneath us Buenos Aires fanned, its skyscrapers punctuating the flatness of the land (pages 666-7).

I could make out the Riachuelo winding to La Boca, waterfront region where the stream's mouth nuzzles the mother river and where Italian rattles from tongues as easily as Spanish. Off to the northwest the parks of Palermo splashed a green swath against the surrounding gray of buildings (page 684). In the distance the city's maze of streets merged with

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EKTACHROME (RIGHT) AND KODACHROMES © N.G.S.

Porteños on parade

TO BULGING BUENOS AIRES, as to New York, people streamed from every nation in Europe. Entering the swirl of this southern melting pot, they added their distinctive flavors to the energetic and animated city.

Elegant in feathered top hat, a bandsman (left) celebrates National Day, May 25.

Soulful salesman (above) offers carnations to evening strollers.

Garland and beads emblazon the costume of a Polish lass selling trinkets for charity (left).

Lean gauchos in baggy trousers size up a bronco at a rodeo (right, above). Like North American cowboys, they stand tall in Argentine legend as rough-and-tough hombres.

Daughter of an industrialist, Susana Cernades wears the bloom of youth.

KODACHROMES © N.G.S.

the countryside—elite, suburban San Isidro; Acassuso and its U. S. colony; and Hurlingham, where British settlers created a bit of Old England (map, page 665, right).

At my feet the Plaza del Congreso spread a fountained base to the capitol building (pages 662-3). Four city blocks were razed and the square laid out and landscaped in a mere 80 days in 1910 to ready it for the 100th anniversary of the rebellion against Spanish rule. Its construction marked completion of stately Avenida de Mayo, built to connect the capitol building with the historic Plaza de Mayo where great acts in the nation's dramatic past have been played (pages 682-3).

Nation Observes Two Independence Days

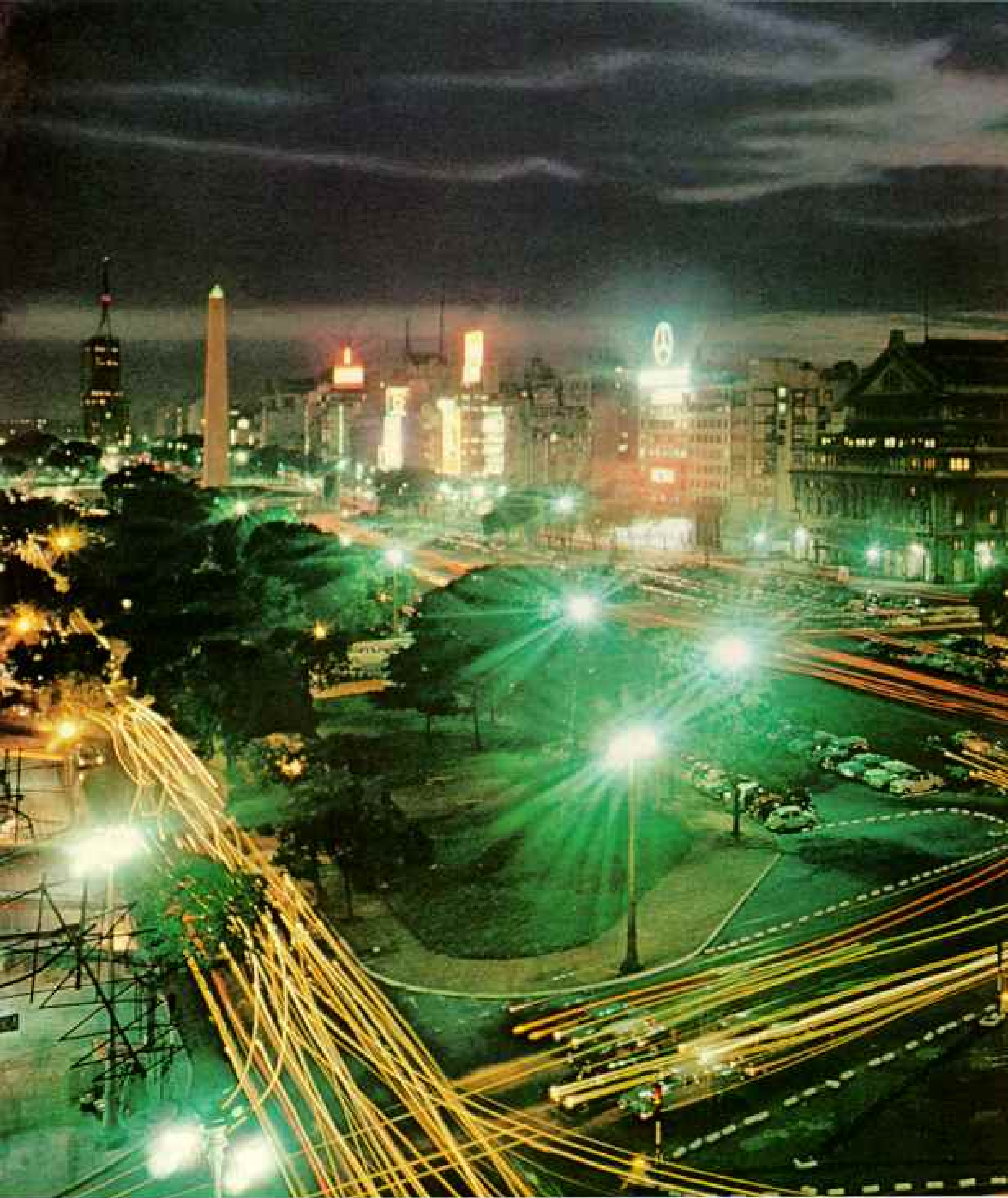
Descending from our lofty perch, Teva and I walked along the avenue toward Plaza de Mayo. At its intersection with 9 de Julio, we dodged the traffic crowding this 150-yard-wide thoroughfare which Argentines claim is the broadest in the world. Parallel to our route ran Avenida Rivadavia. "It has more than 260 blocks," Teva said, "and if that isn't the world's longest street, you can add the miles it goes out into the country." Then at last we came to Plaza de Mayo and the massive stone walls of the Cabildo (page 664).

Begun in 1724, this hoary structure has served as a town hall, court of justice, house of parliament, library, and prison. Now it is a museum. "From its balcony," Teva explained, "colonial leaders on the 25th of May, 1810, announced to a crowd gathered in the plaza that they had forced Spain's representatives to give up the reins of government.

"Actually we Argentines have two independence days. That first one came when Spain was in the hands of Napoleon's forces. The colonial leaders rebelled against local Spanish authority, but proclaimed themselves still loyal to King Ferdinand, who had been deposed by the French. Not until July 9, 1816, was complete independence declared."

Across the Plaza de Mayo from the Cabildo stands the baroque pile of the Casa Rosada, Argentina's Pink House. Originally a fortress, later the home of the nation's presidents, the building now houses the chief executive's offices and a historical museum.

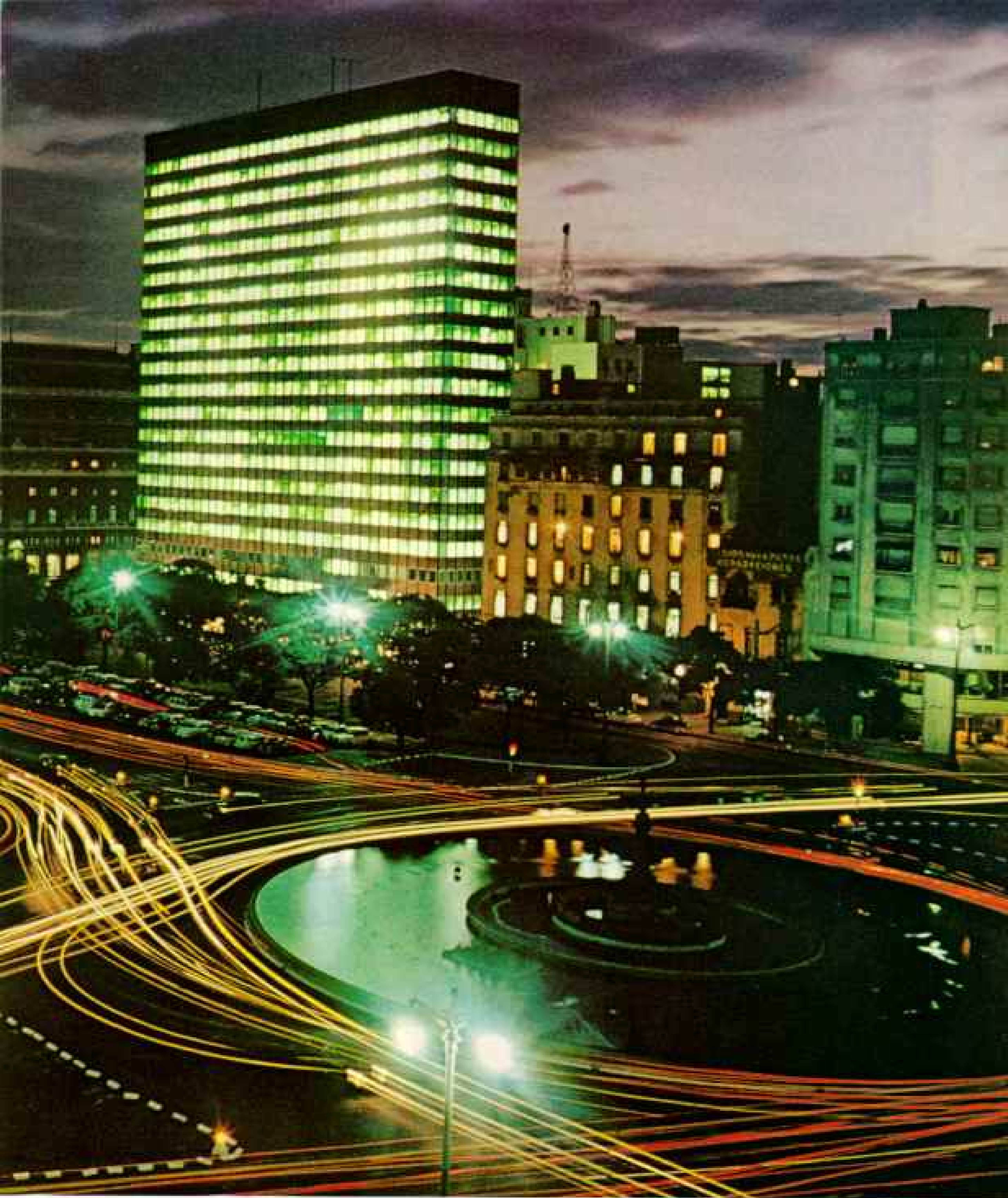
"They tell a story about how it got its color," Teva told me. "It's supposed to have happened in the 1870's during the time of Domingo F. Sarmiento, one of Argentina's great presidents; he laid the foundations for our educational system—on the U. S. model. There were two political parties then; one



wore red badges, the other white. Sarmiento wanted to be impartial, so when it came time to redecorate the building's exterior he had buckets of white and red paint mixed. And it has been rose-colored ever since."

In visits a year apart, I encountered two markedly different regimes governing Argentina from the Pink House. One was the constitutionally elected administration of President Arturo U. Illia. The other, on my return last April, was the regime headed by Lt. Gen. Juan Carlos Onganía, which had seized power in the June, 1966, coup.

This was Argentina's fourth military takeover in the 11 years since former dictator Juan D. Perón was forced into exile; only one president besides Illia gained office through popular vote. Beneath the turnabout lay the same political shoal on which each previous government had foundered: Peronism.



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The magnetic dictator had instituted wide social reforms through a power base welded from labor and the underprivileged. But his policies also pushed the nation toward bankruptcy. His regime grew oppressive. The military, with popular support, deposed him. Ever since, it has feared a resurgence by his shrunken, though still-potent, following.

When the Illia government failed to solve Argentina's economic troubles, and political

World's broadest boulevard: Thus Buenos Aireans acclaim their city's 450-foot-wide Avenida 9 de Julio. Its name celebrates the day Argentina declared its independence in 1816. Autos' streaking lights outline the central malls. Next to the gleaming Fiat Building stands the darkened opera house. Obelisk commemorates the settling of the city in 1536. To make this double exposure, photographer Parks caught a purple sunset, then an hour later reopened the shutter.

KODACHROME (ABOVE) AND EKTACHROMES © N.G.S.

Bedlam as usual rocks a restaurant in La Boca, a dockside Italian district that each evening erupts in frenzied gaiety. As in other lively night spots, waiters often put aside trays to seize musical instruments, customers leap up to dance or lead a song, and spontaneous conga lines snake between tables—on and on until early morning.

Night owls frug at a discotheque. Though porteños gave the world the tango, they have all but abandoned it in favor of newer steps.

Starting another day, gauchos breakfast on beefsteak and wine at a cafe near the city stockyards. The men handle cattle trucked in from the pampas to B. A.'s enormous livestock area, appropriately named "Nueva Chicago."

trends indicated gains for Peronism in scheduled elections, the Ongania group stepped in. Among its "corrective measures," one limited the role of students in university affairs and brought riots; a second suspended all activity by political parties. But others slowed inflation and encouraged foreign investment.

"I guess you'd have to call it an easy-to-live-with, though hardly popular, dictatorship," one intellectual told me.

Neighbor to the Casa Rosada and the Cabildo, the city's hallowed cathedral fronts the palm trees and flowers of the Plaza de Mayo. Plaster peels from the church's yellowed walls, and pasted-on handbills mar its huge columns. But in a torch mounted near its doorway an eternal flame burns bright, homage to revered hero José de San Martín and to the unknown soldier of Argentina's war for independence.

"San Martín's tomb is in a chapel that opens off the nave," a friend explained. "Figures around it represent countries he helped liberate—Argentina, Chile, Peru."

The politics and bickering that troubled Argentina after the war of independence so discouraged San Martín that he left the country. He died in France, in poverty and almost alone. Thirty years later, in 1880, his remains were brought home to be enshrined in the cathedral.

The cathedral and the Cabildo preserve a touch of colonial days. But to feel the real aura of early times, go to San Telmo, oldest *barrio*—district—in the city. One of its churches bears cannon marks from the British invasion of 1806 and displays captured English flags. Buildings breathe of the past. My favorite is the Casa de los Santos Ejercicios, a still-used convent with massive beams, thick walls, and confessionals spaced every ten feet in the gallery around the spacious patio.

"There must have been a lot of sinners in those days," the mother superior said with a wink as she showed me around.

Not far from San Telmo is the barrio called Nueva Pompeya. There, on Sunday mornings, a remarkable market holds sway. If you've grown tired of your parakeet, or tank of guppies, chances are you'll find another pet owner also willing to trade.

Equally intriguing is the park on Avenida Rivadavia where stamp and coin collectors talk shop under the Sunday-morning sun, and where a person with old magazines to exchange or sell can find a bewildering array of publications offered by others similarly inclined. I discovered, by what I considered astute bargaining, that my lone copy of NATIONAL GEOGRAPHIC could have brought me 23 comic books in Spanish, plus a paperback titled *Six Stories from Edgar Allan Poe.*

Shopkeepers and householders in the barrios scrub sidewalks with brooms and buckets of water. But they find it hard to keep them neat in the face of constant construction. Hazards of walking on sidewalks torn up to replace water and gas lines—many in the city

are 80 years old—cause constant grumbling.

Sometimes the sidewalks can't accommodate the crowds. Then authorities close off the streets to vehicular traffic and Buenos Aireans amble on both walk and pavement. That's the case with Florida, a narrow thoroughfare of smart shops which runs from the Avenida Rivadavia to historic Plaza San Martin. Except in the early-morning hours no cars or trucks may roll on the street. Scurrying shoppers and office workers flood its curbs by day. In the evening it becomes the scene of promenades that give opportunities for young people to flirt, elders to chat, old friends to meet.

Once on Florida while I watched the passing parade, I thought I heard a man nearby address me. "Did you speak?" I asked.

"Not to you," he said. "You don't interest me. But those *chicas* over there—*si!*" And he eyed a trio of approaching misses. Argentine women have a well-deserved reputation for beauty; these three didn't detract from it one whit. They came abreast of where we were standing, and then I heard my first *piropo*.

Stepping aside, my neighbor swept his arm in a flourish and said, "Open wide the gates of heaven to let the angels pass!" The misses smiled and walked on.

Argentine friends told me that the piropo is fast disappearing. Part flattery, part joke, sometimes suggestive, it may owe its demise to a stepped-up tempo that is turning yesterday's leisurely promenade into today's quick walk to the theater, cafe, or subway stop.

Carts and Trucks Perpetuate the *Piropo*

But the changing tempo hasn't entirely eliminated the piropo-like sayings you can see painted on the few horse-drawn milk carts that still clatter over cobblestone streets or on the gaily decorated trucks wheeling past. On one I read a provocative "What curves, and me without brakes!" And on another "Unless you're the Venus de Milo, stick out your hand."

Buenos Aires streets may be crowded, but the place to rub elbows with porteños is in a colectivo or on the city-owned subway at rush hour. Both are jam-packed. My guidebook in English warned tourists not to try the subway unless accompanied by a Buenos Aires resident as guide. I, foolhardy soul, tackled the *subterráneo* alone.

At Carlos Pellegrini station a train braked to a stop. Immediately a surge of people swept me from the platform into the packed interior. In moments we careened into the next stop. Like a cork on a wave, I was spewed out by the disgorging crowd.

The experience ruffled my aplomb and my

KODACHROME BY WINFIELD PARKS © N.G.S.

Viva la independencia! Martial woodwinds and brass salute the 25th of May, the day 157 years ago when Argentines began their struggle against colonial rule. Broad Plaza de Mayo, scene of most patriotic celebrations, echoes again each July 9 as a parade observes the 1816 proclamation of independence.

Savoring the sun, bathers flock to "the coast," as porteños call the banks of their silt-brown river. Municipal beaches and innumerable athletic clubs satisfy the Argentine passion for sports.

Bumper to bumper, Sunday drivers jam Palermo's parks, 1,100 acres of lagoon-laced greensward brightening the city's heart. Palermo lures Buenos Aireans with polo fields, bridle paths, a race track, a geometric rose garden, and grassy plots for broiling steaks on portable stoves or taking a nap in the shade.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

freshly pressed suit, but I decided the Buenos Aires subway was no worse than New York City's at peak periods. And, like the 600,000 residents who use it every day, I found it to be a quick and inexpensive way of getting about the capital; you can ride anywhere on its five interconnecting lines for a fare of ten pesos—three cents.

Furthermore, if I hadn't braved the subways, I would never have known the beauty of the line that runs from Plaza de Mayo to Palermo. Its stations display decorative scenes in hand-painted ceramic tiles. The rich greens and yellows and blues of the murals—55 feet long and 5 feet high—present a brilliant panorama. But Argentines scurry past with hardly a glance.

Their unconcern came as a surprise to me, for interest in art and culture among Buenos Aireans rates remarkably high. The city has a hundred art galleries, with a thousand or so exhibitions annually. In record shops classical albums sell briskly along with rock-and-roll. The city supports three symphony orchestras, a host of legitimate and amateur theaters, and innumerable museums.

Mention culture and chances are you'll hear about the Teatro San Martín and the Teatro Colón. And justifiably so, for the Colón is one of the world's great opera houses, and the San Martín is an 11-story building that houses three separate theaters.

Municipal funds support both the San Martín and the Colón. With Carlos Ramos of

Mayor Schettini's office I explored the San Martín. And with Pedro Larralde, journalist and official of the Argentine Ministry of Culture, I visited the Colón.

The Colón's magnificence awed me. Opened in 1908, the huge building exudes *belle époque* grandeur. Gold brocade covers the walls and red velvet the railings of boxes in its seven tiers of balconies. Gilt, carved friezes, and flaring chandeliers decorate walls and ceiling (pages 692-3).

"Artists who have performed here say it is the most beautiful opera house in the world," Juan Pedro Montero, then the theater's director, told me. "It is one of the world's largest, and I think I can say without being immodest that in artistic standing it is one of the five most important."

"Little Industry" Supports a Big Theater

The theater stages 200 performances a year—ballets, concerts, and operas. Director Montero ran what he called "a little industry." His staff of 1,000 included carpenters, painters, modistes, hairdressers, tailors, shoemakers, hatmakers, and handymen—to say nothing of artists and dancers and musicians.

I wondered how the municipality could support the arts on such a scale.

Cecilio Madanes explained it to me. Jovial, mustachioed Madanes is the creator and director of the Teatro Caminito, a remarkable open-air theater that holds summer performances a step from the waterfront in La Boca. The theater takes its name from a block-long street whose houses are painted in vigorous yellows and greens and other hues typical of this most Italian section (pages 690-91).

To create the theater, the street is closed off, and seats and a stage erected. Residents of houses beside it lend their quarters to the productions; actors speak from balconies and living rooms that become part of the set.

Over a delicious luncheon of shirred eggs that Señor Madanes himself had cooked, we discussed the arts and their support.

"A painter who needs cash to underwrite an exhibit, a writer looking for funds to publish a book, a producer wanting to stage a show—all can ask our National Arts Fund for

All four feet off the ground, a wild horse tries to throw its bareback rider. In this Argentine version of broncobusting, gauchos tie an unbroken horse to a pole, blindfold it, and then mount. When attendants whisk off blinder and tether, the jolting contest begins.

KODACHROME © N.G.S.

support. If the fund thinks the proposal worthwhile, it makes a loan at low interest. Thus the public may enjoy art that private sponsors might not be willing to take a risk on."

The street called Caminito inspired a popular tango, and in the city that gave this dance to the world, I thought it appropriate that I should learn a few steps. So in a dancing salon on Avenida Callao I signed up for lessons.

The maestro who took my money was Santiago Merani, and as we walked from the office into the studio, I looked about for the Argentine beauty I wishfully expected for a dancing partner. The salon was empty. Señor Merani showed me a basic step of the dance form that has been called "a confession of love with the feet," and after half a dozen tries, I mastered it.

Then the maestro put on some tango records while I waited for my dancing partner to enter. I was still waiting when he stepped in front of me, raised his arms, and said, "*Bien*, now try the step with me." And for two hours I learned the tango dancing with a man.

Like soaring hopes, new homes rise above *porteñitos* and their ramshackle *villa miseria* —misery town. The 1,700 units of the Parque Almirante Brown development help Buenos Aires erase 33 slums, where families crowd in tiny shacks built of tin, cardboard, and crates. Yet housing is still so scarce that bachelors hear advice to "find an apartment first, then look for a girl."

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Relishing the ritual of Argentina's traditional drink, Luis Arbano Ponce prepares tealike *mate*—dried yerba mate leaves steeped in hot water and liberally laced with sugar. After a sip through his silver straw, Señor Arbano, a hotel doorman, passes the refreshing brew to wife and daughter.

But the situation was less comical than it might seem. For in the years around 1900, when the tango evolved, its unknown developers were the toughs, the stevedores, and the butchers who peopled the waterfront and slaughterhouse barrios. Since women were scarce in the immigrant society of the times, men often danced with each other on street corners or on the hard-packed earth floor of a neighborhood barroom.

Fruitless Search for a Vanishing Art

Armed with my new knowledge, I set out to find spots where I could see the authentic Argentine tango being danced. I was in for some surprises.

La Boca's bars and cafes still ring with music and dancing as they did half a century ago (pages 680-81). Here tango steps were created, and here, about 1915, words began to be added to the haunting music. Sad words, too, for the tango sings of unfaithful love, of men born under a tortured star, of treachery, suffering, unrequited love—anything so long as it is sad.

But here, where the tango was born, what did I see the cafegoers and night-club patrons dancing? Rock-and-roll.

I went to Corrientes, the street whose ballrooms and bright spots earned the name "the backbone of the tango" in the 1920's and '30's. These were the years when the dance returned to find acceptance in Argentina after first drifting to Europe and gaining popularity there. What did I find the people dancing? The frug, the surf, and the jitterbuglike *cumbia*.

You still can find the tango danced today. But most of the

time the tango you meet will be one sung by entertainers for the message of its words.

Buenos Aires may have lost its taste for the tango, but it keeps a high regard for food. The porteño eats well, and he eats often.

He has coffee with milk, and perhaps a sweet roll, at breakfast time. In midmorning he has coffee again. For lunch he has a full meal, then about five takes time out for more coffee and a dainty sandwich. At seven comes vermouth and soda with accompanying tidbits to nibble on. At nine or ten—or midnight—he dines.

His love for eating reflects itself in myriad ways. His terms of endearment for a ladylove—*un bombón, un caramelo, un kilo*—are words that stem from food. The early evening showtime between matinee and night performances is called the "vermouth." And a popular appetizer goes by the delightful name *matambre*—from *matar*, "to kill," and *hambre*, "hunger."

With such concern for food, Buenos Aires naturally swarms with eating places. Every block has its procession: *Café. Restaurante. Confitería* (a mixture of tearoom, bar, and cafe). *Heladería* (ice-cream parlor, where people eat the ice cream from cones with a wooden spoon, and then throw the cone away). *Sandwichería. Wiskería. Cockteleria.* And so on.

Plenty of Room for More Beef Cattle

But for a Buenos Airean the best dish to put tooth to is meat, and above all beef. From Luis A. Maqueda I got some surprising statistics. Señor Maqueda is a director of Frigoríficos Argentinos S.A.I.C., one of the "big three" among the score of meat-packing plants located in greater Buenos Aires.

"Argentines eat almost twice as much meat—around 200 pounds per person a year—as the next-best-fed country, the United States," he said. "We have 45 million cattle and 23 million people; in the U. S. you have only about half a cow per person. Yet we are an underpopulated country with plenty of space left to raise cattle. We have a tremendous potential for supplying world meat demand."

Gourmets in Buenos Aires argue that cattle fed on pampa grasses provide finer flavor than our grain-fed variety. I had to agree the beef was delectable. I ate it in such tourist-popular restaurants as La Cabaña and in such lesser-known ones as La Cueva, where a musician serenades your table with tunes played on a saw. I dined at Once al Sur, a charming home turned into a cafe which uses the stands of old treadle sewing machines as tables. And I gorged myself at an *asado*.

A young business executive, Emilio A. Gibaja, invited me to this barbecue at a country home in San Isidro. He explained that a true asado, gaucho-style, involves spread-eagled lambs, beef ribs, or haunches—skewered and stuck upright in a circle around a fire of tough quebracho wood. But the one he was inviting me to, he said, would be like a North American cookout. It wasn't.

True, our barbecue chef cooked on a grill over a charcoal fire. But for the little group of us attending, he

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

Street for their theater, culture-loving Argentines crowd a sunset production. To create their Teatro Caminito, porteños block off La Boca's narrow Caminito with a stage at one end, ticket gates at the other, and 800 seats between. Homeowners lend their balconies as sets for the summer performances—and often take bit parts themselves.

Colors turn a corner past a one-way sign in La Boca. Encouraged by the renowned Argentine artist Benito Quinquela Martin, himself a Boquense, townsmen paint houses and shops with vivid hues.

slapped on a dozen chickens cut in half, a mountainous roll of prime filet mignon, and enough *chorizos, mollejas, morcillas,* and *chinchulines* to founder a gang of lumberjacks. The first three—link sausages, tender sweetbreads, and plump blood sausages—I found quite delicious. But the taste of the calves' entrails stirred no clamor from me for a second helping.

All this we washed down with one of Argentina's fine red wines—which residents drink diluted with an equal quantity of carbonated water. And as I lolled in sated pleasure on the lawn, I discovered why Argentines can be such trenchermen and still not produce a nation of fatties.

Younger men got up a game of soccer, the national sport. Other guests

EKTACHROMES © N.G.S.

Finery for a tsar, gold embellishes a 23-pound cloak for the opera *Boris Godunov* in B. A.'s municipal Teatro Colón.

Resplendent in gilt and red plush, the Teatro Colón can accommodate 3,500 opera lovers. Performances take place on a block-long stage. A staff of 1,000 serves symphony, ballet, and opera companies, as well as an operatic museum.

swam or played catch with the children. Athletics, it seems, is an Argentine passion.

Innumerable sports clubs offer swimming, tennis, squash, volleyball, and other facilities. The lacing of waterways by the suburb of Tigre has some thirty clubs devoted to rowing. In the area of the Palermo parks one club hardly ends before another begins.

A club may limit its membership to employees of the city's Department of Sanitation. Another may exist for the families of oil-company workers. There's a French club. There's an Italian club. And so many Spanish clubs that they're specialized by locality—Club Galicia, Club Valenciano, Club Madrileño, for example.

Groups such as the River Plate Club may exact no initiation fee and charge dues of 300

pesos—about $1.00—a month; among other activities, it sponsors a noted soccer team that plays in a stadium seating 100,000. Or the association may be like the very expensive and very exclusive Jockey Club, whose golf course and horse-racing track in San Isidro are Buenos Aires show places.

People who belong to no club at all flock to Rio de la Plata beaches, to public swimming pools, to the waterside steps of the lovely Costanera Drive, or to grassy plots in the parks for picnics (pages 684-5).

Here and there among such lollers you can see a group taking *mate* (pronounced MAH-tay). Argentine friends tell me the custom is dwindling. It involves drinking a tealike beverage from a gourd through a silver straw, passing gourd and straw from one person to another to sip. Modern ideas of hygiene seem to be outweighing the mark of mutual respect and intimacy that comes when two persons share a drink through the same straw.

I first tasted mate when I was invited for Sunday dinner by Luis Arbano Ponce. Luis works as a doorman and lives with his wife and daughter in a tidy apartment above a grocery store (page 689).

Trouble With the Language of Flowers

I took a box of candy under my arm, for I knew that it is customary here to take a small gift to the hostess—and I had learned the hard way about a gift of flowers. Once before, going to a friend's home for dinner, I carried with me two dozen red roses. My friend's wife seemed pleased when I presented them, but not very. Next day I asked another Argentine if it was true that one should take something for the hostess when invited out.

"Oh, yes," he replied, "and maybe a trinket for the children, if they have any. But perhaps it's best not to take red roses."

"Why not?" I blurted.

"Because," he said, "some people consider them a present for a man to take only to his *enamorada*." So I took candy to Señora Arbano. And I felt honored when I was invited to have mate with the family.

Luis's mother, visiting from the city of Córdoba, filled a gourd two-thirds full of the yerba mate leaves, stuck in a silver straw, and added sugar and hot water. We sipped the infusion in rotation.

There is a saying in Buenos Aires about mate. The stranger who drinks of the yerba in this city of a thousand charms, it declares, will irresistibly be drawn one day to return.

I believe it. THE END

KODACHROME © N.G.S.

Through morn's misty hush, an office-bound porteño takes a parkland path. With a growing middle class nourished by burgeoning industries, Buenos Aires shows the way to the good life for a continent.

Dry-Land Fleet Sails the Sahara

By Général de Brigade JEAN du BOUCHER

French Army (Retired)

Photographs by JONATHAN S. BLAIR

ON A GRUELING ODYSSEY, *a land yacht scuds through the stinging blast of a 50-mile-an-hour Sahara sandstorm. Twelve sailing cars set out last February to cross the world's greatest desert; eight completed the 1,700-mile, 32-day adventure.*

KODACHROME © N.G.S.

ONE DOES NOT SPEND 14 years of his life in the desert with impunity. I am under its spell; I know this, I recognize it. It is there, as Ernest Psichari, grandson of our French writer Renan, has said in his *Appel du Silence,* that I knew my first hours of real solitude, there for the first time that I "listened in reverence to the hours falling in the eternal silence of the desert."

During all my service as a French Army officer in western Africa, I had dreamed—people have always reproached me for dreaming too much!—that men might set forth into the desert in sailing machines, as on a genuine ocean, to measure themselves against a wind to whose furious assaults they had so often been forced passively to submit. When at last opportunity came, I organized the First Trans-Sahara Sand and Land Yacht Rally, and last February came to Béchar, Algeria, ready to attempt the first mass crossing of the Sahara under sail.

With me in the pretty oasis are 22 men and one charming lady, fresh from the comfortable countries of France, Great Britain, the United States, Denmark, the Netherlands, and West Germany. None are familiar with these parched sands. All are here in response to invitations mailed to every land yacht club whose address I could find. Thus I am responsible for them and worry about them.

What demon drives me to lure people without any experience of the desert into this mad adventure? Why do I not try it alone, mine alone the risks and dangers, to be the lone hero or the lone victim?

And what makes these people accept an invitation into the unknown from a complete stranger? The splendor of Saharan nights, the appeal of immensities overwhelming in their emptiness—do these things work on their imaginations in the fashion of a magic potion?

Desert Holds Answers to Author's Doubts

Can I live up to my promises of winds steady and favorable, firm, flat terrain at least 80 percent of the way, and above all, safe arrival at our destination?

The answers do not lie here, but far out upon the desert. One way or another, doubts will shortly be resolved: The start is scheduled for next morning.

At Béchar meet two caravan routes of old between northwestern Africa and the steaming lands along the Gulf of Guinea to the south (maps, following pages). The westernmost of these routes goes to Nouakchott, on the Atlantic Ocean, capital of the Islamic Republic of Mauritania. It has been chosen for the road to adventure because I have been told that down it in winter the northeast wind blows fair 26 days in the month.

For us the wind's direction is vital. The whole point of the trip is that we are mounted upon wheeled wind-driven vehicles called *chars à voile*, or sailing chariots. These are nothing more than rubber-tired iceboats.

Able to carry only a single pilot, they are designed and built lightly for speeds as high as 60 miles an hour on smooth beaches. They have virtually no springs, because the cushioning movements of such luxuries would

Four-wheeled forerunners of today's spindly flyers, creaking Netherlands sand cars bear Maurice of Nassau, Prince of Orange, and his friends on a beach jaunt along the Dutch coast in 1600—as depicted in this anonymous engraving. The clumsy square-rigged wagons, designed in the 1500's by Dutch mathematician Simon Stevin, could reach 25 miles an hour, but would roll only when winds blew abaft the beam.

Drop of green in an arid ocean, irrigated fields of Algeria's Béchar mark the beginning of the voyage. Desert tribesmen on earthen bleachers await the starting signal. Rally pilots represent sand and land yacht clubs of the United States, France, Great Britain, West Germany, the Netherlands, and Denmark. Bone-jolting terrain, recurring accidents, and pitiless climate changed the goal of the Sahara's first mass sand regatta from a race to simple survival and completion of the trip.

32 DAYS UNDER SAIL ACROSS THE SAHARA

0 — 100 — 200
STATUTE MILES

Sand — Dry salt lake
Intermittent stream — Well — ▲ Overnight camp
Solid red lines show roads, dashed lines desert tracks.
Elevations in feet

GEOGRAPHIC ART DIVISION
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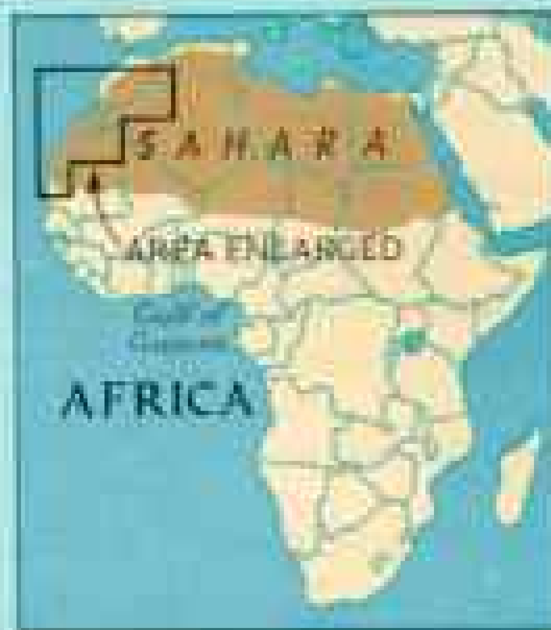


Term	Meaning
Adrar, kediet	Mountain
Ain, bir, hassi	Spring
Dâyet	Depression
Djebel, jebel	Mountain range
Erg	Sand dune region
Hamada	Rocky plateau
Khatt, oued	Watercourse
Oglat	Group of wells
Sebkha	Salt flat, salt marsh

CANARY ISLANDS (SPAIN) · TENERIFE · Las Palmas · GRAN CANARIA · LANZAROTE · FUERTEVENTURA · *Atlantic Ocean* · MOROCCO · IFNI (SPAIN) · SPANISH SAHARA (SPAIN) · ISLAMIC REPUBLIC OF MAURITANIA

Safi · Marrakech · Essaouira · Agadir · Taroudannt · Sidi Ifni · Bou Akba · Tindouf · El Aiun · Semara · El Farsia · Bir Lahmar · Ain Ben Tili · Iguetti · Bir Moghrein · Guelta Zemmur · Rhallamane · Oglat d'Admamlalmat · Fort Gouraud · Zouirat · Agailas · Zug · Villa Cisneros · Port Étienne · Tintane · Bir Iguenl · Dunes de Azefal · Nouamrhar · Boû el Ahouan · Nouakchott

FEB. 18 · FEB. 19 · FEB. 20–22 · FEB. 23 · FEB. 24 · FEB. 25 · FEB. 26 · FEB. 27 · FEB. 28 · MARCH 1 · MARCH 2 · MARCH 3 · MARCH 4–6 · MARCH 7 · MARCH 8 · MARCH 9 · MARCH 10 · MARCH 11 · MARCH 12 · MARCH 13 · MARCH 14

Dinner, dancing, and singing entertain the rallyists, who also enjoy hot tubs and two days' rest

Fleet suffers a sandstorm's whiplash

Elaborate parade greets the expedition

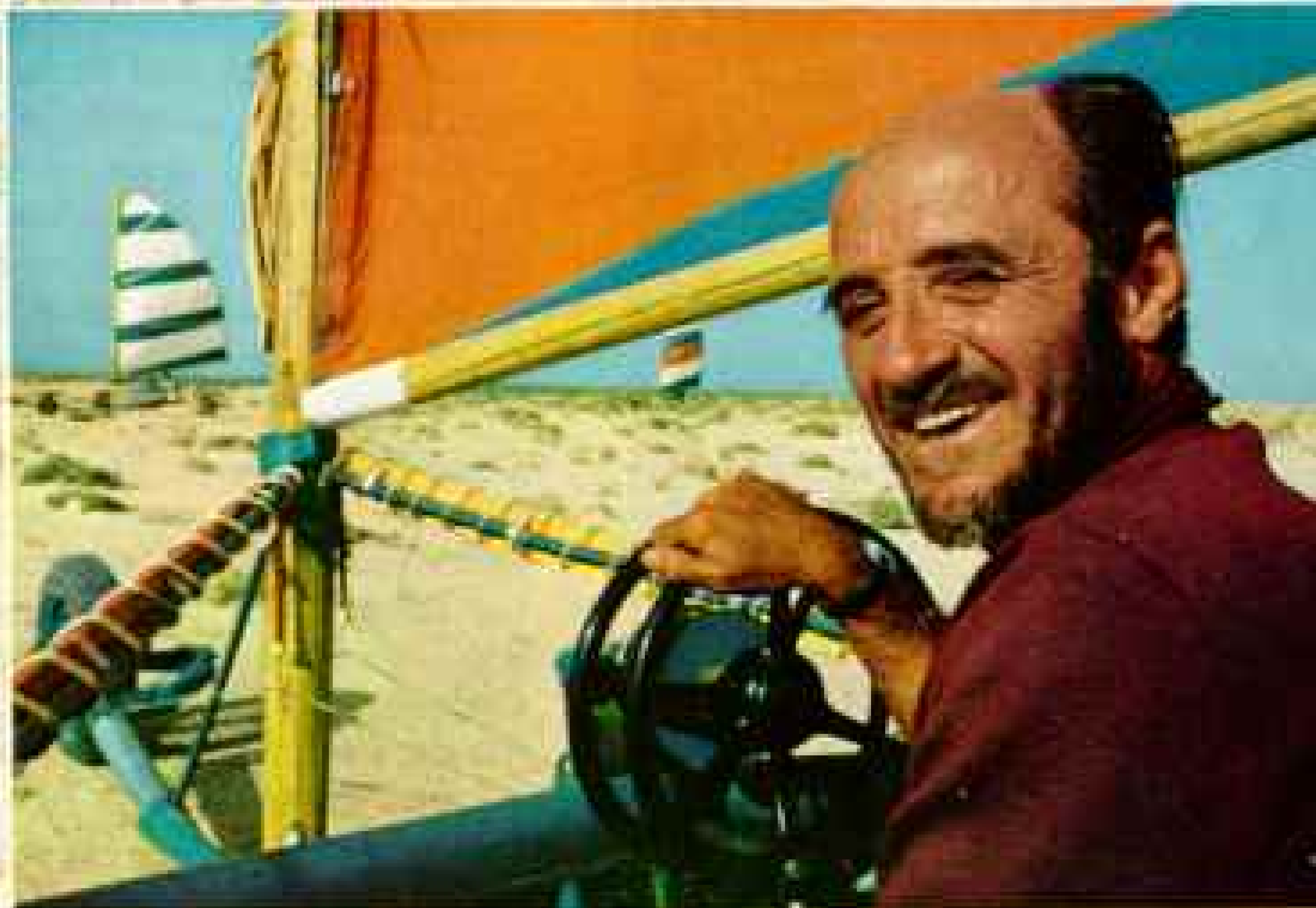
Train bearing fresh tires and repair equipment meets the expedition

A fourth yacht abandoned

Nouakchott
END OF 32-DAY JOURNEY
MARCH 15, 1967

At home in the desert, Saharan veteran Gen. Jean du Boucher (Ret.), then a colonel, led the rally from Béchar to Nouakchott.

KODACHROME © N.G.S.



Spying out the route, Ahmed Zoum Zoum, the voyage's chief navigator, squints across a signless emptiness. He sits atop a Land-Rover. Six of the vehicles, plus two light planes, bore the fleet's radio, food, and water.

KODACHROME © N.G.S.

absorb too much of the wind's power. Also they possess only rudimentary brakes. One type, for example, is slowed by pushing upon a hinged stick, which then drags upon the ground, raising a furious cloud of dust.

With these unlikely machines, it is to be hoped, we will prove that men can defeat the wind of the sands, which from time immemorial has told desert travelers when they may go and when they must stay. The pilots will command, the wind will obey. They will ride the gale, they will be its masters.

Ah, but will they? They will soon learn some things!

The machines will stick in sand; high winds will capsize them. Upon striking obstacles, they will fly into many small pieces of wood and wire. They will limp. But they will go.

Adventure Begins on an Asphalt Road

We assemble and tune the 12 yachts. Six are of one design, "B. B.'s" of French manufacture. No, you are wrong. Those initials do not stand for Brigitte Bardot. The manufacturer merely liked the sound of the letters—*bébé*, French for "baby." Three are Arguins, also French-made, and the rest English.

We are taken under a steady fire of comment from the populace of Béchar. On the whole, the remarks are not encouraging, but happily most of the pilots understand neither French, nor Arabic, nor the languages of the desert.

Among the curious are Blue Men of the Reguibat tribe—"people of the clouds," of Arab and Berber stock. One must not confuse the Reguibat with the Tuareg of the Sahara, although the two peoples have some customs in common.*

"Where are the motors?" asks one of them with experience of lorries.

"We ride the wind," I reply.

"But when the wind sleeps?"

"We also will sleep and await the will of Allah." And this answer meets with approval.

"With such brakes, how will you stop in the face of obstacles?" a Frenchman wishes to know.

"As one does in a sailboat," I say. "Round up, head to wind. The machines are light. The wind stops them quite quickly."

For those who predict we will perish in the sand, I list my arrangements: six accompanying Land-Rovers, two light reconnaissance planes from the French Army, a doctor traveling with us, Algerian and Mauritanian garrisons standing by, a radio network

*See in NATIONAL GEOGRAPHIC: "I Joined a Sahara Salt Caravan," by Victor Englebert, November, 1965; and "Sand in My Eyes," by Jinx Rodger, May, 1958.

Dancer whirls a welcome to the Algerian oasis of Tindouf. Everywhere the party stopped, desert dwellers greeted them with elaborate ceremonies. Love of feasting and dancing runs marrow-deep in the hospitable Reguibats, leathery wanderers of the western Sahara.

established, emergency rations aboard, cooks and mechanics and guides hired. Some I do not convince, and they will be at the starting line with wide eyes that fully expect to see our bones white beneath the sun.

At the hour set for departure, the wind sleeps. It sleeps all day. Finally, in order to protect the yachts from encircling swarms of children, I have the Land-Rovers tow them three miles into the desert.

This, then, is the inglorious start, but next morning the wind awakes, and we roll away along the asphalt lorry road we will follow for the first 330 miles of the journey (map, preceding pages). The tires hum. The people we pass, once over their first shock of astonishment, cheer. We shout and sing with joy.

Then the young Netherlander Jörn Copijn speeds merrily toward a high tension wire. The mast strikes, the yacht staggers, scrapes free, and goes on. Jörn continues to smile. There is no current in the wire.

We camp beside a wadi—a dry stream bed—in early evening. Bundled against the cold that always surprises those not used to northern Sahara nights, we review the day's events.

KODACHROMES © N.G.S.

Beauty in blue, a color favored by the nomads, goes unveiled. Reguibat women often marry men of neighboring tribes, but remain with their own people, who thereupon adopt the groom. As a result of this mingling, few pure-blooded Reguibats remain.

The pilots are divided into four teams. These race each other, but more important, teammates keep one another in sight: We want no yachts lost on the desert.

The American team wins the first stage over the French, although both are mounted upon B. B.'s. Larry Pardey and his fellow Californians Warren Ziebarth and Richard Arthur do not hesitate to get off and push when bends in the road bring the wind in their faces. The French waste time, if not energy, tacking back and forth. The English machines, with smaller sails, come third. The Arguins prove too heavy in the moderate breeze and are towed by the Land-Rovers.

One event of the first day pleases me greatly. I wish my new friends to share my love of the desert. We halt for a while at the edge of a plateau overlooking a deep valley where a village nestles amid gardens and palm trees. The fierce sun paints house walls the whitest of white and makes of the tiny stream that gives life to the oasis a glittering necklace of diamonds.

Cornelis Kortenoever, president of the Netherlands Federation of Sand and Land

Bright-winged craft pass in review at Tindouf. "Somehow, everyone always knew we were coming," marveled photographer Jonathan Blair at the multitudes who greeted the sailors at every halt. Here prevailing northeast trade winds fan

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Dacron sails and rustle palm fronds. More than half the Sahara's scattered peoples shun nomadic life to cluster in oases where date palms and crops of wheat, barley, sorghum, and vegetables can flourish in soil sweetened by irrigation.

Yachts (page 708), stands before the glorious scene with arms raised to the heavens and breathes fervently, "Thank you, my God." I may lead him later into hardship and discomfort, but this moment he will treasure all his life.

My diary entry for the second day might well be a copy of the first. Again no wind, again we tow. And arriving thus ignominiously in the village of Abadla, a yacht once more strikes an electric wire without current.

It is a strong wire, and acting as the fulcrum of a lever, it disassembles the British yacht in an instant. What does it take to disconcert an Englishman? I find Reginald Dawson and Gwyn Powell calmly picking up the bits and pieces.

"What will you do with this debris?" I ask in my voice of a despairing Frenchman.

"Really," says Dawson in his voice of an unperturbed Englishman, "we'll just nip off and rebuild the blighter."

Research Rocket Halts Regatta

So the two Britons go on by Land-Rover the 200 miles to Hassi el Khebi, where there is a government shop with good tools, and the rest make a late start in a light breeze. Sailing steadily, we have thoughts of rolling into the dusk and putting solid distance behind, but after a few miles the lead machines flutter head to wind and stop beside a gesticulating group of French soldiers.

"Quelle pouasse!" I roar at the sergeant in charge.

"It is not a nuisance, sir," says he politely. "You are proceeding into a rocket range, and tomorrow a Diadème satellite will mount into space to make important scientific measurements. You would not wish to find yourselves in its path on your *rustique* machines, I think."

So there we stay the night, and at dawn see the rocket roar away, trailing smoke and fire.

The Hamada du Guir, a plateau over which the rally moves for the next two days, is total desert. Rocky and gullied, it suffers only lean grasses to grow in its barren soil;

Ships of the desert meet: Camels arch eyebrows at their sailing counterparts near Aïn Ben Tili, Mauritania. Though the yachts can attain speeds as high as 60 miles an hour, desert terrain so rough that it made some pilots seasick slowed the Trans-Sahara fleet to a maximum of 40.

No service stations here! Monique Gimel of France pumps up a patched tire, one of more than 500 flats suffered by the fleet. Hans Bernhard Lange of West Germany assists. A champion sailor, Miss Gimel was the only woman to make the trek.

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

not even a bush interrupts the monotony.

Near Oglat Beraber, however, sand dunes crenelate the horizon. Among them an Algerian camel troop awaits our arrival; they wish to pay us honor, and also to exhibit their skill at riding dromedaries. The first real wind of the adventure fills our gay sails as we near the rendezvous. The yachts roll at speed, each trailing its cloud of dust.

Suddenly we hear wild cries, and from the dunes the proud *méharistes* charge in mock attack. We accept the challenge. For two hours sand yachts and camel warriors dance a veritable ballet, each group seeking to encircle the other and end the game.

The machines win, but pay heavily for victory. One after another the wheel mounts of the Arguins let go on the rough terrain. The mechanics cannot repair them. We abandon the Arguins and arrange for their crews to take turns on the B. B.'s.

Sand Dunes Settle in Their Old Age

During the halt, the Netherlands skippers find neolithic stone artifacts at the base of a large dune in the Erg er Raoui.

"Is it a myth, then," they ask, "that Sahara dunes constantly move with the winds? If they did, they would long ago have buried this site."

Quaff of camel's milk refreshes Netherlander Cornelis Kortenoever, dressed in a new *gandoura*.

Drums beat, hands clap as women welcome the rally to Aïn Ben Tili. Tribal tradition decrees that every performance include praise of Allah, a vision of desert life, and a psalm of love.

Whole roasted sheep provides a welcome change from the sailors' everyday diet of corned beef and noodles. One guest attends informally.

KODACHROME (UPPER) AND EKTACHROMES © N.G.S.

"In old age some dunes settle down," I reply. "This occurs when all the dust and light sand have blown away, leaving only particles too heavy for the wind to shift."

In the morning we wake to the music of a rising breeze whistling through the tamarisk grove in which camp has been made. The méharistes melt back into the dunes, their true domain. Prudently we roll two reefs into each sail, shortening it.

I signal the start with a brilliant red smoke flare. As each skipper races past, he gives the thumbs-up sign. In my Land-Rover, I am as drunk as they with the feel of the hurrying wind and the singing of speeding wheels, and I roar in their wakes, until at noon we wheel into Hassi el Khebi.

Here Dawson and Powell stand beside their reassembled yacht, ready to go on. Pitiless, I light another flare, and the race is off again at the same thrilling pace.

At 5 p.m., with the snapping green flag at the door of my Land-Rover signaling "Go!" the yachts whiz past the outpost of Tinfouchy, disappointing the Algerian garrison, which had counted on seeing the unfamiliar machines at close range. We do not halt until full dark; the laggard pilots furl their sails by the light of Land-Rover headlamps.

Desert Travel Exhausts Skippers

Beside the campfire I calculate we have made a day's run of almost 150 miles! But we have paid a price: Lines of fatigue mark the dusty faces of the skippers.

Am I driving them too hard? Are they suffering from their sparse rations, all I could afford on this costly adventure? The psychological fetters of my military background prevent me from expressing my concern, yet it is sincerely there. Uncomplaining bravery always elicits my admiration.

To arouse the camp in the morning, I destroy the sweetness of the Sahara dawn with strident Land-Rover klaxons. Still under shortened sail, the rally races away on the last 25 miles of asphalt paving, after which we will ride over virgin desert.

The final bit of road descends in hairpin bends into a dry valley. I go ahead with the doctor and we take up our station beside the worst curve.

At risk of their necks, Larry Pardey and Richard Arthur charge the turn as Don Quixote tilted at the windmill. Instead of spilling the breeze from their sails, they come into the bend trimmed flat, rear wheels sliding and lifting dangerously.

On the valley floor at the end of the asphalt they greet our worried expressions with carefree laughter.

"We're seasick, doc," they tease. "Have you any pills for that?"

Now in quick succession come two new types of terrain. First the *fesh-fesh*, thinly crusted dust. The light yachts scamper across it with ease. The Land-Rovers break through and have constantly to be dug out.

Planes Appear, Like Guardian Angels

After 20 miles of patches of fesh-fesh, we run on the *reg* that extends some 130 miles to the first rest stop at Tindouf. Reg is hard, flat gravel. To the astonishment of the skippers, it abounds in acacia trees here.

With the pavement finished, I unleash the yachts to find their own paths along the general line of march. The light planes arrive, and will patrol the route like guardian angels all the way to Nouakchott.

We have acquired a certain freedom of movement, but once again we pay a price. Casually inspected before the start, some of the tires prove to be old ones. Spines of desert plants and sharp rocks easily puncture them. Long before Nouakchott I record 500 flat tires, at which point I cease counting!

In sight of Tindouf, I cannot resist driving a sand yacht myself. Between two rows of camel-mounted Blue Men drawn up as guard of honor, with the French lady pilot Monique Gimel (page 706) careering wheel-to-wheel alongside, I sail triumphantly into the village.

Monique and I return the greetings of the village officials alone.

"I apologize for the absence of my companions," I say. "I cannot imagine where they might be."

"We saw their machines rush directly to the hot baths of Tindouf," the officials grin. "We

Bounding perilously on a plank seat only inches from scorching sand, American pilot Larry Pardey rockets over the baked wastes of Mauritania. Tinted goggles shield eyes from glare and pelting sand. With feet ready to brake the French-built yacht, Pardey grips a steering wheel mounted in tandem with another wheel that controls the trim of his reefed mainsail. Astern, another yacht bowls before the sweeping wind.

KODACHROME © N.G.S.

will not be offended if you should join them immediately."

Tindouf, a former caravan relay station, affords us our first knowledge of the extent to which the sand-yacht rally has fired the imaginations of the desert dwellers. The people of the oasis have gone to great trouble building arches of welcome across the street and assembling flags of the countries we represent.

Men and women dressed in their best robes of blue or white cheer with drums, clapping hands, and stamping feet. In the evening we are given a reception that includes a magnificent desert dinner: *mechoui,* whole sheep roasted on a spit; *chorba,* highly seasoned bouillon; and *couscous,* a peppery dish of tiny wheat grains steamed over aromatic vegetables.

Next day the women of the oasis dance the *guedra.* To rhythmic song and pounding drums, the blue-garbed performers move arms, wrists, and fingers with stiff but feline grace. Solo dancers drop with exhaustion, but others take their places.

On February 23 we leave Tindouf. Before reaching Zouîrât, near the Idjil salt mines (page 716) and the rich iron-ore deposits of the Idjil range, we must cross

Bringing their goats safely home, sand-stung children drive the animals to shelter as camel's-hair tents flap like thunder. Abrasive winds, which generate tremendous charges of static electricity, may blow for days with humidity at a throat-parching 5 percent. The disturbances afflict travelers with headaches, loss of appetite, and nervousness.

KODACHROMES © N.G.S.

Swathed in a dust filter, English sand yachtsman Peter Venn faces the Mauritanian desert Berber-style.

Life-saving water from the Iguetti hole—precious even though dark with mud and scum—fills tanks. Almost out of water, the rallyists pinpointed the spring after pressing through a driving sandstorm that lowered visibility to a mere 100 yards.

550 miles of desert. Nothing will mark the trail except, perhaps, the bones of camels. Before, while sailing on the asphalt, we had ample water, for a tank truck marched with us; now we must rely on the slightly saline water of desert wells.

As we roll away southward, we follow a course indicated by important additions to the expedition: eight Reguibat guides. All had served in my desert commands of the past. Ahmed Zoum Zoum, their chief, is, in particular, my old and respected friend (page 701).

They will ride to Nouakchott atop the Land-Rovers, field glasses in hand, and lead us by a sense of direction one can trust as much as a compass. At night by the campfires they will teach the skippers desert lore and the graceful tea ceremony of the Bedouin.

We cross the Mauritanian border without knowing we do so. In days when the great powers of Europe were dividing the Sahara among themselves, diplomats drew this line on a conference table map. The nomads have never seen the map and go where they wish.

KODACHROME © N.G.S.

Frantic patchwork with on-the-spot materials heals the havoc wrought by the Sahara's *regs* and *ergs*—gravel-littered plains and clogging dunes. As one crewman fashions a new seat, others capsize the craft to fix the undercarriage. To cure leaky Land-Rover gas tanks, drivers resorted to a local remedy: They plugged holes with dates.

Skirting the border of Spanish Sahara, we occasionally cross the firm but often cracked and bumpy bed of a dry lake. The largest, the Dâyet el Aam of about 100 square miles, I remember from a 1958 patrol as filled with water upon which wild ducks rested!

In the valley of the Oued el Hamra there have been rains the preceding autumn. In consequence, there is green grass, and to the rare feast have been driven huge herds of Reguibat camels. They are in prime condition. Their owners consider themselves wealthy beyond dreams.

"I possess a she camel," boasts Zoum Zoum, "who on such magnificent pasturage would give three liters of milk a day."

"And I own a cow," says Kortenoever, "that on Dutch pasture yields forty." The dumfounded Zoum Zoum refuses to believe him.

Blue Women Parade on Camels

We come to a large Reguibat encampment where I am touched to learn that an old friend, Abba ould Dhrill, now a Mauritanian Government official, has arranged a reception. It begins with a most unusual spectacle, a camel parade of Blue Women riding on the great palanquins they use on marches.

"They handle dromedaries better than you men," I tease Abba. "Perhaps you should not have let us see this."

We are received as nomads receive important guests, in a huge tent decorated with the most beautiful rugs and tapestries the tribe possesses. Another surprise: Baddou, a famous troubadour, whom I had not seen in some years, has come to sing for us.

He has composed a ballad about us, but I do not tell the pilots. Instead I watch them suddenly sit upright upon hearing, in the midst of strange words, such familiar ones as *"chars à voile," "le colonel du Boucher,"*—I was a colonel at that time—and "Larry Pardey *l'américain."*

The Saharan troubadour's art has rigid rules. Accompanying himself on a sort of lyre called a *tidirit,* the singer begins with a few hummed chords and, after that, a nasal song syncopated abruptly when the performer's

Fleeting tropical dusk turns to instant inky night as yachts moor near Zouîrât, Mauritania. After sundown, 100-degree Saharan temperatures may plummet as much as 30 degrees in ten minutes; sun-heated stones, cooled too quickly, sometimes explode like musketry.

Communal gazelle roast warms huddled sailors; sweaters and ski caps ward off the stabbing cold. However, the clear night air proved a life saver. Two yachts that strayed far off course spotted a Land-Rover signaling, beacon-fashion, 40 miles away.

EKTACHROME (BELOW) AND KODACHROME BY JONATHAN S. BLAIR © N.G.S.

breath runs low. One is reminded of both Jewish lamentation and Andalusian flamenco.

Always the song subjects follow a precise order—first a couplet in praise of the Prophet and a call to war, then evocations of life in the desert, which might be songs of camel drivers, the music of pulleys at a desert water wheel, or the roar of the sandstorm. At the end comes the poetry of love in gay and rapid rhythm; the voice of the minstrel is punctuated by the shrill ululating cries of the women grouped in a corner of the tent behind their men.

Baddou, like his fellow minstrels and storytellers, is an extortionist. Should his listeners not be generous, his next song will satirize them in biting words!

In the afternoon the wind rises in sudden fury, knocking down half the tents. I seek out Zoum Zoum.

"Sandstorm?" I ask.

"Yes. In the morning for sure. Traveling will be perilous."

Zoum Zoum is right. In the morning the world seems constituted entirely of sand. Gale-driven, it hisses against the Land-Rover beside which I huddle. It fills hair, beard, teeth, clothing. It blots out the sun and light (pages 696-7).

Myself, I am not especially uncomfortable, for the shrieking *tempête de sable* has been as much a part of my life as the soft showers of Paris springtimes. I am, however, uneasy.

Low Canteens Force a Gamble for Water

Our canteens and jerricans are almost empty. The Reguibat camp is a dry one, and our hosts have no water to spare, although they would share what there is did we ask. The only way in which we can replenish our supplies is to push on to the water hole of Iguetti, somewhere ahead in the swirling sand.

What shall I do? Shall I hold my people here and trust that the storm will die before the canteens are completely empty? Or would it be better to go on and risk missing Iguetti, our last water hole before the Rhallamane, "the land without water"?

KODACHROME © N.G.S.

Topknot on a child's head represents a handle, Moslem Haratin believe, that will help Allah pull him to heaven. The family takes shelter in what appears to be a haystack—a windowless home of straw and goatskins, hung about with tin cans.

Carving precious salt from the open mines of Sebkha d'Idjil, six-man teams of Haratin, former vassals of the mines' Moorish owners, pry about 120 bars a day from layers of clay. Sugary tea slakes their thirst. Bedouins prize the salt as if it were gold and use it as currency.

Making up my mind is especially difficult because years ago, in almost the same place, I faced the same decision, and I remember all too well what happened. In that other time I ordered the hardened desert warriors of my troop to march, and we did not find Iguetti in the blinding storm, but circled back to it, finally, with the last of our strength. I do not want this to happen again.

Draped in a blanket against the driving sand, Larry Pardey lurches out of the gloom.

"At least," I tell him, "we have managed nearly half of our 1,700-mile journey."

Larry emits a large sound I have been told is the war cry of the American Indian.

"Then we've done it!" he says. "The first half is the hardest."

"Thank you, Larry," I reply. "You make me understand why Lafayette was willing to exchange the ladies and cuisine of France for hardship at the side of the Americans."

I call Zoum Zoum and ask him to lead on. He does so with such accuracy that we almost sail the machines into the pool of Iguetti!

Bathing Forbidden – and Forbidding

I warn the skippers not to bathe in the water, for the people of the desert would then consider it polluted by contact with human bodies (page 712).

Choppy as ocean waves, sand hillocks and veins of rock jolt the fleet in Spanish Sahara. The

"*We* pollute *this?*" roars Christian Nau of the French contingent. "It is already a paste of mud, and I think you will agree it also contains a quantity of camel dung."

"You can always do as the nomads do," I suggest. "Let the water settle a bit before you drink it."

In the morning the wind has dropped, but clouds of dust yet tower into the sky, seriously limiting visibility. Ahead lie a series of *sebkhas,* which are terminal basins of rivers. Wet, they are morasses; dry, they are networks of wide cracks in cement-hard surfaces.

Zoum Zoum tries to lead us around them, but he is off form this time and guides us to the brink of a very wide one. We cannot return against the wind. We must go on.

Fortunately the plain is dry. I send the sand yachts across, but order a detour for the Land-Rovers, which are of course independent of the wind.

I go with the yachts. The crossing is devilishly hard. For ten miles the light machines jump about like baby goats. We are so tired we camp the moment we are safely across, hands and arms numbed from clinging to the steering wheels, derrières painful from the pounding of the seats.

Worse is yet to come. The Land-Rovers with the food break down on their distant

desert's vast perspectives can evoke the illusion of sailing uphill even when going downhill.

KODACHROME © N.G.S.

The ocean at last! Stewart Dibden of England wheels his *Mink* past Portuguese fishing boats anchored off Mauritania. After a month in the desert, the sand-weary sailors gleefully splashed fully clothed into the Atlantic surf.

detour and do not catch up until the following noon. No dinner. No breakfast. The skippers are giving me unfriendly looks.

The atmosphere is strained when finally we go on. Immediately we run into soft sand. The wind selects this moment to die. The yachts sink to the hubs and halt.

For three hours we push them, and also frequently dig out the Land-Rovers. When at last we come to the hard flat parts of the Rhallamane, the pilots are giving me no looks at all—not even unfriendly ones.

Thinking to regain their favor, I fly ahead in one of the planes to Zouirât, where I make sure every possible comfort will be awaiting my weary adventurers. I return to the agreed place of rendezvous to find a lone Land-Rover and no yachts.

"They would not wait," says the driver. "They spoke much of cold showers and sizzling steaks in Zouirât."

He points into the distance.

"Thanks to Allah," he says, "the sizzling steaks rest in the shade of thorn trees. Those small objects are gazelles."

I shoot from the window of the careering Land-Rover, and fortunately my aim is true. What with sizzling steaks and the cool of

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

Spooling nets on pointed sticks, Imraguen tribesmen launch a fishing expedition at Bóu el Abouar, Mauritania. Powerful swimmers, they tow the reels offshore, paying out the seines as they go. When beached, the nets disgorge oily-fleshed mullet.

evening, my friends are again speaking kindly to me around the campfire northeast of Zouîrât (page 715). They are pleased also when I suggest we no longer race each other, but run in a group with the sole object of completing the journey.

Yachts Pick Up Unwilling Passengers

When we do reach Zouîrât, we speed in under full sail, with a fine breeze astern. It is a wild scene. The streets are jammed with people; we can neither stop nor avoid them. More than one we leave sprawling in our wake, and some yachts reach the center of town with one or two people draped helplessly over a wheel strut. Fortunately, no one is injured.

It will remain for one of the pilots to become the expedition's first casualty. When the journey resumes after two days' rest, the young English skipper Michael Benson is using a borrowed French sail considerably larger than his own. He capsizes in a gust of wind and is pinned almost unconscious beneath the wreckage of his machine.

Carefully he is put into a plane and sent back to Zouîrât. To our intense relief he returns by car the next day, swathed in

bandages but ready to sail on as soon as his yacht is repaired.

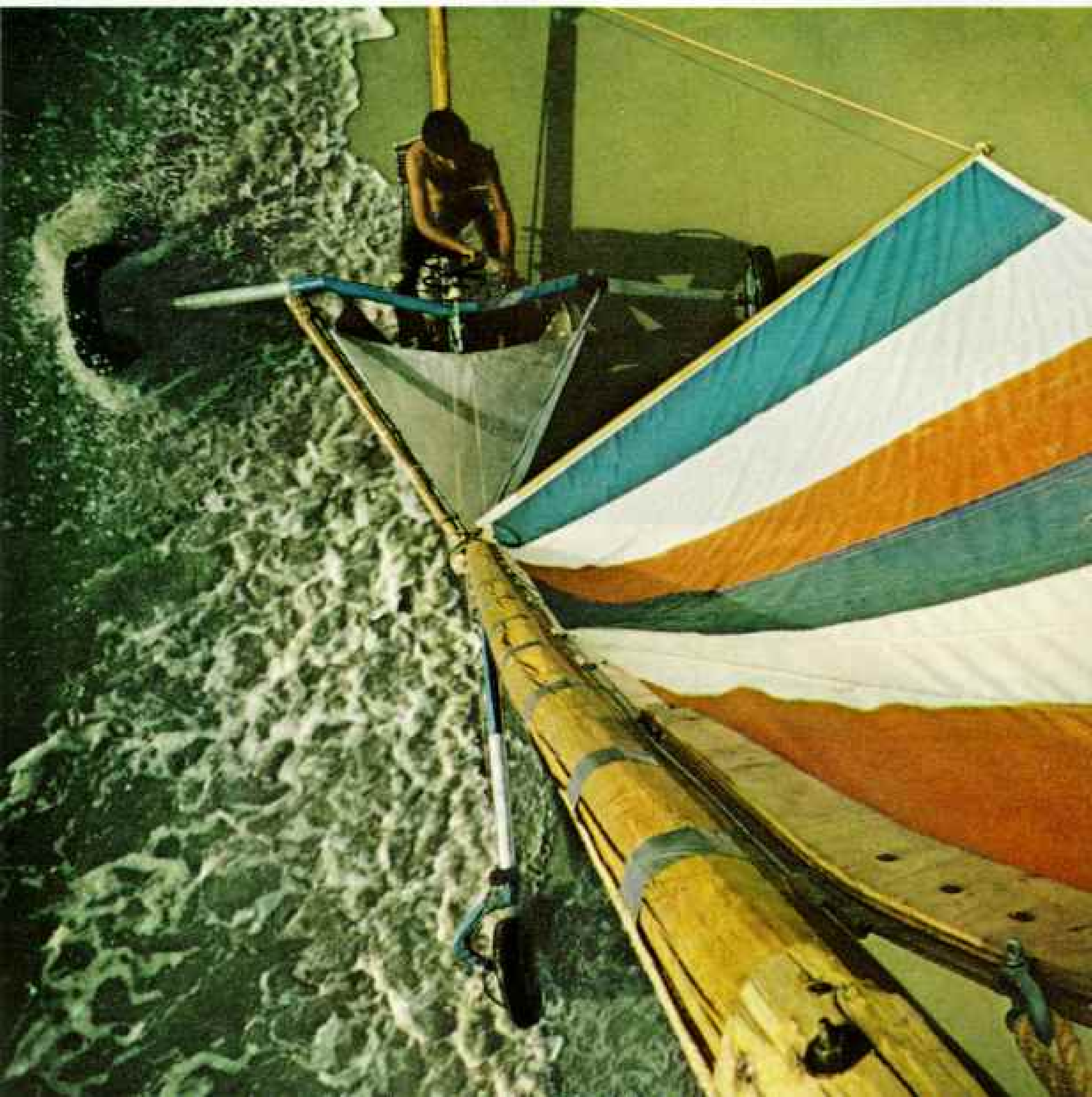
At the first camp past Zouirât, I change the route. As we are behind schedule, the yachts will take a short cut across the corner of Spanish Sahara, and thus we will avoid the great Azefal Dunes.

However, not even Zoum Zoum is familiar with the Spanish desert. The machines therefore stick frequently in unexpected sand and make many detours around impressive sudden peaks of crystalline rock.

But when we again reach Mauritanian soil (map, page 700), civilization comes to meet us in the form of a tiny railroad engine on which perches a small man with a large grin. He plays the "Marseillaise" on an accordion, and he brings new tires for the yachts.

His engine rides the line of the railroad that carries Zouirât's iron ore to the Atlantic Ocean. Although his accordion wheezes from the effects of many sandstorms, he is a welcome visitor. In addition to tires and smiles, he has brought a welding outfit with which the pilots set to work repairing the B. B.'s, most of which have broken chassis tubing.

On a sudsy verge 'twixt sand and sea, Californian Warren Ziebarth zips down the home stretch.



One of them cannot be rejuvenated. We leave it behind; now, with less than 200 miles to the sea, we are down to eight machines.

The pilots laugh and joke at the thought of creaming surf and ocean bathing so tantalizingly near. They fall silent when the breeze dies and leaves them motionless under the blazing sun of the southern Sahara.

The guides seek the shade of thorn bushes. We stay in the oven-hot Land-Rovers, too discouraged to move. Zoum Zoum teases us.

"Look, you foreigners do not even have the sense of us nomads and camels," he shouts, pointing to the sleeping beasts against which he and his colleagues are leaning beneath their bush.

I agree with him and order the yachts towed. That way we at least manufacture our own small breeze. In camp that night, we smell the salt of the sea, or think we do, and in the morning the tents are covered with dew.

One of the planes lands as the skippers are making sail.

"Ten miles to the sea!" the pilot cries.

We cheer, we race away. Riding to the top of every knoll they can find, the skippers stand in their cockpits to see the ocean ahead.

"Sea ho!" they cry each time, thinking they sight it.

But always the white line they believe to be surf recedes ahead. It is the mirage. And when finally we do come upon the true sea, no one says a word, but all drive to its edge and tumble into the waves, clothes and all.

All but Zoum Zoum, that is. This warrior, who has proved his courage in a hundred battles, fears the waves.

"That there could be so much water in the world!" he mutters, retreating from the surf like a woman wearing dancing slippers.

Tape binds the mast, riven by wind and heat.

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

Porpoises Aid Nouamrhar Fishermen

One of the Englishmen happens to tumble into a bit of ocean occupied at the time by a large fish. As the fish does not appear in the least disturbed, the Briton removes his undershirt and, using it as a net, catches the fish.

We are wondering how to divide it among so many at dinner when men from the nearby village of Nouamrhar arrive with more fish, called *courbines*. The men, perhaps descendants of the country's aborigines, fish from their beaches with Atlantic porpoises as unwitting allies. When hungry porpoises herd the fish into tight schools and drive them into shallow water, the fishermen are ready with their nets.

In the night the surf breaking upon the sand sounds like the mutter of huge drums. From Nouamrhar, a cluster of tiny lights in the distance, drums rumble like the beat of surf. We are full of fish and happy. Nouakchott is only 100 miles to the south, and the road to the capital is the beach, for which sand yachts were designed.

Unfortunately not all this Mauritanian strand is wide and smooth. Sometimes at high tide it disappears, sometimes it is littered with large stones. More than once we are

KODACHROME © N.G.S.

Rally destination, thriving Nouakchott mushrooms as the capital of iron-rich Mauritania, independent from France since 1960. Although the city invades the tawny desert here, elsewhere drifting sands encroach on useful lands.

Indomitable conquerors of the desert roll across the finish line while onlookers applaud. A final tribute to the rally came from Mauritania's first President, Moktar ould Daddah, who designated 1967 as the "Year of the Sand Yachts."

forced inland and must travel terrain as rough as any we have seen in the past month. Frequently we tow, and sometimes push, but no one minds now, for we can see the beach of Nouakchott, the end of the voyage. It is black with people.

Sand Sailors Receive National Honors

Briefly we halt so that stragglers may catch up. Then with sails full we race in a group to the finish line (opposite). Cheering crowds escort us to the center of town.

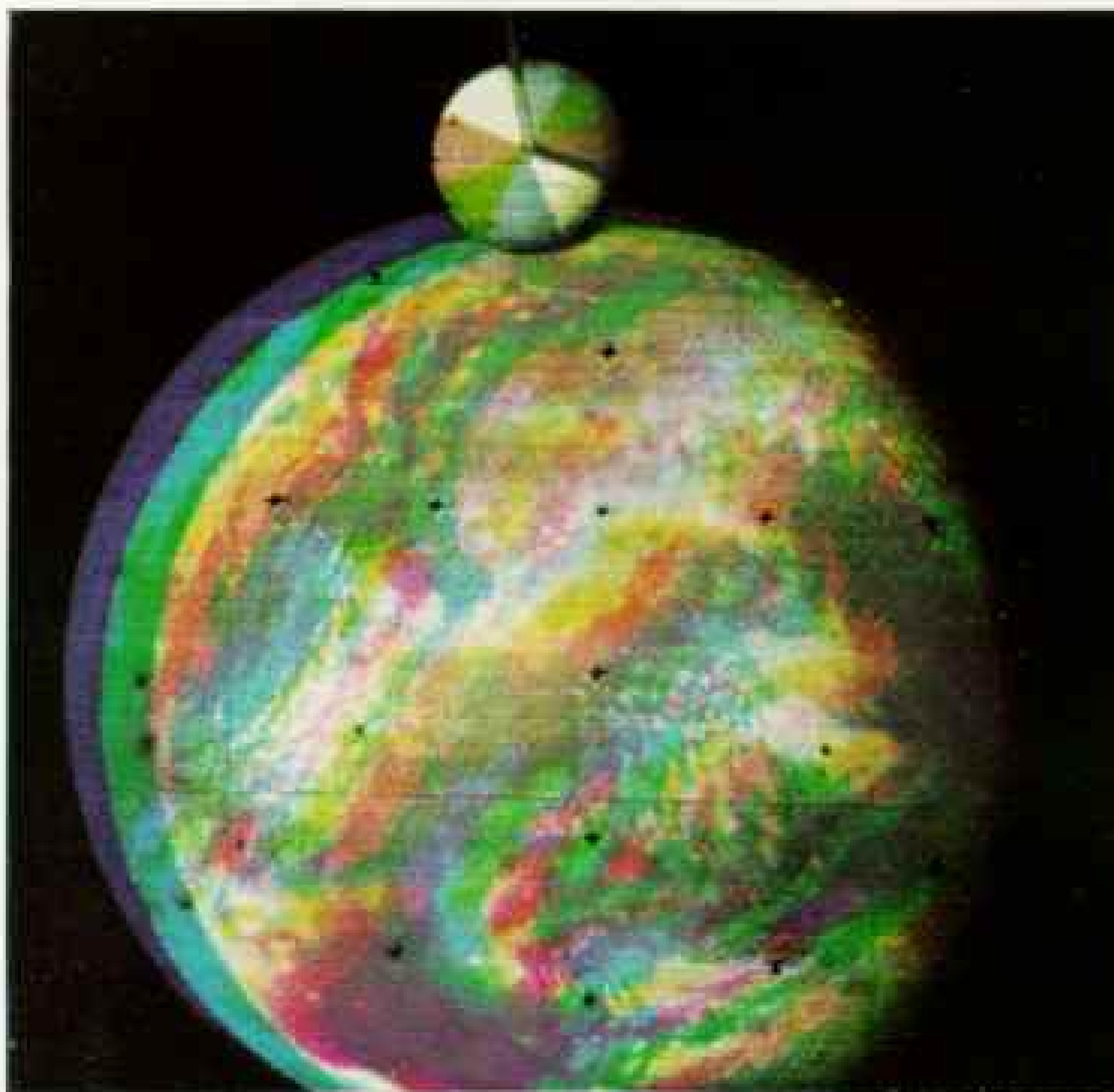
We pass in review before a grandstand filled with officials. Speeches are made. The President of the Republic, Moktar ould Daddah, awards each of us the gold medal of the National Order of Mauritania.

The First Trans-Sahara Sand and Land Yacht Rally is over. What did we prove? Ah, that men of determination can accomplish almost anything they set out to do! Also, we had a wonderful adventure.

To Zoum Zoum comes perhaps the greatest reward. Looking at the victorious sand yachts with their clumsy patches, shredded tires, and ripped sails, he shakes his head triumphantly and muses:

"No matter what his faith, can there now be one among us who doubts the mercy of Allah?"

THE END



PHOTOGRAPH BY DODGE SATELLITE

Psychedelic patterns blur the face of Planet Earth in three superimposed color-separation photographs taken from 21,000 miles in space by an unmanned United States satellite. Through blue, green, and red filters, a TV camera made 1.2-second exposures of earth and of a pie-sliced color guide poking from the satellite's nose. Spacecraft movement during the 6.6-minute intervals between pictures caused the blurring. Photographic alignment of the three images produced the portrait opposite.

Historic Color Portrait of Earth From Space

By KENNETH F. WEAVER, Assistant Editor

Above the rolling ball in cloud part screen'd . . . "LUCIFER IN STARLIGHT," BY GEORGE MEREDITH, 1883

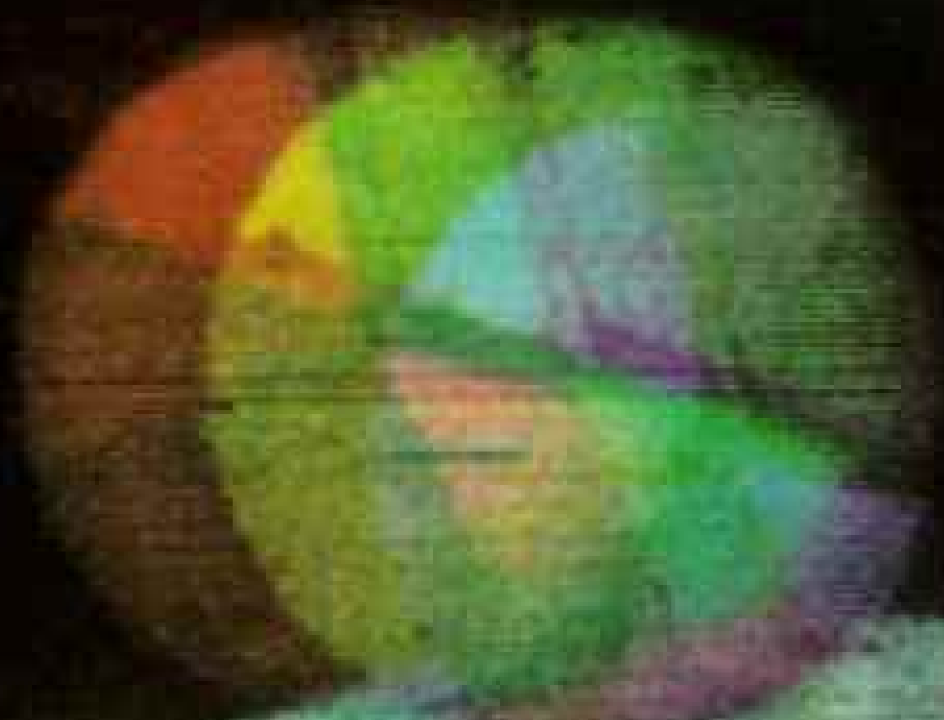
EVERY HOUR ON THE HALF HOUR, for days at a time, you are on candid camera.

You never see the camera. It rides a leisurely path high above your head, part of a remarkable United States Department of Defense spacecraft known as DODGE that went into orbit without fanfare last July 1.

At 21,000 miles altitude, DODGE cannot detect objects less than 18 miles across, so you will hardly see yourself in its photographs. But if the satellite cannot show things small, it can quite splendidly show them large. In the photograph opposite, DODGE has captured earth's "rolling ball" as no man has seen it—for the first time not only in virtually full face, but also in full color.

Clouds—far more than many people would have guessed—veil the face of earth in this portrait, disguising its familiar outlines. Yet one can identify the arid, sandy stretches of the Sahara, the darker Mediterranean, the Iberian Peninsula, the Red Sea. The southern half of Africa, a uniformly dark expanse, merges imperceptibly into the blue of the ocean. And the bulge of South America, unaccountably burgundy-hued, aims its wedge at the Bight of Benin.

"At last man can satisfy his profound curiosity about how his home planet would



PHOTOGRAPH BY DODGE SATELLITE

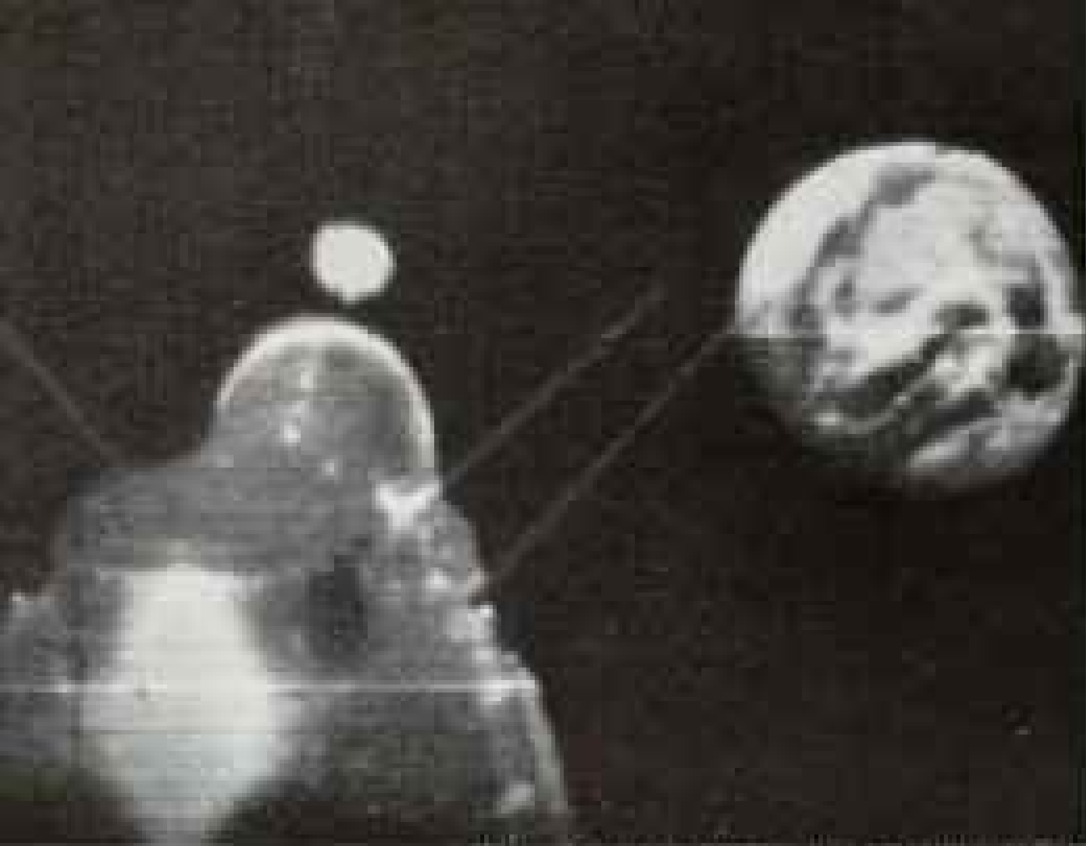
Clouds wreathe the earth, but fail to obscure Africa's Sahara, sprawling vast and brown beside the Mediterranean. Globe above shows the angle and the area of the picture.

Proper alignment of the three color-separation photographs gives an unblurred view of earth, but throws the color guide out of register.

Source of this picture is a 430-pound spacecraft named DODGE, for Department of Defense Gravity Experiment. Its mission: to test how well satellites can be stabilized by earth's gravity, and thus make long-distance communications vastly more efficient and inexpensive.

Earth's actual photograph bears a family resemblance to the scientists' conception (below)—published with the article "Space Satellites, Tools of Earth Research," in the April, 1956, GEOGRAPHIC. "Most beautiful planet of the solar system," wrote the author, Heinz Haber, "the blue planet, the home of man."

PAINTING BY WILLIAM H. PALMSTROM © N.G.S.



WIDE-ANGLE-LENS PHOTOGRAPH BY DODGE SATELLITE

DODGE takes its own picture (foreground) and sees earth as a marbled bowling ball.

PAINTING BY ROGER R. SIMMONS

Responding to earth's gravity, knobbed booms stabilize DODGE as it glides through space. The booms—eight out of ten show in this painting—can run out 150 feet to start or control yaw, pitch, and roll, so that scientists can learn how to make DODGE stable after such a disturbance. One of the larger balls serves as a color guide. Blue solar panels supply electricity.

EKTACHROME BY JAMES E. RUSSELL © N.G.S.

really look to travelers far out in space," says Dr. Richard B. Kershner, head of the Space Development Department at the Johns Hopkins Applied Physics Laboratory, near Washington, D. C., which built and launched the spacecraft under the direction of the U. S. Navy.

Satellite Tests the Use of Gravity

Strangely, this fine portrait is a by-product. Unlike the weather satellites, DODGE was not launched for taking pictures. Rather, it seeks to test a method of stabilizing satellites—keeping them from twisting and turning—by the pull of earth's gravity. Hence its name, an acronym for "Department of Defense Gravity Experiment."

DODGE photographs earth simply as a check on how well it is locked into position. Its two cameras aim down a long cylinder, much as a hunter aims down the barrel of his gun. Earth remains fixed in the field of view when all oscillations have been damped out and the spacecraft is properly stabilized. (The picture on pages 727-8, slightly cut off at bottom, shows that the craft was not quite steady.) One photograph an hour flashes by telemetry to the control station in the Maryland countryside.

Most of the pictures are black and white. But on occasion a command goes to the spacecraft to place red, green, and blue filters, one by one, in front of the camera, and to take three pictures over a 13.3-minute period.

Such a series of photographs was combined by Clyde T. Holliday, physicist at the Applied Physics Laboratory, to produce the color portrait accompanying this article.* The highly complicated process, on which the GEOGRAPHIC's photographic laboratory lent its counsel, required careful comparison of the multicolored ball at the end of the boom in the picture with a duplicate on the ground to assure color accuracy.

At the Applied Physics Laboratory, I watched the televised pictures come in, line by line, to build an image, as on your television screen, but slowly instead of instantaneously. John Dassoulas, APL Project Engineer for DODGE, explained how the craft operates.

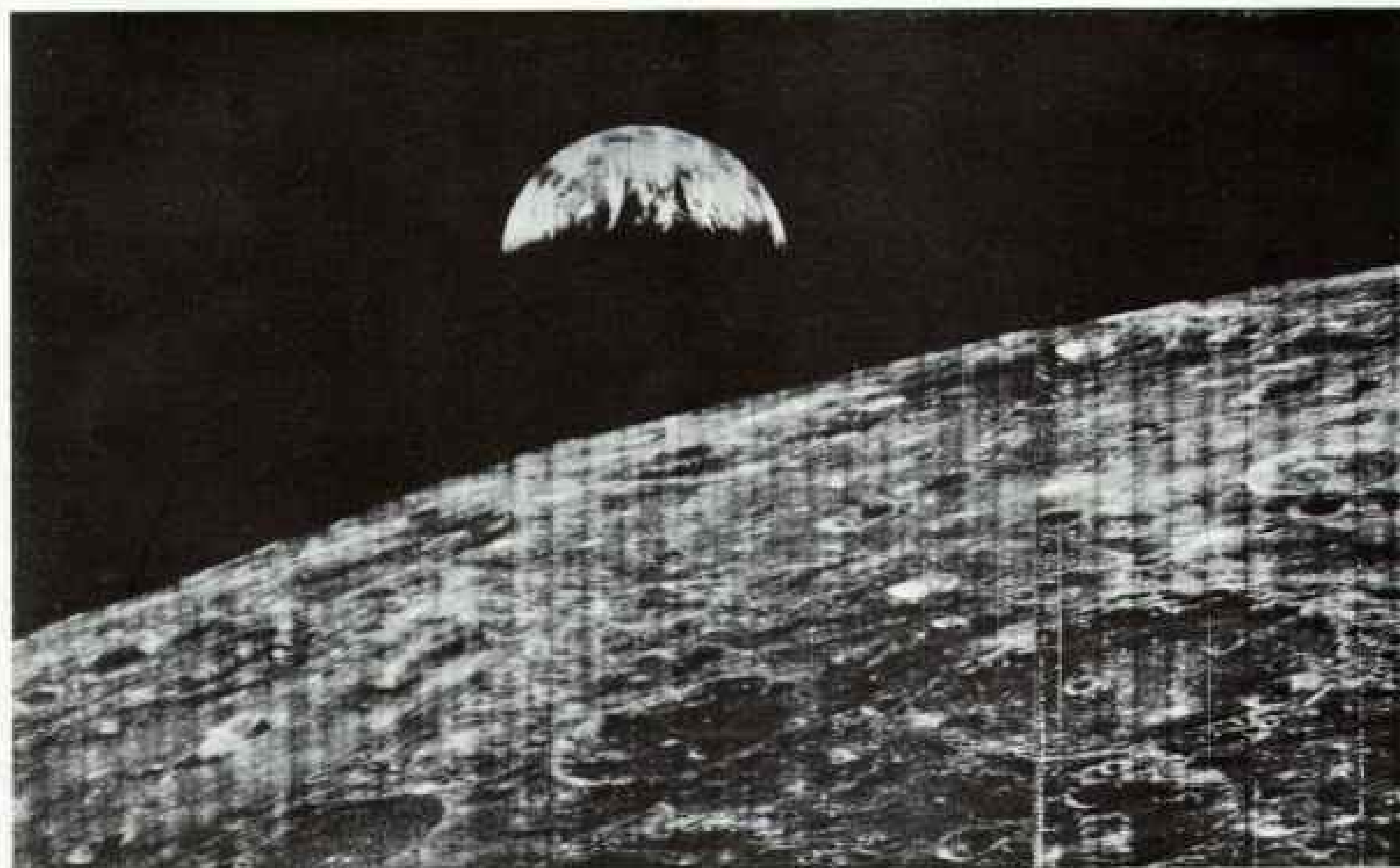
"DODGE makes one complete circuit in 22

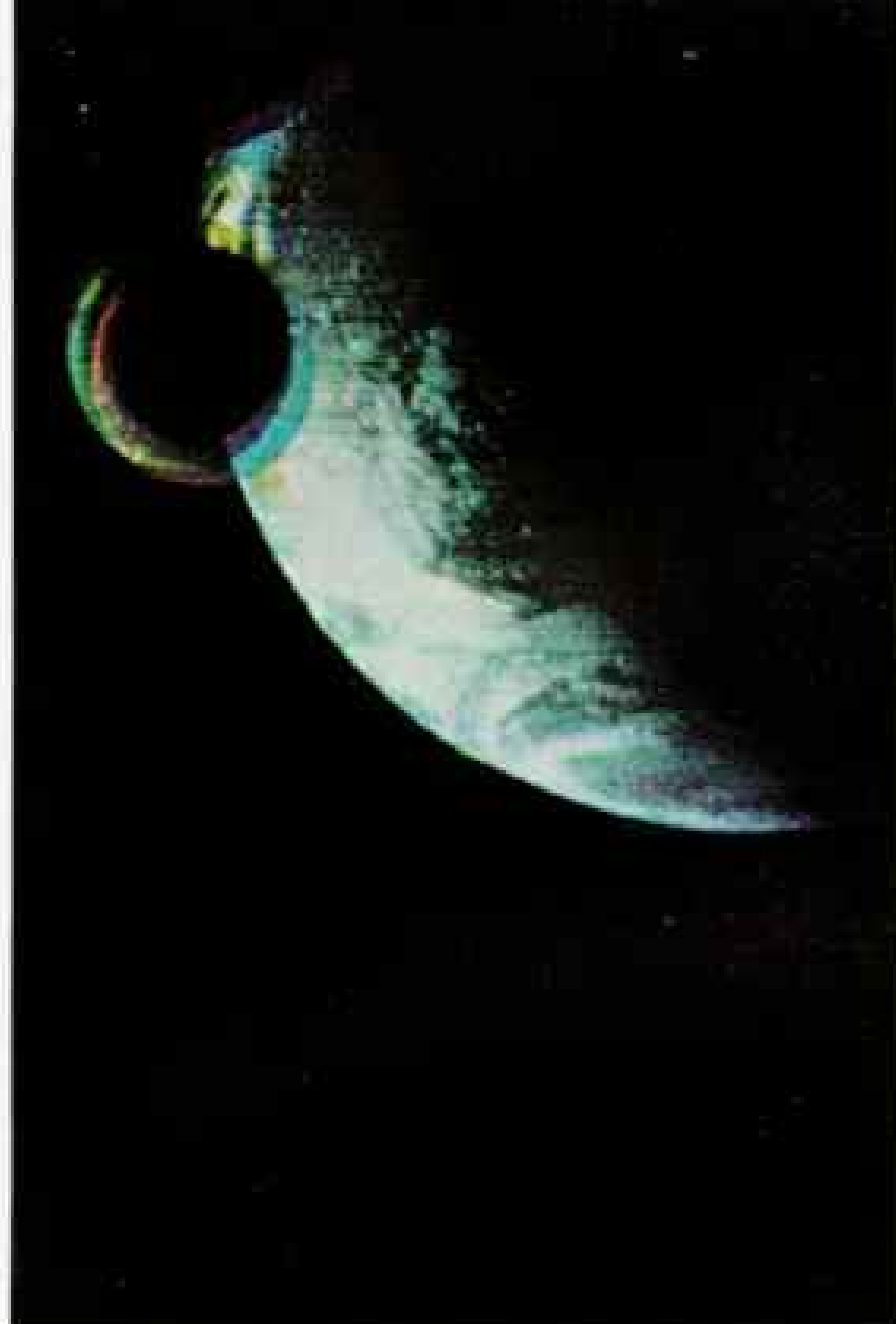
*Mr. Holliday reported pioneering experiments in space photography—from V-2 rockets—in "Seeing the Earth From 80 Miles Up," published in the October, 1950, issue of NATIONAL GEOGRAPHIC.

Big ear near Washington, D. C.—a 60-foot-diameter parabolic antenna—receives signals from distant DODGE for relay to a computer. Technicians test controls at the Johns Hopkins University's Applied Physics Laboratory, which built and operates the satellite.

Darkness engulfs the earth in this three-hour sequence. Gliding over Brazil with the color guide pointing near the North Pole, DODGE shows the line of darkness, or terminator, as the sun retreats across western Africa. Two hours later, night has advanced to the mid-Atlantic and in another hour it nears the U. S. east

Moon's-eye view of earth: Swinging around earth's pocked companion, U. S. Lunar Orbiter I gave man this view of his planet in August, 1966. The camera took it from a distance eleven times farther away than

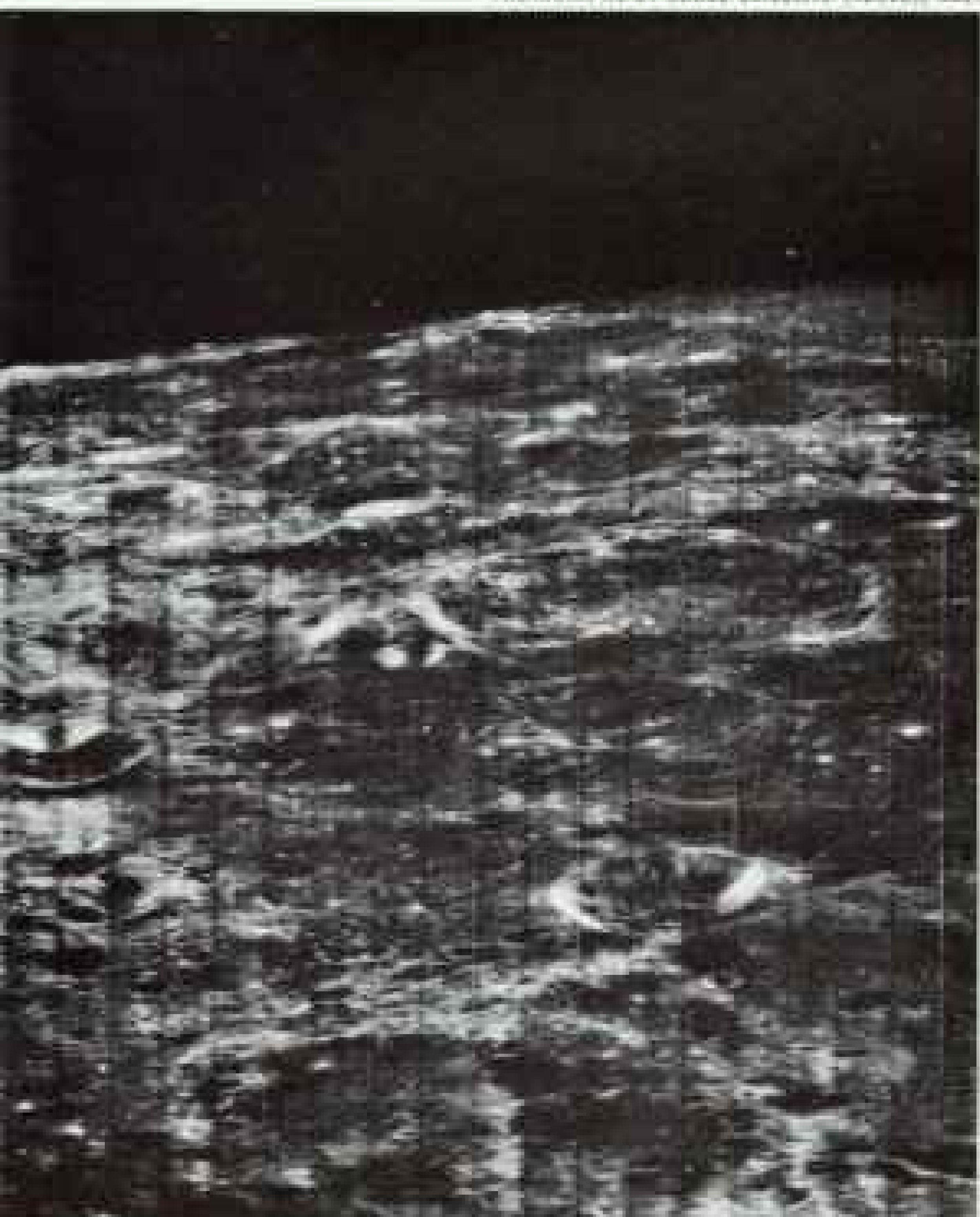




coast. Sunlight lingering on high clouds gives the terminator a ragged look, even when seen from as far away as the moon (below).

DODGE. Such a vista will greet Apollo astronauts when they circle the moon for a landing.

PHOTOGRAPHS BY DODGE SATELLITE (ABOVE); NASA



hours. This is somewhat faster than the 24 hours of earth's rotation, so the satellite moves gradually across the face of earth. At about 90 miles an hour ground speed, it covers the entire globe in 11.2 days, and we get pictures during the 5½ days it is in sight of our antenna here in Maryland."

DODGE is one of the most sophisticated of the 250 U. S. satellites now in orbit. It carries its own spare parts and can repair itself electronically. With only a little luck, it can still be operating five years from now.

I asked how gravity stabilization works. Robert E. Fischell, Project Scientist, explained that if two knobs protrude from the spacecraft on long booms, one toward the earth and one away, earth's gravity tugs on the nearer knob with one-third of a millionth of a pound more pull than on the farther, because of the slight difference in distance. In frictionless space, that "gravity gradient" is enough to keep the craft steadily pointed toward earth.

In the same way, he said, gravity gradient stabilization keeps one face of the moon always turned toward earth. The moon, slightly lopsided, turns its long axis earthward in response to the planet's pull.

Gravity Offers a Heavy Pay-off

Since there are other methods of stabilizing satellites, I wondered why gravity stabilization is so important.

Capt. L. P. Pressler, USN, who, as Director of Astronautics for the Navy, oversees the DODGE project, puts it this way:

"Sure, you can stabilize a satellite by firing control jets, but that requires fuel. With gravity gradient, earth provides the energy at no cost, and the effect is permanent.

"Moreover, with the more precise gravity system, future communications satellites could focus all their transmitter energy directly toward earth, instead of spilling it all over the universe. Then we could use smaller, lighter antennas on our ships, and mount them high in the superstructure for a more unobstructed view of the satellites.

"This will mean a lot to civilians, too. For example, with a cheap five-foot aluminum-dish antenna, any school could pick up educational TV from special satellites, which several organizations are now considering."

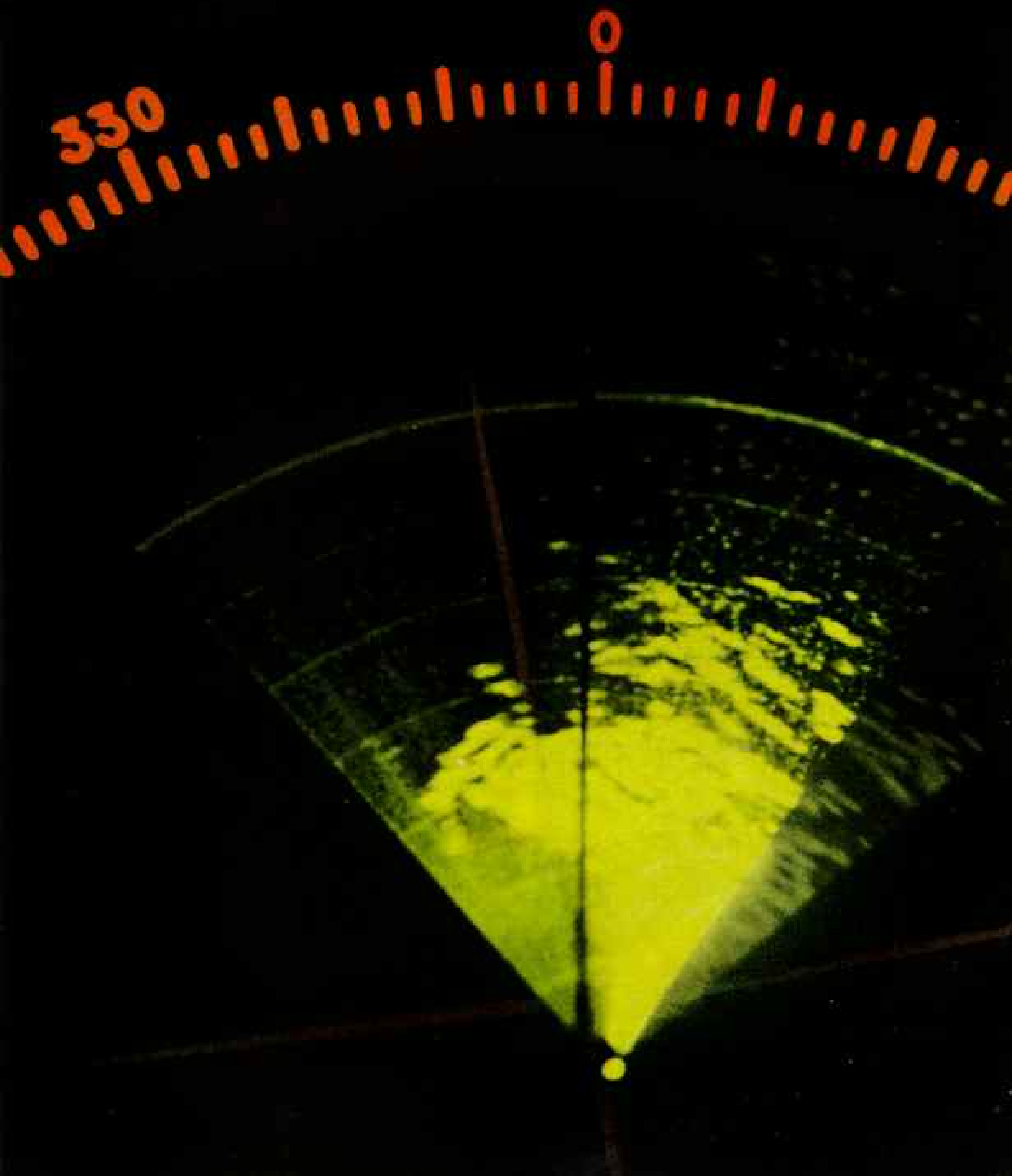
Improvement of communications is, of course, important. But until it comes, DODGE pays off handsomely with its eye-filling portrait of earth, predominantly bluish and resplendent against the black void of space.

THE END

Flight Into Antarctic

By REAR ADM. J. LLOYD ABBOT, JR., USN
Commander, United States Naval Support Force, Antarctica

Photographs by DAVID S. BOYER National Geographic Foreign Staff



Darkness

EVER SINCE Antarctic exploration began, men wintering over on the frozen continent have taken for granted being completely cut off from the rest of civilization. Rear Adm. Richard E. Byrd, writing in NATIONAL GEOGRAPHIC of his 1928-30 party, soon to be marooned in the darkness of Antarctica, said: "When the winter night should set in, all the combined merchant marines and navies of the world could not reach us."

Now all that has changed. Last June, I was proud to be aboard a history-making airplane—the first to make a regularly scheduled flight to Antarctica in the black of its winter night. With that flight, we achieved the final breakdown of the continent's long, total winter isolation.

A beginning was made in 1961, when a Soviet exchange scientist wintering at remote Byrd Station fell critically ill. Our Navy flew in and got him out, and he recovered. We flew in for another patient in 1964, and two more in 1966. All these flights were made on an emergency basis—and of course at considerable risk—during the months when, traditionally, Antarctica is cut off from the world.

Land ahead! Probing radar of a high-flying C-130 picks up Antarctica's Cape Adare (extreme left on screen). Thus Navy airmen, flying 2,400 perilous miles from New Zealand, inaugurate a dark-season service for the winter-locked American base on McMurdo Sound.

Cockpit's glowing snugness contrasts with a pitch-black afternoon and an outside temperature of minus 71° F. In the soft red light that airmen use to protect night vision, the author peers at the radar while Comdr. Fred Schneider flies the plane.

EKTACHROME © N.G.S.

"Look! McMurdo's lit up like Reno." The icy continent's only street lamps, powered by an atomic reactor, blaze a welcome to pioneering airmen homing in on McMurdo, base for 191 men. At nearby Williams Field, electric lights and Coleman gasoline lanterns lined 8,000 feet of skiway leveled by dragline.

COURTESY U. S. NAVY (UPPER); EKTACHROMES BY DAVID S. BOYER © N.G.S.

Mail-hungry eyes above breath-frosted beards watch as the C-130 roars in and disgorges its precious cargo.

More than 250 men wintered over this year at five U. S. stations in Antarctica (map, right).

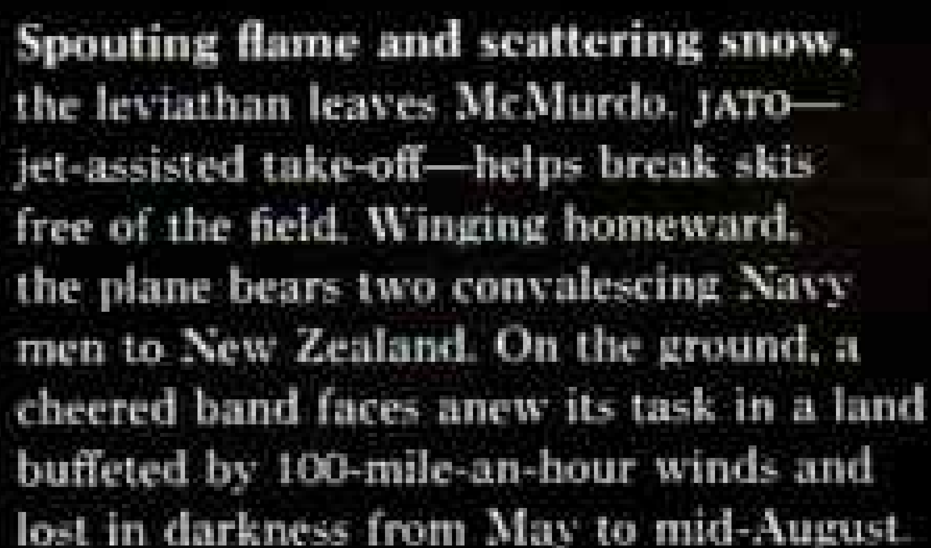
Billowing infernally, fog from the exhalations of men and machines eddies about the plane during the six-hour stopover. Overloaded by 14,000 pounds, the aptly named Hercules carried fresh food, mail, and equipment, plus 22 persons on the 8-hour flight.

These evacuations sparked an idea among those concerned with the scientific programs and support needs of our Antarctic bases: If we could get in and out safely in an emergency, why could we not fly in—and with greater safety—on a regular, planned schedule?

There was no doubt about the aircraft to be used—the ski-equipped version of the Lockheed C-130 Hercules. Since 1960 this powerful turboprop plane has become the weight-lifting champion and mainstay of Deep Freeze, the Navy's operation to support the National Science Foundation in its Antarctic Research Program.

During the summer, Navy C-130's shuttle back and forth on routine over-ocean flights between the Deep Freeze advance base at Christchurch, New Zealand, and McMurdo Station, the main American scientific base in Antarctica. But these flights are made in broad 24-hour daylight. Even in summer, though we call it "routine," flying to and from Antarctica is hazardous. A man down in that icy water could live only about 10 minutes.

In winter's darkness and more intense cold, the perils are multiplied. An aircraft down at sea or on "the Ice" (our everyday



Spouting flame and scattering snow, the leviathan leaves McMurdo. JATO—jet-assisted take-off—helps break skis free of the field. Winging homeward, the plane bears two convalescing Navy men to New Zealand. On the ground, a cheered band faces anew its task in a land buffeted by 100-mile-an-hour winds and lost in darkness from May to mid-August.

EKTACHROME © N.G.S.

term for Antarctica) can be a lot harder to find at night than in daylight.

Yet, despite these hazards, we had strong reason to open up Antarctica in winter. Scientists working in United States universities have summers (Antarctic winters) free for research. Regular fly-ins would allow us to deliver them and pick them up in time to resume their academic duties. Obviously the flights would be popular with the men on the Ice and good for morale, for they would carry in mail and fresh provisions.

At a conference last January, we agreed to begin with two flights—one in June and one in August. I decided to join the first one.

For this first scheduled winter fly-in, the National Science Foundation sponsored two research projects. Dr. Chun Chi Lee of the Institute of Marine Sciences, University of Miami, Florida, would go to investigate the effect of solar energy on microscopic plants and animals, especially as light increased from midwinter's zero to summer's 24-hour illumination.

The second program, led by Dr. Jacques S. Zaneveld, Director of the Institute of Oceanography at Old Dominion College in Norfolk, Virginia, would study the occurrence of algae and the adaptation of salt-water plants to extreme winter conditions. Three daring young civilian divers would fly down with us, for both projects would involve scuba diving under the sea ice in total darkness.

"Hot and Dusty at McMurdo"

On June 10 I flew out of Washington for Christchurch, and on Saturday evening, June 17, our meteorological officer gave the thumbs-up signal.

"It's hot and dusty at McMurdo,

sir," he said. "Not a thing to keep you from going."

"Hot and dusty" is Navy lingo for cloudless weather, anywhere in the world—even Antarctica.

With Comdr. Fred Schneider at the controls, our plane lumbered into the air next morning at 6:15. Ahead lay 2,400 miles of ocean and pack ice.

Our load exceeded normal maximum take-off weight by seven tons. Besides 22 persons, we carried 5,032 pounds of mail, bales of newspapers, 2,920 pounds of fresh vegetables, eggs, and milk, and 12 dozen cookies baked by women of the New Zealand Antarctic Society for their countrymen at Scott Station, near McMurdo.

The sun slowly dropped into the sea behind us, and we passed into the Antarctic night. Looking back, we could see twilight and a sharp horizon. Ahead we plunged into blackness, with no visible horizon at all.

When we reached the pack ice, 1,170 miles from take-off, there was still a faint glow in the sky astern. Soon this too disappeared, and we were flying through utter darkness.

Five and a half hours and 1,650 miles out, we approached what we call the PSR—point of safe return. McMurdo radio maintained a lively interest in this stage of the flight, for beyond PSR there is no turning back—you have to go on. In fact, a standing joke has it that once a plane passes PSR, McMurdo tells the pilot what the weather there is *really* like.

Always the formless fingers of our radar were probing below and ahead. At 11:47 a.m. the radar showed the coast of Antarctica, and at 1:13 p.m. it picked up Mount Erebus, the active volcano overlooking McMurdo Sound, 200 miles dead ahead.

Just-arrived oceanographer Dr. Jacques S. Zaneveld briefs Leonard Nero, right, on seaweed that the civilian scuba diver will seek in the Stygian depths under the ice.

News of home's hot summer warms snowbound men who can now look forward to twice-a-winter delivery of letters and packages from their families.

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

Fifty miles out we made contact with the Williams Field radar controller. Although we probably were the only airborne plane within 2,000 miles, he elaborately cleared us for a Ground Controlled Approach to "McMurdo International Airport."

A nearly full moon had risen, and we were treated, as we descended, to a spectacle not many men have seen—the whole mountain and ice panorama of the McMurdo Sound area bathed in brilliant moonlight. The view of our piece of Antarctica, lying there under a crystal-clear sky, was an experience beyond description, bringing home to us the stark beauty, unremitting cold, grim desolation, and solitude of the Antarctic Continent.

Then we sighted McMurdo, bright with street lights—thanks to Antarctica's first and only nuclear power plant.* Electric lights and gasoline lanterns framed the snow-covered skiway of Williams Field for 8,000 feet.

Commander Schneider's approach was smooth and precise. Gently the plane's big skis met the freshly leveled airstrip, and we were down. It was 2:27 p.m. The C-130 made a stately swing toward huddled welcomers, the crew door dropped open, and we all tumbled out to handshakes and shouted hellos.

Hooded figures converged to unload the airplane. Fresh fruit and vegetables were rushed to the galley before they could freeze in the $-39°$ F. air. The five thousand pounds of mail got even faster handling.

Six hours had been allowed for the turnaround, and they were busy ones. Whisked to the station by helicopter, I conferred with commanders, addressed the men, inspected buildings, and went through the abundant chow line. Plainly, morale—already high—had been boosted by contact with the world of light and warmth. I wished it had been possible to bring the same boost to the other Americans wintering in Antarctica.

Back at the airstrip, we loaded return mail and took aboard two convalescing patients from the dispensary. With a roaring boost from eight JATO bottles, we lifted from the skiway. The first scheduled winter fly-in to Antarctica had been completed without casualties. The fly-out was equally smooth.

Looking back, I think we instilled in the people at McMurdo a certain comfortable feeling that they will never again be totally isolated. Last September 3 another C-130 made an equally successful scheduled flight to McMurdo and return. So far as I'm concerned, winter fly-ins are now a regular part of the Antarctic Support Force repertoire.

*See "New Era in the Loneliest Continent," by Rear Adm. David M. Tyree, USN, GEOGRAPHIC, February, 1963, and "First Flight Across the Bottom of the World," by Rear Adm. James R. Reedy, USN, March, 1964.

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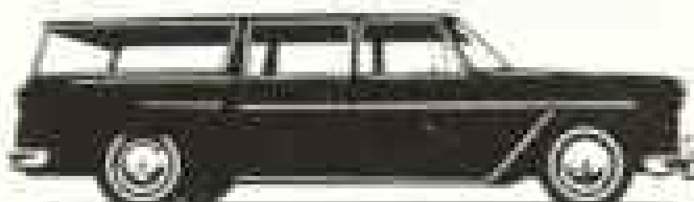

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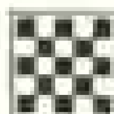

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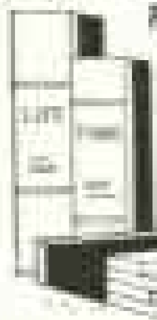

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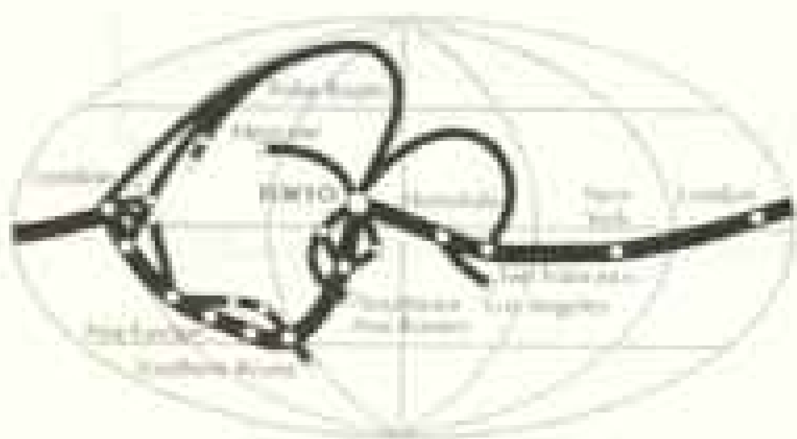

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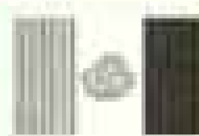

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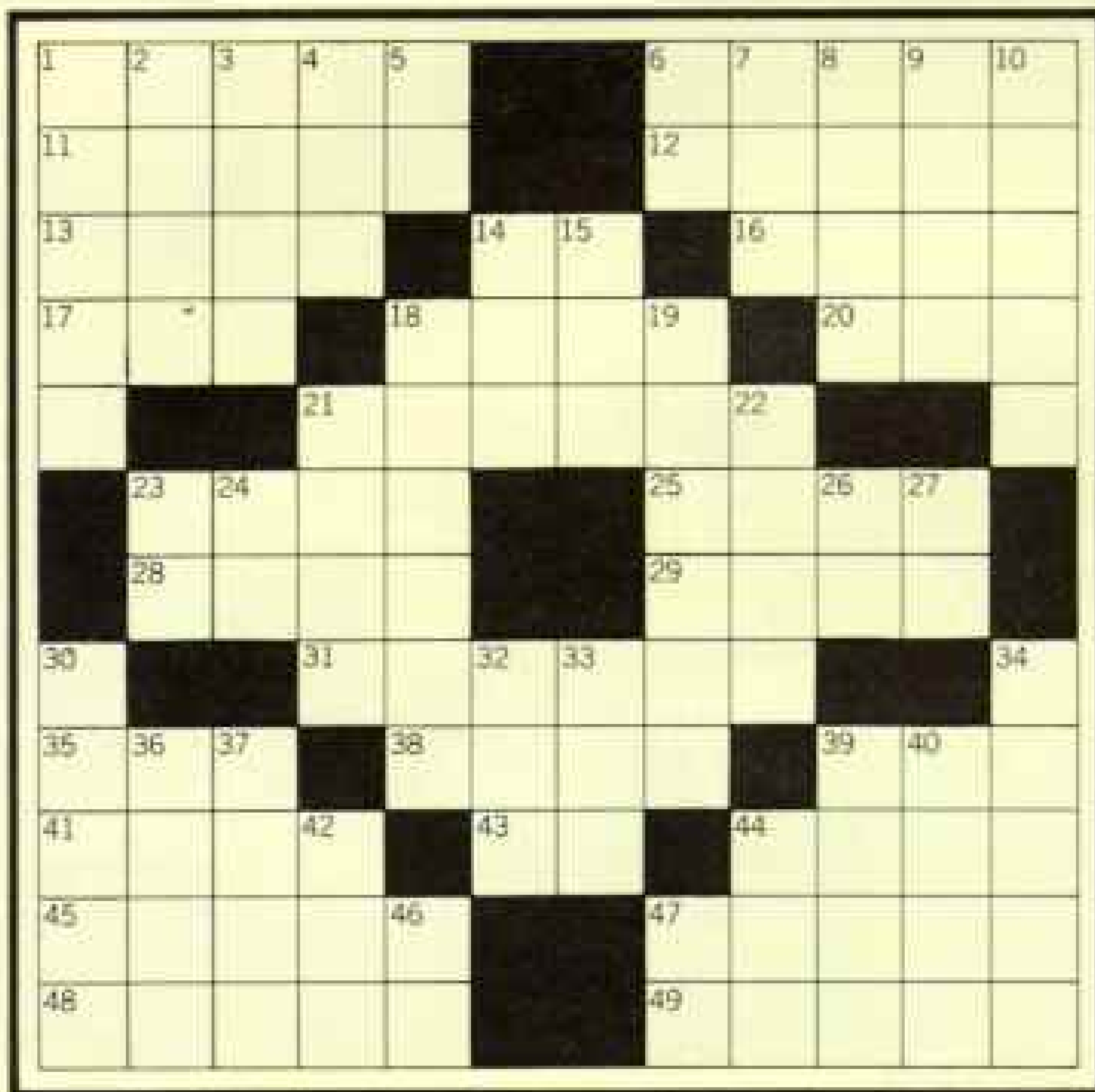

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1. Rabbit or knockout
6. Florida city
11. Hollywood statue
12. Command
13. Man's first name, Ponce's last name
14. The spirit of___.
16. Kiss Me___.
17. Printed persuaders
18. Couples
20. Non-women
21. Railway stations
23. Sherlock Holmes' Baker St. address
25. Girl's name
28. How many Arabian nights?
29. Metal
31. Bends over
35. A limb
38. Hurt
39. Female deer
41. To judge
43. LXX
44. The Jones and the Sawyer boy
45. Mr. Stevenson
47. A flat cap for men or women
48. Cowboy circus
49. Baked, lima, or jelly___.

DOWN

1. White bear
2. Second-hand
3. Sergeants
4. Tin container
5. Sixty minutes (Abbr.)
6. U. S. State (Abbr.)
7. Annoy
8. First man
9. To allot
10. Girl's name
14. Soft drink
15. Into the valley of death rode the___.
18. Entries of debt
19. Privates have one
21. God (Spanish)
22. Gentlemen
23. Voting age
24. XX
26. Preposition
27. In grammar, an article
30. Electronic eye
32. Killer's license number
33. Gold (Spanish)
34. Lies down
36. Do over
37. Canasta term
39. The dumb girl
40. A portent
42. Girl's name
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47. Ammunition for toy gun

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