DOUBLE SUPPLEMENT MAP: THE SOVIET UNION AND ITS PEOPLES

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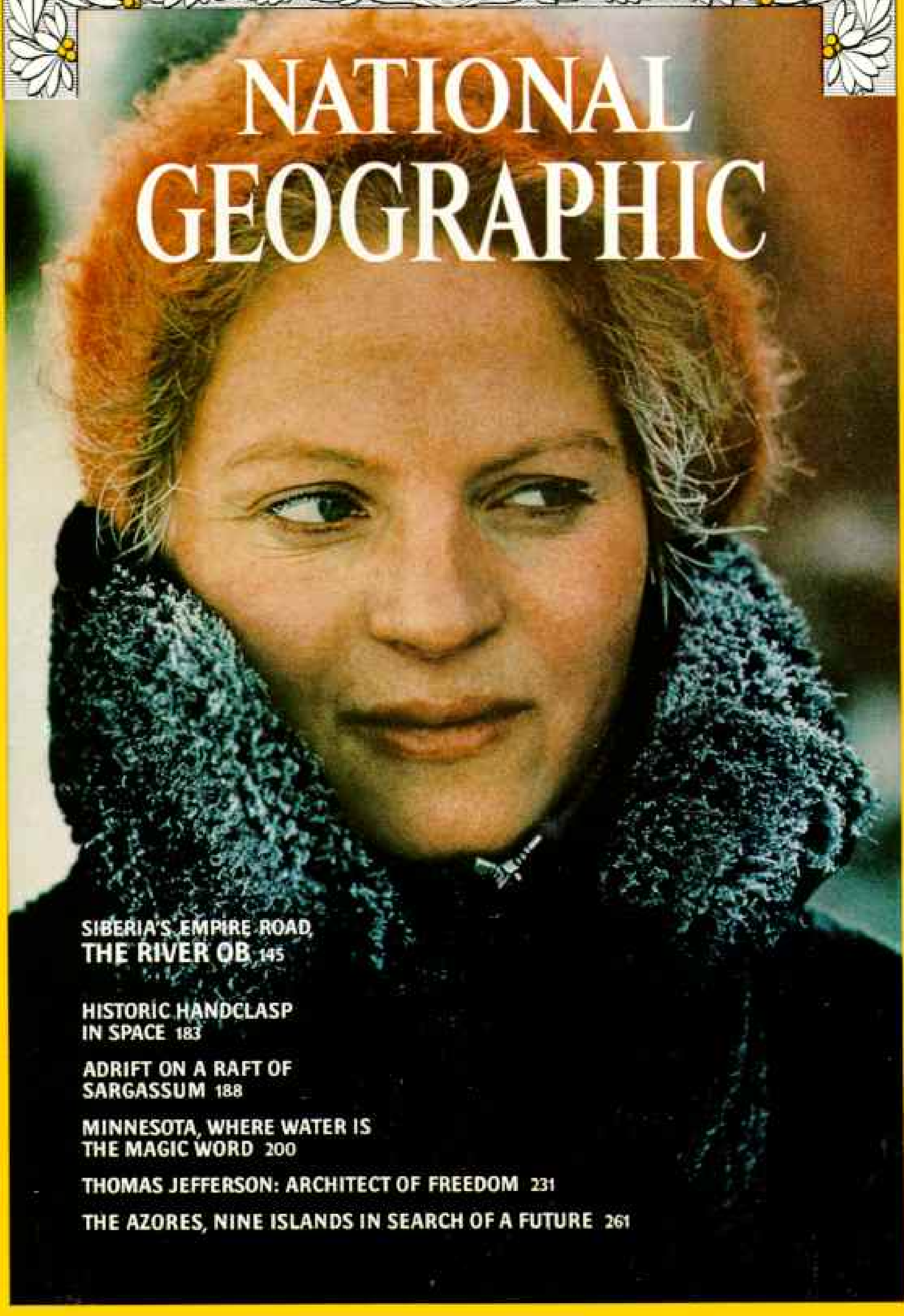

SEE "THE ANIMALS NOBODY LOVED" TUESDAY, FEB. 10, ON PBS TV

AMONG odds and ends gathered from various parts of the world that adorn my office and home is an enameled insignia from a Russian Army uniform. Some three years ago, while riding on a train from Irkutsk to Novosibirsk, deep in the vastness of Siberia, I met a happy young soldier returning from the Chinese border. He had been married more than a year before, ordered to duty after a brief honeymoon, and now was about to see, for the first time, his young son. As a gesture of our 24-hour friendship, he gave the insignia to my wife, Donna, and we had our own small détente rolling through the endless Siberian night.

That vignette of memory helps to recall other impressions of a nation so vast it encompasses a sixth of the total landmass of the planet, stretches across eleven time zones, and numbers more than a hundred distinct ethnic groups. (See the double-sided map of the **Soviet Union** and **Peoples of the Soviet Union** enclosed with this issue.)

I recall, for example, a fascinating interview with Dr. Pavel Melnikov, Director of the Permafrost Institute at Yakutsk—one of the world's few large cities built on permanently frozen ground.

"Nearly half of the Soviet Union is underlain with permafrost," he told me, "but these cold regions are now being actively developed. Oil, gas, and ores are all present in quantity, but their production requires special techniques. The environmental conditions are both awesome and fragile. We have had helpful cooperation with Canadian arctic experts. I believe that scientists must work together."

Quite often, however, the desire for intellectual communication runs afoul of other national interests. Melnikov himself said that he had once been denied permission by the United States to visit an Army-run cold regions research center in this country. (He has since been welcomed there.) The GEOGRAPHIC team that this month reports on the River Ob could not get permission to travel the river's final 400 miles.

In any nation where the state has a direct interest in the activities of journalists, the experiences of covering a story can be frustrating and harrowing. Yet, with persistence, patience, and fortitude, men like NATIONAL GEOGRAPHIC's Dean Conger and Robert Paul Jordan have been able to bring us unique articles from places normally closed to Western journalists—parts of Siberia, the length of the Volga, and now, in this issue, the River Ob.

In this era of détente, we believe the product worth the sometimes agonizing effort, but we do not delude ourselves that it will be entirely fulfilling, and we know that certain disquieting realities of Soviet life will be beyond our purview.

Gilbert M. Grosvenor

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COVER: *Along the River Ob (pages 144-181). Siberian winter adds high color to a woman's cheeks. Photograph by Dean Conger.*

Siberia's Road, the River Ob

By ROBERT PAUL JORDAN
Photographs by
DEAN CONGER
BOTH NATIONAL GEOGRAPHIC STAFF

LONG AGO, people living beside the River Ob, where the tumultuous metropolis of Novosibirsk now spreads, called the wide stream Babushka—Grandmother. She was slow and strong and a great help, provider of food and transportation.

To me, the name still fits. On her broad bosom Grandmother carries civilization into Siberia's harsh wilderness.

I have journeyed twice, winter and summer, along most of the Ob's winding course, from the wild mountains of her birth near Mongolia to the land of the midnight sun. Airplanes, ships, and kidney-jarring jeeps took me to places no other contemporary Westerners have seen. Along the corridor of the Ob many doors were opened; others remained closed, still others unknown.

In February the air was so cold and dry that it burned the face and tormented the lungs. "*Teplo*—warm," scoffed an escort as I rubbed my white-tipped nose to restore circulation. In July, the breezes were as gentle and sweet as a caress. "The time is coming," a guide quipped, "when we will bottle this oxygen and sell it."

The story the Ob told me is the story of hardy and determined men and women, most of them young, who are building an industrial empire on Grandmother's banks. They like to quote an old saying: "In Siberia, forty degrees below zero is not a frost, a hundred kilometers is not a distance, half a liter of vodka is not a drink, and forty years is not a woman."

As we all do, the Ob begins life noisy and vigorous. Her twin sources, the Biya and the Katun, rise deep in the Altay Mountains of southwestern Siberia. Farther south, in China, springs the Irtysh, the Ob's great tributary. North they flow, nearly to the world's top.

The slim and dancing Katun, milky with rock flour, and the swift Biya, shingled in spring flood with pine logs floating downstream to the mills, meet at the city of Biysk. When loggers of old discovered this union, so the legend goes, they cried *"Oba!"*—Russian for "both."

From Biysk the river glides ever northerly, ever wider and more sluggish. At Novosibirsk, Siberia's largest city and its unofficial capital, I saw the Ob shouldering enormous shipments of supplies and equipment to feed the fast-developing oil country of Tyumen Oblast (Region), 600 and more miles ahead.

Summer bursts forth in Siberia's largest city, Novosibirsk, where workers erect a new Intourist hotel (**facing page**). Cranes seem to nod (**above**) as dusk settles over the Ob riverfront.

In this remarkable look at a region richly endowed and seldom visited by foreigners, the author reports how a functional new society is rising along the banks of the Ob.

Then she rolls in middle course across the lowland of western Siberia, spreading far beyond her banks in high-water time, recharging mosquito-infested swamps and lakes. In her lower reach near Khanty Mansiysk, where the Irtysh marries the Ob, I sailed on a silt-colored stream two miles wide. Beyond Salekhard, 25 miles would not span the river's mouth where she pours at last into an arm of the Arctic Ocean. By then the river has drained a basin of 1,300,000 square miles, not much smaller than that of the Mississippi and Missouri (map, page 151).

From source to mouth, the Ob-Irtysh river system, fourth longest in the world, flows nearly 3,500 miles. But few in the Soviet Union ever travel its length, and to Westerners the Ob remains more mysterious than the Amazon.

Temperatures Vary by 160 Degrees

Do not think that the Siberians along its banks are inhospitable. They made photographer Dean Conger and me welcome a hundred times over. But Siberia *is* forbidding. Temperature extremes along the Ob range from nearly 60 degrees below zero F. to more than 100 above. Emptiness lies from horizon to horizon. There are few highways and accommodations.

Yet natural wealth abounds. Not only oil and gas, but also vast reserves of coal and ores, forests, land, and water. Here lies the U.S.S.R.'s future for generations to come, a future only now being unlocked.

Dean and I prevailed upon Soviet officialdom to let us glimpse that future along the Ob's course. The Novosti Press Agency arranged our travel from Moscow—with some difficulty because the itinerary was unprecedented—and sent journalists with us as interpreters. Often we became a small expedition. Local representatives met us at each stop, along with cars and drivers. Then, usually on a tight schedule, we headed out to farms, factories, and institutes, where our entourage, and our interpreters' woes, often doubled.

From Moscow our way led us four time zones east to Novosibirsk. (See National Geographic's new map of the **Soviet Union,** distributed with this issue.) This city began as a huddle of wooden huts at the turn of the century, when the Trans-Siberian Railroad bridge across the Ob was completed. V. I. Lenin, the visionary who molded the Soviet Union and left his mark on the world, paused here in 1897 en route to exile; he described the cruel country as a "barren wilderness . . . with no habitations, no towns. . . ."

Today Novosibirsk reverberates as "Siberia's Chicago," and its face changes daily. With 1.3 million residents, it

Hand-carved gingerbread woodwork, and the houses it decorates, will soon give way to contemporary-style new apartments and schools in Tobolsk. Only dwellings considered historically valuable will be spared.

Siberia or Sarasota? Sailboats skim the Ob Sea, where the river is dammed to provide power and water for Novosibirsk. Apartments at the water's edge house scientists who work at Akademgorodok, the "Science Town" literally built into the forest near Novosibirsk. Here, in one of the world's great think tanks, more than 3,000 specialists probe Siberia's past and plan for its future.

While a colleague looks on, Academician Aleksey

Pavlovich Okladnikov (**left**) holds a cast of the skull and a reconstructed portrait of a Neanderthal child who lived in Uzbekistan some 40,000 years ago.

An entomologist striving to solve the mysteries of genetics (**right**) studies a yeast-eating fly, *Drosophila virilis*. Such research may provide clues for the development of new plant and animal strains that will be able to withstand sweltering summers and numbing winters.

ranks as a leading Soviet producer of heavy machine tools, hydroelectric generators, and other electrical equipment. People throng wide sidewalks; taxis, private cars, trucks, tandem trolleys, and motorcycles crowd the streets. New apartments spring up by the thousands, a 24-story Intourist hotel rises downtown (page 144), and designers have scheduled a subway for completion by 1980 —a project to which thousands of workers have been assigned, a city official casually informed me.

Novosibirsk remains a vital transportation hub and center of trade routes. Grain from the south, furs from the north, lumber from endless forests, and travelers from throughout the Soviet Union pause here in midpassage. This is a major stop on the Trans-Siberian Railroad's Moscow-Vladivostok run —seven nights and seven days, the longest train ride of all. Aeroflot's armada of sleek jets and workhorse propeller craft, some of them biplanes, strains airport facilities.

Down on the waterfront heavy ship and barge traffic plies the Ob. Dredges maintain the channel's depth and passenger ships carry people to villages, beaches, and forests. Grandmother would astonish the nomads who once roamed her banks.

Giant Port Could Be Even Bigger

One summer afternoon I rode along on the river past tilting cranes, shuttling freight cars, and barges gorging on bulk cargoes. Piles of sand, brick, crates, concrete slabs, boilers, and pipe lined the banks—the stuff of raw new wilderness cities and the key to untapped oceans of oil and gas.

Beside me the Port of Novosibirsk's director leaned against the rail of his white cabin cruiser and swept an arm. "That's just one of our 45 berths," said 39-year-old Vyacheslav Minayev. "The port extends for many miles along the Ob. We ship out ten million metric tons of cargo a year."

He frowned. "It isn't enough. The Tyumen

On mirror-calm Lake Teletskoye, a research vessel lies moored as scientists warm up by a fire ashore. Dozens of streams feed the deep, clear lake, nestled in the Altay Mountains. The lake in turn gives rise to the swift-flowing Biya, which rushes to a rendezvous with the Katun. Together they form the Ob—perhaps from the Russian word *oba*, for "both."

The River Ob: Highway to frontier riches

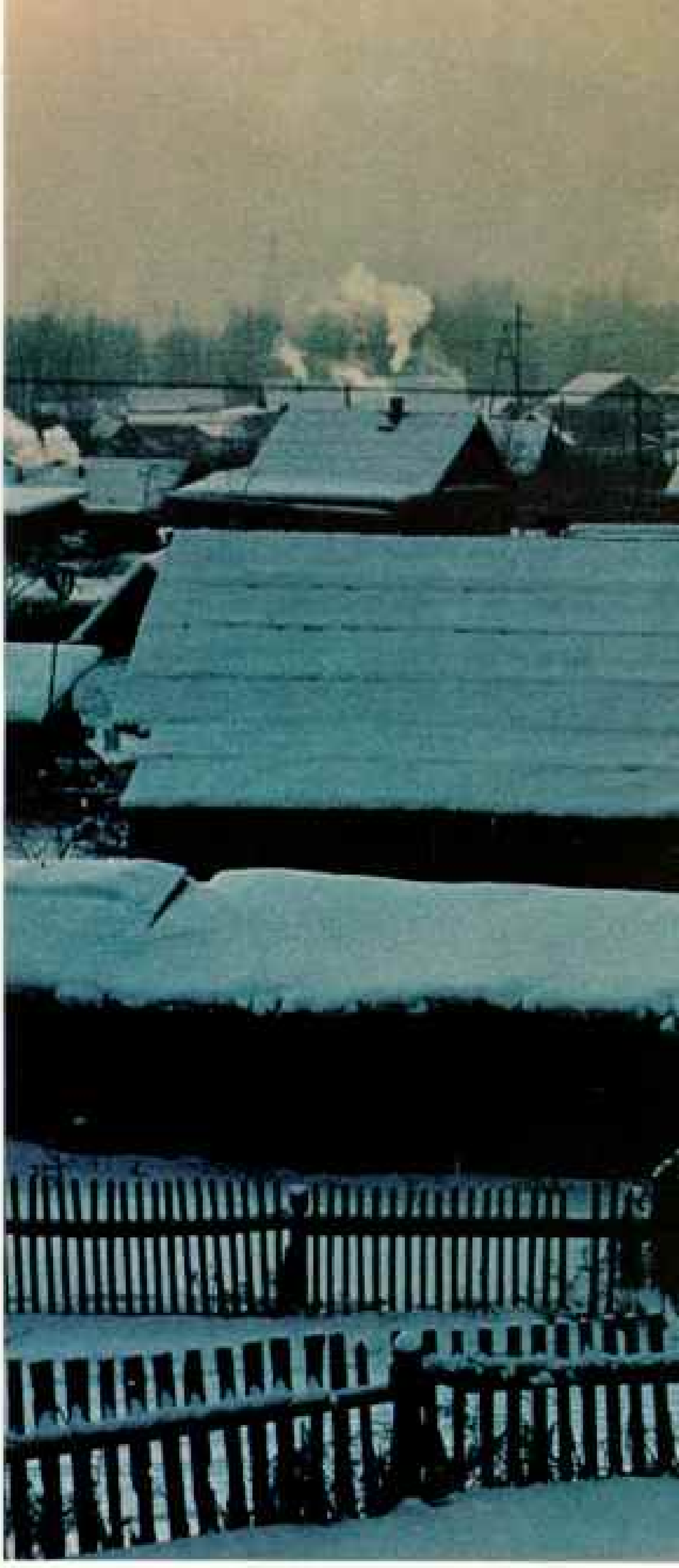
NEARLY AS LONG as the Mississippi, the Ob is joined by its chief tributary, the Irtysh, to comprise a river system stretching nearly 3,500 miles. At the Ob's sources in the Altay Mountains, pines and firs provide abundant timber. Since the river never quite drains the swampy western Siberian lowland, few cared about the area until immense deposits of oil and natural gas were discovered there in the 1960's.

Novaya Zemlya
NORTHERN SEA ROUTE
Dickson
Kara Sea
Gulf of Ob
Khalmer Yu.
Vorkuta
ARCTIC CIRCLE
Novyy Port
Labytnangi
Salekhard
Ural Mountains
Pangody
Nadym
Urengoy
Yagelnyy
Berezovo
Ob
TYUMEN OBLAST
Sergino
West Siberian Plain
Surgut
Khanty Mansiysk
SAMOTLOR
Nizhnevartovsk
Strezhevoy
Mezhdurechenskiy
Demyanskoye
Uvat
Tavda
Tobolsk
RUSSIAN SOVIET FEDERATED SOCIALIST REPUBLIC
Tyumen
Yalutorovsk
Golyshmanovo
Kurgan
Ishim
Tyukalinsk
Irtysh
Tara
Asino
Tomsk
Bogotol
Marinsk
Krasnoyarsk
Anzhero Sudzhensk
Kemerovo
Kuybyshev
Omsk
TRANS-SIBERIAN RAILROAD
Chulym
Novosibirsk
Akademgorodok
Ob Sea
Petropavlovsk
Isilkul
Ishim
Belovo
Abakan
Minusinsk
Novokuznetsk
Kokchetav
KAZAKH S.S.R.
Barnaul
Biysk
OB-IRTYSH CANAL (NOW UNDER CONSTRUCTION)
Atbasar
Pavlodar
Gorno Altaysk
Artybash
Nizhnyaya Souzga
Lake Teletskoye
Rubtsovsk
ALTAY KRAY
Shebalino
Tselinograd
IRTYSH-KARAGANDA CANAL
Kulada
Onguday
Semipalatinsk
Karaganda
Ust Kamenogorsk
Zyryanovsk
MONGOLIA
Altay Mountains
Lake Zaysan
CHINA
Zaysan
STATUTE MILES
Road
Railroad
Swamp
Airport
Oil field
Gas field
Dam
Elevations in feet

Administrative subdivisions of western Siberia are outlined on the map; where they are not labeled, they bear the same names as their capitals, shown thus ⊛

"**All's cold,**" smoking chimneys seem to signal at Gorno Altaysk (**right**), while the sun struggles to pierce a veil of clouds. Timber from the forests along the Ob's headwaters provides material for snug log cabins.

While winter winds howl outside her log home at Nizhnyaya Souzga, Tanya Mikhaylova (**below**) cuddles the family cat. Television brings her a program via satellite from Moscow, four time zones to the west.



oil frontier is developing so fast we can't keep up with its demands. The Ob is our lifeblood, but the blood turns to ice in October and remains frozen until April. In six months we must supply the north for the entire year. We are working at our extreme limits."

As he spoke, shipping activity gave way to serene pine forests fronted by long beaches. Humanity in bathing suits covered the sand. Women in bikinis faced the sun with their arms outstretched and their palms open, statuesque supplicants seeking an even tan. I could understand their devotion. With a climate that imposes a frosty monochrome half the year or more, Siberians treasure flowers and color and strong sun.

We waved as an excursion boat passed, its decks awash with holidaying cityfolk. "Our people love nature," said Mr. Minayev. "On nice weekends like this, everybody wants to go somewhere on the water. They all try to board our ships at the same time Saturday

morning. They all want to go home at the same time Sunday evening. We do our best."

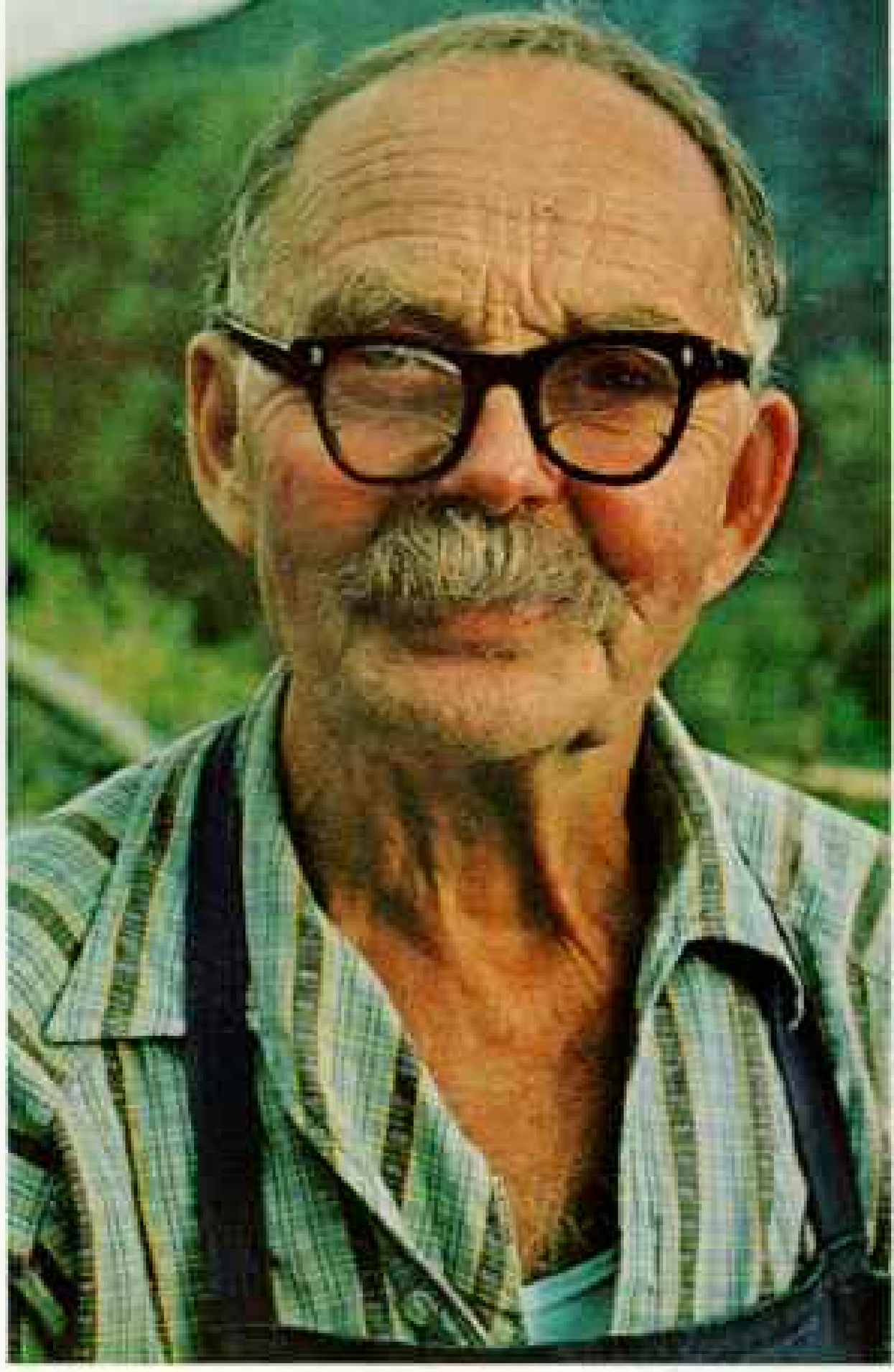
Favored Delicacy an Acquired Taste

A small hydrofoil skimmed alongside us and settled on its haunches; the driver handed up a bag of the fish called sterlet—a kind of sturgeon—freshly taken from the Ob. In the galley the port director deftly prepared this Siberian delicacy. He laid each fat fish open, cleaned it, flecked the inside with salt, pepper, and chopped onions, and closed it.

Half an hour later I glumly contemplated the taste treat placed before me—sterlet is served raw. My host took a thick slice in his fingers, tore meat from skin with flashing teeth, and chomped enthusiastically. "Eat!" he commanded.

I did. It tasted like greasy, uncooked fish. "*Ya sibiryak,*" I muttered. "I am a Siberiak." The director only grinned.

Still, I did come to count myself a Siberiak



They're a hardy breed, the Siberiaks who live and work along the Ob. Clockwise from above: A young woman endures a temperature of minus 40° F. while she waits for a department store to open in Khanty Mansiysk.

His zest for life and work still intact, Nikolay Smirnov has spent nearly half a century on his isolated farm at Lake Teletskoye. He grows flowers and vegetables—including American-bred tomatoes—tends dairy cows, and has raised 18 children, delivering all but one himself.

Face rimmed with fur, a girl of a nomadic tribe warms up at Khanty Mansiysk's museum. Many of her people, among the oldest surviving natives of Siberia, still roam with their reindeer herds through the subarctic coniferous forests called the taiga. Some have adapted to the life of city and oil field.

A robust construction worker takes a break from building an apartment complex near Khanty Mansiysk.

At a summer camp outside Novosibirsk a young girl wears a smile almost as broad as that of the bear that decorates her head.

in small ways. As I roamed Novosibirsk, no one kept better watch for the vendor of *morozhnoye*—ice cream. Kerchiefed babushkas sold me *kvas*, a light drink made from fermented rye bread, or *pivo*—beer. They dispensed the beverages, sometimes with a gold- or steel-toothed smile, from sidewalk trucks, rewashing glasses as necessary.

Higher culture also claimed me. One night I joined droves of people strolling to the Theater of Opera and Ballet (pages 160-61). There we balletomanes, more than 2,000 of us, filled a richly appointed hall and applauded a stunning *Anna Karenina* danced by a beautiful prima ballerina and a company of 110. I returned the next evening, still smitten with Anna, and lost my heart to a saucy *Carmen*.

Apartment Can Be a Wedding Bonus

But that was only make-believe. For true love I can recommend the wedding palace, "the happiest place in town," as my guide said. In this former day-care center on busy Krasnyy Prospekt—Red Avenue—five couples an hour enter into matrimony, nine hours a day, five days a week.

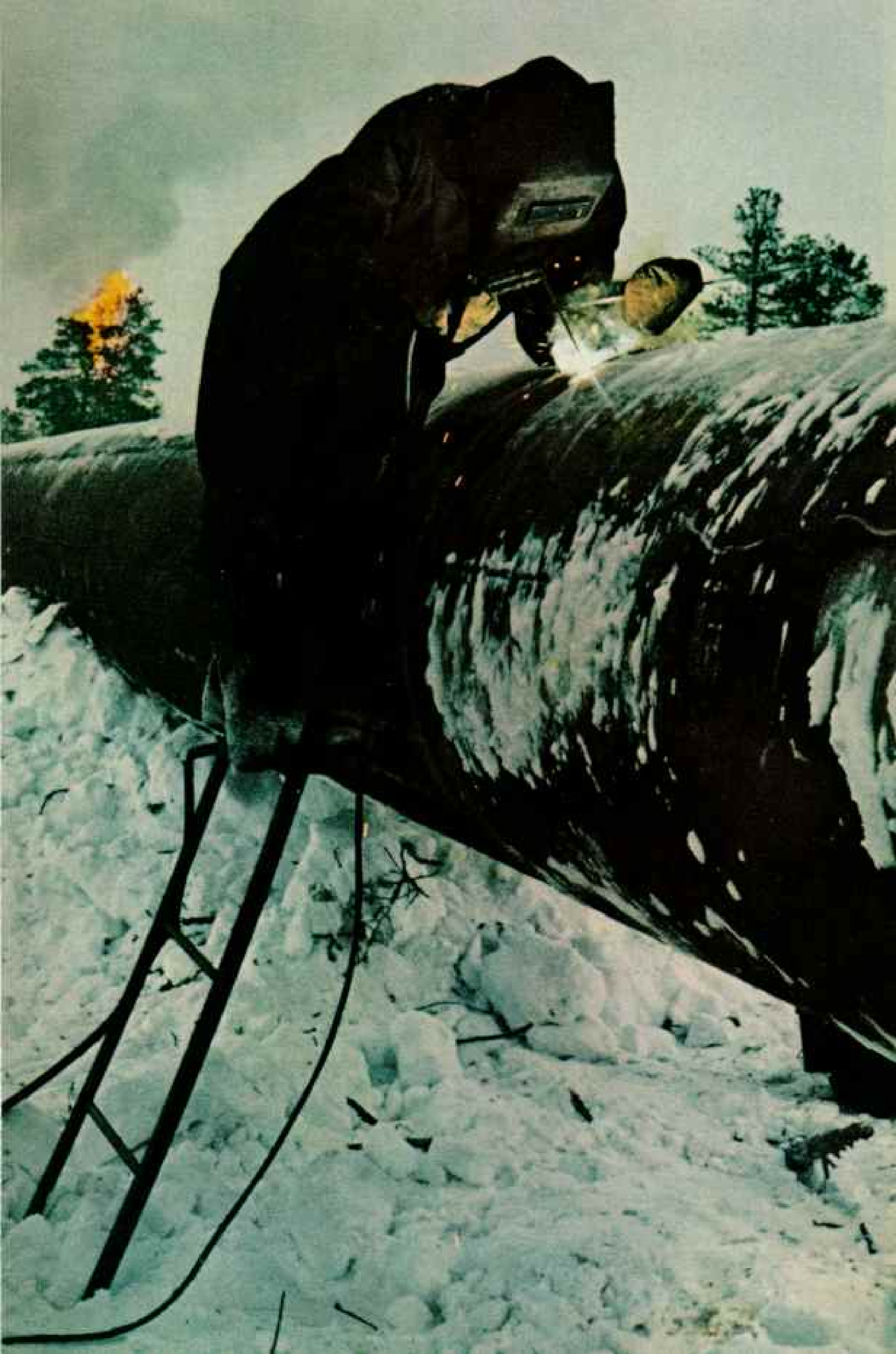
Mrs. Lyudmila Kosova, the plump and cheerful grandmother in charge of the palace, invited me to watch several weddings. Though they were civil ceremonies and rapid fire, I sensed in them the same emotions, the same faith and hope as in the church nuptials I had attended at home.

Brides wore white and carried flowers; some were nervous, some all smiles. Grooms wore black suits and white shirts and a uniformly serious mien. Mothers dabbed at their eyes, fathers beamed. Best men stood by in studied calm; one of them disdained suit coat and tie, and bared muscular arms.

A weary recording of Tchaikovsky's "Piano Concerto No. 1," with Van Cliburn at the keyboard, accompanied each ceremony. Mrs. Kosova officiated.

"Do you agree?" she asked a typical bride, Masha Ostroginskaya. Softly came the reply, "*Da.*" "Do you agree?" she asked the groom, Boris Anoprikov. "*Da.*" Firm response.

After they signed the registry, she pronounced them man and wife and offered the couple a word of advice. "You have new obligations. Remember that life is very complicated. The main thing is to be patient with each other. In your happiness do not forget

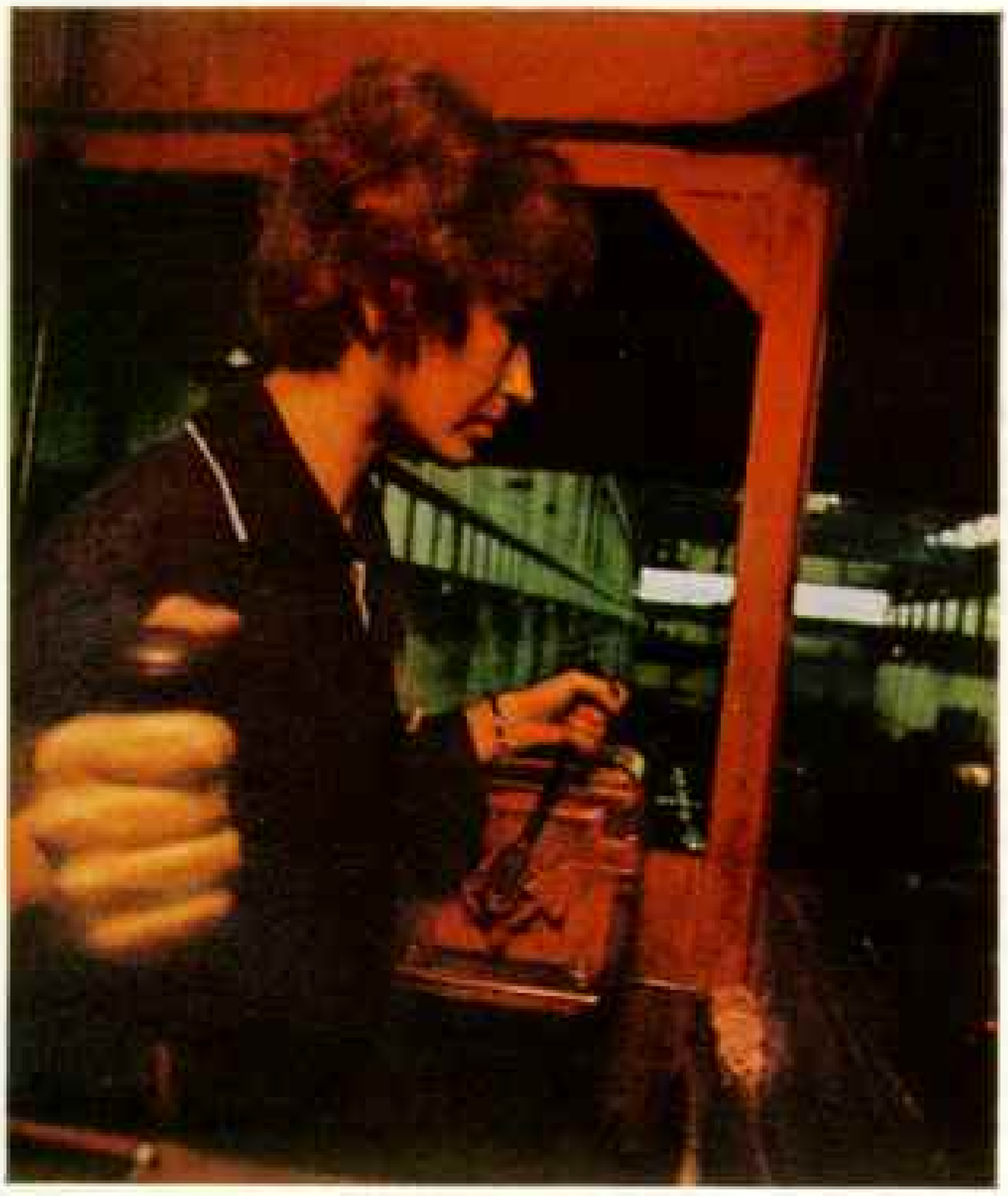


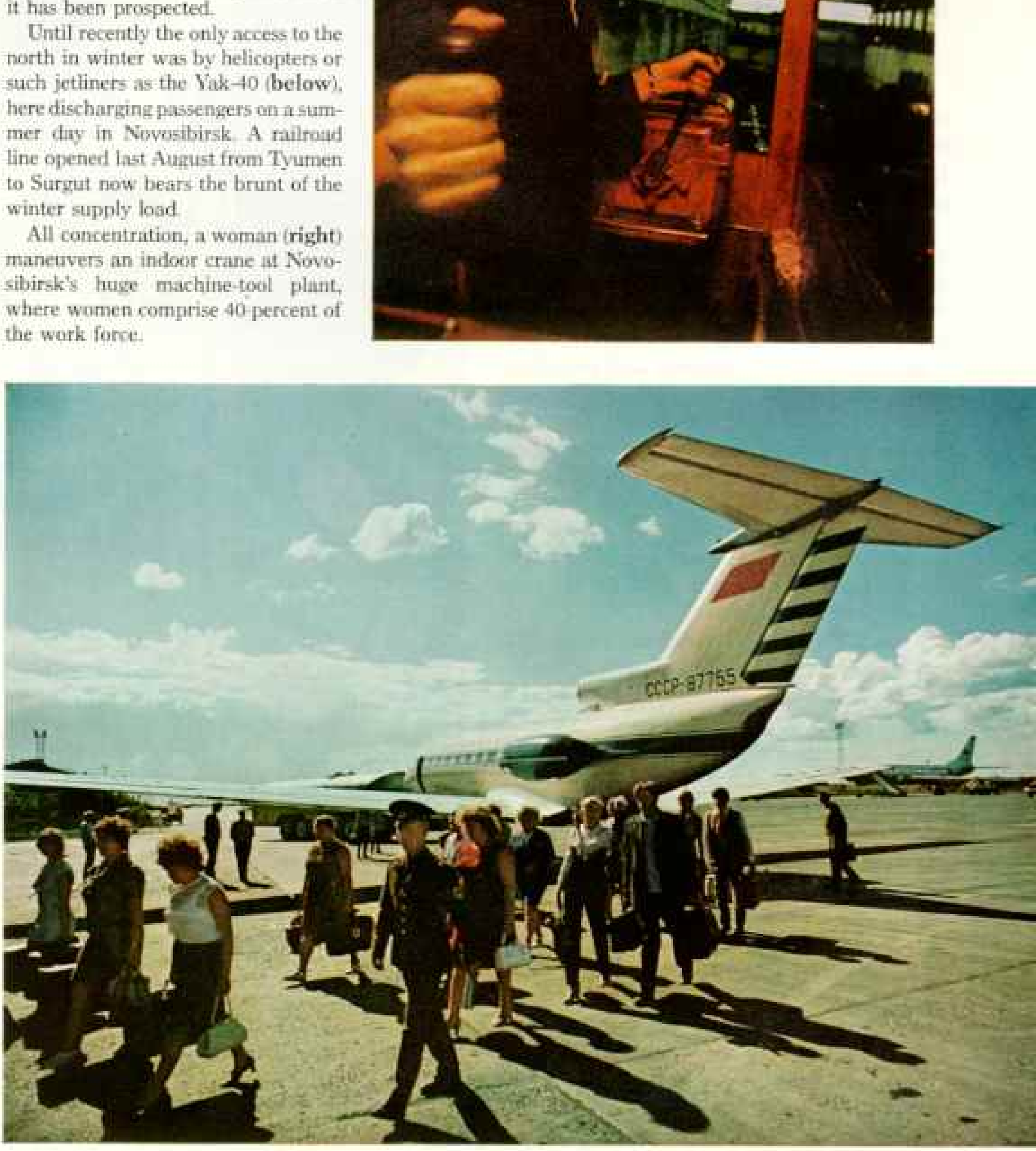
Stitching a seam with an electric welder (**left**), a worker readies a pipeline to carry the black bounty of the Samotlor oil field, where a gas burn-off flares treetop high. Reserves of 14 billion barrels make it one of the world's great oil pools.

Since 1960 geologists have discovered dozens of oil fields in the swampy northern lowland, and there are undoubtedly more to come. The entire region is as large as Alaska and Texas combined, but only a fourth of it has been prospected.

Until recently the only access to the north in winter was by helicopters or such jetliners as the Yak-40 (**below**), here discharging passengers on a summer day in Novosibirsk. A railroad line opened last August from Tyumen to Surgut now bears the brunt of the winter supply load.

All concentration, a woman (**right**) maneuvers an indoor crane at Novosibirsk's huge machine-tool plant, where women comprise 40 percent of the work force.





Siberia's Empire Road, the River Ob

your parents. Their experience can help you."

Then it was over, and the groom received the marriage papers. After members of the wedding party posed for photographs, Boris, a husky electrical-parts assemblyman, scooped lovely Masha, a secretary, off her feet and carried her out of the palace.

Rented cars waited to take the party to a celebration at a hotel, where champagne corks would fly. A three-day holiday would follow, gift of the state. Best of all, they were to receive the keys to a flat of their own, a bonus from the factory where they worked.

Factory Is Hub of Daily Life

In Siberia labor is at a premium. Many who move there find life too difficult, especially in the north. Housing also is in short supply. Large enterprises must offer enticements to attract and keep workers.

Visiting Novosibirsk's 133-acre machine-tool factory, I expected its shirt-sleeved director to run out of superlatives. "We call it the 'Plant of Plants,'" declared Igor Sidorov. "It is like a small kingdom."

He pointed out a hospital and polyclinic, two kindergartens, five schools—including a vocational and a technical school—sports facilities, greenhouse (workers receive bouquets on their birthdays), and a surrounding town that houses the plant's 6,000 employees.

Each year the enterprise constructs 200 flats. Newlyweds like Masha and Boris would move into a two-room unit. The rent? Four or 5 percent of their income.

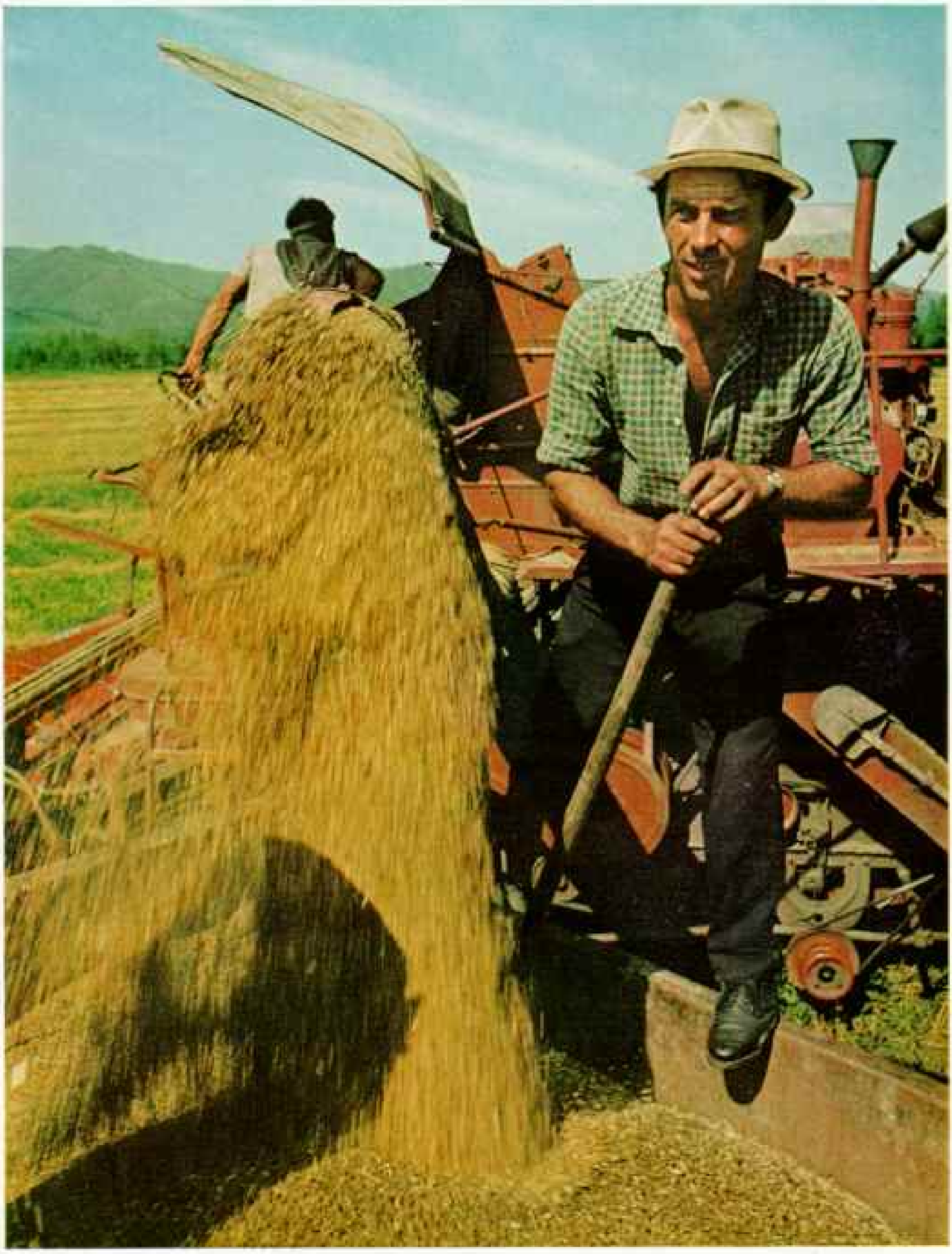
I asked the director about recreation. "We have everything," he said with pride. "Radio, television, cinema, athletics, and clubs. We have our own ship; it carries us down the Ob to our recreation camp. And we also have a camp for hunters and fishermen."

Walking through the factory, we watched gigantic hydraulic presses and horizontal boring machines take shape. High overhead, powerful cranes clicked back and forth on steel tracks. The operator of one, a striking young woman with a glory of hennaed hair, impassively set a five-ton iron casting down beside me as if it were a slice of cake; it could have weighed ten times more, and she doubtless would have parked it as gently.

Amid a constant hubbub, I talked with Nikolai Gamarnik, an employee for 20 years. A top-ranking *(Continued on page 162)*

Sunflower fences keep snow from blowing away from experimental wheat fields at a research center near Barnaul, thus hoarding snowmelt for the soil.

The institute has experimented with more than 32,000 varieties of wheat, some of them American, in the search for strains that will better survive the rigorous climate.



Wheat cascades from a combine (**above**) near Gorno Altaysk. Though the soil here is fertile, growing seasons are short—late April through August—and rainfall chancy.

Drought and lean harvests in the U.S.S.R. have sent the Soviets to the granaries of the United States and Canada to buy wheat and corn. In return for the sale of American grain, the U. S. now hopes to reach an agreement for purchase of Siberian oil.

Meanwhile the Ob flows relentlessly northward into an arm of the Arctic Ocean, and the Soviets plan to divert some of its water for irrigation. One canal already taps the Irtysh, and another will connect the first with the man-made Ob Sea.

"**Telegraph wires moaning** under the icy wind" were all that reminded writer Anton Chekhov of civilization when he traveled through western Siberia in 1890. Perhaps the most soaring cultural symbol of today's Siberia is Novosibirsk's Theater of Opera and Ballet (**left**), built while World War II raged some 3,000 miles to the west. A heroic statue of Lenin, father of the Bolshevik Revolution, guards the edifice.

Members of the ballet troupe perform Tchaikovsky's *Swan Lake* (**left, above**) for more than 2,000 patrons in the theater's main hall (**above**). An adjacent hall seats another thousand.

Siberia's Empire Road, the River Ob

machinery assembler, he begins his day at 8 a.m., takes 45 minutes for lunch, and quits at 4:30 p.m. The plant itself operates two shifts a day on a five-day week.

"I am paid about 270 rubles a month," he said. That equals nearly $400. "My wife also works here, in the supply and materials department; she receives about 175 rubles, the factory's average wage. It is quite enough for us and our two children."

Her monthly wage was 34 rubles higher than the national average in the Soviet Union; better pay is an inducement to work in Siberia. While workers in Novosibirsk Oblast and areas to the south pull down wages at least 15 percent higher than elsewhere in the U.S.S.R., those in the far north can earn nearly 100 percent more. A time ago, under czar and commissar, many toiled in Siberia with no choice and little hope. In fact, the word Siberia became synonymous with forced-labor camps filled with political prisoners.

I glanced about the humming plant, and asked how it seemed to worker Gamarnik. "I wouldn't stay here if I didn't like it," he answered. "I have brought my friends here. We have plenty to do."

Compact Car, Deluxe Price

On weekends Nikolai and his wife sometimes don crash helmets and walk to the garage where he keeps his motorcycle. With Mrs. Gamarnik riding in the sidecar, they head for an outing in the country. "I'm saving to buy an automobile," he said.

It will be expensive. The least expensive version of the popular Zhiguli, modeled after the Fiat 124, costs 5,600 rubles—equivalent

Groomed for the occasion, young men await their brides at Novosibirsk's wedding palace. The man at right forgot his marriage license, but officials cut through the red tape quickly and performed the five-minute civil ceremony.

to about $8,000. And there will be a long wait. Not one person in a hundred now has a car; many are exported in search of foreign exchange. In West Germany the same Zhiguli, called the Lada, costs only about $2,800.

Before departing, I thanked Director Sidorov. A strong-voiced man of 40, he spoke warmly of the improving relations between his country and mine. Beside him stood an older man who heads the Communist Party organization at the plant. He added a thought.

"I was at the Elbe in World War II when you Americans joined up with us," he said. "We have not forgotten the help you gave us, the food and clothing. I know more than most how horrible war is. Nine men of my family went to war. Only two came back."

Hope for Amity Often Expressed

Growing friendship, the need for peace—the themes recurred many times. Though I am sure many of those I met were curious about day-to-day life in the United States, they asked few questions because, I believe, of a reluctance to pry. After the Watergate disclosures resulted in President Nixon's resignation from office, various bureaucrats and journalists I spoke with all declined to comment, politely but firmly. "It is your internal affair," they said.

Not that my Russian associates were without reservations about life in the United States. "I do not think I could live as you do—it is too demanding," remarked an engineer. "You are always under pressure, because you must compete. You must make as much money as you can, because you pay for so many things that should be free—medical care, university educations, insurance."

He reflected a moment. "We have our problems too. We have no use for parasites. For example, an alcoholic worker or a shirker may be paid as much as the productive men and women alongside him. We are working on this problem. Some directors solve it by giving bonuses, some ranging as high as 300 rubles. At the end of the year, good workers may also receive the '13th wage,' which usually equals a month's pay. We honor our best workers—you will see their photographs displayed in factories, on office walls, and in sidewalk galleries."

The word "problem" cropped up often as I followed the Ob. The complaint columns of newspapers were popular features; letter writers sounded off about everything from street potholes to the need for more recreational facilities. In this onward-and-upward land, their criticism was always constructive, however indignant.

The thought often occurred that Siberians were at least a match for their extraordinary domain. Near Novosibirsk, Akademgorodok (generally referred to as "Science Town") provided me with a dramatic example (pages 148-9). Perhaps the world's largest assemblage of scientists, more than 3,000, strives here at numerous institutes for advanced study to further Siberia's orderly growth.

Less than two decades ago the site of this bright, contemporary-style new town with its broad avenues, supermarkets, and department stores was an uninhabited pine and birch forest brushing against the Ob Sea, Novosibirsk's huge man-made reservoir. Today some 50,000 people live and work under Academician Mikhail Lavrentyev in this woodland setting.

Lavrentyev and his wife, both in their seventies, received me in their commodious log home. I was surprised by a photograph on the mantel of novelist Ernest Hemingway. Mrs. Lavrentyeva spoke in English, which she had perfected as a high-school and college student in New York State.

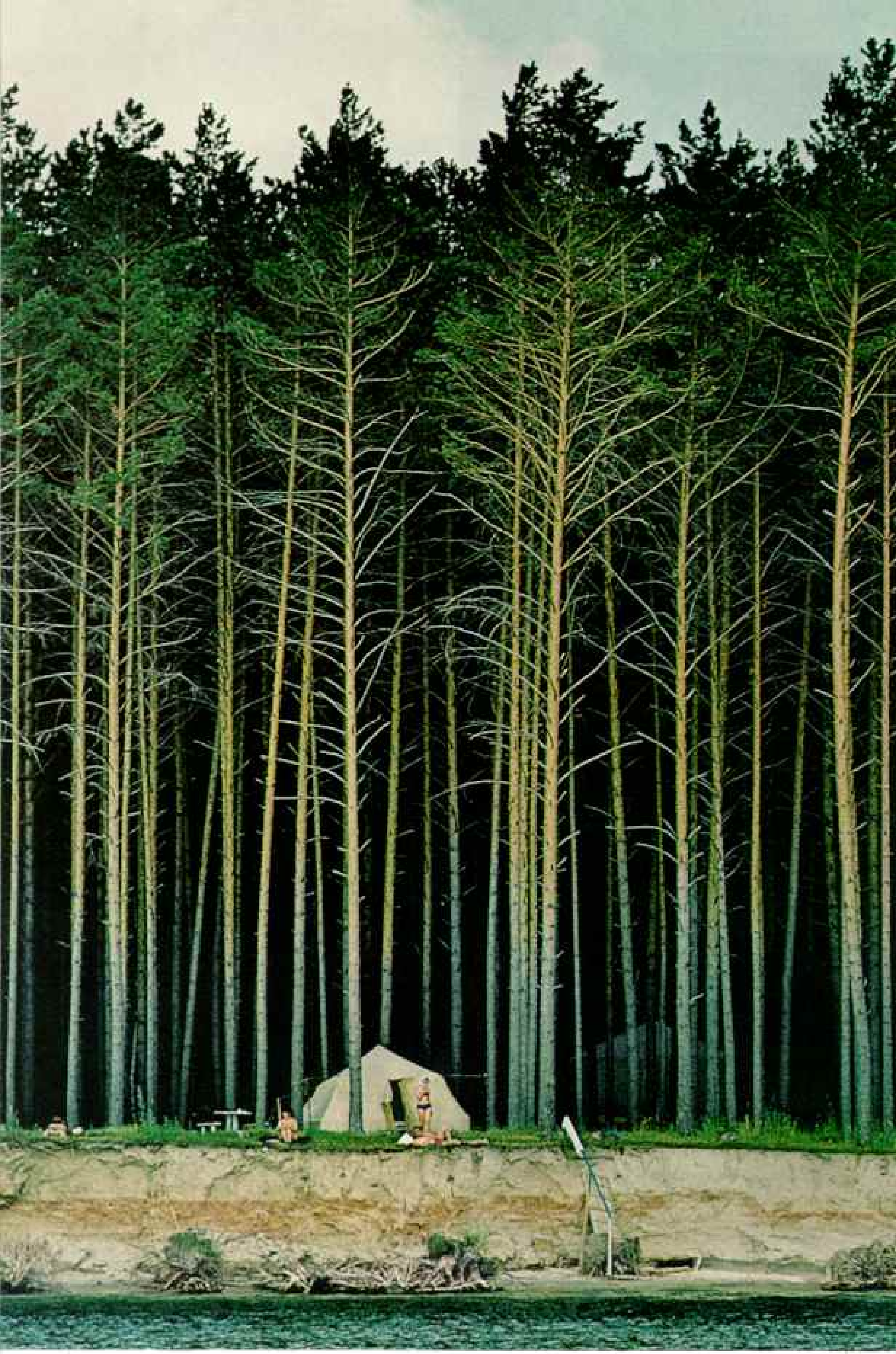
"I like Hemingway's writings very much," she said. "He is very popular in the Soviet Union. I admire NATIONAL GEOGRAPHIC as well; I have been a member of your Society for 30 years." We tipped glasses of white wine.

Mikhail Lavrentyev, a founder of Science Town, ticked off some of the institutes in his charge: nuclear physics, chemistry, hydrodynamics, thermophysics, geology and geophysics. . . . "We conduct not only theoretical but also practical research," he said. "We mix old and young scientists, and our branches work together to cross-fertilize one another. We dream dreams, and produce solutions."

Modern Ways Reach Into Siberia

That same evening I dined with two of his young dreamer-producers at their book-lined fourth-floor flat: Professor Leonid Korochkin, an internationally known geneticist, and his attractive wife, Dr. Lyuba Korochkina, a cytologist, both under 40. He investigates altering genes *(Continued on page 167)*

Railroad station, anywhere. People read, sleep, talk, and sew. Also, here in the terminal of the Trans-Siberian Railroad in Novosibirsk (**left**), lovers hold each other in a quiet embrace. Upstairs the Soviets offer such amenities as a waiting room where mothers can rent beds for themselves and their children (**above**); a well-equipped playroom adjoins it. Other travelers pausing in their journeys may rent private rooms here for a shower and a snooze.



to combat hereditary diseases, while she studies mutations, hormone regulation, and chromosome activity.

But this was a social evening. After a repast of caviar, reindeer tongue, meat pies, tomato-and-cucumber salad, candies, and many toasts, Professor Korochkin showed me a number of English-language science-fiction and detective novels in a crammed bookcase. "They help me relax," said the sport-shirted geneticist. "Do you read Agatha Christie?"

A large television set and a shortwave radio-phonograph dominated one end of the living-dining area. "I like classical music," he said, placing a record on the turntable, "and also some of your American singers." The resonant twang of Johnny Cash filled the room. "We could also play the Frank Sinatra recordings," interjected his wife.

Science and Culture Share Spotlight

Leaving Akademgorodok, I headed farther south, to the sources of the Biya and Katun Rivers. Below my plane the Ob looped a sandy swath across brown steppes on which wheat cutters crawled like large bugs spewing columns of dust.

It was a short flight to the industrial city of Barnaul. Sited on a river bluff, this capital of Altay Kray (Territory) is home to 500,000 people. The usual whirlwind tour followed: synthetic-fibers factory, sports palace, museum, library, theater, research institutes for fruit, cheese, and grain development.

In the theater crystal chandeliers glittered from high ceilings, marble walls glowed softly, red-carpeted walkways set off rich-hued parquet floors and led the playgoers to red-upholstered seats. They cradled precisely 1,014 of us. "Full house," announced the red-haired directress. The evening's entertainment: Shakespeare's *Winter's Tale*, which seemed to lose none of its poetry in Russian.

Drinking Whey to Shed Years

At the cheese-development institute, our group halted before a small reactor whose cobalt radiations caused mutations in microbes, first step in developing a better cheese. "Atoms for peaceful aims," echoed a solemn voice. Before leaving, I sampled several tasty Siberian cheeses and drank as many glasses of whey as I could—"Each glass makes a man one year younger," a technician had vowed with a straight face.

Strolling through the fruit institute's gardens and plantations, with the Ob curling past on one side and a busy Barnaul thoroughfare on the other, I started: Was that a large wild animal watching us from behind foliage and shrubs? "Yes," said a botanist calmly. "That's a maral—a deer. He and his family eat the willows. We have decided not to destroy them, but we wish they would go away."

Few Westerners have ever seen the city of Barnaul, and none before us, I was told, had penetrated farther south in recent decades. Many people were surprised to meet us: "*Amerikantsy?* I don't believe. What do you think of our Siberia?"

At dinner one evening in the little city of Gorno Altaysk, while couples gyrated to a loud and enthusiastic band playing rock and other Western music, Dean Conger clicked

"Taiga—big home. Sky—big ceiling," a forest-roaming Evenk tribesman once told a visiting American. "Evenk like big home, big air." So do most other Siberiaks, both native born and newcomers, who find respite from their labors in hiking, skiing, sailing, sunbathing, and camping. Along the Ob Sea (**left**) a family pitches a tent and relaxes in the "big air."

Make-do barometer announces дождь — rain—at a deer farm in Shebalino (**right**). Moisture penetrates the wand of willow and makes it bend downward. If moisture decreases, the wand straightens. Then tomorrow will be ясно—clear.

Siberia's Empire Road, the River Ob

his Polaroid camera at our ebullient peroxide-blond waitress. A minute later he gave her the finished snapshot. She left with a golden smile and returned in seconds, jauntily presenting him with a carnation.

Next morning we drove south along the rock-ribbed Katun, jolting for hours toward Mongolia. I do not expect to travel a dustier, more rugged road. Families splashed in the swift river, and women knelt on the banks to wash clothes and fill buckets. Babushkas sat in ageless patience at village entrances, chatting and peddling cucumbers. Horse-drawn carts plodded into eternity, creaking their plaintive road song. On a low mountain flank drifted a herd of yak, trailed by a herdsman and his busy dog in the ancient tableau.

Friendship Blossoms at First Meeting

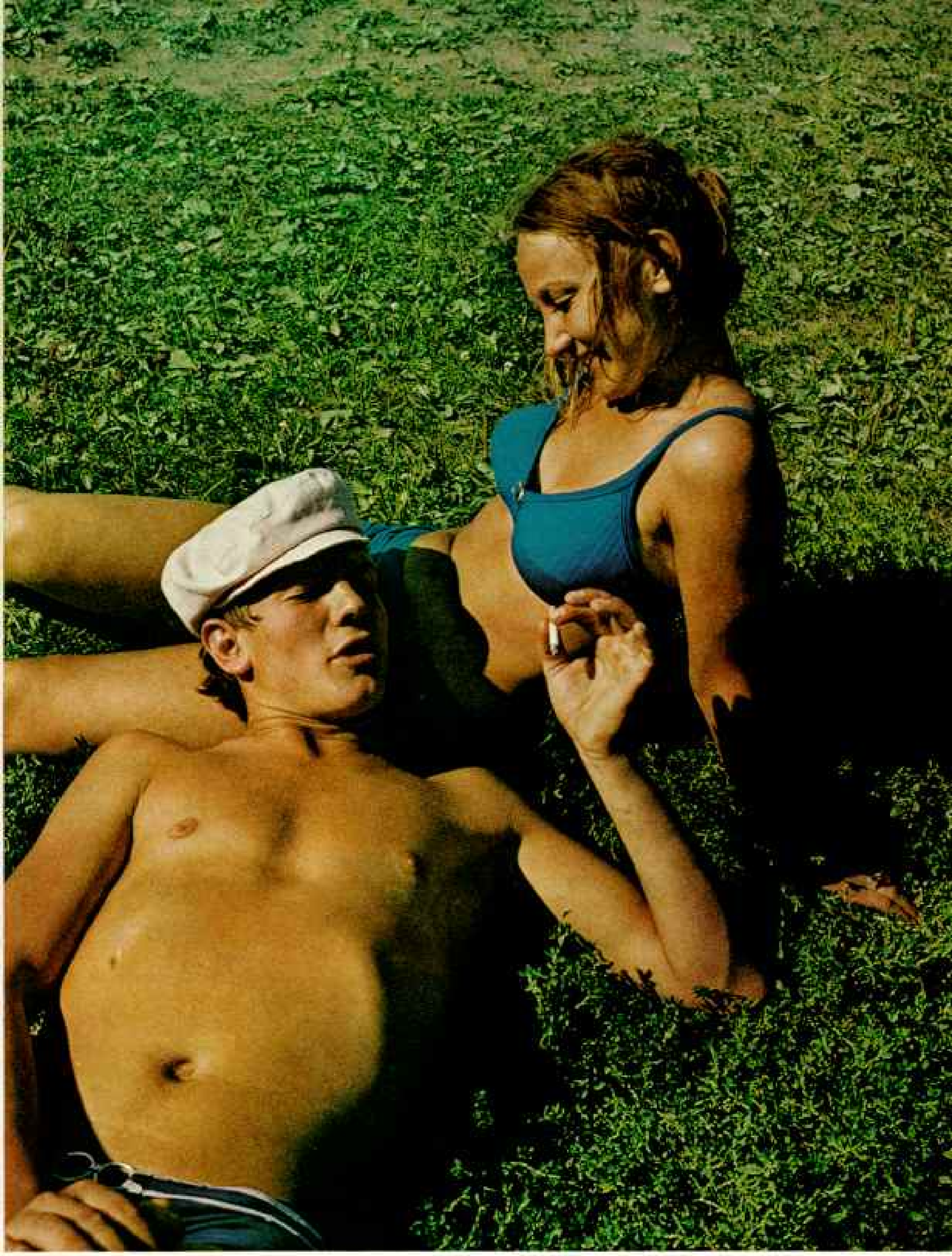
At last we turned off the road, bobbing across flowering meadows along a telephone line toward a distant, lowering range. In its lee nestled the little community of Kulada, a collection of small, weathered log houses no different in appearance from many other Russian villages we had passed.

About 500 Altay tribesmen, descendants of the original inhabitants, live in Kulada. A people of Turkic origin, they are short and stocky, with broad faces and slanting eyes and, in the person of my friend Ezher Irishev, graced with nobly drooping mustache and wispy goatee (page 171). Fu Manchu would have been envious.

I call Ezher friend though we met only that one time. His home was mine, said the 69-year-old retired herdsman as he showed me about the house: immaculate whitewashed walls, plank floors, table, chairs, davenport, and oven in the living-cooking room; two beds, hanging tapestry, rugs, radio, and large heater in the bedroom.

Soon we gathered with a handful of neighbors for a bountiful meal prepared by his wife. She served a tangy homemade smoked cheese, slices of lamb, cranberries, crisp unleavened bread, *shashlyk*—kebab of mutton—and tea. We toasted one another with the national vodka of Altay, a clear, pungent liquor homemade from milk.

"Once we were nomads," said Ezher in his husky voice. "We worked for rich farmers, and we worked by hand. Now it is a better world. We still graze our cattle in mountain meadows in summer, when nature is best. When my son Ozoi here learned you were coming, he rode 30 kilometers [18½ miles] from his family and herd to greet you. But we



Just taking it easy, bathers soak up the sun (**above**) after a dip in Lake Manzherokskoye, near Gorno Altaysk. They presented photographer Conger with a glass of *kumys*—fermented mare's milk. A motorcylist (**left**) wears bedroom slippers for a tour along the Katun River.

live in one place, Kulada, our collective farm's headquarters. And we have tractors."

He smiled. "I never thought Americans would come here. I am very pleased. How do people work in your country?"

Dusk was falling as we prepared to leave. At the jeep, I reached out to clasp hands. The old gentleman bent forward, put his arm around me, and kissed my cheek. "You asked me," he said, "what I might say to your people. I say, 'Let us have friendship.'"

Worthless Gold Gave Lake Its Name

Not far southeast of Kulada rises the Katun River, but no road leads to its mountain source. We did drive up to Lake Teletskoye, into which flow more than 70 streams and out of which pours only one—the Biya.

Teletskoye, called the Golden Lake, hangs between steep mountains, a pendant of deep, pure water about fifty miles long and two miles wide on the average (page 150). It is the brilliant showpiece of Altay Reserve, whose 2,135,485 acres, slightly less than Yellowstone National Park, make it the Soviet Union's second largest reserve. As a ship carried us toward the lake's southern tip, Dr. Eduard Irisov, the park's deputy director, told me a legend of how the name originated.

"Long ago," he said, "in a hungry year, an Altay man found a piece of gold the size of a horse's head on the shore. He tried to trade it for grain, but failed, for it was a hungry year. So he climbed to the top of a mountain and threw it in the lake. Now you and I sail on Golden Lake, and there"—pointing—"is Golden Mountain."

Both of us liked the tale. Dr. Irisov liked even better what he told me next. With only two small tourist bases, the number of visitors has been held to about 30,000 a year, and they are limited to boating and shoreline recreational activities. "The reserve will never be developed economically," he said.

Dr. Irisov heads a large scientific-research program here. "We are keeping a diary of nature," he said. "We observe how birds adapt to life in the high mountains. We study the fish; some species are unusual. We watch the wild mountain deer, nearly 1,300 of them, and 89 other kinds of animals, even mice. Many *medvedi*—bears—live in the park."

Our ship passed a waterfall whose silver path punctuated a slope clad in tall pines. The scientist nodded approvingly. "What," he asked, "do bears and mice and men and pine trees have in common? Bears devour the pine nuts and become very fat. Mice eat the tiny trees as they sprout. Men take the big ones for lumber. So we are preparing a dynamic of the pine's growth. Our plan is to protect the trees biologically, to ensure that there will be enough of them for bears and mice and men."

The soul expands in such places, but cruises always end. I saluted the newborn Biya as she emerged from Teletskoye, left the river to drive through mountains, and completed a ride of 125 miles and several hours at the Gorno Altaysk airport. There I embarked for the north and Tyumen Oblast's booming oil and gas frontier. From the Biya's pristine birthplace to the moiling provincial capital, Tyumen city, stretched 1,100 airline miles. But worlds separated them.

Forbidding Land Hoards Mineral Trove

Cossacks founded Tyumen in 1586 as they rode deep into Siberia to conquer the Mongols. Perched on the Tura River, a distant tributary of the Irtysh, the outpost became a port, trade center, and gateway. Thousands of exiles straggled through the log-hut village on the long trek to eastern Siberia. By the time of the October 1917 Revolution, the city had grown to 50,000 people.

Today more than 350,000 live in Tyumen, and the old crossroads seethes with black-gold fever. The city sits at the edge of an immeasurably rich oil- and gas-bearing plain that extends 1,250 miles north to south and about 800 miles west to east. Since 1960, at least 140 fields have been discovered; Tyumen is the lifeline to all of them.

Three-fourths of this marshy wilderness remains to be *(Continued on page 174)*

Herdsman and hero, Ezher Irishev of Kulada wears a *shapka* made from wildcat fur. He won some of his medals as an army bridge builder during World War II campaigns in the Caucasus Mountains, the Crimea, and the Ukraine. Irishev's nomadic ancestors, the Altays, once lived under the rule of Genghis Khan.


ЗА ОТВАГУ
СССР

Work and play, home and job are all one for a tugboat skipper, who lives with his wife aboard the boat at Novosibirsk. They look up from their evening meal (**left**) at photographer Conger and his interpreter, mirrored in the window.

Tugboats are as busy as water bugs around the port during the summer months, nudging barges filled with pipe, trucks, coal, sand, and machinery to feed the appetite of expanding oil fields in the north.

On the way out, a diesel-powered passenger craft plods along the Irtysh (**left**) toward Khanty Mansiysk. Such vessels are being replaced by hydrofoils that will skim along the Irtysh and the Ob at 60 miles an hour.

Arriving in Khanty Mansiysk, a young mother eyes her family's new home (**right**). In western Siberia, as throughout the rest of the Soviet Union, most women work, while state-run nurseries take care of the children. Families pay 5 percent or less of their salaries for housing. Recreation camps are subsidized by industry.

Siberia's Empire Road, the River Ob

explored for petroleum. What geologists and geophysicists already have discovered challenges the imagination. They say that the Urengoy gas field near the Arctic Circle is the world's largest, equal to all the gas deposits of the United States. Western Siberia's pride and joy, however, is Samotlor, an ocean of oil discovered just ten years ago. Of the order of Alaska's North Slope, Samotlor contains reserves estimated at 14 billion barrels.

The Soviet Union increases the flow of western Siberia's buried wealth as rapidly as possible. The Tyumen Region yielded 1.07 billion barrels of crude oil in 1975, and this year will produce about 1.29 billion. By 1980, with accelerating development, it is expected to give up more than two billion barrels, half of the U.S.S.R.'s total production. Samotlor will be the biggest single source.

Bitter Cold Makes Work Easier

Winter is the best time for oil operations, despite temperatures of 40° and 50° below zero F. As a Tyumen geologist said to me, "The frost helps us—the frost is our friend. You must see the oil country then."

He meant that workers can handle heavy machinery and pipe with relative ease as long as the swamps and lakes remain frozen. In spring, because ice still blocks the Ob at its mouth, the river backs up and the resulting overflow turns land into sea. Then the mosquitoes and midges move more efficiently than anything else.

So I did return in winter. Early one February morning I put behind me Tyumen city's rows of five- and nine-story housing projects, its factories and crowded avenues, and flew 500 miles northeast to Nizhnevartovsk, the rough-and-tumble new city that supports the Samotlor field.

My fellow passengers and I, somnolent in heavy boots and thick fur coats and hats, hunched in our seats like beavers. We churned through the Siberian emptiness while a baleful full moon hung low in the west and a fireball flared above the eastern horizon. The beaver beside me stirred, scraped the frost-encrusted porthole, and hooded his eyes against the brilliant rays. "If an artist would paint the sun in such a way, I couldn't believe," he said. "It looks like a loaf of round Russian bread coming out of the oven."

Against this backdrop I soon came upon

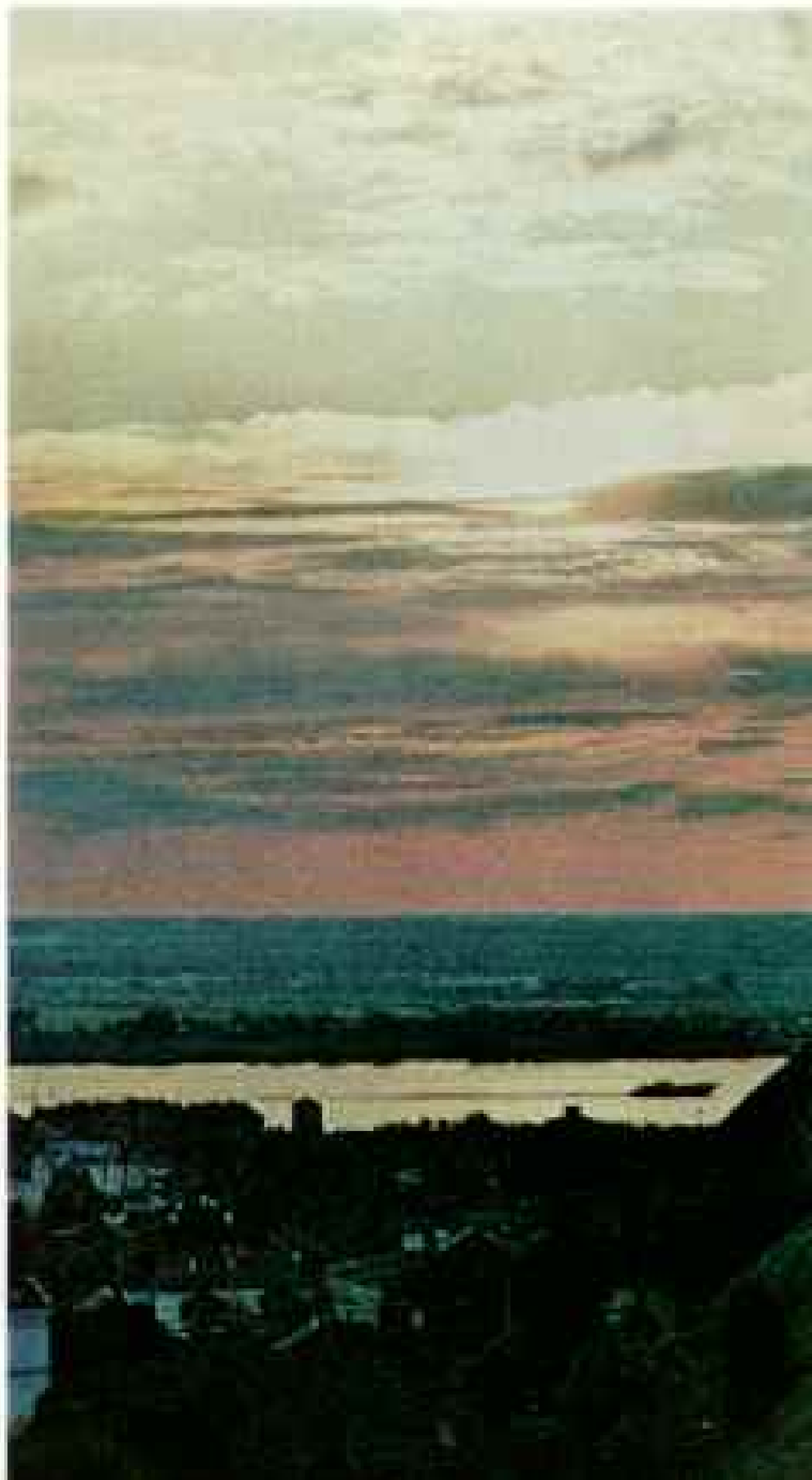
Frozen rock-hard, the Tura River, part of the Ob-Irtysh system, shoulders schoolchildren practicing cross-country ski techniques at Tyumen (**above**). Essential conversations generally take place before passengers board a propeller-driven ski sledge (**below**) at Khanty Mansiysk for the noisy ride to a nearby village. Neither sleet nor snow deters the craft, which also delivers the mail.

Nizhnevartovsk sitting atop a frozen Ob swamp, a man-made island in the midst of explosion. Trucks and buses, radiators swathed against the metal-cracking cold, lumbered along the two-lane highway from the airport into town. Heavy-duty helicopters lifted roustabouts and equipment to remote fields. Men and women in padded clothing toiled side by side, laying the brick walls of apartment houses. Cranes hoisted massive prefabricated concrete panels into place on skeletal flats and factory buildings.

All sound and motion, this phenomenon. Less than fifteen years ago its predecessor squatted in peace beside the river, a jumble of log huts whose people lived by fishing and lumbering. Now rooftop television antennas receive programs sent by satellite from Moscow, movie fare occasionally includes films made in the United States, and a railroad will soon link the city to the outside world. Planners strive to cope with the influx of humanity, which stands at 50,000 and is expected to triple in the next ten to fifteen years.

What about food? "In the north," said Grigoriy Kokuyevskiy, an oil official, "everybody eats twice as much as in the south."

But with the enormous supply problems,



Queen city of Siberia in the 18th century, Tobolsk still retains her antique charm, symbolized by the old kremlin rising above the gleaming Irtysh (**right**). But now they're tearing most of the old city down in order to build it up again, to accommodate workers coming in and oil going out. A major refinery is being constructed nearby.

Under a bust of Lenin, an artisan of Tobolsk begins to carve a whale's tooth (**top**). Talent and patience produce such creations as a herdsman with dog and reindeer (**above**).

some items, such as fresh fruit, can run low. Meat and citrus fruit are flown in; ships bring flour, macaroni, sugar, beer, and champagne. Nearby state farms raise chickens, grow hothouse vegetables, and produce yogurt, cottage cheese, milk, and other dairy items.

From the Ob comes a bounty of fish, including lean and tasty *muksun*, a kind of salmon. Sliced potato-chip thin, seasoned, chilled to crystalline crispness, raw muksun melts in the mouth, a culinary work of genius.

Land Transformed by Oil Quest

Samotlor means "dead lake" in the language of the Khanty people, after a body of water that covers a fifth of the field's 200 square miles. Grigoriy Kokuyevskiy escorted me there on a grim day when frost grew in my eyebrows and the cold sandpapered my face the color of borscht.

A sense of otherworldliness hung over the bleak land. Orange flames of flaring gas thundered skyward and disappeared. Ahead, derricks rising out of the frozen lake looked like high-masted ships on a wide, white sea.

We pulled up beside a group of low buildings. "Welcome!" shouted Viktor Kitayev, foreman of a drilling crew. "For you, true Samotlor hospitality. We have turned off the wind." I appreciated his jest. Thirty degrees below zero F. needed no aggravation from a wind-chill factor.

I jammed a hard hat on top of my fur *shapka* and walked to a drilling rig that looked like a pyramidal fountain of ice 13 stories high. Half a dozen roustabouts wearing heavy, high-collared jackets and felt boots clambered briskly to the platform nearly 25 feet overhead. I followed, mounting the slippery steps as tentatively as if they had led to a scaffold.

Cruel temperature and icy footing notwithstanding, Viktor Kitayev's men went about their brawny business the same as oil workers do the world over. I watched them reset the mud-slick pipe—lifting, turning, testing until it was seated just so. Then drilling resumed; steam and heat soon would melt the ice where they stood.

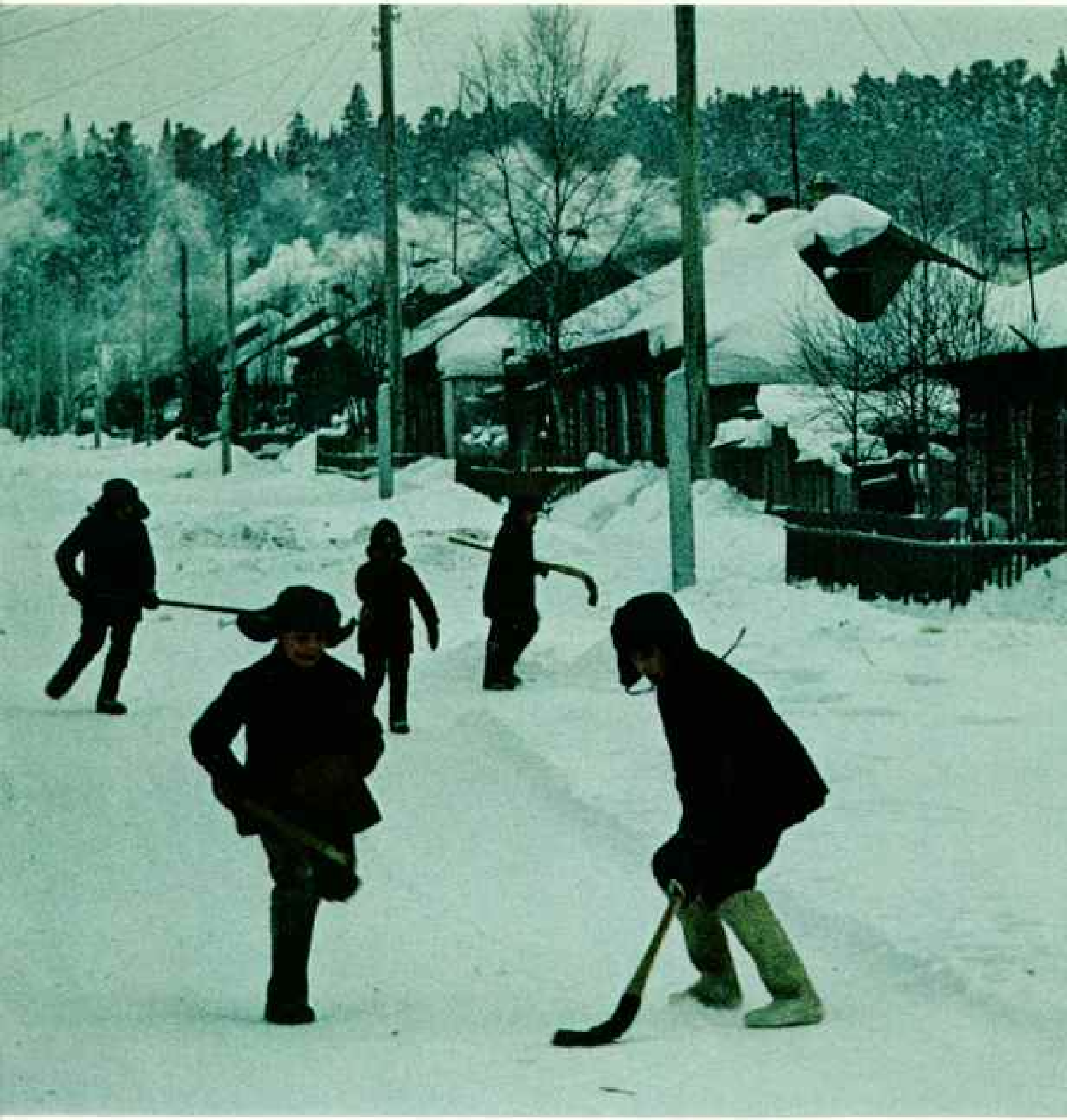
Eight to ten days of round-the-clock drilling here taps oil at about the 7,000-foot level. The work, though simple, is prodigious. First, bulldozers must sink large permanent bases of timbers and sand deep into the frozen lake; the fill material also insulates against melting. Then a single rig mounted on tracks drills a

number of wells in a row on the base, spaced about ten feet apart and angled in different directions.

Back in his bunkroom-office, foreman Kitayev turned down the music on his shortwave radio and indicated a pot of tea. "We're in the middle of the lake," he said. "This base is more than 300 feet long, and we'll drill 12 or 13 wells on it. Then we'll move to a new base and start over. That's our job: Where the oil is, we are. I think everybody in the world now knows about oil, da?"

Later, returning to town, we pulled over to watch welders join sections of large-diameter pipeline (page 156). These conduits also conveniently serve as walkways, which reminded our jeep driver of a story:

"Vladimir Smirnov was walking home after work on a pipeline, carrying on his back a net of fish he had just caught. Then



suddenly he felt someone grab at the net. He tugged back sharply, turned, and saw a bear. The bear fell off the pipe on one side, and Vladimir on the other, safe from the bear. But he broke his leg."

The driver lit a cigarette, puffed thoughtfully. "Now, did Vladimir fall on work time or free time? It would make a difference in his pay. Well, they decided that since it happened in a work area, it was work time."

I never learned the disposition of the bear or the fish.

I moved on, to places with names like Surgut . . . Tobolsk . . . Khanty Mansiysk, places rarely seen by contemporary American eyes. All began as frontier outposts, hubs of trade, homes of hunters, fishermen, and reindeer herders—Khanty and Mansi tribesmen, some of whom still follow the ways of their fathers, while others have moved to towns. (Various ethnic and cultural groups are shown on the map supplement, **Peoples of the Soviet Union**, distributed with this issue.)

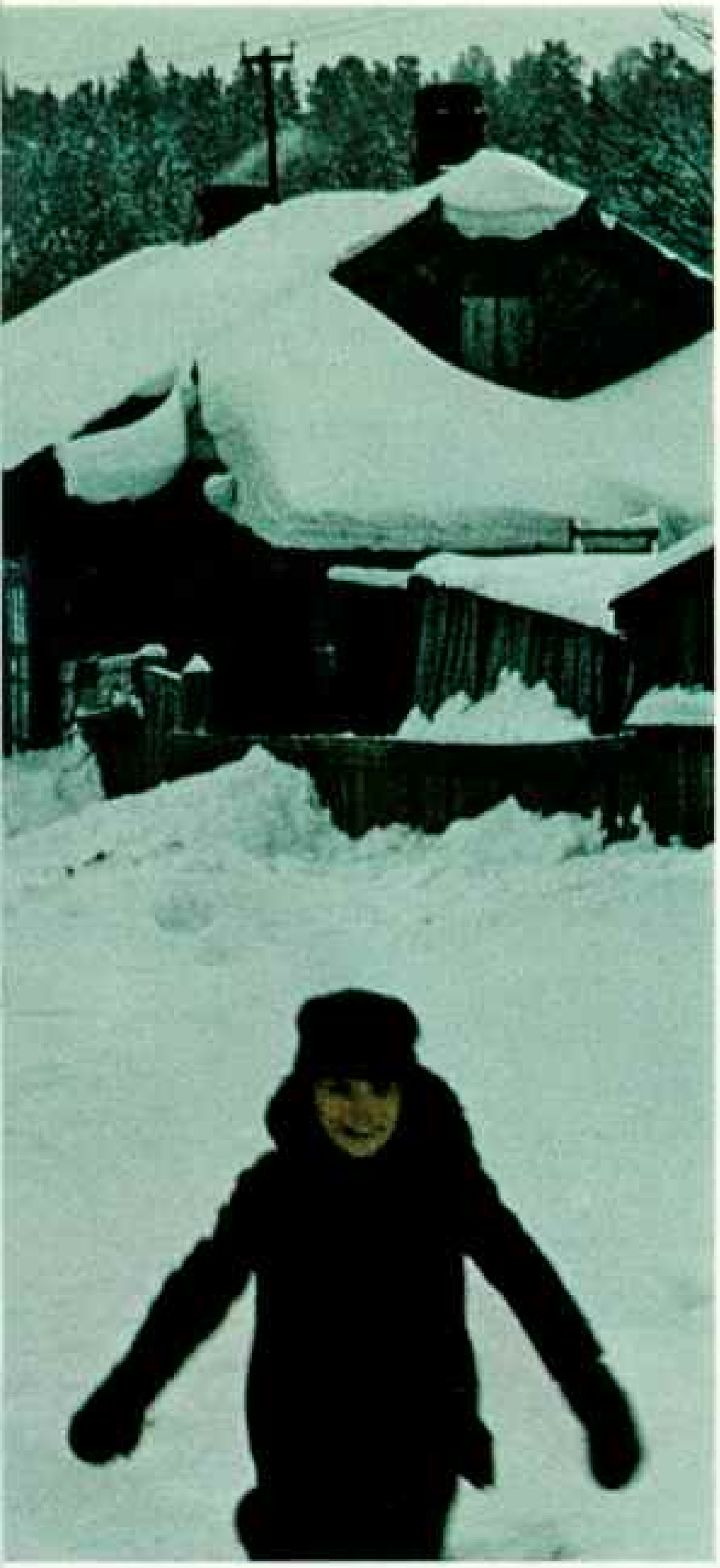
Surgut, population 53,000, was a sleepy Ob village until the region's first large petroleum discoveries were made. There I toured a large gas-fired power station scheduled for completion in 1978; it was already in operation. "We'll generate about a third as much power here as all Moscow uses," said Igor Davydovsky, the installation's manager.

Surgut's energy will serve the cities and towns of Tyumen Oblast and power the northland's far-flung oil and gas fields.

New Life Planned for Old City

Tobolsk will need the energy too. I am sad for the old city of wood because it must die. But I am happy too because it will be born again. I found it sitting near the confluence of the Tobol and Irtysh Rivers as it has for nearly 400 years, the sagging, still-proud relic of an 18th-century heyday when it was the capital of Siberia.

Trade routes converged on Tobolsk then from the rich cities of European Russia, from the east, from the south. Prosperous merchants displayed fine carpets, vases, and other wares, and lived in fine houses. Diplomats and peasants kept their boots as clean as possible by using plank sidewalks and streets. On a bluff above the floodplain rose the spires and turrets of a majestic kremlin, citadel of this important city (pages 176-7).



Too cold for school at 40 below, boys warm up with a game of ice hockey on a street in Khanty Mansiysk (**above**). Schools here close when the temperature dips lower than minus 37° F. The 26,000 inhabitants make their living as fishermen, loggers, and reindeer herdsmen. The oil boom hasn't hit Khanty Mansiysk.

Siberia's Empire Road, the River Ob

Then came change. The city of Omsk took over Tobolsk's governmental functions in the 19th century, trade routes shifted there, the long decline began. Now, planners told me, four-fifths of Tobolsk is to be torn down; only historically valuable structures will be saved. Schools, flats, and office buildings will rise, and the river will be diked to avert the floods that have plagued Tobolsk through all its existence. Nearby a major oil-refining complex takes shape. In 15 years the city is expected to mushroom from 60,000 people to a quarter of a million.

I wandered through the rock-and-brick kremlin, which is being restored by the state as an architectural monument. Outside the church, one of the two still in sparse use in Tobolsk, I halted. The door was bolted, and the caretaker, an old woman, peered through a window shaking her head. The priest was out of town, she said; we could not enter.

A student beside me remonstrated with the caretaker. "Let us in," he demanded. "God works all the time."

The old woman shrugged her shoulders. "Ah," she said, lifting her eyes heavenward, "but God is up there. I am in charge here." And she turned away.

River Becomes a Frozen Highway

The Irtysh and the Ob flow together 200 miles north of Tobolsk, close by Khanty Mansiysk. Not far beyond, as Siberian distances go, the Ob empties into ocean waters near Salekhard on the Arctic Circle. We never quite got to this city; many places in Siberia remain inaccessible.

Twice we visited Khanty Mansiysk. In winter small craft lay captive in the frozen river, while propeller-driven ski sledges roared across the ice carrying mail and occasional passengers to remote villages (page

175). I watched dozens of skiers skim along floodlit slopes in early afternoon darkness —youngsters freed from classes when the thermometer reached 37° below zero F., the school-closing temperature. "This winter is rather warm," said Misha, our jeep driver. "A warm winter is a present."

Months later, aboard a passenger ship, I came up to the little city and hardly recognized it in its brief fling with summer. Green hills tumbled down to the river; leafy trees softened the outlines of man's handiwork. I paused in the park. Birches loomed over a sign that saluted World War II heroes; 18,726 men and women had entered service, 5,322 had died. A procession of preschoolers trooped past hand in hand as I stood there: recess time. In the street a pretty young woman wearing ponytails and a gay print dress led a cow on a rope.

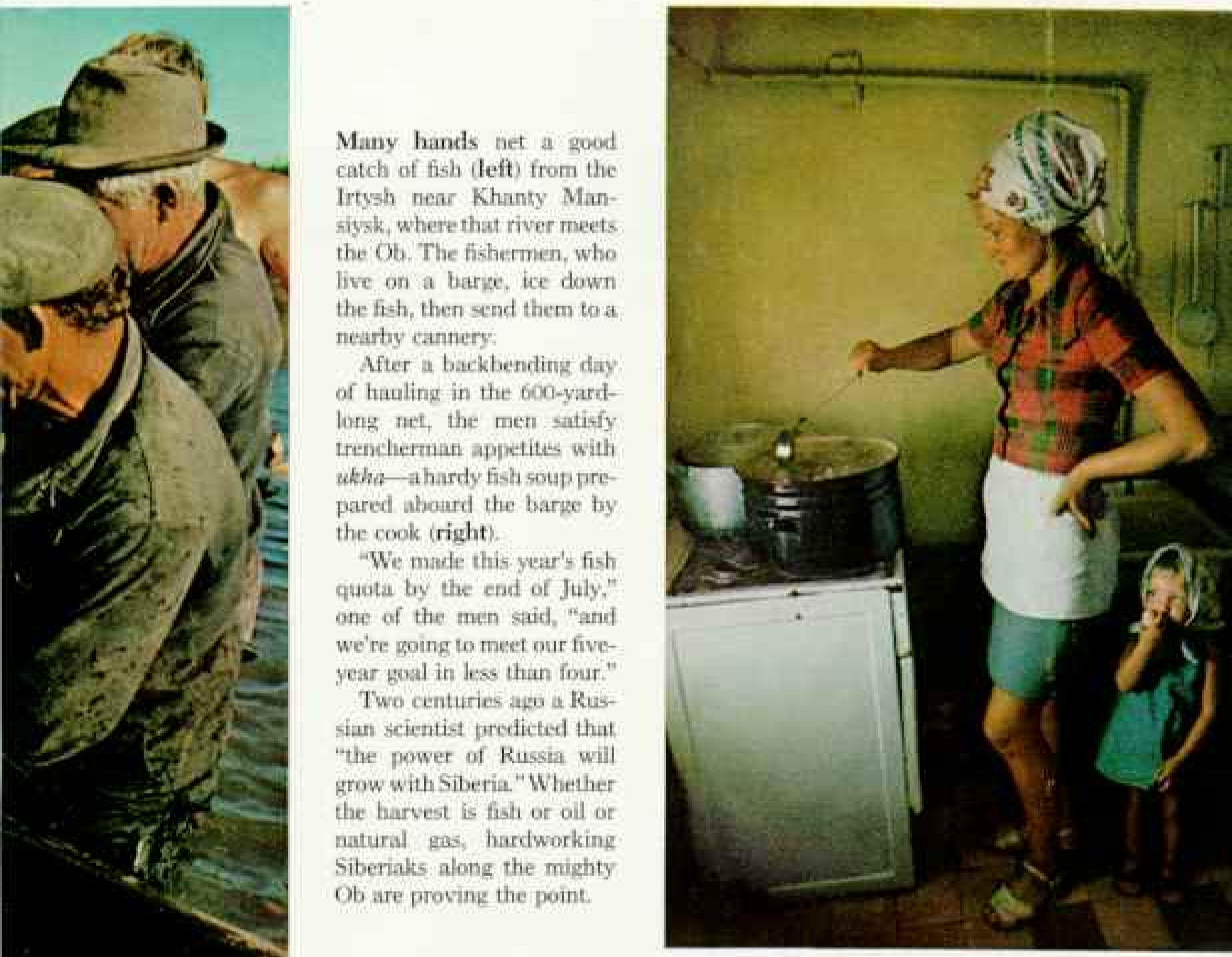
Khanty Mansiysk makes no pretensions. Its 26,000 citizens herd reindeer, breed foxes for their fur, can fish, log the forest. But another day is coming. Oil and gas deposits await tapping in this vicinity too.

Siberia Faces a Hopeful Future

Where the Irtysh and Ob come together, I talked with fishermen as they put out their net and slowly reeled it to shore. It was hard work, and I said as much to one of the men, a bearded giant with the torso of a wrestler. He grinned.

"I used to be a miner," he said. "It is better, for the health, to catch fish than coal."

I looked beyond him, following the wide Ob until it merged into the horizon on its way to Salekhard, at world's end. My fisherman friend was passing his days better than once he had. And so too, I thought, were countless other Siberiaks I had met, all along Grandmother's banks. □

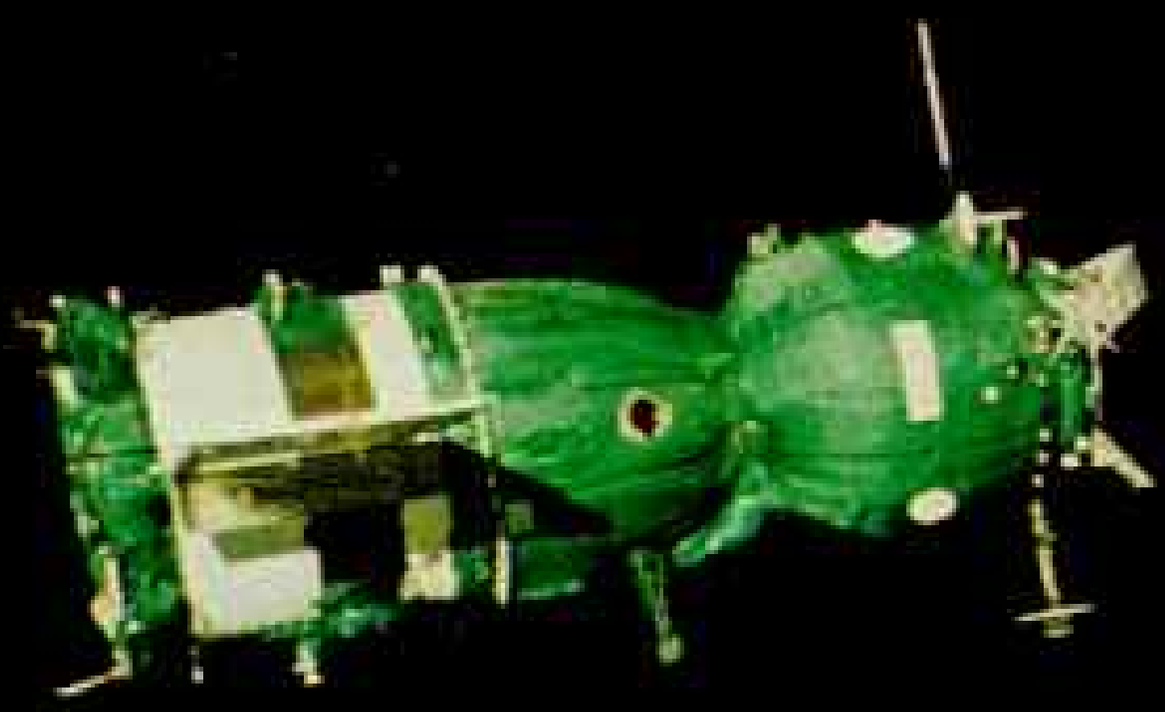


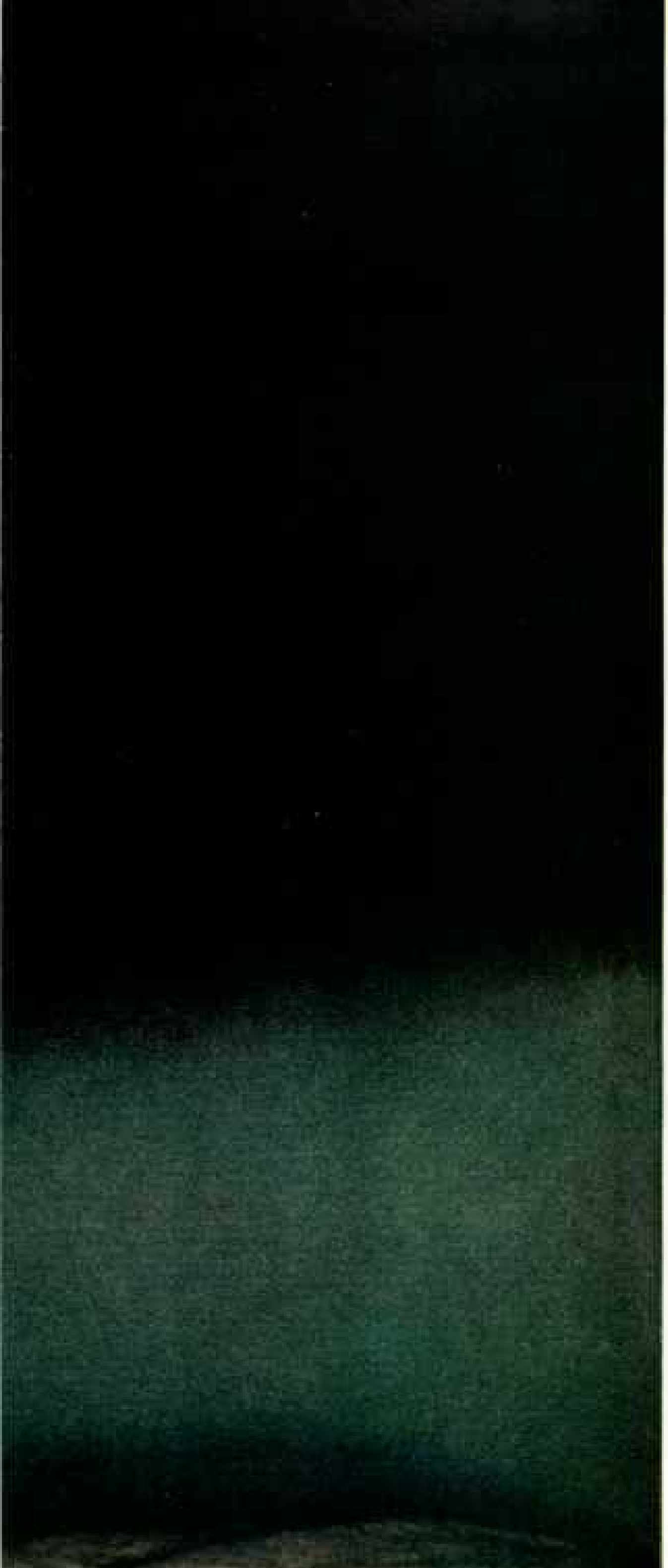
Many hands net a good catch of fish (**left**) from the Irtysh near Khanty Mansiysk, where that river meets the Ob. The fishermen, who live on a barge, ice down the fish, then send them to a nearby cannery.

After a backbending day of hauling in the 600-yard-long net, the men satisfy trencherman appetites with *ukha*—a hardy fish soup prepared aboard the barge by the cook (**right**).

"We made this year's fish quota by the end of July," one of the men said, "and we're going to meet our five-year goal in less than four."

Two centuries ago a Russian scientist predicted that "the power of Russia will grow with Siberia." Whether the harvest is fish or oil or natural gas, hardworking Siberiaks along the mighty Ob are proving the point.





APOLLO-SOYUZ

Handclasp in Space

By THOMAS Y. CANBY

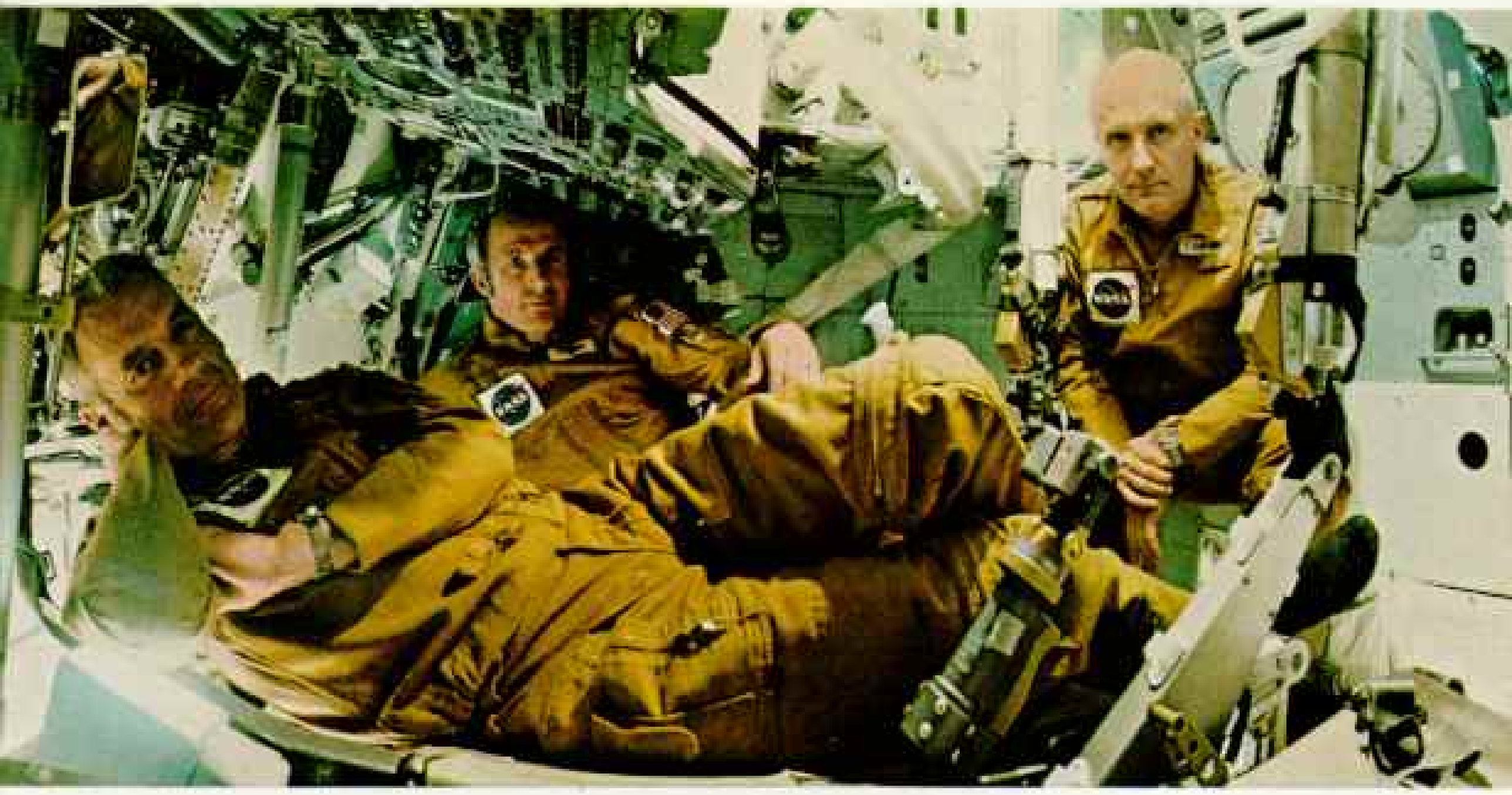
NATIONAL GEOGRAPHIC STAFF

BOTH BY NASA

BEETLELIKE in the deep blackness of space, Soyuz, manned by two Soviet cosmonauts, orbits 140 miles above the storm-blanketed Black Sea region. A mere 110 feet away, the three-man Apollo team that took this picture flies in tight formation. The spacefarers are high-flying ambassadors of détente, visible symbols of rival nations cooperating in a demanding challenge. After a dual launch last July, the ships linked, and the world saw Apollo Commander Thomas P. Stafford (**above,** right) reach out for a historic handclasp with his Soviet counterpart, Aleksey A. Leonov.

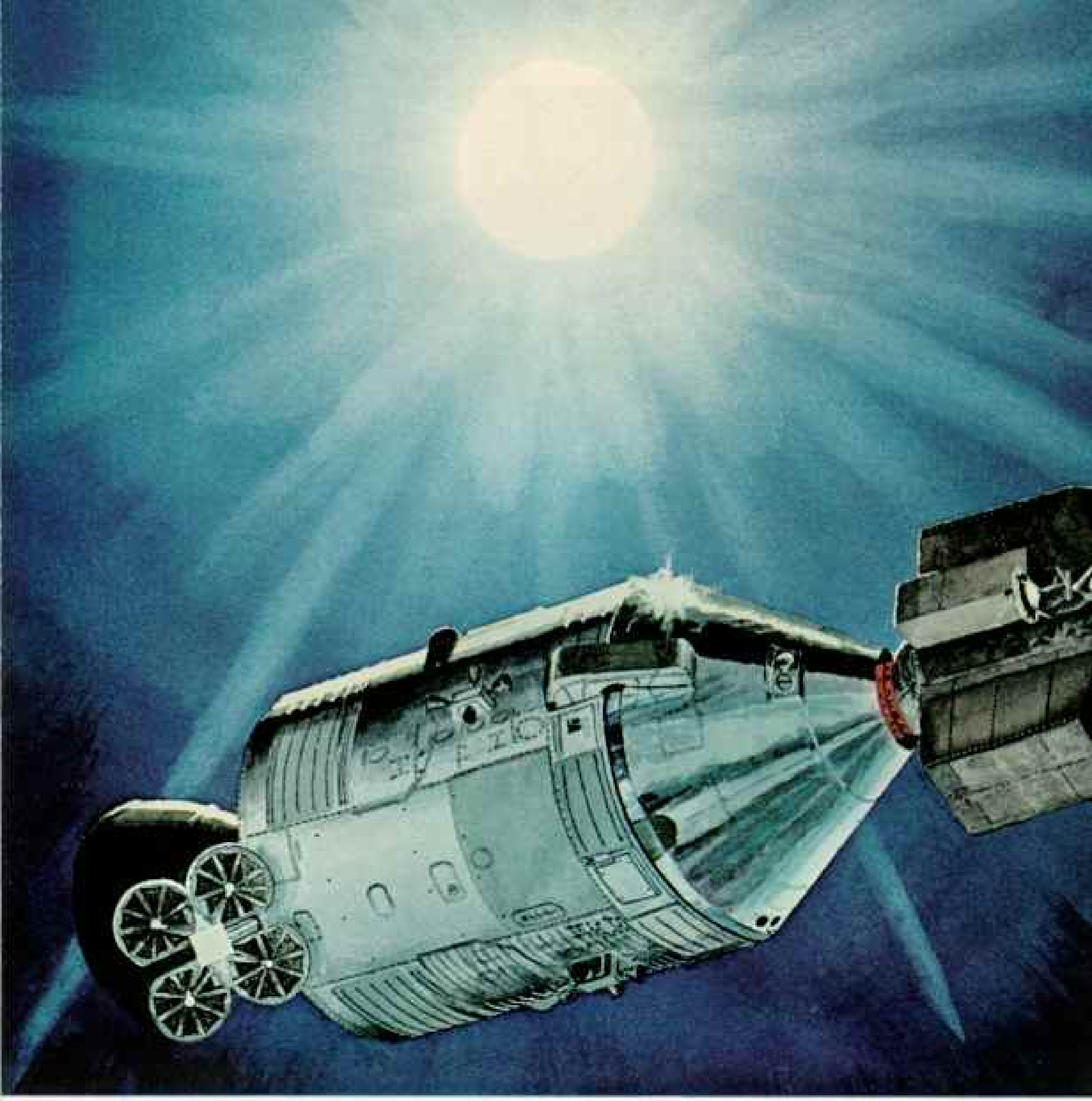
SHRUGGING FREE of its shackles, a Vostok rocket lifts Soyuz skyward at the U.S.S.R.'s vast Baykonur Cosmodrome in remote Kazakhstan. In a thunderous echo 7½ hours later, a Saturn rocket hurled Apollo aloft from Kennedy Space Center, Florida, beginning the 44 hours of complex maneuvers that would culminate in the linkup.

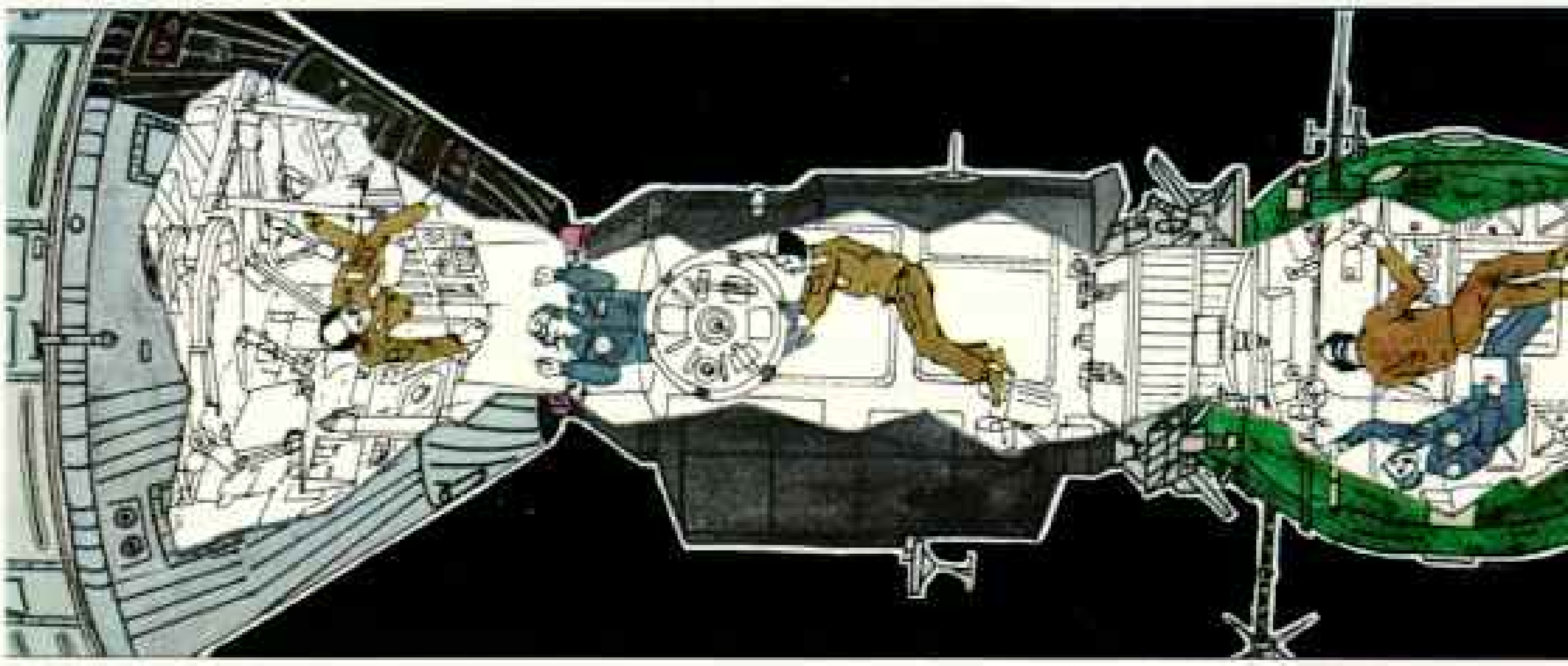
For two years before the flight the crews exchanged visits and studied each others' language and equipment. For their union in space they agreed to exchange languages, the cosmonauts speaking English, the astronauts Russian. They jested about needing a third tongue: the Oklahoma twang of Apollo Commander Stafford (**top,** right). He and his



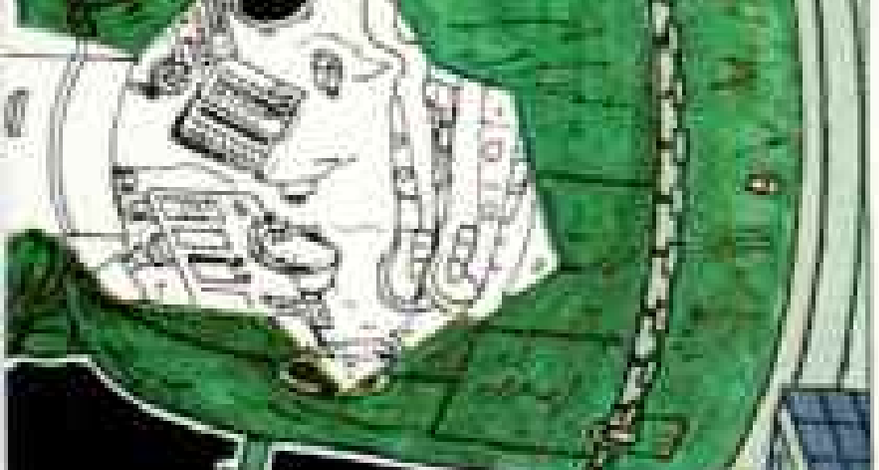
teammates, Vance D. Brand, center, and Donald K. "Deke" Slayton, trained in a mock-up of the ship they would ride into space.

Apollo-Soyuz marks the second space voyage for Leonov, whose place in history is secure: In 1965, he became the first person to walk in space. Noted for his wit and high spirits, he wears a rare solemn look during training with crewmate Valeriy Kubasov (**above,** right). A television camera peers between the cosmonauts. Never before had the U.S.S.R. public seen live TV coverage of a Soviet space venture from launch to "bump-down." Unlike American space missions, Soviet manned flights have always ended on land rather than at sea.





PAINTINGS BY PAUL FIELD



DOCKING LATCHES AT THE READY, the craft join over the Atlantic. Carrying far more fuel than Soyuz, Apollo executes the approach maneuvers. "Please don't forget about your [braking] engine," Leonov jokes to the Americans, who soon announce triumphantly, "Прикасание—Мы успели это сделать!—Contact... We have succeeded!"

Conical Apollo's docking module enables the crews to visit each other while maintaining the two craft's different atmospheres. Brown flight suits identify the Americans during one of the transfers (**left**).

With their splashdown July 24, the U.S. crew closed the Apollo era that took 38 Americans into earth orbit, to the moon, to Skylab, and to this historic rendezvous in space. □

Adrift on a Raft of Sargassum

A PICTURE STORY
BY
ROBERT F. SISSON
NATIONAL GEOGRAPHIC
NATURAL SCIENCE PHOTOGRAPHER

BEFORE ME UNFOLDED the classic drama between predator and prey. This suspenseful episode, however, was being played out in an underwater forest of sargassum weed by a fish whose pectoral fins operate like ten-fingered hands. Alternately grasping stems that matched its own coloration, the minnow-size sargassum fish inched toward an unsuspecting smaller fish.

Whoosh—the large jaws popped open, creating suction that pulled the victim into the gaping mouth. Fins spread, the hunter headed into a thicket of fronds (**right**), as the protruding tail of its meal seemed to wave a final good-bye.

My stage was a 50-gallon tank in the Miami Seaquarium, filled with seawater and sargassum—a marine alga related to kelp. Thanks to my friends at the Seaquarium, both the sea-borne plants and their inhabitants had been lifted from the Atlantic Ocean and transported to several such tanks in the laboratory in less than an hour's time. For weeks I studied life in this maze through the camera lens—my keyhole for peering into a little-known world of the ocean.

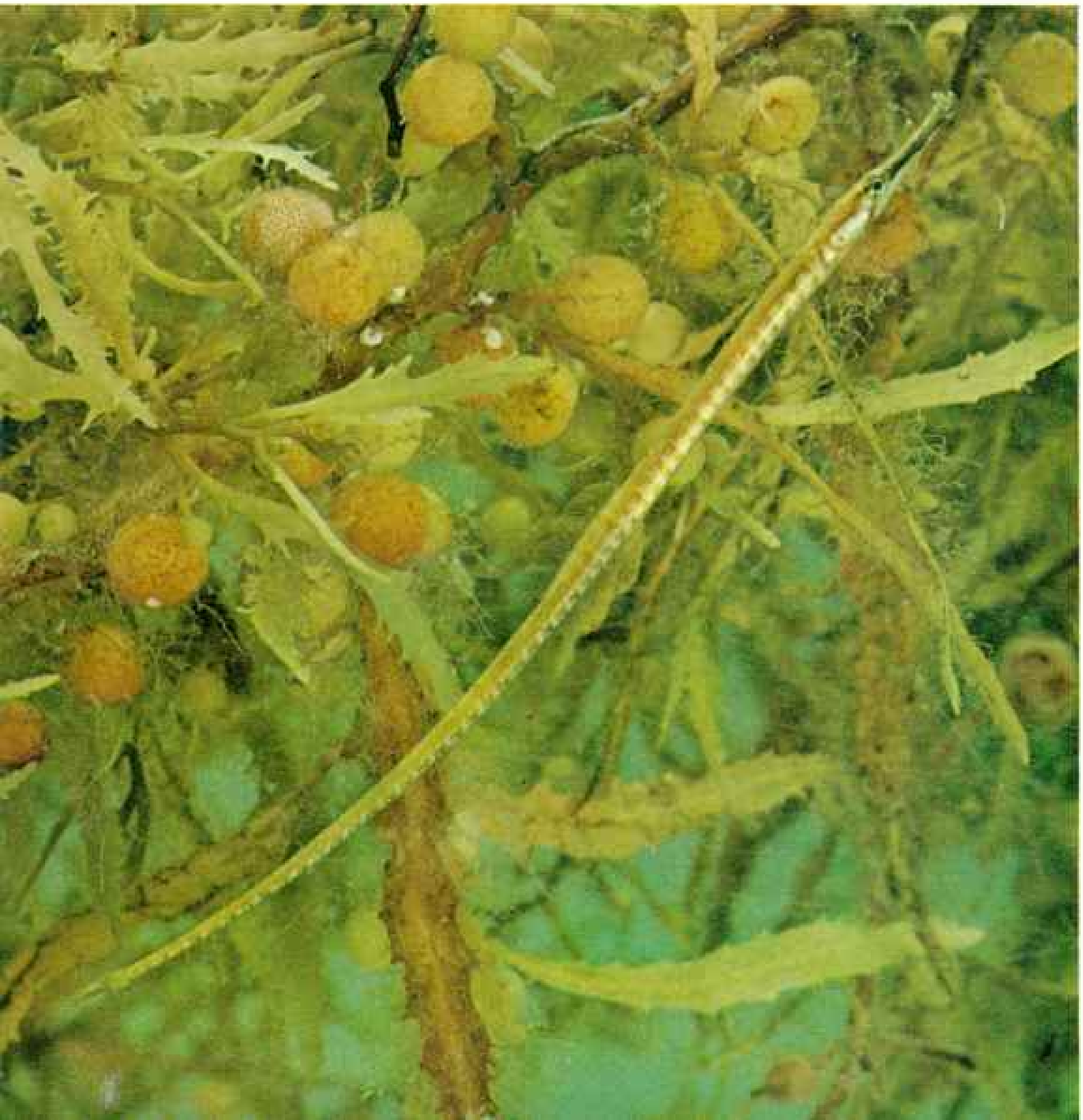
SARGASSUM FISH, ANTENNARIUS HISTRIO, 6 1/2 INCHES

RAGGED ROOF ON THE SEA, *sargassum shades a school of immature jacks as divers enter the blue realm of the Gulf Stream off the Florida Keys. Land-based in origin, the gold-and-olive weed became pelagic millenniums ago when portions drifted out to sea from coastal areas. By breaking into fragments that thrive separately, the plant perpetuates itself indefinitely.*

DAVID DOUBILET

VAST WATERY PASTURE in the Atlantic, the Sargasso Sea takes its name from the patches of weed that cover an egg-shaped area two-thirds as large as the contiguous United States. For centuries mariners believed the tangle, which sometimes stretches from horizon to horizon, could ensnare sailing ships, but the pulpy layer has never been thick enough to hinder navigation. Ocean currents swirl around the sea (**map, left**), a relatively still and shallow warm pool resting on colder, deeper ocean layers. The Sargasso's warmth prevents its mixing with the mineral-rich waters below, leaving upper regions nearly devoid of life except within the sunlit rafts of sargassum.

Portuguese sailors of old are said to have



FILEFISH, ENSIGNATHUS PELAGICUS, 6 INCHES; CRAB, PORTUNUS SAYI, 1 INCH; FILEFISH, MONACANTHUS HISPIDUS, 1/8 INCH; SHRIMP, LEANDER TENUICORNIS, 1 1/4 INCHES

named sargassum after a kind of grape resembling the gas-filled bladders that hold the plant near the surface. The pea-size floats loom large when magnified along with a pipefish (**left**), one of several small denizens seeking food and protection in the floating fields. Most of the creatures are similar to species found in coastal waters. A swimming crab (**top, left**) resembles the blue crab familiar on restaurant menus. Columbus, spying a sargassum crab some two thousand miles from North America, believed himself near land. The diminutive filefish munching on fronds (**top, right**) bears sandpapery skin and a dorsal barb to repel enemies. A shrimp's disguise, amid floats darkened by age (**above**), features white flecks that resemble bryozoan colonies (pages 196-97).

I BLINKED MY EYES to make sure I was not imagining what I saw. Yes, one of the weedy walls of the sargassum before me was slowly moving upward. By looking carefully, I detected a bright-green eye. A sargassum fish was again demonstrating its talent as master mimic. Motionless against the foliage, *Histrio histrio* fairly melts into the surroundings (**above**), a self-preserving ploy whether it is the hunter or the hunted. The blotchy coloration blends with new and old plant growth, white spots match the tube worms (page 197) that often grow on the weed, and wispy tabs of frond-like tissue fringe the body like a jungle fighter's camouflage net.

The exquisite disguise, evolved over hundreds of thousands of years, testifies to the length of time sargassum has thrived and been occupied in the open sea. I have seen the sargassum fish, one of few fishes with true prehensile fins, swing from frond to frond

SARGASSUM FISH, HISTRIO HISTRIO

and even hang upside down. Pairs of muscles in each pectoral fin close all ten rays, or "fingers" (**right**), at once, like a drawstring on a bag. The device helps the fish to approach prey stealthily through tangled foliage. A cannibal, the voracious eater seems to prefer its own smaller brethren to other species. In open areas, where stealth takes a backseat to speed, it frequently propels itself by spurting jets of water from round gill openings under the fins.

PARTING THE WEEDS for a closer look, I saw sections of sargassum laced with white (**right**), as though covered with moss or mold. Commonly called "moss animals," ubiquitous bryozoans are minute invertebrates found in waters from the tropics to polar regions. The drifting larvae of this species moor on plants, where they grow crusty external skeletons. Although developed from fertilized eggs, the settlers establish a colony by simply budding new individuals, each of which builds one of the hard white coverings that often give sargassum a piebald appearance.

Magnification reveals bryozoans' ciliated arms extending from the skeletal walls in search of food (**lower right**). Coordinated beating of the cilia creates a current that sweeps microplankton into the creature's central mouth. At the approach of a grazing snail, *Litiopa* (**upper, far right**), the tentacles are quickly withdrawn.

Added weight from the buildup of bryozoans may eventually help cause the host plant to sink in the water, denying it growth-giving sunlight. As the plant slowly begins a long descent to the bottom, fish, crabs, and shrimp dash toward another raft, but nonswimming inhabitants must ride their home downward to a chilly death.

BRYOZOANS, MEMBRANIPORA TUBICIGLATA, ENLARGED 60 TIMES (BELOW); ENLARGED 3 1/2 TIMES (LEFT, ABOVE); SNAIL, LITIOPA MELANOSTOMA, AND TUBE WORMS, SPIRORBIS CORRUGATUS, ENLARGED 33 TIMES (ABOVE)

SARGASSUM FISH, *HISTRIO HISTRIO*; FILEFISH, *MONACANTHUS HISPIDUS*

VIEW FROM DOOM'S DOOR: A tiny filefish visible through the diaphanous lower jaw of *Histrio* (**left**) seems to take a last wistful look at the world. Equipped with a huge wraparound mouth and belly to match, the sargassum fish devours prey nearly as large as itself. Like other anglerfishes, the fin-walker wiggles a fleshy appendage on its snout (**above**) when hunting. I have watched filefish stare at the quivering protuberance as though hypnotized. Were the sargassum fish alone in using such mimicry, it might soon become the chief inhabitant of the weed rafts. Fortunately, fellow voyagers have developed their own masquerades as means of survival, thus balancing the scale of life and death amid the floating meadows of sargassum. □

Minnesota, Where Water Is the Magic Word

By DAVID S. BOYER
NATIONAL GEOGRAPHIC STAFF
Photographs by the author and DAVID BRILL

High over a wide and handsome land, pilot Howard Sevdy rolls his biplane

IN THE LANGUAGE of the Dakota Nation, the Sioux, the very sound is soft and flowing: Minnetonka, Minnehaha, Minneapolis, Minnesota. Big water, laughing water, city of water, sky-blue water.

Land of 10,000 lakes, as the automobile license plates proclaim? Not really. Fifteen thousand, two hundred and ninety-one. And in Minnesota, if a lake hopes to count, it has to cover at least ten acres and flow with fresh water. No ponds or potholes, please.

From Lake Itasca rises a gentle stream that gathers such waters as the Turtle, Prairie, Crow Wing, Rum, and Minnesota as it bends and falls away southward. Its name is Mississippi—big river. Another system flows northward along the path of a long-vanished glacier. The Red River—fed by the Otter Tail and the Buffalo and myriad other waters—reaches toward Hudson Bay.

Thus geography and water impose upon the state an image that has as much truth as poetry. Minnesota is located almost exactly in the middle of the North American Continent,

above many-hued fields of corn, soybeans, and oats quilting southern Minnesota. 201

JIM BRANDENBURG

and its way of life seems permanently positioned in the middle of the American dream.

I'm talking now about the vision that brought immigrants to our shores, that bent men to the plow, that promised in return for honest labor a life of some plenty, some peace, and some dignity. A life in which people respect their community, and each man repays something of what he thinks he owes to it. A life formed by a closeness to nature.

Not every Minnesotan, of course, has a cottage on a lake. Or a canoe, sailboat, or powerboat. Some spend the long northern summers dry and dusty, working the rich prairie soil in the state's southern tier, cultivating corn and soybeans, feeding pigs and cattle, milking cows and keeping an ear tuned to the barn radio to catch the fluctuation of futures on the Minneapolis Grain Exchange.

"If crops and prices are good enough," a farmer in Blue Earth County told me, "we get rewarded for our summer penance. We can escape the worst weeks of below-zero weather by flying to Florida in January."

Both of us knew his admission bordered on heresy. A good Minnesotan is supposed to come alive when the temperature falls below zero. "I remember walking to work when the wind-chill factor was ninety below," a small-town girl told me. "I don't remember, ever, that they closed our schools because of cold."

Minnesotans do feel obliged to be outside —fishing through the ice, snowshoeing, snowmobiling, skiing, skating, or iceboating—except perhaps for some southbound farmers and a handful of orthodox urbanites in what other Minnesotans call the "Cities."

Twins by Geography Only

The Cities are a vast conglomeration of urbanity spreading into seven counties and containing two million people, half the state's population. Minneapolis and St. Paul, at the heart of the complex, are known as the Twin Cities—though they are about as untwinlike as any cities ever linked by bridges.

Russell Fridley, director of the Minnesota Historical Society, knows both intimately, and he characterizes them succinctly: "St. Paul—old, staid, Irish Catholic, conservative. Minneapolis—youthful, inventive, cosmopolitan, trying hard to be liberal."

The sprawling confusion of the urban area around the Twin Cities was giving 134 local governments such headaches that a few years ago the state created a Metropolitan Council with the power to decide where such things as highways, parks, and hospitals should or shouldn't be.

The Council has become Big Brother to the local governments, and they are slowly learning to live with him. "Metro" may well become a national model for urban organization.

Culture, Not Crime, in the Cities

The Cities, almost more suburban than urban in layout and personality, suffer less than most American metropolises from traffic jams, human congestion, poverty, and violent crime. The Cities are far more congenial to the Muses. Wealthy underwriters of the arts live there, and over the years they have contributed half a billion dollars to cultural and other civic development in the Cities as well as throughout the state.

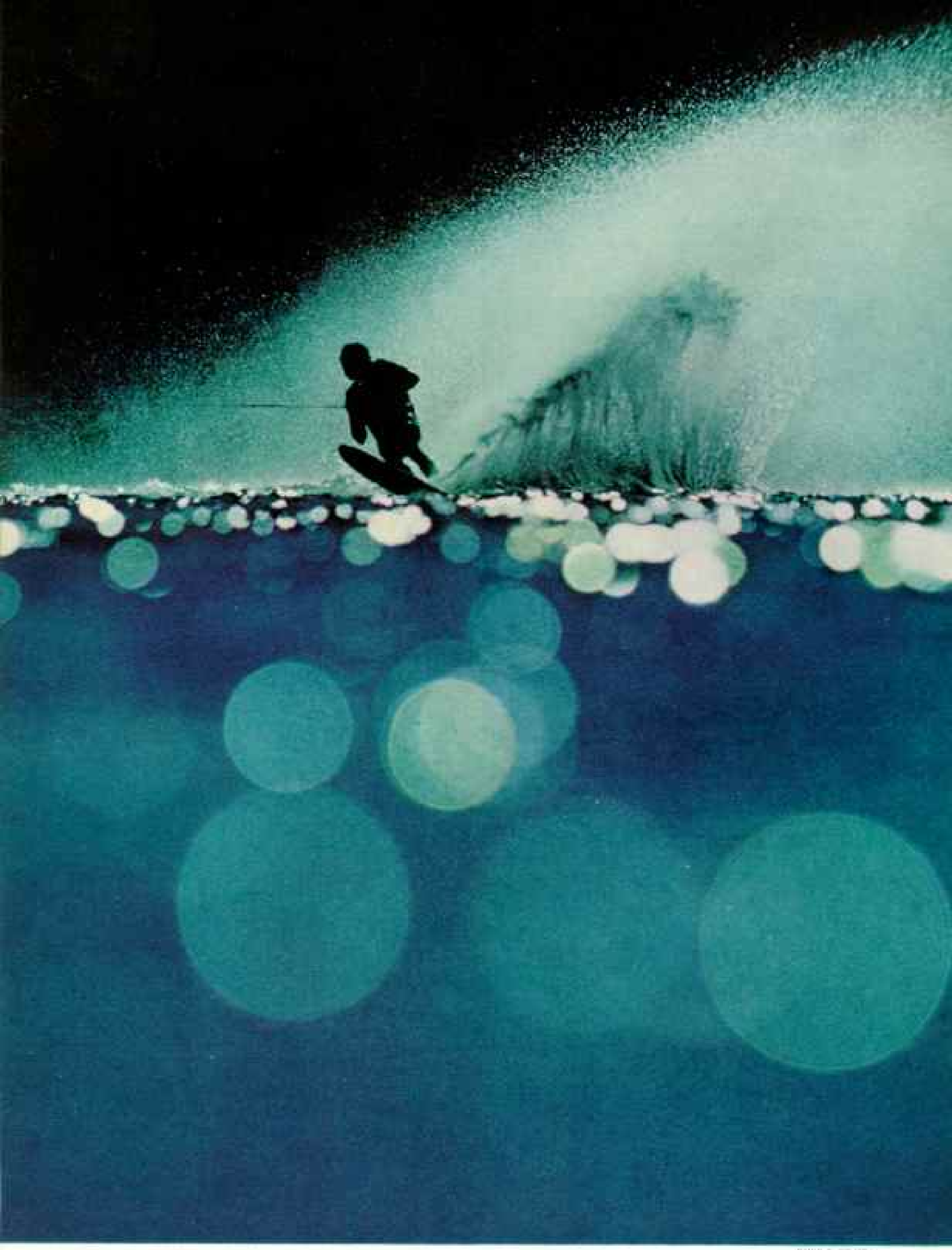
From all over Minnesota people pour into the Cities for such cultural amenities as theater, music, dance, art, and education. But they take pride in their state's rugged outdoor image as well. On radio and TV they are often reminded of it by the haunting voice of the loon, Minnesota's state bird, which inhabits its wilderness lakes.

The image of life and action stems from the immigrants of the 1800's—Germans and Norwegians, Swedes and Finns, Slavs and Irish, Danes and New England Yankees. Together they subdued this rigorous northland—logged its white-pine forests, mined its deep-down iron ore, and broke its prairies to the plow. To achieve it at all, they had to help one another. Their progeny are still there, still helpful, still proud of their ethnic backgrounds and their common pioneer courage.

One afternoon I leaned against the stone fireplace of Hubert Humphrey's summer guest cottage on Waverly Lake and listened to Minnesota's favorite son talk about the state that made him Mayor of Minneapolis, then United States Senator.

He recalled how close he had come to conferring his Minnesota-bred philosophy on his nation as a Presidential candidate in 1968. Now, however, he was the philosopher in work shirt, looking back, glad for limited success in demonstrating the Minnesota way.

"There are other Minnesotans to come," the Senator said. "For a time Fritz Mondale



DAVID S. BOYER

Slicing a path to fame, champion water-skier Nito Quitevis of St. Paul practices his slalom. Minnesota breeds champions; waterskiing was born here 54 years ago. The state owes much of its buoyant outdoor spirit to its rivers and 15,291 lakes.

Governor Wendell R. Anderson lands a bass while fishing the Mississippi south of Monticello. His trip publicized a study looking toward protection of the upper Mississippi under the Wild and Scenic Rivers Act. Anderson was the nation's youngest governor when elected in 1970 at the age of 37.

DAVID S. BOYER

wanted to be President. Wendy Anderson could be a candidate one day, too."

Months earlier I'd watched Governor Wendell Anderson go sprawling across the ice, missing a hockey goal, laughing about it later: "Playing hockey is part of campaigning up here," he said.

With fishing rods, I'd gone campaigning with Senator Walter (Fritz) Mondale, on the Mississippi south of St. Cloud. "Too many of our lakes are polluted," he told me, "but we also have 25,000 miles of rivers and streams, most of them still pure. We're determined to keep them that way—including this still-unruined stretch of the Mississippi. If the legislation we're sponsoring goes through, we'll be able to fish and swim in it forever."

Fritz Mondale grinned and cast a purple-colored "ugly bug" over beside a beaver lodge near the shore.

"The Washington scene is fascinating," he said. "But, believe me, the best place to be a politician is Minnesota. This is a vast and exciting physical and political environment. And the things that count here are lakes and rivers and people."

Senator Humphrey understood all this. "Maybe," he said, "it will finally prove more important to Fritz and Wendy that they've got Minnesota in their blood than whether they really hit the big time. It is for me."

We left the guesthouse and walked on down to the boat dock. The Senator, who had brought along a bucket and a broom, started washing down the deck of his pontoon boat.

State Fosters Liberal Ideas

"There's a really great thing about Minnesotans," he said. "If you try to maintain the kind of honesty and morality they stand for—and it's pretty rigid—they'll forgive any crazy ideas you have. No matter how liberal. Lots of the great liberal ideas of this nation came from Minnesotans."

Before the 20th century came the Grange, the first national farm organization. Ignatius Donnelly in the 1890's trumpeted the cause of the Populist movement, the People's Party. "From the same prolific womb of governmental injustice," he wrote, "we breed two great classes—paupers and millionaires!"

During World War I, Charles A. Lindbergh, father of the aviator, was a leading exponent of the Progressive movement, opposing Wall Street and vested interests everywhere. Arthur C. Townley organized the Nonpartisan League of antiwar socialists.

Out of Minnesota liberalism grew the Farmer-Labor Party. Merging with the state Democratic Party in 1944, it contributed many liberal ideas to the Democratic national platform. Today the Democratic-Farmer-Labor Party is the party of Wendell Anderson.

Senator Humphrey sloshed another bucket of water across the deck.

"What we do is lash three or four of these pontoon boats together out in the lake," he said. "We and the neighbors. One boat becomes the bar, another one the dance floor, and a third one for just talking. Only we don't talk politics. No politicians out there on that water. Just Minnesotans."

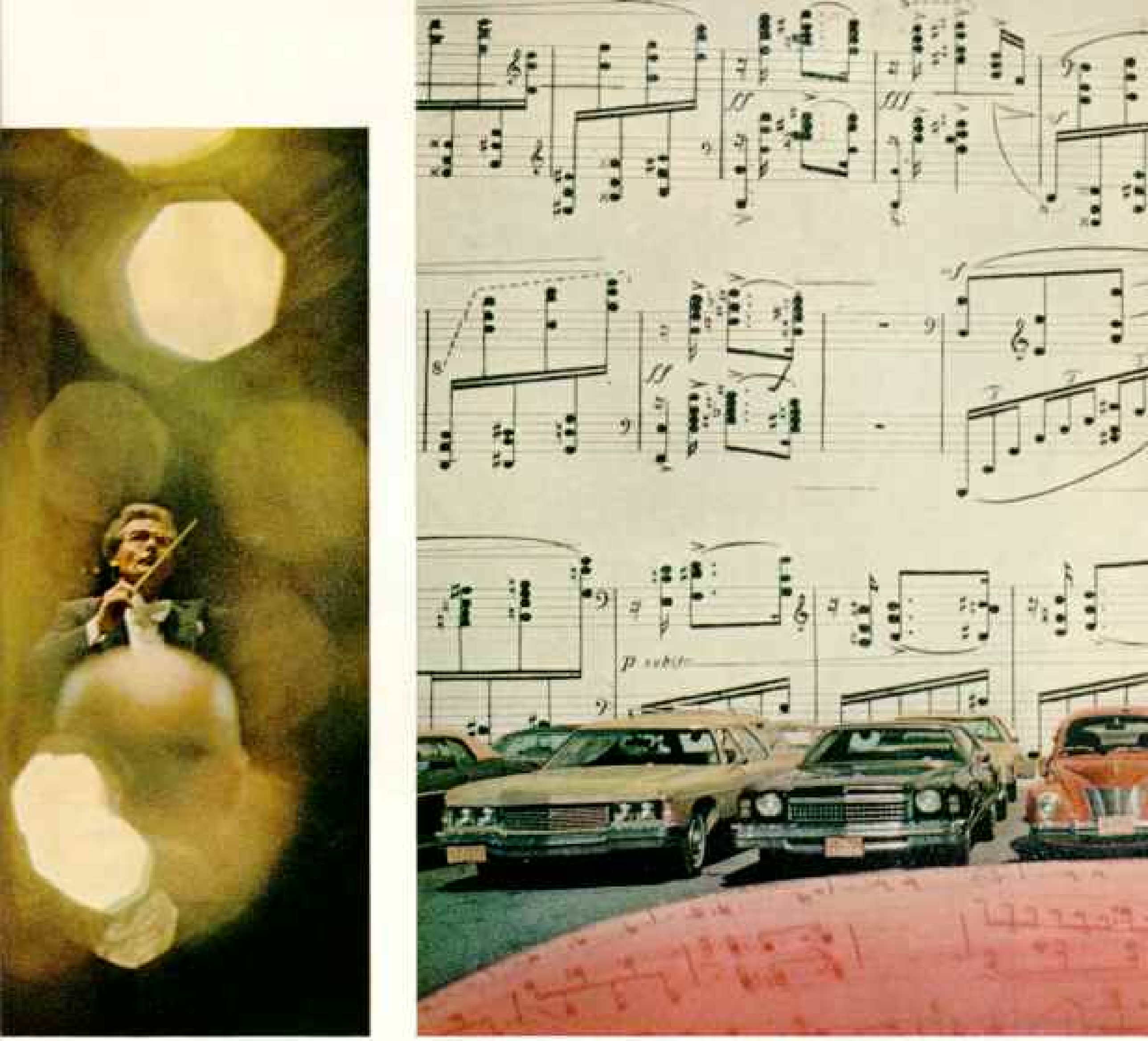
Humphrey, born in neighboring South Dakota, is a proud graduate of the University of Minnesota and was later a professor there. Its medical school is world famed, and many of its physician-professors are enshrined in medical history. *(Continued on page 208)*

"Minnesota,

hats off to thee!" goes the rousing football song of the University of Minnesota, and countless sons and daughters agree. Sinclair Lewis, whose book, *Main Street,* dissected small-town life, loved his boyhood home of Sauk Centre enough to be buried there. The town, which chafed under the author's criticism, now takes pride in the man who was the United States' first winner of the Nobel Prize for literature.

A glacier-carved land of rivers and lakes, Minnesota recalls her early French explorers with the state motto: "L'Etoile du Nord, Star of the North."

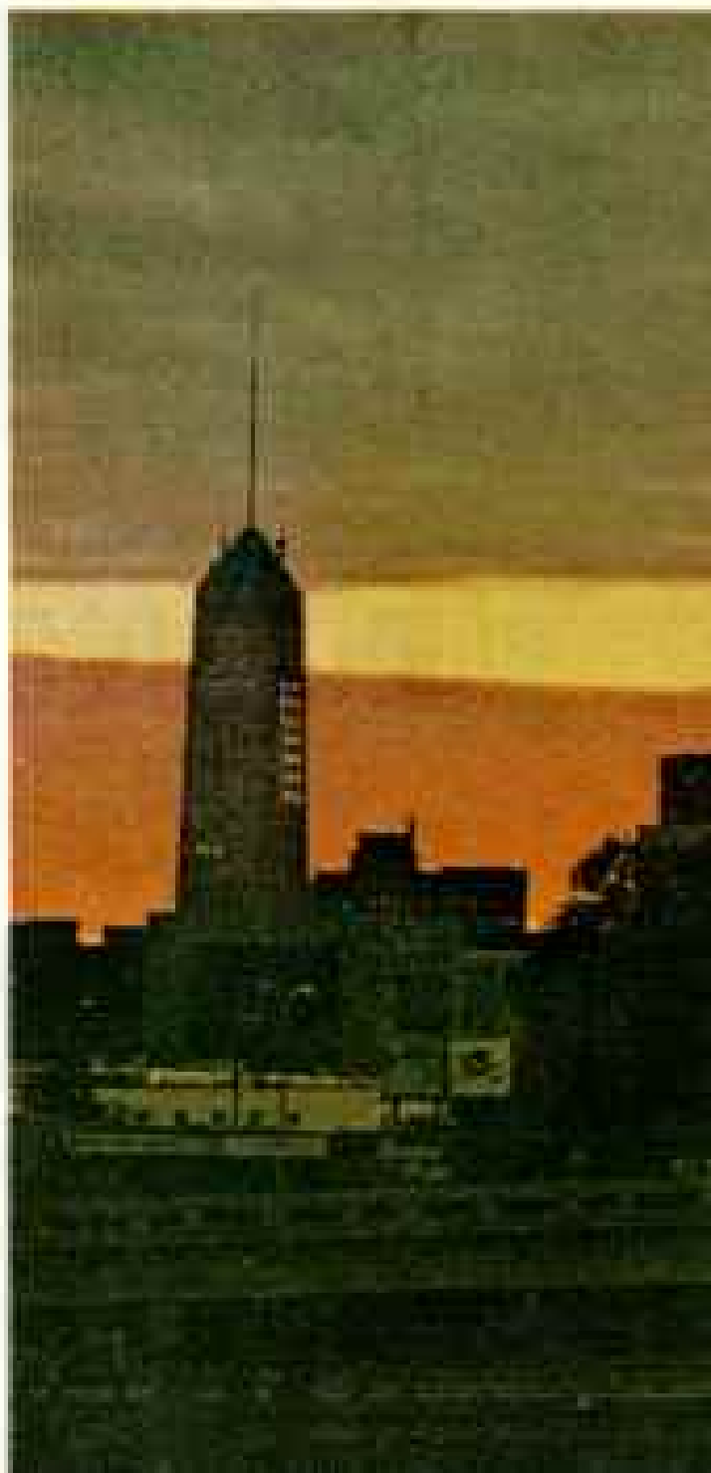
AREA: 84,068 sq. mi., 12th in nation. **POPULATION:** 3,917,000, ranks 19th. **ECONOMY:** Leads nation in butter production, mines 70 percent of its iron ore. Major industries: agribusiness, mining, forest products. **MAJOR CITIES:** Minneapolis, 427,860, financial center; St. Paul, 306,962, capital. **ADMISSION:** 1858, as 32d state.

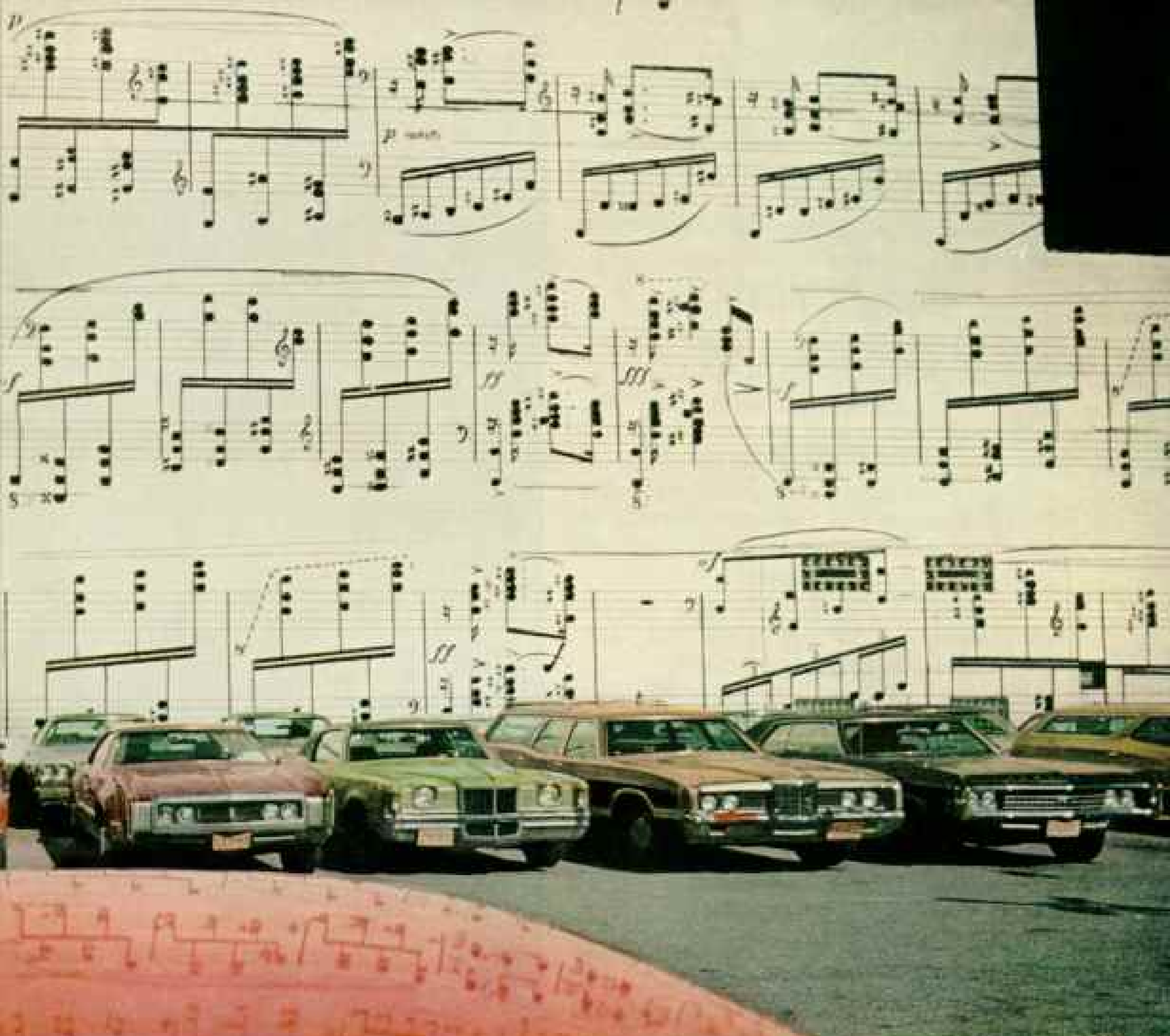


Giving a lilt to a parking lot, Schmitt Music Company in downtown Minneapolis covered a side wall with the score of Maurice Ravel's "Gaspard de la Nuit." Thus businesses help Minnesota's largest city orchestrate the demands of citizens, merchants, and planners to create an upbeat downtown. Private contributions have provided nearly all the 13.5 million dollars to build a concert-hall home for the Minnesota Orchestra. Music Director Stanislaw Skrowaczewski opened the hall in October 1974 (**above left**).

The prize-winning 51-story IDS (Investors Diversified Services) Center looms over the skyline (**right**), the tallest building between Chicago and San Francisco. Its all-weather Crystal Court, lined with shops and cafés, is linked to other city blocks by glass-enclosed carpeted bridges. By 1985 skyways will connect 64 blocks.

Concerned about the entire urban area, which includes St. Paul and 133 other municipalities, the state in 1967 set up a pioneering Metropolitan Council. "Metro" stopped highway construction through cities, relocated a new airport, improved sewage treatment, and now uses computers to coordinate patterns of growth.





DAVID S. ROTH (UPPER LEFT AND BELOW) AND DAVID BELL

In the 1940's Dr. Ancel Keys warned the world that a culprit called cholesterol was causing hardening of the arteries. Before that, Dr. Owen Wangensteen had pioneered in intestinal surgery. During the 1950's and 1960's, Dr. C. Walton Lillehei proved that open-heart surgery was practical.

"Big John" Tackles Kidneys

When I entered operating room F, at seven o'clock on a Thursday morning, I knew that today's star was Dr. John S. Najarian. "Big John," they called him, the nurses and students and interns scrubbing for surgery; years ago, at 245 pounds, he had played left tackle for the University of California. Because of Dr. Najarian, Minnesota has become a world center for kidney transplants.

In adjoining surgical theaters doctors made incisions in the sides of two men from St. Paul—a father-to-son transplant.

Not until 9:30 did I open a nodding acquaintance with Big John, over surgical masks. I watched as he tenderly accepted the father's severed kidney and plunged it into a cold solution of salt water, to cool it and drain it of blood, minimizing trauma to the organ.

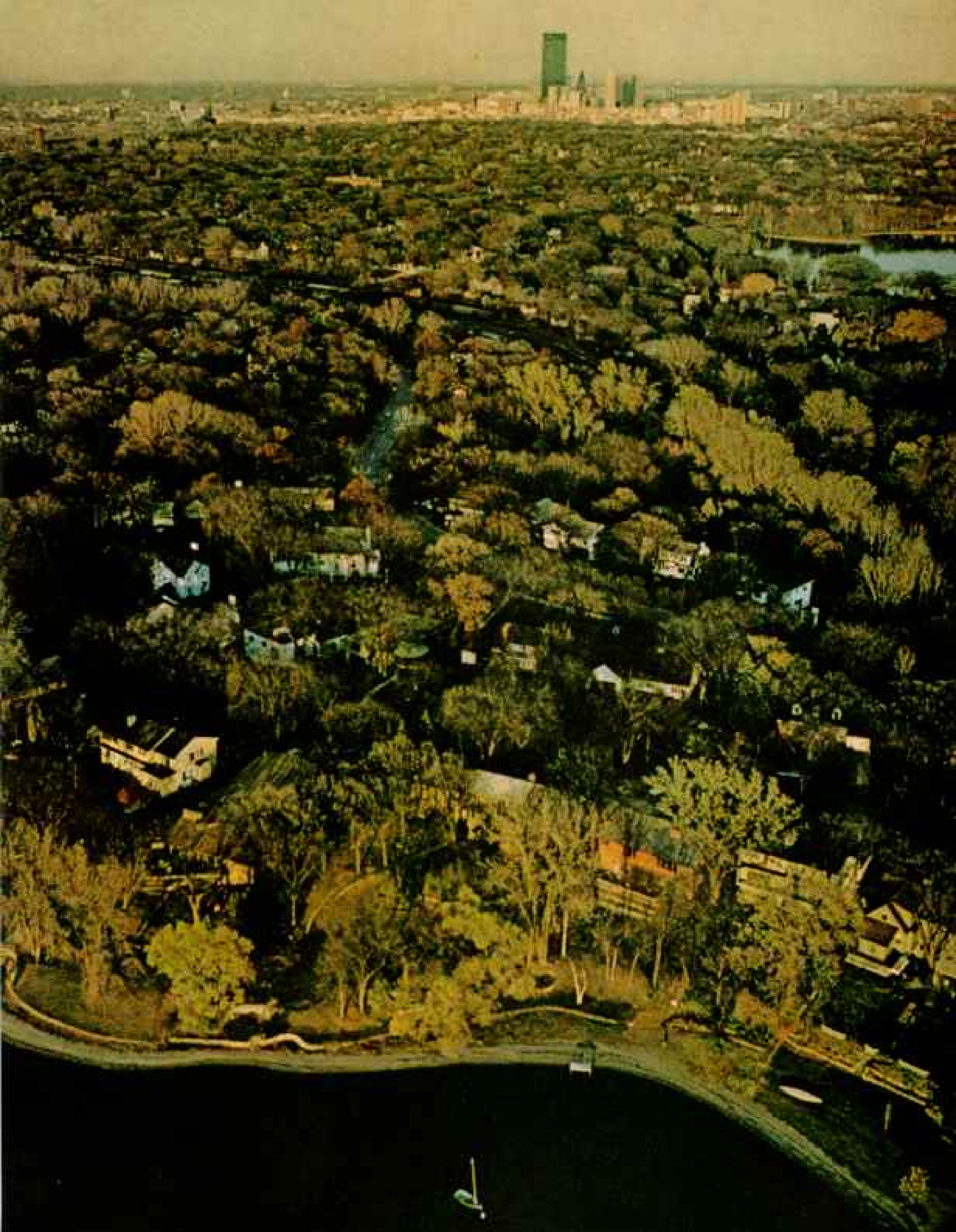
But his eyes clearly showed that something was wrong. The bath was scheduled for two minutes. Four long minutes went by, a nurse nervously counting off the seconds. Dr. Najarian and Dr. Robert Casali worked, their hands under water. Worry furrowed every forehead in the room. Finally, no more time could be allowed. The kidney was carried to the son, and the operation went on. For hours more, the strain was almost palpable.

"You happened in on a tough operation," Dr. Najarian said, shucking off his green operating gown and sitting down with a sigh in his office at 1:30. "We never had one quite like that before. A branch artery to one-third of that kidney was damaged beyond repair in its removal. The only thing I could think of was to pull over an artery leading to the left leg, to supply the kidney with blood. When that final third went pink, I felt a lot better. He's going to be fine.

"That boy's mother had given him a kidney eight years ago. Now, his father. When people make sacrifices like that, you'd feel pretty bad if you had to sew up both father and son without a kidney."

At Rochester, eighty miles southeast of the

Boats in the front yard and downtown only three miles away, Minneapolis families



DAVID BRILL

along Cedar Lake enjoy the best of two worlds. Clear air and outdoor recreation help Minneapolis preserve its highly acclaimed quality of life.

university medical school, is the Mayo Clinic. Almost everyone knows something about the Mayo brothers, Will and Charlie. Born in southern Minnesota farm country in the 1860's, sons of a country doctor, they went on to become the most celebrated team of diagnosticians and surgeons of the 20th century.

Mayo Clinic: Modern Medical Shrine

Rochester today is a mecca for nearly a quarter of a million medical pilgrims annually —a city of rooming houses and motels for outpatients; of doctors, hospitals, medical students, and technicians.

On a Monday I watched a thousand new patients, full of hopes and fears, apprehensively sign Mayo registers in the giant lobby of a gray marble skyscraper, one of two rising out of the rolling Minnesota cornfields. Hundreds of others waited on every floor for their names to be called—for exams, injections, X rays, cobalt treatments for cancer.

Dr. Hillier L. (Bud) Baker of the diagnostic radiology department took me down rows of dressing rooms, like some super-antiseptic country club. Nurses, technicians, and patients scurried around on waxed floors.

"We do a million X rays a year," Dr. Baker said. That's more than any other medical facility in the world—and the problems are ones of scheduling, filing, and retrieving. Today it's all being computerized.

Dr. Paul W. Scanlon, specialist in radiation therapy, showed me his department's new computer. "In three minutes it can plot the radiation around a tumor anywhere in the body. It used to take us three hours.

"We're curing more and more cancers. There are more than 200 kinds. Some have a cure rate of 95 percent. Others, only 2. Early detection is the key. Anyone who smokes should have an X ray every six months."

Far north of Mayo's, almost to the Canadian border, I met a different face of Minnesota. Two grinning faces, in fact. Brothers Richard and Lynn Rynning are farmers in the Red River Valley, a "valley" 80 miles wide, dead flat, and quilted with the lush green of sugar beets and the changing shades of malting barley and high-yield semidwarf wheat.

It was almost harvesttime, and the valley was becoming a water bed. Rain. But that didn't kill the grins on the faces of these two genial, giant young men.

ALL BY DAVID S. BOYER

Wizardry of modern medicine assures quality health care. At the University of Minnesota Medical School (**facing page**), an argon laser beam, aimed by Dr. David E. Eifrig's hand-held lens, enters the eye of a patient to cauterize a ruptured blood vessel.

"Raise two fingers," Dr. Darrell E. Rose instructs (**above**), and a 4-year-old, isolated behind soundproof glass, responds during a hearing test at the world-renowned Mayo Clinic in Rochester.

Ammunition for fighting disease, pills seen in this double exposure (**top**) are manufactured at Rowell Laboratories in Baudette. The company began 40 years ago, when a combination fisherman-fox farmer and his pharmacist son discovered that burbot fish oil, which gave glossy coats to foxes, was more potent than cod-liver oil.

DAVID S. ROTEN (ABOVE) AND MICHAEL KOFF

Iron mining in the north enjoys a great resurgence, recalling the opening of the Mesabi Range in the 1890's. Investing billions of dollars, companies now mine low-grade ore called taconite. Spewing nonpolluting steam at Hoyt Lakes, Erie Mining Company smashes the hard rock to powder, then extracts magnetic iron-bearing particles and forms them into pellets suitable for blast furnaces. Such operations, employing 11,300 people, keep Minnesota in the competition to supply Great Lakes steel mills.

Putting away for a sunny day, neighbors ignore December cold to stack 700-pound blocks of ice from Lake of the Woods in the icehouse of fisherman Ed Vickaryous on Hay Island. In summer the Vickaryouses crush the ice to pack catches of walleyed pike for restaurants in nearby Warroad.

"When it rains, we come in here, to our think tank," they said. The room was a paneled hideaway in a giant new garage, with lounge chairs, sofa, desk, telephone, calculator, books on farming, and machinery catalogs. We slumped into the soft seats.

"Every minute it rains, we're losing money," Richard said. "Up here, we say a farmer's time during harvest is worth $1,000 an hour. For one thing, this rain's going to cost us $8,000 for a bigger grain dryer."

"But if it weren't for the weather," Lynn said, "farming would be an incredible bore."

Trouble was, the weather poured down and became a tragedy. Thousands of farms flooded (pages 216-17). Nearly a hundred million dollars in damage.

"But it's awfully hard to kill us off," Richard told me after it was all over. "The average U.S. wheat yield is 32 bushels an acre. We get 50, sometimes 74. We just have to wait for next year.

"Anyway, we didn't lose it all. If the Russians buy enough wheat and the price goes up, we could still make out this year."

The waiting, in the northern Minnesota winter, is long. "Once," Lynn said, "we had a blizzard for three days. I'd have had to climb out an upstairs window if a neighbor hadn't shoveled a tunnel to my front door."

Snowmobile Fleet Stirs Debate

There is one snowmobile for every 13 people in Minnesota, and only in Florida will you find more water skis per capita. You'd think the men who developed them—both Minnesotans—would be wealthy, but they're not. And to most Minnesotans I've met, money for money's sake seems singularly unimportant.

Edgar Hetteen has given twenty years to the snowmobile, and he remains so busy building, riding, and defending them, he doesn't take time to wonder why he's not rich.

Defend snowmobiles in Minnesota? That's like having to uphold champagne in France.

In Thief River Falls, where he is an executive for Arctic Enterprises, Edgar admits that too many of his customers mix gasoline with alcohol. "You can become intoxicated with the freedom of a snowmobile, or you can become just plain intoxicated."

Cross-country skiers, particularly, complain about snowmobiles desecrating the

silence and disturbing the wildlife, about damage to trees and fences, about beer cans, about snowmobile deaths and injuries.

"There's far too much truth in all that," Edgar continued. "But there's another side to the coin. Who knows how many Minnesota families owe their solidarity to getting out into the wilderness together? Besides, snowmobiling is growing up. Trails are being built. And snowmobilers are learning to respect private property and to stay out of areas reserved for skiing and snowshoeing."

I tried snow-covered Minnesota both ways. Several times I rode roaring snowmobiles over the ice and the white-carpeted canoe portages of the north country's lakelands. Even through a frosted face mask I came to understand, a little, the snowmobile mystique. There's a sense of suddenly owning the wilderness when you're racing around the trackless racetracks of frozen lakes. But to hear only the rhythmic whisper of skis, and perhaps the sound of a deer, is to know another feeling—as if the wilderness owns you.

Ralph Samuelson never got rich either, though he invented water skis 54 years ago at Lake City, where the Mississippi widens into Lake Pepin. In those days there wasn't a boat fast enough to get Ralph really going on his primitive pine boards, so he made some of his first rides towed by a seaplane.

Water skis and motorboats are forbidden in most parts of the Boundary Waters Canoe Area—a million acres of wilderness, mainly reserved for canoes. This blue, forested silence blends into another vast wilderness, Quetico Provincial Park, in Canada—the legendary land of the voyageurs (map, page 205).

Through these rivers and lakes, in birch-bark canoes, 18th-century French-Canadians carried the axes and guns, the blankets and beads, and the wine and whiskey that were traded to the Indians for furs.

Minnesotans Cherish Their Wilderness

More than half a century ago a few far-sighted men anticipated the craving of future generations for lonely land and sky-blue water—in the Cities as well as in the wilderness. For example, much of the open space so cherished by residents of Minneapolis today was nurtured and developed into one of the nation's finest municipal park systems during the 30-year superintendency of Theodore Wirth. Building on this tradition, his son, Conrad L. Wirth, rose to become director of the National Park Service. Others in Minnesota carry on the gospel of conservation.

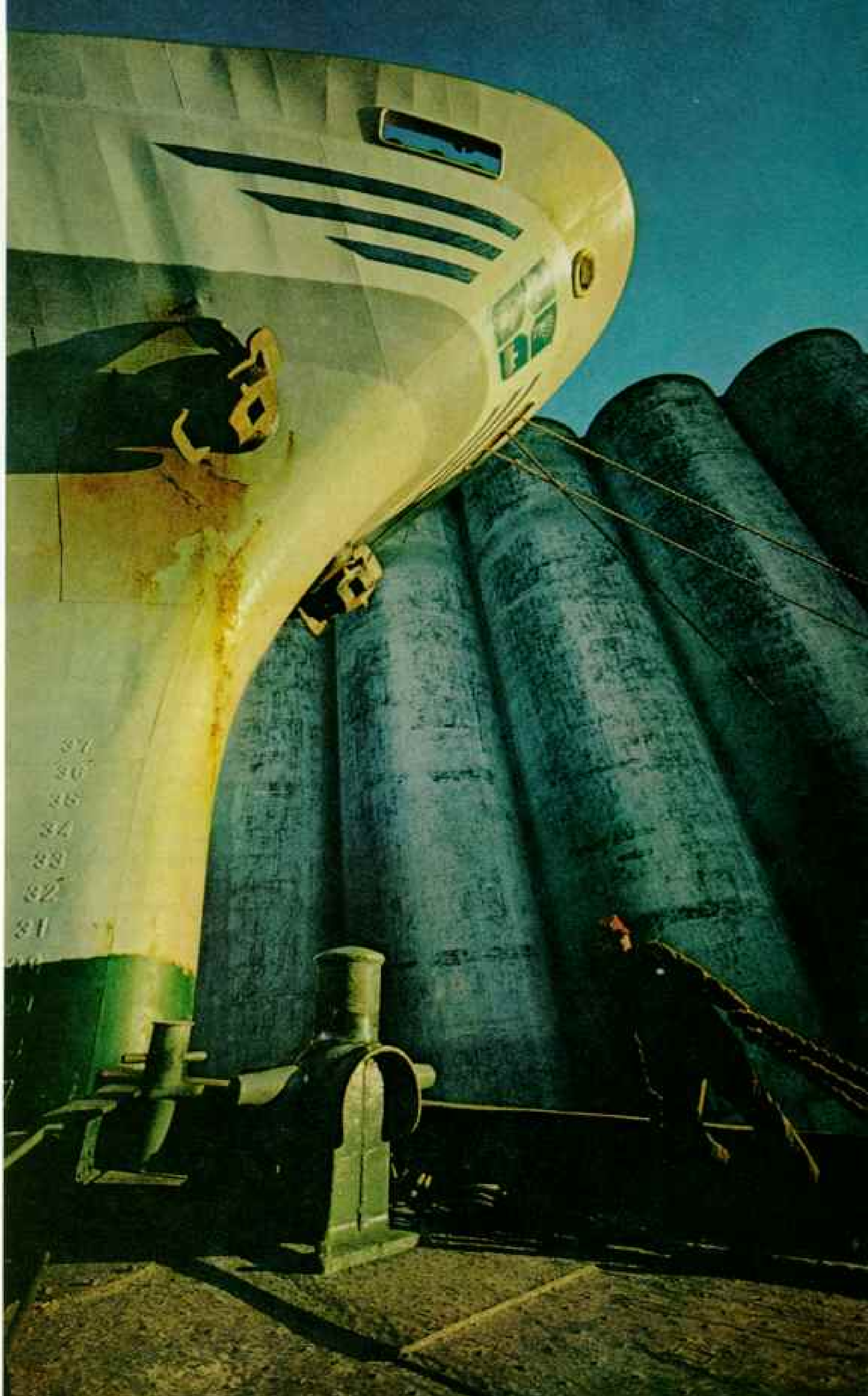
Sigurd F. Olson, of Ely, is one (page 220). In *Wilderness Days* and other books he has pressed into prose the poetry of the singing wilderness. Long before the environmental revolution of the sixties, he sensed the saving grace of wind and rain and sun, of water and stars and silence—for the soul of man.

Frank B. Hubachek, of Minneapolis and Chicago, is another. He has poured much of his life and wealth into studies, conducted by

BOTH BY DAVID ROSS

Seaport in the heartland, Duluth-Superior on the west end of Lake Superior ranks among the nation's top ten harbors (**right**). This Greek freighter fills its hold from a grain elevator; such large vessels—including Soviet carriers—steam away with 170 million bushels a year.

Just a drop in that bucket, a single bushel of shelled corn, hefted by Jerry and Pat Zeman (**left**), will feed ten hogs for one day. The Zemans of Owatonna raise grain to fatten livestock; crop surpluses may end up as far away as Calcutta.



the Wilderness Research Foundation, that may one day repopulate the northland with the stately white pine. First by logging and then by disease, that noble tree has been threatened over the years in Minnesota.

A third is Ernest C. Oberholtzer, of Ranier. Together with Sig Olson, "Hub" Hubachek, and others, he launched the successful fight to keep Minnesota's power and pulp-and-paper industries from turning the white-water rapids of the voyageurs' country into one long polluted sluiceway. Recently another 340 square miles of that wilderness has been set aside as Voyageurs National Park.

But if there is a patron saint of the Minnesota wilderness, it is Sig Olson. I watched scores of people beating a trail to his door in Ely, just to say "thank-you" before leaving for their week or their month in the Boundary Waters Canoe Area.

With Sig, I took a canoe into the quiet land of the lakes, camped with him under a Milky Way arching over an infinity of wilderness, and watched a rising Venus pouring out a silver pathway across the black water.

Sig stays on to savor the long, deep silence of winter in the north. But with some of the less hardy, I retreated to the Cities.

On the snowiest day of December you can walk in shirt-sleeves to a dozen of the finest hotels, restaurants, and department stores of Minneapolis. Eleven city blocks are connected by second-floor pedestrian arcades, called skyways.

Maestro a Study in Intensity

In their acoustically exquisite new hall, musicians of the renowned Minnesota Orchestra sat in white tie or black evening dresses. The audience sat in formal gowns and black tie, and I sat in splendor between a trombone and a bass viol, playing a Nikon camera.

Through a telephoto lens I followed the movements of the maestro, Stanislaw Skrowaczewski—the blurring motion of the baton and hands; the purse-string tightening of the lips; the imperative admonishing of the eyes, and the rapierlike signaling by finger to individual musicians (page 206).

Now when I play Minnesota Orchestra records, I see and understand as well as hear.

At the Guthrie Theater one night I watched a magnificent production of *King Lear,* and I also understood more about perfection in drama, for I had been backstage all day. One of the best repertory theaters in the nation, it creates all its own scenery and costumes and employs a full-time voice-and-body coach.

I had watched, wincing, as Fran Bennett put her actors and actresses through two hours of excruciating yogalike exercises (page 223). Imagine being tied into a knot, rocking back and forth on the floor, and maneuvering your vocal cords through an almost endless series of sounds from what Fran calls "your basement to your attic."

Culturally, St. Paul is a close rival of its twin, but its dramatics take other forms: The St. Paul Winter Carnival is the show of the year. But St. Paul, in its conservatism, places more emphasis on its venerated architecture, as well as on the treasures of its museums. Even so, it is St. Paul that is the seat of the state's liberal government—marked, perhaps, by high taxes, but also by notable results in education and social services, and in balancing the protection of the environment with the promotion of industry.

To the East Coast and to the Far East fly planes of Minnesota-born Northwest Orient Airlines. North Central Airlines, from its Twin Cities home, brackets eight states and two Canadian provinces. From here the Great Northern and Northern Pacific Railroads opened the Northwest, pushing their steel across the mountains to Portland and Seattle. Even *(Continued on page 222)*

Minnesota, Where Water Is the Magic Word

BOTH BY DAVID BRILL

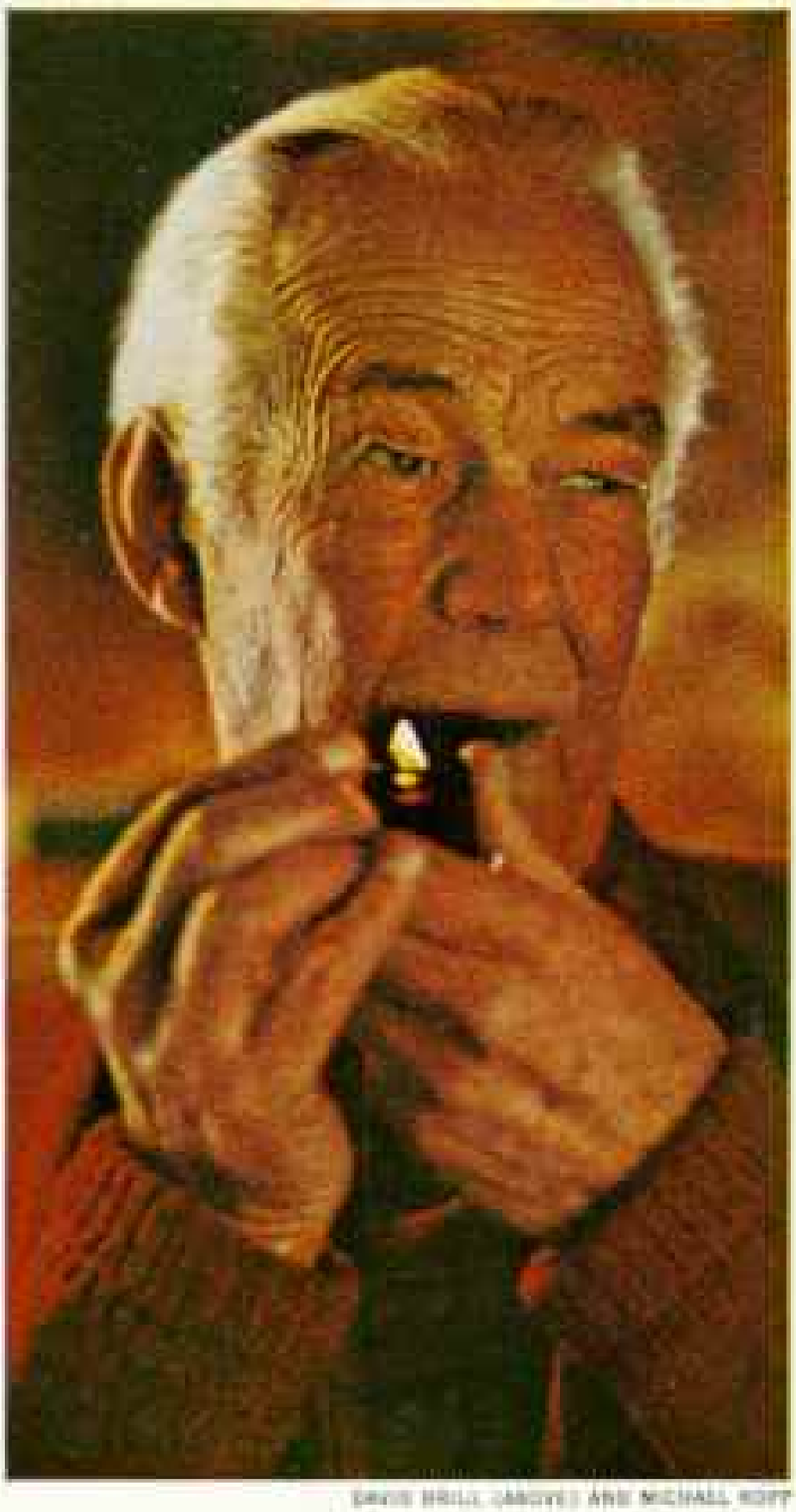
During the flood, the stillness of disbelief hovered over the Red River Valley last July. Here at Kragnes (**above**), grain storage sheds, right, awaited bumper crops; then 14 inches of rain in a week destroyed barley (**below**), wheat, oats, sugar beets, and potatoes, as well as buildings and equipment —a loss estimated at $95,000,000. But farmers have cleaned up and planted again, gambling on good weather this summer.

Thermometers sink to 30° below zero; breath freezes on noses and lips. Instead of curling up by a fire, many Minnesotans in winter race outdoors to test their mettle at sports (**above right**). At Gilbert, these 6- to 8-year-olds, called "ice mice," send a puck flying into the net. Eveleth, a nearby town of 5,000, has already sent 13 players to the National Hockey League; four of them are honored in Eveleth's newly opened United States Hockey Hall of Fame.

Straining against harnesses, Alaskan malamutes, capable of pulling 100 pounds each, exercise under the guidance of John Park in Superior National Forest (**above**); his father, B. R. Park, helped bring All American Championship Sled Dog Races to Ely.

Once vital for winter transport, now kept for sport, dog teams give way to the snowmobile, developed by Minnesotans. Today every thirteenth resident owns one. Racers compete in an "International 500" (**right**) on a course between Winnipeg, Manitoba, and St. Paul. Offering $39,000 in prize money, the Minnesota capital sponsors the contest during its Winter Carnival.

DAVID S. ROSEN (UPPER LEFT AND ABOVE) AND DAVID BALL



ERNIE BRILL (ABOVE) AND MICHAEL KOPP

"Whither beautiful Minnesota?" For more than fifty years, noted ecologist and writer Sigurd F. Olson has sought answers to complex questions of wilderness preservation. From home base at Ely, he has explored every wild area left in the United States and Canada. His preferred vehicle, the canoe, "helps me recapture a magic compounded of distance, adventure, solitude, and peace. These spiritual values are the real benefits of saving the wilderness."

Assault on the wilderness: Logging leaves clear-cut areas beside clumps of spruce, which in a striking optical illusion appear recessed. In the desolate interior of the Northwest Angle, a thumb of Minnesota that juts into Lake of the Woods, the ground is so spongy that loggers can remove cut timber only after freeze-up.

(Continued from page 217) today railroads carry much of the northland's commerce. Down the Mississippi from the cities go barges laden with grain, oil, and coal. From the 9th Federal Reserve District building, and other banks, flows much of the financing for a six-state area.

Robert L. Herbst, head of the state's Department of Natural Resources, briefed me on Minnesota's delightful new problem, the exploitation of important deposits of copper and nickel—delightful because of what it may mean to the economy, a problem because of the potentially grim impact on the environment. The ore, and the proposed mining, lie in prime northern vacationland.

Taconite a Mixed Blessing

Minnesota has started down such a road before, and its end is still uncertain. *The United States of America et al* v. *Reserve Mining Company et al* is one of the most prolonged and complicated pollution controversies in U.S. history. It began 35 years ago when a Minnesotan, Dr. E. W. Davis, led the development of a process to transform taconite, a low-grade magnetic iron ore, into a high-grade pelletized concentrate. Taconite would become a turning point in the life and prosperity of northern Minnesota.

Mining companies were aware that the nation's largest deposits of high-grade iron ore in the Mesabi Range would not last forever. By the 1960's depression and unemployment were threatening the mining towns and their mother city, Duluth.

But giant companies had begun pouring billions into developing far greater deposits of taconite, shipping the pellets by rail to Lake Superior ports. Taconite was a superior product for the blast furnaces of the East.

Reserve Mining Company, with state encouragement, had built a processing plant and an attractive community for its workers at Silver Bay. For the past ten years, Reserve has deposited nearly 60,000 tons of taconite tailings daily in Lake Superior.

Everyone was happy with taconite. Except, belatedly, the Department of Natural Resources, the Pollution Control Agency, the U.S. Government, and Judge Miles Lord. For a year, the struggle raged before his federal bench in St. Paul. Judge Lord's name became a household word.

BOTH BY DAVID R. BOYER

Sharpening the senses, young artists find some of the best instruction in the country in Minneapolis. In a gallery for the visually impaired at the Minneapolis Institute of Arts, student sculptors with normal vision (**left**) look with their hands before trying their own skills, still blindfolded, at the Minneapolis College of Art and Design. The college, the institute, and the Children's Theater Company form a tripart arts center opened in October 1974.

At the Guthrie Theater, voice-and-body coach Fran Bennett helps fellow actors "explore new facets of their abilities." For nine years she has worked to stage plays from Shakespeare to Solzhenitsyn to Lonne Elder.

The outcome: Reserve must stop polluting the lake and the air and dispose of its tailings on land. But where?

Bob Herbst and his staff had helped fight Reserve's first proposal for a tailings basin behind Silver Bay. I understood why when I went there. Two shimmering lakes lay like sapphires set into the forested hills. Tailings basins? Never! Exactly what Miles Lord thundered from his bench.

But with a pilot from Silver Bay I flew over the plant and the town and the pilot's home. "The judge and the state did their best to get Reserve shut down," he said. "They saw it as a pollution problem. But it's a people problem, too. There are 700 families with homes and jobs down there, and we've gone through hell worrying about this."

I met the judge, by chance, one Sunday afternoon on Lake Minnetonka, most famous of all the playground lakes within the Cities. He wore a crushed fishing hat and baggy pants, and had, in fact, just arrived on a floatplane from a fishing trip in Canada. That, like escaping to Florida in January, is a Minnesota heresy. To atone, he was now fishing on Minnetonka with his grandchildren.

The State of Minnesota and Reserve had been ordered by an appeals court to agree on a better site for the tailings basin.

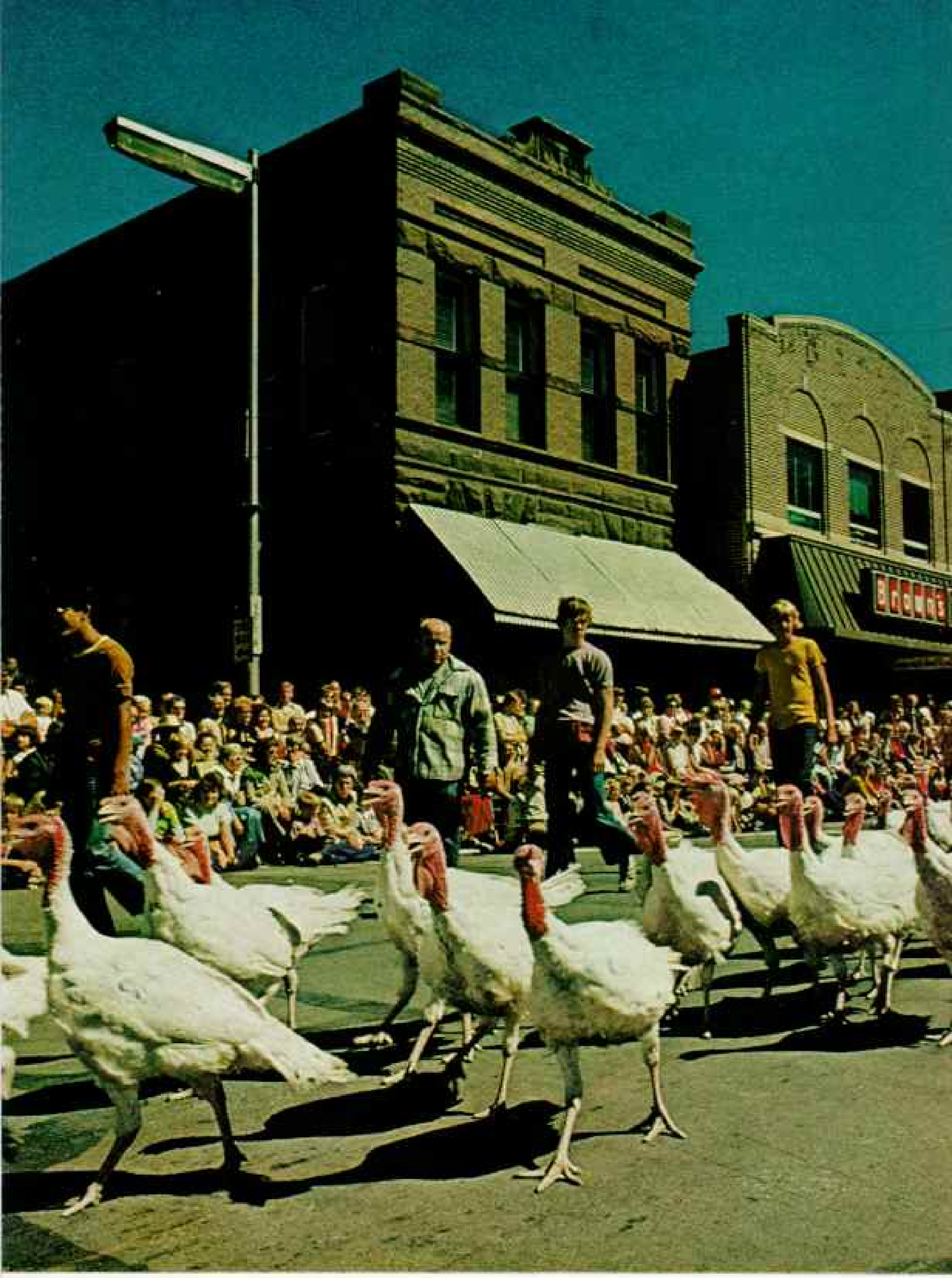
And Judge Miles Lord? "I'll be out of the eye of the storm now," he replied, squinting into the water. "But I'll still be involved, settling all the fines and penalties."

Never known for reticence, Judge Lord may yet have more to say about pollution and tailings basins. So will Bob Herbst. Bob introduced me to staff engineer Bill Brice.

"Suppose," Bill said, "you want to find all the places across the north best suited for taconite tailings basins or copper-nickel waste—areas where the least harm would be done to the environment."

He unrolled a sheaf of maps created by computer. Some depicted forests, rivers, recreation areas, and farmland; others traced mineral deposits, highways, towns, transmission lines. Overlaid, they became a composite of resources, identifying land of least overall value, the best locations for dumping industrial waste.

Bob Herbst summed up the story: "One day we hope all Minnesota will be mapped by computer. We're a computer state. IBM,



Gobble of turkeys struts down the main street in Worthington, unaware that their trail's end will be a soup factory. Turkey Day began 36 years ago when raising the birds was big business.

Now it draws thousands of spectators and a gaggle of politicians on the campaign trail.

Control Data, Honeywell, Univac are among our larger industries. What better job for computers than to compile all the known facts about our land and draw designs for its salvation?"

Economic salvation is on its way to the port city of Duluth, partly through taconite, but also through increased shipment of grain to the Soviet Union and other countries (page 215), and through other Minnesota resources like soybeans and sunflower seeds. New facilities to process and ship them are part of Duluth's new hope for the future.

Immigrants Stressed Religion, Education

Minnesotans have always lavished money and concern on a more important resource, their children. The state has a major university and 58 colleges, 47 of them founded as church schools. With the earliest Minnesota immigrants had come commitments to learning as well as to God.

For the most part graduates find their futures within their own state. Their dedication helps rank Minnesota high in the nation in economic growth.

Technical and vocational schools have begun to proliferate, rivaling academic institutions in number. The Hennepin Technical Centers operate 52 weeks a year, day and night, and include, scattered throughout the student body, people who are mentally or physically handicapped. "We're trying to serve every kind of citizen in the community," campus director James P. Lund told me.

Daytimes, students from high schools are bused in to join classes in auto mechanics, professional cooking, carpentry, television, and dozens of other trades. Nighttimes are for paying adults.

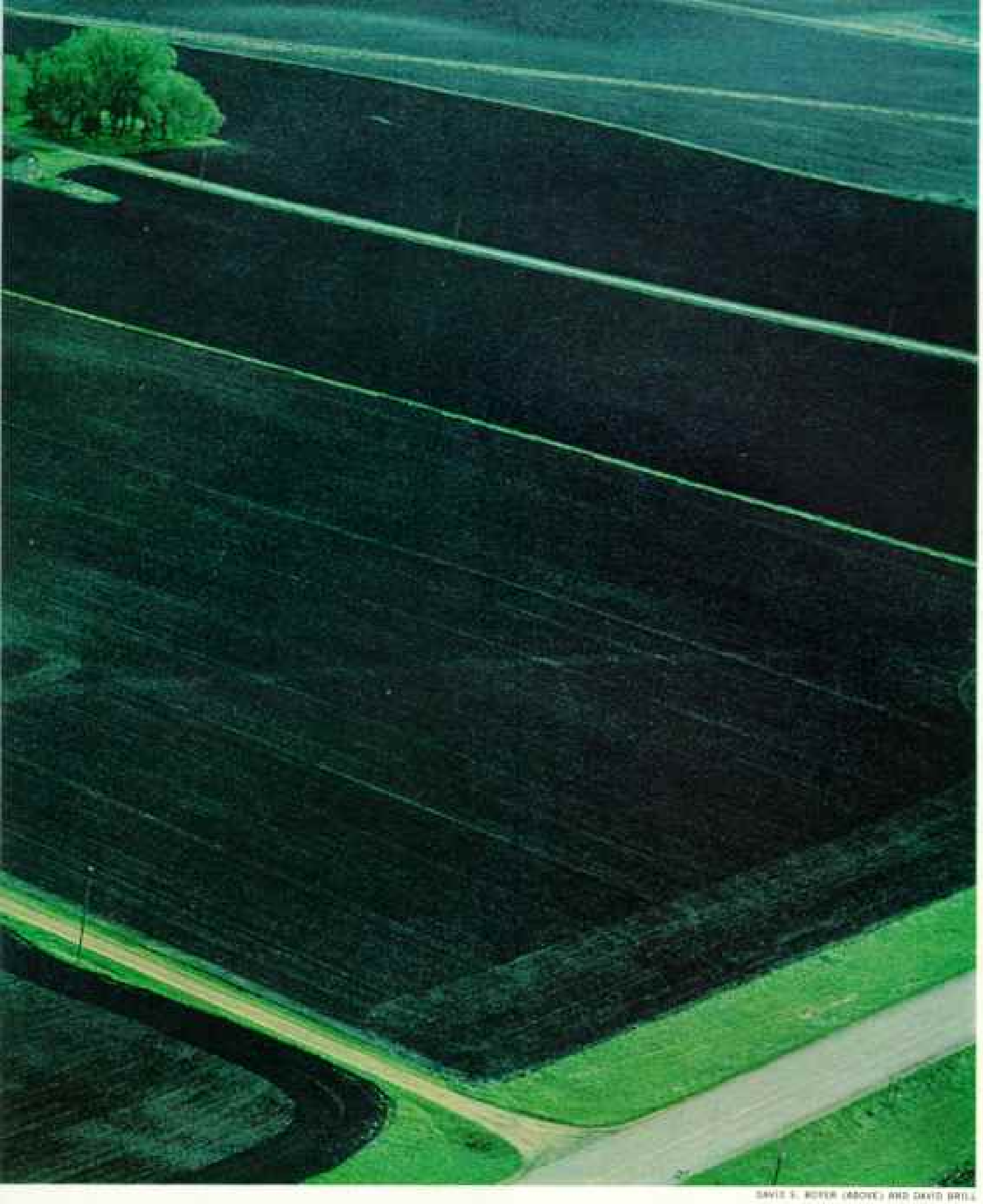
Nearly half of Minnesota's 23,000 Sioux and Chippewa Indians can call on the educational advantages of the Cities, for they live there.

Chris Cavender, of suburban Hopkins, is a Dakota, or Sioux. He is a University of Minnesota graduate, one of about a hundred American Indians with a Ph.D.

"My daughters, Audrey and Angela, are practically acculturated," Chris said, "what with white schoolmates, TV, air conditioning, and stereo. I hope they won't inherit my own suspicion and bitterness about the white man. That should die with my generation.

The earth abides, but young farmers don't; they leave in droves for factory jobs in town. Cities spread and farmland shrinks. The state's present total of 30.5 million agricultural acres is down by two million from 1935, yet production has doubled and land prices skyrocket. Values leaped an amazing 100 percent in the past five years.

Witness to this evolution, 72-year-old Albert Born farms the deep, black soil near Mankato (**above**). His Swiss-born grandfather cleared trees by hand and broke the virgin sod in 1861, just three years after Minnesota joined the Union. Today the Borns raise soybeans for local food-processing plants. Some 900 such firms help make agribusiness one of the state's leading industries. At a Green Giant plant in Glencoe (**right**) samples of corn pass the taste test as well as checks for color, weight, and maturity.



DAVID S. BOYER (ABOVE) AND DAVID BRILL

"But we will teach them to be Indians in their hearts. Our new Native American Center here, the nation's first, should help many Indians understand and hold to their heritage."

The way of the Minnesota Indian, from the day of the legendary Hiawatha and Minnehaha, has been a way of water. Today his birchbark canoe is gone, replaced by one of aluminum. And in autumn, when he loads it on his car for the ritual of harvesting the wild rice of Minnesota lakes, he is joined by thousands of non-Indians from the Cities.

Minnesota's lakes are more than just a way of life. A bikini-clad girl I once met in a canoe put it this way:

"Yesterday, as I paddled along, I was aching and tired and hungry. But then I realized there was nowhere else in the world I would rather be. Except maybe at the next campground, with the fire flickering, the stew simmering, and moonlight on the water."

Institute Studies Freshwater Biology

It is not surprising that the religion of water includes in its congregation many Minnesota philanthropists. Their contributions of some four million dollars have built a Freshwater Biological Institute, administered by the University of Minnesota.

To head it, a committee selected John Wood, of Leeds University, England, a chemist and microbiologist who discovered how mercury, accumulating in fish, may poison the human nervous system.

In the new institute on Lake Minnetonka, John Wood guided me through the sparkling laboratories where scientists pursue the problems and wonders of fresh water. And, by extension, of Minnesota.

"Our work," he said, "is the freshwater system, and its animals and plants, from those of a single cell to the wild rice and the beaver. That, and combating water pollution.

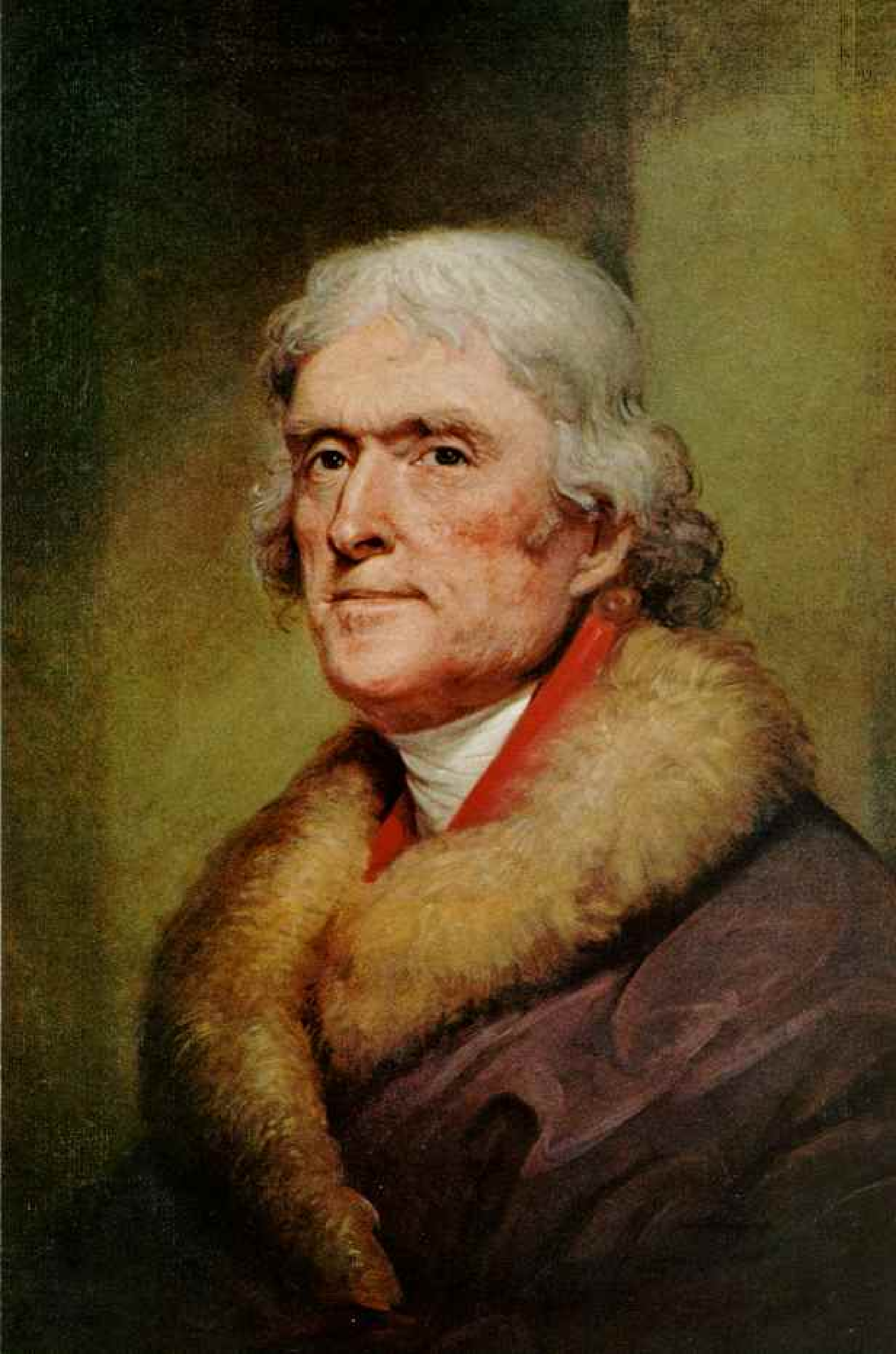
"Our goal will be clear lakes, teeming with fish, and enjoyed by people who know that only they can keep them that way."

John Wood and Hubert Humphrey are both Minnesotans by adoption. Though they come from far different places, each has a home and a boat on a Minnesota lake.

And what comes through when you talk to either one of them is that water is the magic word. No politicians or scientists out there on that water. Just Minnesotans. □

BOTH BY DAVID BRILL

Holiday dinner bagged, a son exhausted, Ed Passe heads home after an early-morning duck hunt on the Mississippi near Wabasha. Ducks and geese dot the skies each fall, heading toward southern wintering grounds. But some eccentric colonies take up residence; these Canadas (**left**) winter over on a lake warmed by power-plant runoff at Rochester. Treasuring such neighborliness with nature, Minnesotans seek a balance between saving the wilderness and helping their state toward industrial growth and prosperity.



ARCHITECT of FREEDOM

Thomas Jefferson

BY MIKE W. EDWARDS

NATIONAL GEOGRAPHIC STAFF

PHOTOGRAPHS by LINDA BARTLETT

IF A RIVER can belong to one man, the little Rivanna, snaking across the Virginia Piedmont, flying a pennant of sycamore and river birch, is assuredly Thomas Jefferson's.

It was beside this gentle stream, three miles below present-day Charlottesville, that he was born in 1743. As a young man he canoed the Rivanna to see if it could be made navigable to carry tobacco down to the James and thence to the Tidewater ports. It *could* be navigated, he concluded; all that was necessary was the removal of some rocks. Jefferson collected money from his neighbors to pay for the work—his first public service.

On a blustery October day that brought snow flurries to the Piedmont, Booton Herndon and I put a canoe into Thomas Jefferson's river. A large, bald, friendly man who lives in Charlottesville, "Boo" had offered to show me a lock through which 19th-century boatmen bypassed a rapid, continuing Jefferson's legacy of commerce.

"I know it isn't very far now," Boo would call out encouragingly as we paddled and portaged—now and again, as Jefferson probably did, scaring up a great blue heron.

At lunchtime we came to the lock, two walls of granite blocks under a hill dark with hemlocks, a strange and incongruous sight in this seeming wilderness. "See," Boo said triumphantly, "I told you it was here."

We wandered over this relic, then ate sandwiches. In the afternoon, coasting with the current, we cast for bass and spoke of Jefferson: The incredible Jefferson who was author of the Declaration of Independence, diplomat, governor of his state, founder of its university, and President of his country; who was architect, scientist, inventor, gadgeteer; who loved knowledge and disliked politics and achieved distinction in both spheres.

"Well," Boo remarked as I lifted a flopping fish into the canoe, "one thing he didn't do: He didn't invent the fishhook. At least," he added doubtfully, "I don't think he did."

A few nights later a waitress in Charlottesville assured me that *Mister* Jefferson (as they call him in his hometown) was the first man to eat a tomato. *(Continued on page 236)*

"**I have sworn upon the altar of God** eternal hostility against every form of tyranny over the mind of man." Thus Thomas Jefferson expressed the credo that guided his greatness. Author of the Declaration of Independence, our third President championed the rights of his countrymen. Architect, philosopher, and scientist, he bequeathed the legacy of his omnivorous mind to all men.

PAINTING BY REMBRANDT PEALE, COURTESY NEW-YORK HISTORICAL SOCIETY

"**All my wishes end** where I hope my days will end, at Monticello." Jefferson's home near Charlottesville, Virginia, was his lifelong passion. He began building Monticello, Italian for "Little Mountain," when he was 26, in 1769. That year he assumed his first elective post in a 40-year political career, delegate to the Virginia House of Burgesses.

Jefferson built the mansion on land he had roamed as a youth. His architectural inspiration: ancient Rome.

In January 1772, when snow adorned the holly, Jefferson brought his bride Martha to his still-unfinished estate, and they spent their first months in the "honeymoon cottage" at right. A dozen years after it was begun, Monticello stood complete. But

a decade later the architect became dissatisfied with its design. He added the dome and rearranged windows to disguise the second story, styles he had admired in France.

A European visitor to Monticello observed: "Mr. Jefferson is the first American who has consulted the fine arts to know how he should shelter himself. . . ."

THOMAS JEFFERSON MEMORIAL FOUNDATION

"**My farm, my family, my books** and my building, give me much more pleasure than any public office. . . ." At Monticello Jefferson channeled his practical instincts and patrician tastes into a monument to his creativity. He divided his bedroom-study (**above**) with an alcove bed like one he had seen in France. He devised a chaise with a table, right, for writing—in one year, after retirement, he received 1,267 letters requiring answers.

Jefferson was devastated by his wife's death in 1782; his 10-year-old daughter Martha comforted him. As a grown woman (**left**) she sometimes served as hostess at his elegant table. Partial to fine vintages, Jefferson built a dumbwaiter to save trips from the wine cellar.

The table shimmers again (**right**) during the annual Founder's Day dinner, hosted by the Thomas Jefferson Memorial Foundation. A violinist (**above, right**) entertains, much as Jefferson played in spirited musicales at Monticello.

There was never in the White House another President with such prodigious talent, such breadth of intellect. Perhaps, given the specialization of our era, there never will be again. Jefferson's achievements are as enormous as the Louisiana Territory, as humble as the dime. "I wrote some Notes on the subject," he recorded modestly of his part in arranging our money system. In the simple, clever plan he offered to Congress, coins would be divisible by ten.

HOW DOES ONE EXPLAIN this freckled, reddish-haired Leonardo who towered (symbolically as well as literally, it seems now) at 6 feet 2 when the average height of American men was perhaps 5 feet 5?

"**It is in the love of one's family** only that heartfelt happiness is known." With 13 adoring grandchildren, Jefferson's cup was full.

Six generations later Roberts Coles, Jr., 23 (**above**), hauntingly evokes his ancestor at his family's farm near Charlottesville. Like Jefferson, whom he portrays in a touring play, Rob is 6 feet 2, red-haired, and freckled. Family features also mark 13-year-old Virginia Cox (**facing page**) of Aylett, Virginia, whose forebears were cousins to Jefferson's father and mother.

"How do you define genius?" answered Dumas Malone, the eminent Jefferson scholar (page 254). I called on Dr. Malone in his office in the University of Virginia library in Charlottesville, where at age 83 he is writing in longhand the sixth and final volume of his monumental biography of Jefferson.

"He was a man of tremendous energy," Dr. Malone said, "like all great men—Napoleon, FDR, Theodore Roosevelt. His mind was never still." For a friend bent on improving himself, Jefferson prepared a day-long reading regimen, beginning with physical sciences, ethics, and religion *before* breakfast.

Amiable, at ease among friends, he seemed to a White House visitor "a little awkward." "A bit shy" is Dr. Malone's phrase for him. "He'd have a lot of trouble running for office today. He might not be good on TV. So far as I know, he never made a political speech."

He found it difficult to get into combat with someone else, noted another biographer, Dr. Merrill Peterson, also at the University of Virginia. "He had an aversion to heat and anger." Jefferson himself said that nature intended him for the "tranquil pursuits of science." Yet he spent nearly half his 83 years in the political arena—only one of the seeming paradoxes in the man.

A progressive agriculturist, he could not make his thousands of acres pay well enough to retire his debts. Perhaps no one could have made Monticello pay; crop failures and poor prices plagued Jefferson's later years. On the other hand, he could not curtail his grand lifestyle, ordering 150 bottles of Muscat de Riversalle while tottering toward bankruptcy.

Greatest paradox of all, he lived off the sweat of 150 slaves while writing grandly of liberty. "He very well knew that was a contradiction from every moral standpoint," Dr. Peterson said. "It was the dilemma he was concerned about all his life—and he never really found a solution."

But his philosophies live. "If he were alive today, he'd be terribly concerned about abuses of individual rights," said another biographer, Fawn M. Brodie.

And he would applaud the efforts of the press to reveal those abuses. "The only security of all is in a free press," he wrote. "The force of public opinion cannot be resisted"—a truth demonstrated again in Watergate.

Jefferson learned *(Continued on page 242)*

"ONE OF THE MOST STUPENDOUS SCENES *in nature," Jefferson described the meeting of the Shenandoah (lower right) and Potomac Rivers at Harpers Ferry. His enthusiasm and scholarship distinguish* **Notes on the State of Virginia,** *his book on the Old Dominion's natural history, geography, people, customs, laws, and commerce.*

"**Holy bond of our Union,**" Jefferson called the Declaration of Independence. An original draft (**facing page**) on display at the Library of Congress contains changes, some suggested by Benjamin Franklin and John Adams. The author winced as Congress heatedly debated his work for three days and altered parts of it. Among the changes: deletion of Jefferson's denunciation of the slave trade. Retained virtually intact was his stinging recital of King George III's "repeated injuries & usurpations."

Jefferson drafted the majestic document while lodging in the Philadelphia home of Jacob Graff, a bricklayer. The house has been reconstructed (**below**) by the National Park Service and opened as a museum; a modernistic wing features exhibits and a short film on the Declaration.

The 33-year-old delegate to the Second Continental Congress sought in the Declaration to explain "to the tribunal of the world" Congress's decision to break with Great Britain. Needing "neither book nor pamphlet," Jefferson tried "not to find out new principles . . . but to place before mankind the common sense of the subject. . . ."

Twelve states approved the final draft of the Declaration on July 4, 1776. New York's delegates abstained initially but signed later.

LIBRARY OF CONGRESS (RIGHT)

A Declaration by the Representatives of the UNITED STATES OF AMERICA, in General Congress assembled.

When in the course of human events it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth the separate and equal station to which the laws of nature & of nature's god entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal & independent, that from that equal creation they derive rights inherent & inalienable, among which are the preservation of life, & liberty, & the pursuit of happiness; that to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, & to institute new government, laying it's foundation on such principles & organising it's powers in such form, as to them shall seem most likely to effect their safety & happiness. prudence indeed will dictate that governments long established should not be changed for light & transient causes: and accordingly all experience hath shewn that mankind are more disposed to suffer while evils are sufferable than to right themselves by abolishing the forms to which they are accustomed. but when a long train of abuses & usurpations [begun at a distinguished period & pursuing invariably the same object, evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such government, & to provide new guards for their future security. such has been the patient sufferance of these colonies; & such is now the necessity which constrains them to expunge their former systems of government. the history of the present King of Great Britain is a history of unremitting injuries and usurpations, among which, appears no solitary fact to contradict the uniform tenor of the rest, all of which have in direct object the establishment of an absolute tyranny over these states. to prove this, let facts be submitted to a candid world [for the truth of which we pledge a faith yet unsullied by falsehood.]

"**The most perfect model** of antient *[sic]* architecture remaining on earth" was Jefferson's inspiration for the stately Virginia Capitol at Richmond (**above**). In the Maison Carrée (**right**), a Roman temple built at Nimes, France, in the first century, Jefferson

to ride and shoot, perhaps to draw and measure, from his father, Peter, mapmaker, surveyor, and a man of prodigious strength—able to simultaneously up-end two tobacco hogsheads, each exceeding 500 pounds. Peter may not have been the wealthiest man in Albermarle County, but as chief of militia he was the most prominent. In the colonial order of things, his son would follow him as militia chief, justice of the peace, and member of the House of Burgesses at Williamsburg.

Patrick Henry, that hot-gospeler of revolution, studied law for a few months at most before hanging out his shingle. Also determining upon a career in the law, Jefferson studied at Virginia's capital for seven years, arriving in 1760 as a gangly 17-year-old.

ON A SPRING NIGHT in Colonial Williamsburg, the restored capital, lanterns lit my way to the Governor's Palace. In the ballroom maestro Cary McMurran, looking both grandfatherly and cherubic in white wig and knee breeches, addressed himself to the keys of a harpsichord. He signaled to the five other musicians and the concert began.

A selection by the 18th-century composer Georg Philipp Telemann commenced sedately. As the tempo picked up, the maestro's wig bobbed cheerfully in time.

Jefferson often joined Governor Francis Fauquier in informal concerts at the palace. He was an enthusiastic violinist, and the Age of Enlightenment, as we call it now, admired the gentleman amateur, good at many things—the universal man.

Francis Bacon, John Locke, and Isaac Newton, among other great intellects, inspired the wave of thought that swept across the ocean in the 18th century. Man had natural rights: freedom, dignity, equality. Government should be based on reason alone. The mind should be free to challenge and discover.

Jefferson probably learned this heady stuff first from William Small, his mathematics teacher at the College of William and Mary. From the scientific-minded Fauquier and his "friends of all hours," Small and the scholarly George Wythe, Jefferson heard "more good

found the embodiment of the Romans' simple yet elegant style. He hoped to "improve the taste of my countrymen" through his architecture—and succeeded, critics agree. The Virginia Capitol profoundly influenced architecture in the United States.

sense, more rational and philosophical conversations than in all my life besides." They recognized the promise of this lad from the near wilderness. Wythe, who was also his law tutor, lent him books: literature, philosophy, the classics. These last he read in the original Latin and Greek.

A stimulating conversationalist among friends, he acquired no reputation as an orator. But in the House of Burgesses from 1769 to 1775 he won the respect of colleagues for his gift with the written word, particularly for his treatise "A Summary View of the Rights of British America." The reputation followed him to Philadelphia where, at age 33, he reached his rendezvous with immortality.

On June 7, 1776, Richard Henry Lee, a fellow Virginian, rose in the Pennsylvania State House to present to the Continental Congress a resolution: "... these United Colonies are, and of right ought to be, free and independent States...." A committee was appointed to prepare "a declaration to the effect."

It seemed likely that the author would be Jefferson or John Adams. Years later the Massachusetts delegate described this colloquy: "Jefferson proposed to me to make the draught; I said I will not. You should do it. Oh! no. Why will you not? You ought to do it. I will not. Why? Reason enough. . . . You can write ten times better than I can."

Jefferson did not recall the conversation. Asked to undertake the draft, he wrote during a period of 17 days in his rented suite on the second floor of a brick house owned by Jacob Graff, Jr., at Seventh and Market Streets.

Shops and stores smothered the Graff house long ago. But now, especially for the Bicentennial, there is a reconstruction (page 240), and I spoke to its curator, Charles G. Dorman of the National Park Service. He showed me a replica of Jefferson's writing box, the size of a sheet of foolscap, with a drawer for ink, pens, and paper. "He sat in an armchair at a dining table," Mr. Dorman said, "with the box on the table."

I asked what he wrote with.

"Jefferson would have used goose quills." He looked at me. "Have you ever tried to write with one? They are awful!"

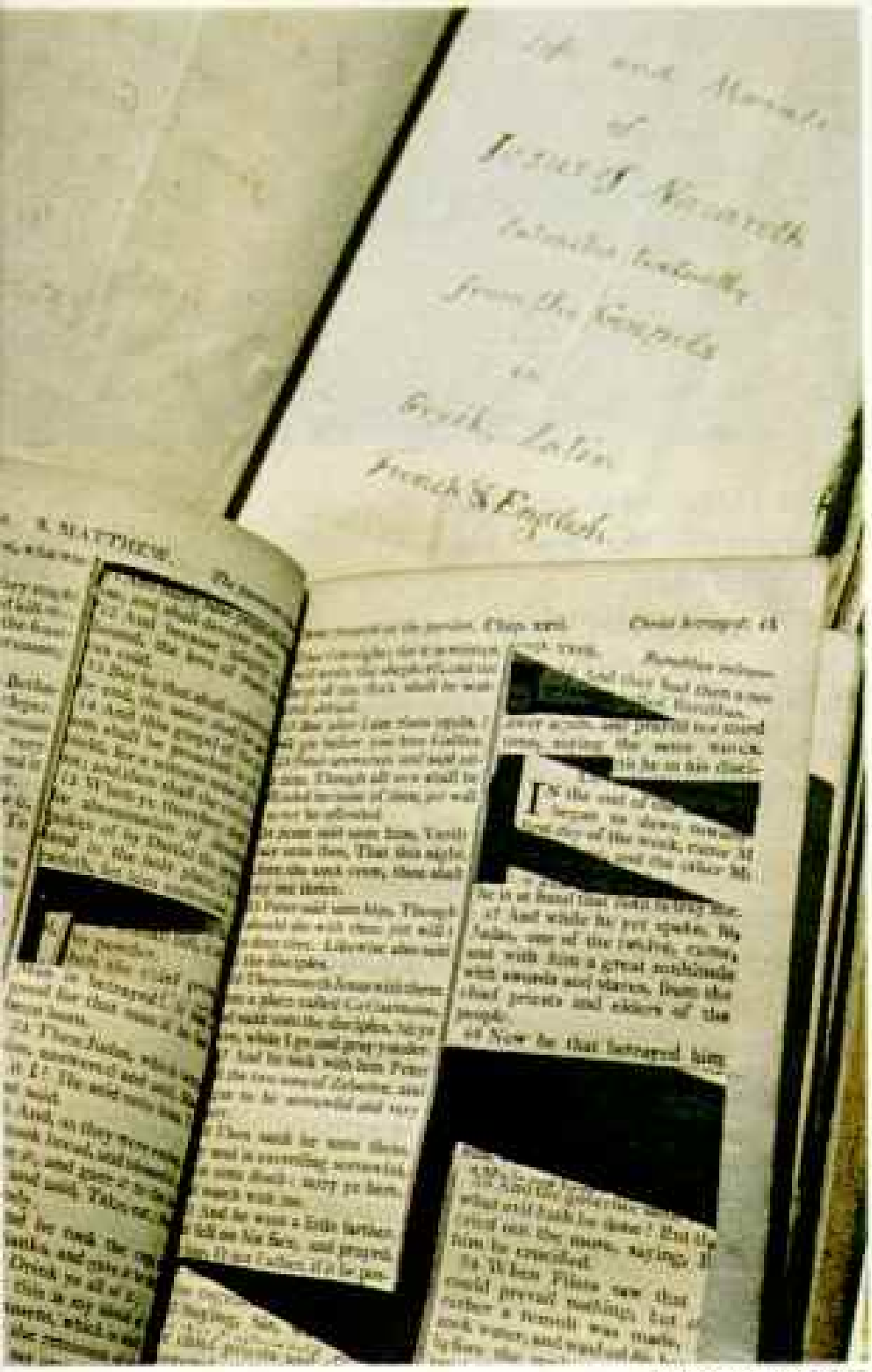
Mr. Dorman thinks Jefferson wrote between 6 p.m. and midnight. "He was a creature of habit and always got up with the sun. Then a servant would bring a basin of cold water for him to plunge his feet into. You know, he claimed this routine was the reason he hardly ever had a cold. After these ablutions, he waited for a barber to come and shave him. From 9 o'clock until sometime in the afternoon, he was at the Congress."

As Jefferson scratched away, the Enlightenment tenets were engraved upon his mind. He often revised his phrases, striving for just the right word and cadence. Adams and Benjamin Franklin suggested a few changes.

Jefferson began his second paragraph: "We hold these truths to be sacred & undeniable." Franklin may have inserted the crisper "self-evident." Jefferson made other revisions, at last yielding the basic text (slightly altered later by Congress) of one of the great rolling passages of all history:

"We hold these truths to be self-evident; that all men are created equal; that they are endowed by their creator with inherent & inalienable rights; that among these are life, liberty, & the pursuit of happiness; that to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed. . . ."

Documenting for a "candid world" King George's "long train of abuses & usurpations," Jefferson hammered away like a lawyer before a jury: "He has refused . . . forbidden . . . dissolved . . . endeavored to prevent . . . plundered our seas, ravaged our coasts, burnt our towns & destroyed the lives of our people." Now, as any man could see, separation was the only course.



SMITHSONIAN INSTITUTION

"I am a sect by myself." Believing that Jesus' teachings had been distorted, Jefferson snipped verses from the New Testament that he felt expressed Jesus' true mind. Then he compiled them, in four languages, into the so-called Jefferson Bible. A member of no church but a contributor to many, Jefferson saw separation of church and state as the key to religious freedom.

THE DRAFT was ready June 28. Four days later the delegates approved Lee's June 7 resolution calling for separation. Thus it was actually on July 2 that the Colonies declared themselves free; on July 4, Congress justified its action on paper.

Jefferson squirmed as members picked at his prose. "Depredations," he called their changes, "mutilations." On July 4, his day of days, perhaps he could sit still no longer. His account book reveals that he bought seven pairs of gloves for his wife, Martha. With another purchase, a thermometer, he took Philadelphia's temperature: 6 a.m., 68° F.; 1 p.m., 76°; 9 p.m., 73½°.

He did not declare in his draft that liberty was the right of slaves. He did, however, accuse the king of waging "cruel war against human nature itself" in the slave trade, and now of inciting slaves to rebel and murder their masters. It was not George III, of course, who traded in human beings; colonists were intimately involved. Congress deleted this section after South Carolina and Georgia objected. Jefferson chronicled that some

northern delegates, perhaps reflecting the feelings of slave-ship owners, were relieved.

Not until noon on July 8, after copies were printed, was the Declaration read in public. Only a small crowd gathered; Philadelphians already knew what had occurred in the State House (now Independence Hall) and some disapproved. That night the document was read again as bells pealed and bonfires lit Center Square. Symbolically the royal arms, wrenched from a wall, went up in smoke.

DURING the next three years, as the Revolution flared, Jefferson seemed determined to make good the promised dream. Back in Virginia he worked on bills to abolish the laws of primogeniture and entail that circumscribed inheritance. "Patrician order," he argued, ought to give way to "an aristocracy of virtue and talent." More far-reaching was his bill to provide free education. Virginia would gradually adopt such reforms; Jefferson anticipated rights that Americans now take for granted.

Another target was the Church of England. The Established Church was supported by taxes while preachers of the "Dissenters" —Baptists, Presbyterians— were occasionally arrested for disturbing the peace. Jefferson once more foreshadowed a basic American belief: No man could be compelled to support "any religious worship, place or ministry" or be "restrained, molested, or burthened" on account of his convictions.

He had another reform in mind—one, as Dr. Peterson remarked when I talked to him, that "really went to the guts of society." But he did not offer his plan for gradual emancipation, acknowledging that freedom for Virginia's nearly 300,000 blacks, the backbone of the planter system, was a proposition "the public mind would not yet bear."

It would have touched off a fierce battle, and, as Dr. Peterson reminded me, Jefferson was basically a peaceable man. "He wouldn't risk all the hostility, he wouldn't risk the kind of martyrdom that was involved. Which isn't to say that he didn't do anything about slavery; he did. He attacked it from the periphery. We think he was responsible for the law of 1778 by which Virginia closed its doors to the African slave trade."

A few years later Jefferson mounted another peripheral attack, attempting to prohibit slavery in future states. The provision lost in Congress by a single vote, leaving, as he wrote, "the fate of millions unborn hanging on the tongue of one man."

It is hard to picture this tall, freckled lover of tranquillity in the legislative bustle. It is easier to imagine him in other pursuits: Jefferson the man who could make a brass key or a lock and was ever fascinated by gadgets, Jefferson the naturalist, Jefferson the builder.

These talents flowered while he pursued his reforms. He transformed Monticello, his "Little Mountain" overlooking the Rivanna, into a gracious residence. The home to which he had borne Martha in 1772 had but one room. Jefferson turned to drawings by English architects and the great Italian Andrea Palladio for a design—a design he would alter later, for the building of Monticello was to become the work of half a lifetime.

In the ceiling of the portico Monticello's master installed a mechanism to tell him the wind direction as indicated by a vane on the roof. Collecting the memories of an older neighbor and adding them to his own, he discerned the pattern of locusts: They appeared every 17 years. "The females make a noise well known. The males are silent."

Much as he preferred these pursuits, he interrupted them when, in 1779, the Virginia legislature elected him governor—a burden, he observed stoically, "which it would be wrong to decline." The Revolution was going badly. The state was practically defenseless when Benedict Arnold led 1,600 men in a raid on the new capital, Richmond.

"JEFFERSON!" An old man in a country store spat the name out like tobacco juice when I mentioned it. "Had to run from the British!" In truth Jefferson did not flee Lt. Col. Banastre Tarleton's cavalry until the last moment, but the ignominy lingers in a state that reveres soldiers like Robert E. Lee and Stonewall Jackson.

I was on the trail of Jack Jouett, Virginia's unsung Paul Revere, but for whom Jefferson's situation might have been even more embarrassing in the spring of 1781. The trail began 40 miles east of Charlottesville, at a crossroads named Cuckoo, recalling, it is said, a clock owned by an early resident. Legend says Jack Jouett was in a tavern at Cuckoo when British troops thundered up. He heard

that they were riding for Charlottesville, to which Governor Jefferson, his staff, and members of the legislature had retreated.

Cuckoo is one of those places that changes slowly—very slowly. I found myself gazing at a 1937 calendar with a picture of bird dogs. It was tacked to a wall in the waiting room of a physician, Dr. Barbour Pendleton. Other walls bore shelves of brown medicine bottles. A wood stove warmed the patients. Incongruous calendar aside, I might have been in the office of a rural physician of about 1900.

In fact Dr. Pendleton has practiced for 67 years and, like three Doctors Pendleton before him, still mixes prescriptions. Stooped now and slow of movement, he nevertheless is relied upon by people from three counties. "Doc can fix a strep throat better'n anybody," testified a sawmiller waiting to see him. "When he swabs you, you're *swabbed.*"

Dr. Pendleton took up the story of Jouett. "He knew he had to warn Jefferson. The British left by the main road. Jouett took less traveled ways, including the old Mountain

COURTESY MRS. DAPHNE FORREST (ABOVE)

"I am much pleased with the people," wrote Jefferson from Paris. He was charmed by beautiful Maria Cosway, an English painter (**above**). After a brief idyll, Maria returned to England, prompting a touching 4,000-word letter from the 43-year-old widower. Traveling south, Jefferson visited the Château de Laye-Epinaye (**left**) near Lyon and was captivated by its statue of Diana, "a delicious morsel of sculpture."

He crammed his travel notebooks with all he saw, from a "sublime" art gallery in Düsseldorf to the method of preparing Parmesan cheese in Italy.

Road. He got to Monticello about dawn."

Not until his telescope revealed Redcoats in Charlottesville did Jefferson mount his horse. But as his enemies later told the story, he had played the coward.

To mortification was added grief: Martha gave birth to their sixth child in May 1782, then sank toward death. Pregnancy had always been difficult for her. Four of their children died early.

At Martha's passing, Jefferson seemed on the edge of insensibility, walking, walking, walking, day and night, until exhaustion felled him. We know little about this "pretty lady" with auburn hair and hazel eyes, a widow at 23 when Jefferson married her. Though he preserved thousands of papers, he destroyed virtually all that spoke of her.

Through it all he worked on a book. Answering a Frenchman's inquiry, he set out to record merely the facts of his state—boundaries, rivers, towns—but *Notes on the State of Virginia* became a showcase of its author's mind. He described his excavation of

an Indian burial site, in which he pioneered systematic archeological methods. Mixing science with a touch of chauvinism, he offered dimensions of beavers, weasels, and bears to rebut a French naturalist who claimed that New World mammals were smaller and fewer than those of the Old, and "very few ferocious, and none formidable."

He described Natural Bridge, the limestone arch over a stream near Lexington, as the "most sublime of Nature's works." Jefferson admired it so much, in fact, that he bought it. Another sight, where the Potomac and Shenandoah Rivers meet beneath the Blue Ridge, was "worth a voyage across the Atlantic. In the moment of their junction they rush together against the mountain, rend it asunder, and pass off to the sea" (pages 238-9).

THE NEW NATION recognized, Congress in 1784 asked Jefferson to go to Paris to negotiate treaties of friendship and commerce. Would Europe buy more of America's tobacco and rice, furs and whale oil? Jefferson found scant interest. But he soon found other pursuits. He became a funnel of information from Old World to New, a peripatetic pack rat sending his hoard of technology and science across the ocean.

Think of the joy of the phosphorous match, he wrote home, of "lighting a candle without getting out of bed . . ." He wrote of steam-powered mills (American inventors might be interested); of a boat powered by an air propeller (he thought the propeller would work better in water). To George Washington, an advocate of canals, he sent notes on France's Canal de Languedoc. He told Congress of a new idea in musket manufacture, locks with interchangeable parts: "I put several together myself. . . ."

He dispatched seeds, hundreds of varieties. Learning of an excellent rice grown in northern Italy, he went there determined to get some for American planters. Export of the unhusked seed was forbidden. Jefferson loaded his pockets with bootleg grains.

In Paris he enjoyed the company of painters and sculptors—and to one he may have lost his heart. Petite Maria Cosway (page 247) was an artist, the wife of a foppish London miniaturist. Jefferson met her at the Paris grain market. He was intrigued by the market's soaring dome, but when he wrote that

PRINCETON UNIVERSITY LIBRARY (LEFT)

"**Burr's enterprise** is the most extraordinary since . . . Don Quixote," Jefferson termed former Vice President Aaron Burr's alleged plot to take over the Western states in 1806. Acquitted of treason, Burr was haunted by the stigma during his remaining 30 years. A death mask (**facing page**) reflects his grim visage. In 1804 Burr killed Alexander Hamilton in a duel at Weehawken, New Jersey, across from New York. Hamilton's bust commemorates the event (**above**).

he had seen that day the "most superb thing on earth," he did not mean just the building.

While Richard Cosway executed a painting commission, Jefferson and Maria toured Paris. He was much in her company for two months, until the Cosways left for London.

An affair? Biographers, studying the correspondence between the 43-year-old widower and the 27-year-old lady, do not agree. But in a fascinating letter of more than 4,000 words, he poured out his emotions to her. The epistle took the form of a dialogue between head and heart. Heart had no regret despite the pain of parting: "We have no rose without it's thorn; no pleasure without alloy."

On his return to the United States in 1789 Jefferson found "with real regret" an invitation from President George Washington to become Secretary of State. Reluctantly he accepted. Diplomacy being a simpler craft then —he had a full-time staff of four—the Secretary also served as a kind of executive assistant to the President in the temporary capitals of New York and Philadelphia.

One task that delighted him was assisting in the planning of the "Grand Columbian Federal City" rising on the banks of the Potomac River. No detail escaped his interest. Should Germans and Scots be imported for labor? Can we have maps engraved in Boston? To the city's French designer, Maj. Pierre Charles L'Enfant, he sent his maps of European cities. Anonymously, he submitted a design for the "President's House"; it looked much like today's Monticello.

"IF I COULD not go to heaven but with a party," Jefferson once said, "I would not go there at all." Yet he was instrumental in dividing the nation into rival political entities.

In President Washington's official family nearly every issue of nation shaping separated the Secretary of State, with his "loose shackling Air," and Treasury Secretary Alexander Hamilton, a dashing military hero. Hamilton espoused a strong central government; Jefferson inclined toward strong states. Hamilton's policies benefited merchants and speculators; Jefferson championed the little man. Hamilton wanted foreign policy to favor Britain; Jefferson was a Francophile.

Hamilton's faction evolved into the Federalist Party, Jefferson's into the Republican (actually the forerunner of the modern Democratic Party). Leaders took sides; partisan newspapers began to harangue the populace.

BY 1794 THE LOVER of tranquillity had endured enough of strife. Resigning, he sought the quiet of Monticello.

"It couldn't have been very quiet," Bill Beiswanger, Monticello's architectural historian, observed. "Jefferson looked at the place and said, 'My house is only half finished.' It took a brave man to come back and tear down a good part of his home."

In Paris Jefferson had seen commodious houses designed to appear as if small and of only a single story. And he had watched a house under construction that had a dome.

"Architecture is my delight," he declared, "and putting up, and pulling down, one of my favorite amusements." The second story must yield to a mezzanine. The east front must be rebuilt, wings and a dome added. Treasures poured in: books, busts, more than sixty paintings, gilded furniture from France.

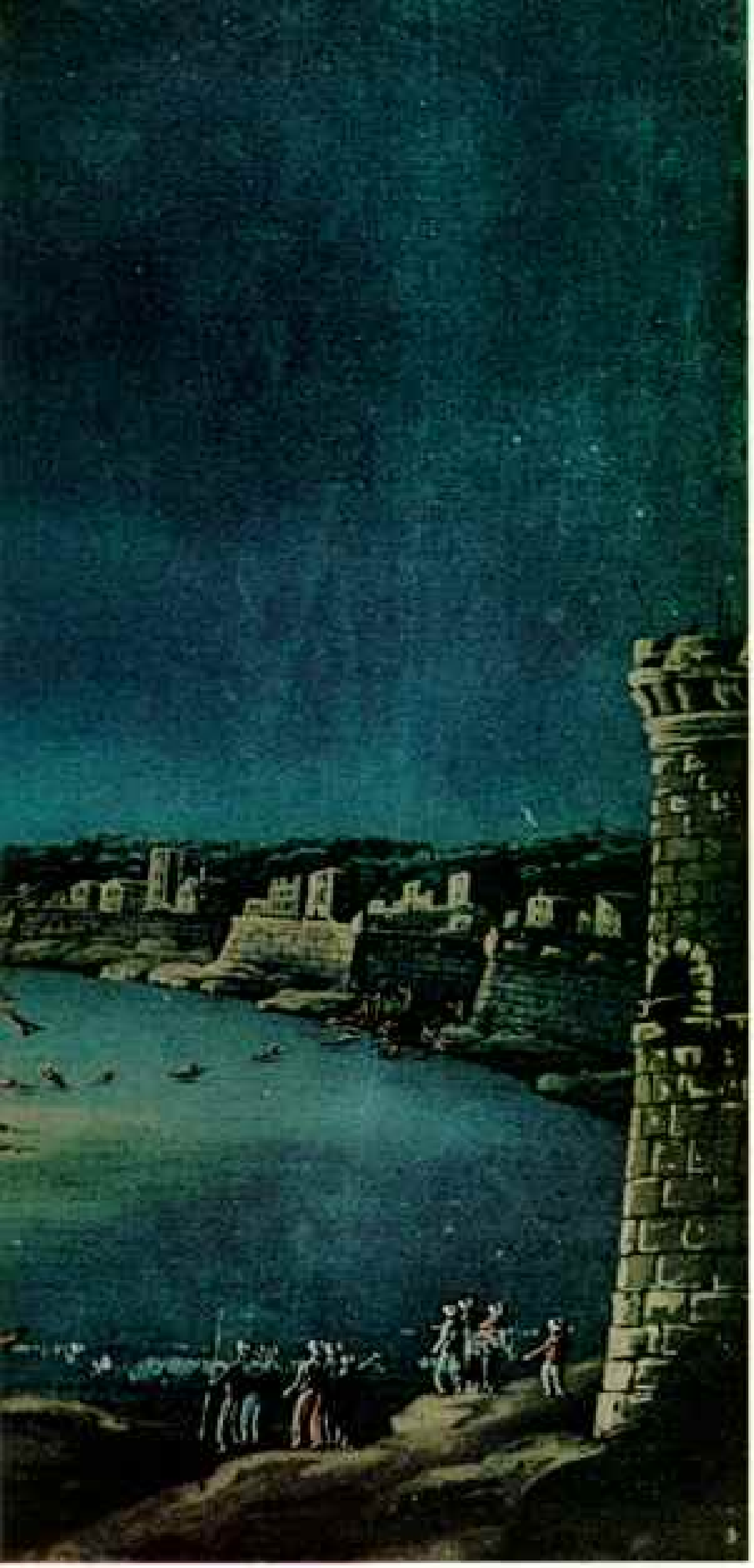
Between entrance hall and parlor I opened one of the double doors. Magically, the other swung open. "There's a chain and sprocket under the floor," Bill explained. "So far as we know, it has never been repaired."

Jefferson meanwhile strove to improve his lands, experimenting with crop rotation and such restorative covers as red clover and vetch—spurred, no doubt, by his financial straits. Like most planters, he bought on credit, paid when his tobacco went to market, postponed some debts for years. It was easy to get into trouble, and he did.

A serious difficulty was a debt of 4,000 pounds that Martha inherited in 1774, along with 11,000 acres. Jefferson sold half the land to retire the obligation, putting the money in the state treasury during the Revolution; under one of his own laws, the state

"Desirous of quiet," Jefferson in his later years sometimes fled to the tranquillity of Poplar Forest, his retreat 70 miles southwest of Monticello, which had become a mecca for visitors. Gardening and horseback riding helped the weary statesman shed his tensions here. Serpentine walls, inspired by a Jefferson design, were added in 1947.

"Neither slavery nor involuntary servitude" should be allowed in the West, said Jefferson, a slaveholder who despised slavery. But Congress rejected that plan, as well as his suggestion to give Indian names with classical endings—such as Pelisipia and Cherronesus—to some of the 14 states he visualized, as drawn by a contemporary on this map. The Northwest Ordinance in 1787 largely restored Jefferson's anti-slavery clause.



"Lawless pirates," President Jefferson termed North Africa's Barbary States, which exacted tribute for the safe passage of ships. To end the extortion, he waged war on Tripoli. When the *Philadelphia* fell into enemy hands, Lt. Stephen Decatur led sailors into the foe's harbor in 1804 to set the vessel afire (**left**).

A Jefferson traveling desk in the Blue Room of the White House (**below**) holds a letter the President wrote to Surveyor of Federal Buildings Benjamin Latrobe.

MARINERS' MUSEUM, NEWPORT NEWS (LEFT) AND WILLIAM L. CLEMENTS LIBRARY, UNIVERSITY OF MICHIGAN

was to pay British creditors of Virginians at war's end. But the state could not pay, and Jefferson had to assume the note again. Even after 1800 he was chipping away at this debt—among others.

One wonders how he justified the enormous expense of rebuilding Monticello while so burdened. "One thing he wasn't," commented James A. Bear, Jr., Monticello's curator, "was a shrewd money manager. There were some things he couldn't stint on."

Above Jim's office I pored for hours over copies of Jefferson's account books, mines of detail on the affairs of a universal man. He paid to see a "tyger" and to buy "4. cones of Cedar of Lebanon." He could not resist books, increasing his library to 7,000 volumes, largest private collection in America. To a wounded soldier he poured out a pocketful of shillings.

When the Republicans urged him to stand for President in 1796, the salary—$25,000 a year—surely made him less reluctant to return to politics.

The office went to his Federalist opponent, John Adams. Amassing the second largest number of electoral votes, Jefferson, under the law then in effect, became the Vice President. He set out for Philadelphia in February 1797,

carrying a box of bones in his luggage.

Found in what is now West Virginia, these fossils were of a "quadruped of the clawed kind," he told the American Philosophical Society. That league of scientists, who honored Jefferson as their own president, also heard him give the animal a name: *Megalonyx*, or Great Claw. In fact, the bones were a sloth's.

There was much to ridicule in a Vice President who liked bones. When relations with France had turned hostile as a result of French raids on American ships and other acts, a Federalist orator toasted: "To Adams: May he, like Samson, slay thousands of Frenchmen with the jawbone of Jefferson."

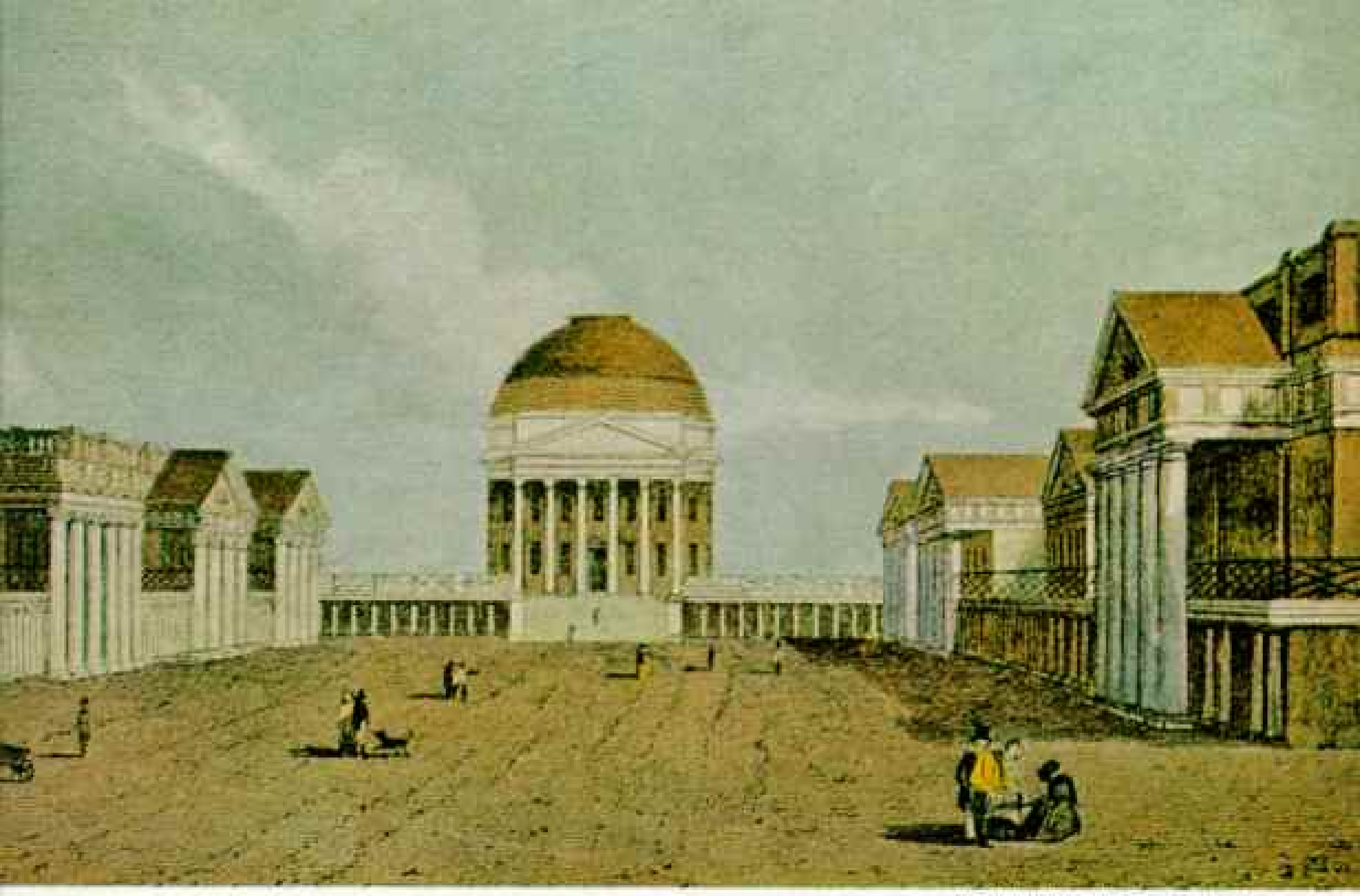
Jefferson busied himself with models of a plow he had designed; its streamlined moldboard turned the soil more easily than other plows and its share bit deeper. Presiding over the Senate, he watched in dismay as Federalists rammed through numerous war measures, fanning hysteria over the prospect of conflict with France. Xenophobia reared its head in laws restricting alien citizenship. The Federalists aimed the Sedition Act at "domestic traitors," convicting ten newspapermen who criticized the government. Jefferson counseled his followers to have faith: "we shall see the reign of witches pass over. . . ."

"Hobby of my old age," the founder of the University of Virginia at Charlottesville called his "last service" to his country. Jefferson was 75 when plans were approved for the "academical village" he designed

A CONFIRMED POLITICIAN NOW, he encouraged his friends in their efforts to win him the Presidency in 1800. As electoral results trickled in to Washington, the new seat of government, it became clear that the imperfect election machinery had produced another quirk: Jefferson and his own vice-presidential running mate, Aaron Burr of New York, were tied at the top with 73 votes. The House of Representatives would have to choose. Some Federalists sensed opportunity: Burr might be manipulated.

Jefferson received support from an enemy. He is a "contemptible hypocrite," Alexander Hamilton advised, but "not so dangerous" as Burr—who proved mortally dangerous three and a half years later, slaying Hamilton in a duel. Yet Federalists in the House supported Burr for 35 ballots. On the 36th, some abstained; Jefferson became President.

He was nearly 58 years old, and his hair, having turned from red to gray, was worn "in negligent disorder, though not ungracefully." A diplomat said that he looked like a "tall,



ALDERMAN LIBRARY, UNIVERSITY OF VIRGINIA

around a spacious lawn (**above**). He watched with a telescope from his "Little Mountain" as his dream took shape far below.

Today selected fourth-year students live in the 54 rooms on the Lawn (**below**), while faculty members live in the two-story pavilions. Dr. Dumas Malone, 83 (**left**), works at his university office on his six-volume biography, *Jefferson and His Time*, which won him a Pulitzer Prize in 1975.

large-boned farmer." He might dress for dinner but met morning callers at the President's House (it was not generally known as the White House until after the War of 1812) in run-down slippers and a threadbare coat.

TO CALL ON THE PRESIDENT, you picked your way across the grounds, in early months littered with construction debris, and knocked.

I passed through today's White House gate —after showing two pieces of identification— to call on Betty Monkman, who has worked in the curator's office there for eight years. She led me to the southwest corner room on the main floor, where Jefferson had his "cabinet," or library, and conducted affairs of office.

It must have been a scene, like his hair, of somewhat "negligent disorder," for he had here, besides bookcases, a large desk, "paper cases" for filing documents, 14 chairs, a sofa, several tables, globes, charts, potted plants—a lot for even this large room. His pet mockingbird hopped about, sometimes pecking a crumb from the President's lips.

"This is the State Dining Room now," Betty told me. "Theodore Roosevelt remodeled and enlarged it." All was elegance and order. We stood beside a long mahogany table holding massive candelabra; around the table were 16 chairs upholstered in velvet.

Jefferson entertained almost daily, plying his guests with fine wines and the fine dishes prepared by a French chef. In four months 651 guests emptied 207 bottles of champagne. Jefferson ordered 40 dozen bottles more. In those days a President had no expense allowance; by one estimate, Jefferson went ten thousand dollars further into debt during his Presidential years.

In 1802 Spain abruptly closed the port of New Orleans to the hundreds of American boatmen plying the Mississippi. Worse tidings had reached Jefferson from Europe; Spain had ceded Louisiana back to France—under Napoleon, the most rapacious of the world powers. As a neighbor in America, France must be reckoned an enemy.

Jefferson was determined to pursue "pacific means to the last moment." Perhaps New Orleans could be bought. His good friend James Monroe went to Paris to join Robert R. Livingston in negotiating with the French.

Weeks passed anxiously. Then, on July 4, 1803, the *National Intelligencer* published a stunning birthday scoop, obtained from the President: The U. S. had bought the whole Louisiana Territory, virtually doubling the nation's size. Needing money for war with England, Napoleon had sold out for 15 million dollars—less than three cents an acre.

The diplomatic triumph, overwhelmingly popular outside New England, caused Jefferson uneasiness. Where in the Constitution was the government empowered to acquire territory? Nowhere, he concluded. If we ignore the Constitution, won't it become just a blank paper? Others held that the Constitution's treaty provision was authority enough. In any case there was little time for debate; Napoleon might change his mind. Yielding, Jefferson assured the physical greatness of his country—and his re-election in 1804.

What was in that vast expanse? Jefferson already had chosen the leader of a "voyage of discovery" into the West; he had to look no farther than the East Room of his residence, where lived his aide, Meriwether Lewis, an infantry captain experienced in Indian matters. The President's instructions were elaborate: Get precise knowledge of the Missouri River, data on soils, plants, minerals, animals, weather, even extinct animals.

As Lewis and William Clark moved westward, the prizes began to flow back: animal skins, antlers, skeletons, a caged magpie, a "burrowing squirel." Fourteen Indians of the Osage Nation journeyed to Washington to hear the President declare, "We are all now of one family . . . bound to live as brothers."

"GAVE IN CHARITY to James T. Callender 50.D.," Jefferson wrote in his account book in 1801.

Charity? Callender called the 50 dollars "hush money." A star muckraker and critic of

"What a field have we at our doors. . . ." Jefferson exulted at America's bounty, abundantly evident in Monticello's thick forests. There, and beyond, Jefferson became known as a naturalist and paleontologist. His natural curiosity sent Lewis and Clark exploring the Louisiana Territory and beyond to the Pacific.

NATIONAL GEOGRAPHIC PHOTOGRAPHER MAYFIELD PARKE

Federalists, he had been convicted of sedition during John Adams's term. Jefferson had Callender's 200-dollar fine refunded. But Callender wanted more: a postmastership, as well probably as the President's expressed esteem. When the favors did not come, he fired his arrow in the *Richmond Recorder*.

"It is well known," he wrote, "that the man, *whom it delighteth the people to honor*, keeps, and for many years has kept, as his concubine, one of his slaves. Her name is SALLY." She had borne him several children, Callender alleged; her eldest resembled him.

GLEEFULLY SEIZING upon the story, Federalist editors rained abuse upon the President who more than any other championed a free press. Jefferson maintained silence in public, but denied the story in private, as his descendants have continued to do. But the tale would not die. Fawn Brodie treats it extensively in *Thomas Jefferson, An Intimate History*, a recent best-seller.

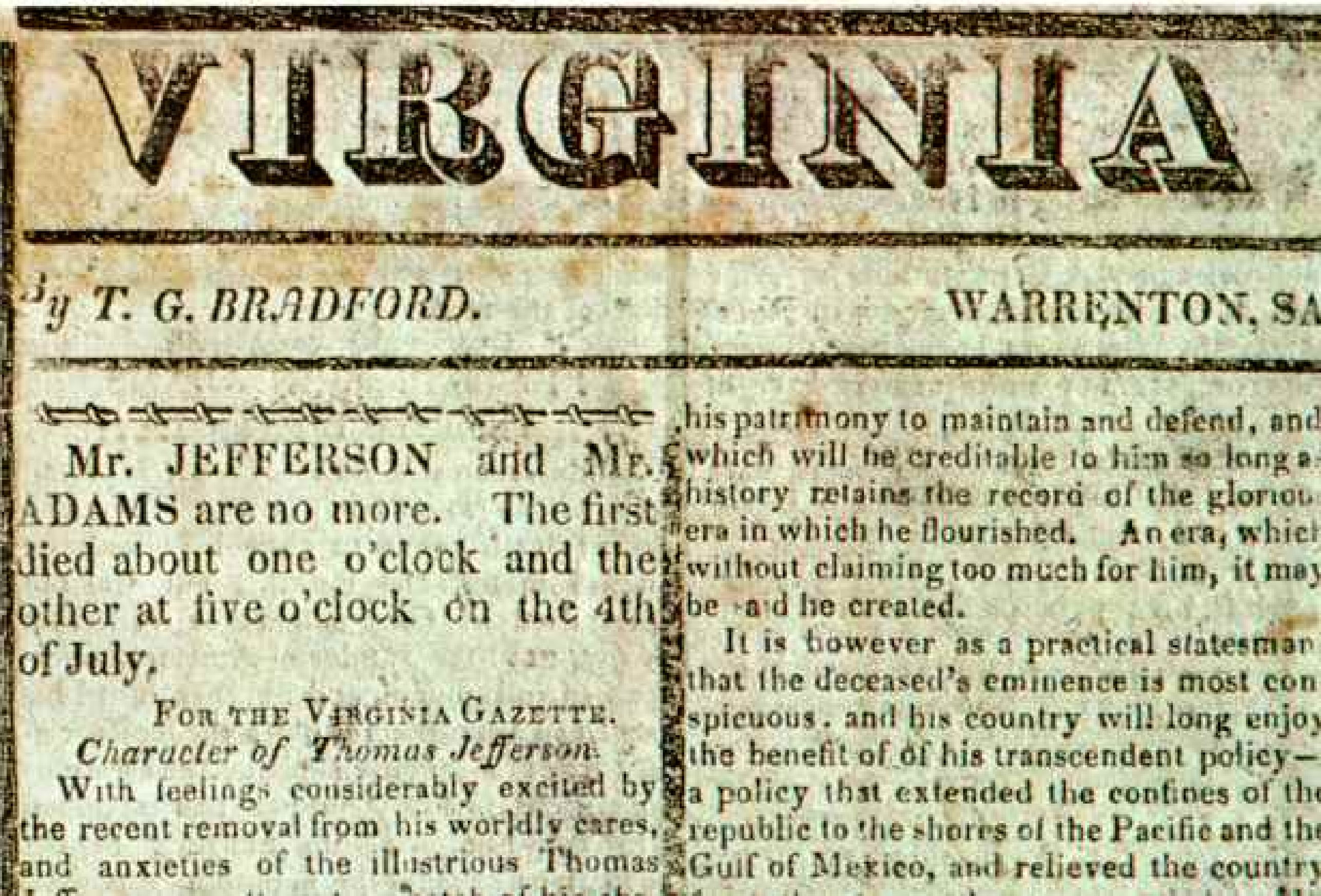
What is the truth? Did the man who wrote immortally of liberty keep a mulatto mistress and sire several slave children? I asked Dr. Malone what he thought.

"Jefferson's affection for his own daughters and grandchildren was extreme if anything," he answered. "That he would have a liaison with a slave and raise up a flock of slave children in the midst of his own family—it's just simply, utterly unthinkable."

In a house overlooking the Pacific, I visited Mrs. Brodie, who teaches at the University of California at Los Angeles. "Dr. Malone and other biographers say the story is not provable," she remarked. "But I'm persuaded it's true."

She believes Sally Hemings provides a clue to Jefferson's toleration of slavery in his later years. Sally became part of the widower's household in France, accompanying his younger daughter across the ocean in 1787. "You can document the fact," Mrs. Brodie said, "that Jefferson was very intent upon emancipation until he went to France, and then you begin to see a backtrack. I think the fact that the young slave girl had come into his life is part of the explanation."

Dr. Malone declared, "He tried in his early years to do something about slavery. He got beaten down. In his later years, if he got rid of his slaves he just couldn't live, and they would have faced great difficulties as free people in a slave state. The practical aspects of the problem baffled Jefferson, but he never ceased believing that emancipation was inevitable."



VIRGINIA

By T. G. BRADFORD. WARRENTON, SA

Mr. JEFFERSON and Mr. ADAMS are no more. The first died about one o'clock and the other at five o'clock on the 4th of July.

FOR THE VIRGINIA GAZETTE.

Character of Thomas Jefferson.

With feelings considerably excited by the recent removal from his worldly cares, and anxieties of the illustrious Thomas

his patrimony to maintain and defend, and which will be creditable to him so long a history retains the record of the glorio era in which he flourished. An era, which without claiming too much for him, it may be said he created.

It is however as a practical statesman that the deceased's eminence is most conspicuous, and his country will long enjoy the benefit of of his transcendent policy— a policy that extended the confines of the republic to the shores of the Pacific and the Gulf of Mexico, and relieved the country

To Mrs. Brodie, Jefferson the slave owner remains a towering figure. "He left an incredible legacy, particularly on freedom of speech and the press. He also said some great things against slavery. But he was trapped in a system he detested."

Released from the "shackles of power" in 1809, the retired Chief Executive remained optimistic that his debts could be managed. When the British burned Washington in 1814, he offered his library as a replacement for the Library of Congress. The $23,950 he received as payment, far below its value, retired debts to a few friends. He promptly went back to collecting books.

At age 75 one more great task lay ahead. He would create a university. For the design of the focal edifice he turned to the Roman Pantheon. Flanking a great domed Rotunda would be rows of student and faculty residences with classroom space (pages 254-5).

ON AN AUTUMN Saturday night, time might hang suspended over this part of the University of Virginia were it not for the occasional beer keg, incongruously aluminum, by a student's door. With the chatter of young voices rises the aroma of beef searing on charcoal.

Living on the Lawn, as the mall below the Rotunda is called, is a privilege reserved for outstanding students: scholars, leaders, doers. Rocking chairs and fireplaces lend flavor to the 54 student rooms, but the baths are off in other buildings.

"I don't think that's a disadvantage," said economics major Bert Ellis. "After all, this is a chance to live in a bygone era. It's kind of fun to meet people in the morning walking to the showers in their bathrobes."

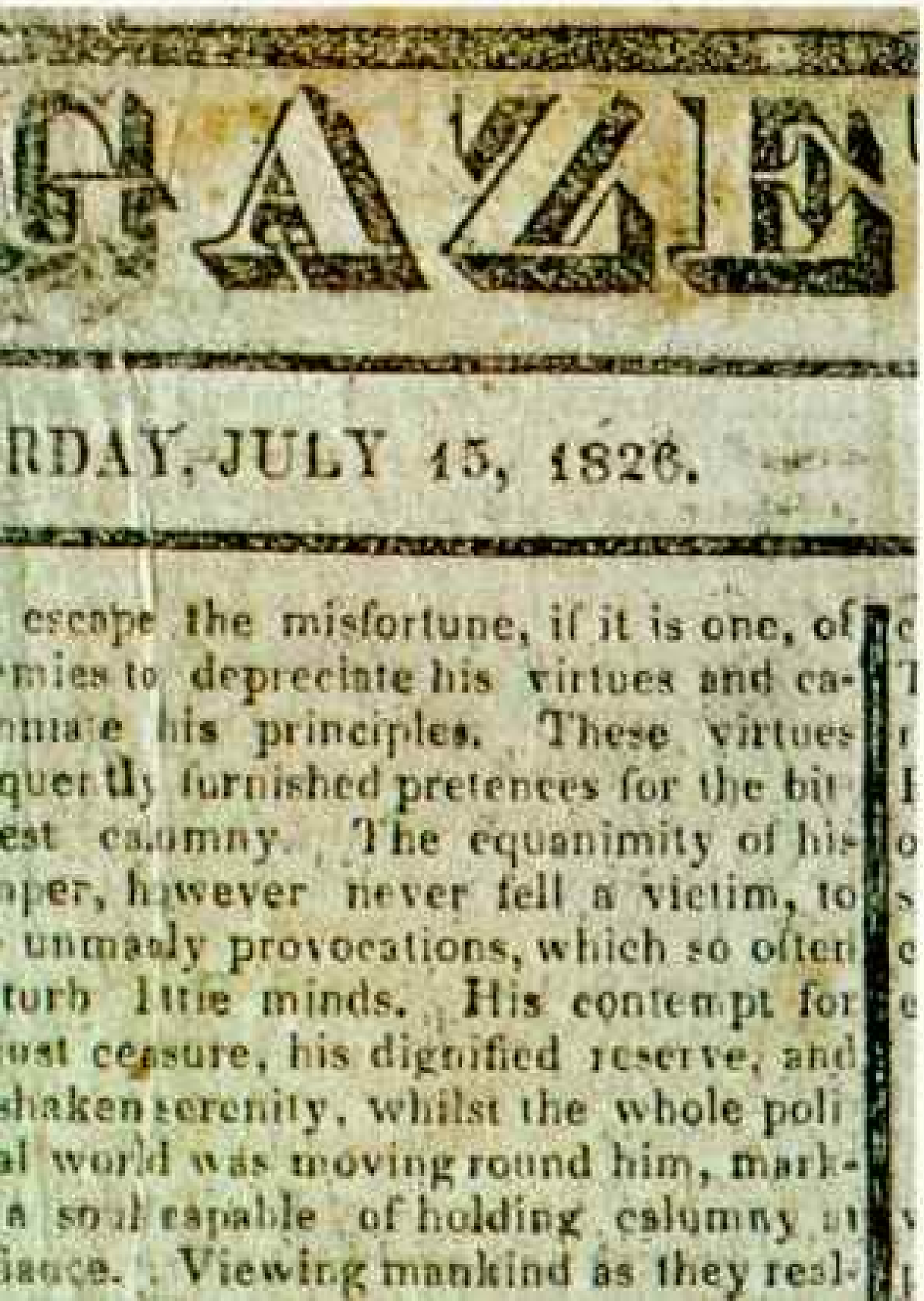
When Jefferson wrote his own epitaph, he chose to list—omitting his Presidency—these three achievements: the Declaration of Independence, his Statute of Religious Freedom, and the University of Virginia.

As summer came in 1826, he was determined to see one more Fourth of July. He did —dying around 1 p.m. that day. On that same Fourth, in Massachusetts, death claimed another architect of freedom, John Adams. Soon Monticello and most of the slaves were sold for debts (Sally had been set free), and the marvelous furnishings were scattered.

A shrine since 1923, Monticello has reacquired many Jefferson belongings as donations, others by purchase. "We'll eventually get nearly everything back except the small items," Jim Bear said confidently. "I mean, not in my time, but somebody will."

That evening I toured the house from wine cellar to dome. I lingered longest in the wing that was Jefferson's library, sitting room, and bedroom. Here are his drawing table, shelves of books, his telescope. Here is the writing table whose top spins like a lazy Susan, taking paper away or bringing it close. A man could be happy in that suite, very happy.

I walked outside. The sun was dropping behind the Blue Ridge. Over the Piedmont a harvest moon hung like a fat cheese, almost close enough to be devoured. The wind rustled the leaves of a yellow poplar. Monticello's dome shone in last daylight and first nightlight: sun and moon in tribute to Thomas Jefferson on his Little Mountain. □


RDAY, JULY 15, 1826.

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"**Honest as a politician** as well as a man." Thus Jefferson described his friend John Adams. Both revolutionaries died on July 4, 1826, the 50th anniversary of the Declaration of Independence. Adams's last words were prophetic: "Thomas Jefferson still survives." In words and deeds, he does.

COLLECTION OF W. SPANN

Catholic, conservative, and proud, with a mind toward home rule, these serene and pastoral isles face uncertain times....

The Azores, Nine Islands in Search of a Future

By DON MOSER

Photographs by O. LOUIS MAZZATENTA

NATIONAL GEOGRAPHIC STAFF

Bid for change: An old woman of Terceira shouts her preference for the *Partido Popular Democrático*—Popular Democratic Party—an advocate of Azorean autonomy within the Portuguese republic. Governed by Portugal for nearly five centuries, the mid-Atlantic islands have long chafed at their role as food basket for that European nation. All through 1975 political turmoil in Lisbon stirred tremors of discontent into a strong move by Azoreans to map their own destiny.

I HAD SLEPT SO SOUNDLY that I didn't hear the lookout's signal rocket bursting above the village at dawn; what woke me was a violent banging on the door of my room and someone shouting, *"Baleia! Baleia!"* A whale had come.

I stumbled out, rubbing sleep from my eyes. Almerindo, the harpooner, was waiting, his lips drawn back in a fierce grin.

"Tekideez," he said.

"Take it easy" is Almerindo's favorite English phrase, but it was hardly what he meant on this morning. I had to stretch to keep up as we trotted along the narrow street to the ramp, where several other *baleeiros* were already sliding the sleek whaling *canoa* down to the water. I jumped aboard the old tow launch while the whalers climbed into the canoa. Then we were plowing at full speed toward the open sea.

For three-quarters of an hour we ran northeastward, the launch captain checking the whale's position by radiotelephone with the lookout high on the dark lava cliffs that border the island of Pico. Behind us, at the end of a towrope, the canoa with its seven whalers plunged and reared.

Suddenly the launch captain hit *(Continued on page 265)*

ROADSIDE HOMES *stitch together a patchwork of fields at the hem of Terceira, third largest of the Azores. Pastures and plots of corn, wheat, and sweet potatoes extend to sheer lava cliffs, wasting little of the fertile volcanic soil.*

my shoulder, yelled, and pointed. I stood up, wrapping my arms around the radio mast to keep from going overboard. Perhaps a mile away a geyser erupted from the sea.

When I looked back, I saw that the canoa had cast loose and the men were raising the mast and sails for the pursuit. Almerindo, his face still split by that fierce grin, gave me a clenched-fist wave as our boats separated. Tekideez, I thought.

The mid-Atlantic archipelago known as the Azores is one of the few places on earth from which men like Almerindo Lemos still go forth in small boats with hand harpoons to challenge the greatest creatures of the seas. The whalers' methods belong to another century—appropriately enough, for in the Azores time moves at a pace of its own, the decades ticking into each other with imperceptible change. That pace, however, has quickened, and just as the days of the whalers seem numbered, so there seems no going back to the past for today's Azoreans.

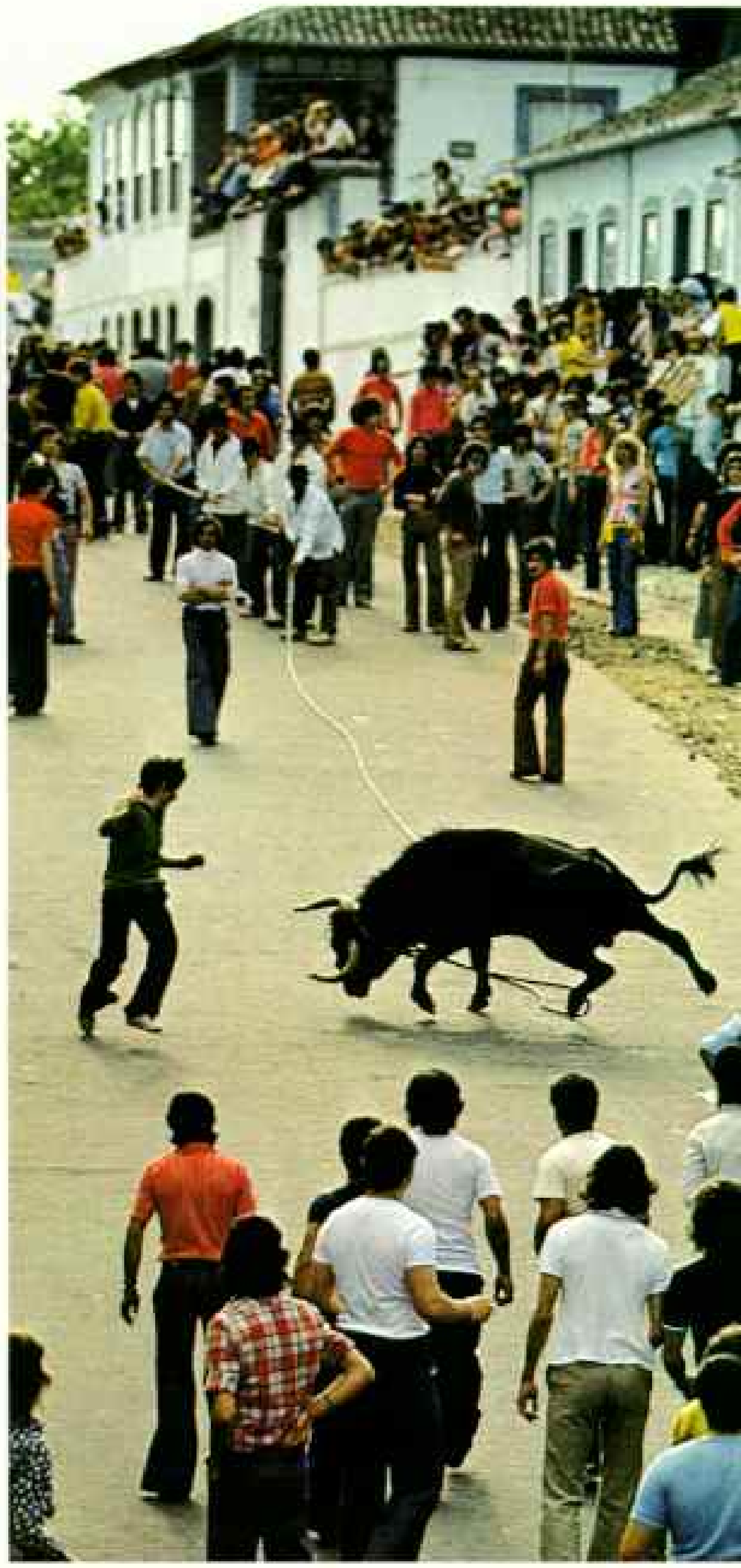
Poor, Perhaps, But Rich in Character

The nine islands—some 900 square miles altogether—are separated from Europe by almost a thousand miles and from North America by sixteen hundred. By some standards, the 300,000 inhabitants are generally poor and ill-educated.

They are also hardworking, generous of spirit, and honest almost beyond credibility. On Corvo, the smallest of the islands, the jail has not been occupied within memory. On any island a visitor who forgets a pencil stub or near-empty cigarette package in a café will be chased down the street by an Azorean trying to return it.

The people are blessed in other ways. They live on old volcanoes rising from the Mid-Atlantic Ridge and cloaked in rich volcanic soil. The North Atlantic Current, a branch of the warm Gulf Stream, ensures a climate without extremes of heat or cold. The earth bursts forth with a copious harvest of crops both temperate and tropical; corn and sugar beets grow here, as do oranges, bananas, and tea. Flowers bloom in an abundance to delight the eye; indeed, they bestowed the name to Flores, a small island at the western end of the archipelago where pastures are separated by lush hedges of hydrangeas.

The bells of the lava-stone churches on the



Agility means survival when young men of sporting blood taunt bulls set free to range the streets of Terceira; young women watching from balconies and behind barriers add fuel to courage. Though hampered by a leash, *o touro* could easily down his tormentor and send rope holders fleeing with a charge to his right. One acrobat (**opposite**) barely eludes an animal with a horn cap missing.

Kaleidoscope of political thought emblazons a wall on Terceira (**right**). In the Azores six Portuguese political parties vied in the 1975 elections. Fear of leftist takeover in Lisbon contributed to anti-Communist sentiments. At Ponta Delgada, stevedores refused to unload a ship believed crewed by Communists, and jeered a ship's officer leaving the vessel (**below**).

A large Azorean immigrant population in the United States fosters close ties with America. Some 1,500 U. S. military personnel are stationed at Lajes Field, Terceira, an antisubmarine base and refueling stop for long-distance flights. Serving together under a husband-and-wife assignment program, Air Force mechanics Jan and Bob Hammond inspect a visiting C-141 transport plane (**above**).

islands peal thrice daily in towns that were fortified to repel the attacks of 16th-century pirates. The horse and oxcart are giving way only slowly to the internal-combustion engine. From the seaside rocks men cast nets for silvery *chicharro*. High on ridges the sails of a few old windmills revolve slowly, turning lava millstones that grind the corn.

Serene and pastoral as the islands appear, they are being disturbed by change. Governed by Portugal for nearly five hundred years, Azoreans have long felt oppressed by their rulers in Lisbon. In the past year a deepening ideological rift aggravated this old grievance. The islanders, devoutly Roman Catholic and intensely anti-Communist, became fearful of the power that the left wing had acquired in continental Portugal.

Demonstrations, near riots, and impassioned rhetoric charged the bucolic Azorean atmosphere with political electricity. Along the narrow streets of Ponta Delgada, the Azores' largest city, I saw many buildings emblazoned with graffiti advocating *independência:* "The Azores for the Azoreans."

Young men wore shirts stenciled with a fierce-looking hawk—*açor* means "goshawk" in Portuguese—its wings spread protectively above nine stars representing the islands. Promenading on the broad waterfront esplanade patterned with lava and Portuguese limestone, they greeted each other with a thumbs-up sign—the symbol of the independence movement.

Pico Whalers Cling to Old Methods

São Miguel, the island on which Ponta Delgada is located, and neighboring Santa Maria are the easternmost of the Azores (map, page 272). A hundred-odd miles to the west lies the central cluster of five islands, the most spectacular of which is surely Pico, whose volcanic cone rises 7,615 feet above the sea. It was on Pico, in the village of Calheta

DEATH POISES *over a wounded sperm whale off the island of Pico as a harpooner aims his lance for the coup de grace. Azoreans are among the last to hunt in this dangerous manner that so directly pits man against leviathan.*

"**Whaling fails to interest the young,**" says harpooner Almerindo Lemos (**above**). He foresees an end to the exciting but hazardous method introduced to Azoreans by New England whalers in the 18th century—and still recorded in islanders' scrimshaw (**below**). The annual catch from the Azores totals no more than 200 whales, compared to thousands taken by modern fleets firing explosive projectiles. Flensers at Cais do Pico cut up a 50-foot sperm whale (**right**) for processing into margarine, cosmetics, livestock feed, and fertilizer.

do Nesquim, that I first perceived something of Azorean character.

A cluster of whitewashed houses hanging on steep hillsides above the coast, Calheta is one of the few villages from which men still go to the whales—much as their forefathers did aboard Yankee ships. Their quarry, the sperm whale, is a blunt-headed leviathan with a lower jaw full of big teeth. Sperm whales can exceed 50 feet and may weigh more than 50 tons. And they can be dangerous; Melville's Moby Dick was a sperm whale. I assumed that only a special kind of man would confront one on anything approaching equal terms. When I met Almerindo Lemos, I knew I had assumed correctly.

A slight but muscular man of 31 with an aquiline nose and steady eyes, Almerindo is amiable in the manner of all Azoreans and quick to laugh. But there is something fierce and catlike about him. When fishing with a cast net, for example, his lips are drawn back in a determined grin and the sinews of his neck bulge like ropes.

A whaler since the age of 20 and a harpooner since 26, he admitted that the risk was great and the pay poor. He has earned as much as 150 dollars a month, but in most years could make more money working on a tuna boat. Some are doing just that, and whaling is dying out in the Azores.

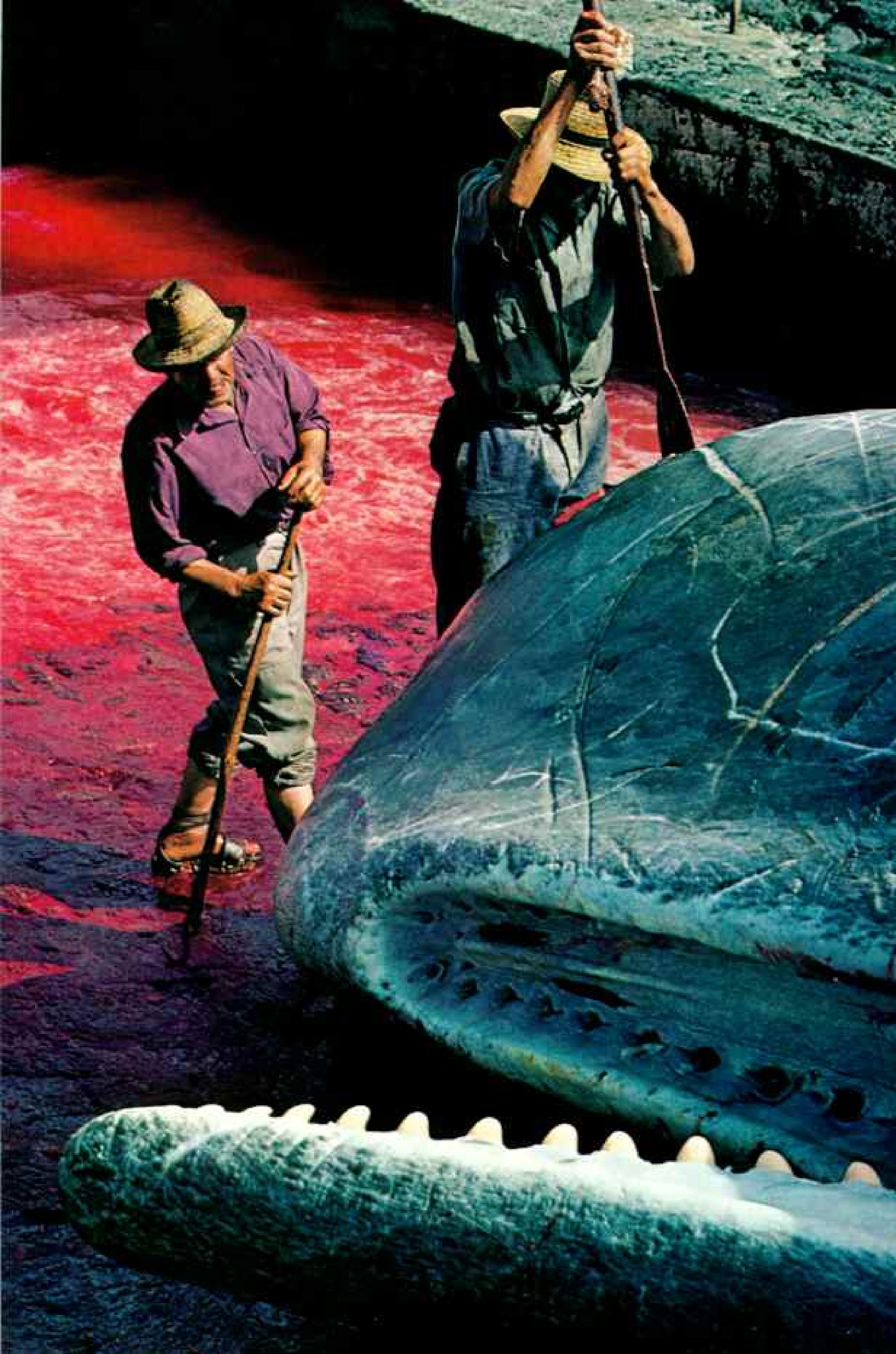
"But I have a craving," he laughed. "I have an addiction."

First Harpoon Finds Its Mark

It was on my fourth day in Calheta that the whale came. As the canoa sailed off in chase, the launch swung in a circle so that the sound of its engine would drive the whale toward its pursuers.

A shout went up from the men on the launch; Almerindo's harpoon had struck. I saw the whale's tail flukes, a dozen feet across, rise from the water and crash back down. The canoa surged forward as the whale towed it. As we drew near, the whale dived deep. The heavy harpoon line ran straight down from the bow of the canoa into the water. The men had broken out their heavy oars now, and they steadied the boat as Almerindo stood poised in the bow, holding a long spearlike lance.

We waited. All around us shearwaters skimmed low over the waves, their long



The Azores

(PORTUGAL)

In the 18th century outward-bound New England whaleships called at the Azores for water and provisions, and to recruit extra crewmen. Today's Azoreans still follow the old ways — using canoes and hand harpoons to take as many as 200 whales each year.

Economic hub of the Azores, the city of Ponta Delgada lies at the foot of cones attesting the volcanic origins of São Miguel and the entire archipelago. Historians are uncertain who first sighted the Azores, but Portuguese navigators of the 15th century were the first to confirm the islands' existence. Spread over some 400 miles of the mid-Atlantic (**map**), the Azores became navigational stepping-stones and supply stations for voyages from the New World. Reminder of that earlier sailing traffic, a three-masted Polish training ship, *Dar Pomorza*, moors amid cargo ships inside the Ponta Delgada breakwater pier.

wings held in taut, motionless bows. Finally the whale began to come up. And suddenly it was there, right next to the canoa, its huge teeth gleaming. Then the jaws snapped shut, a heavy oar splintered, and the gigantic body rolled up beside the boat. Almerindo, no more than six feet away, raised his lance high and drove it home with all his strength.

Victory at Sea, Turmoil at Home

Later the launch towed the huge carcass to a factory where its blubber would be rendered into oil, to be sold abroad as a base for margarine and cosmetics, and the remainder ground into meal for use as fertilizer and in livestock feed. Each year Azorean whalers harvest from one to two hundred whales—a small number compared to the 32,457 taken by the modern whaling fleets of Japan and the Soviet Union in 1973 alone.

The whalers gathered in a *taberna* in Calheta to celebrate. They drank wine and spoke of boats smashed by flukes, of men drowned, or killed or maimed by the great jaws.

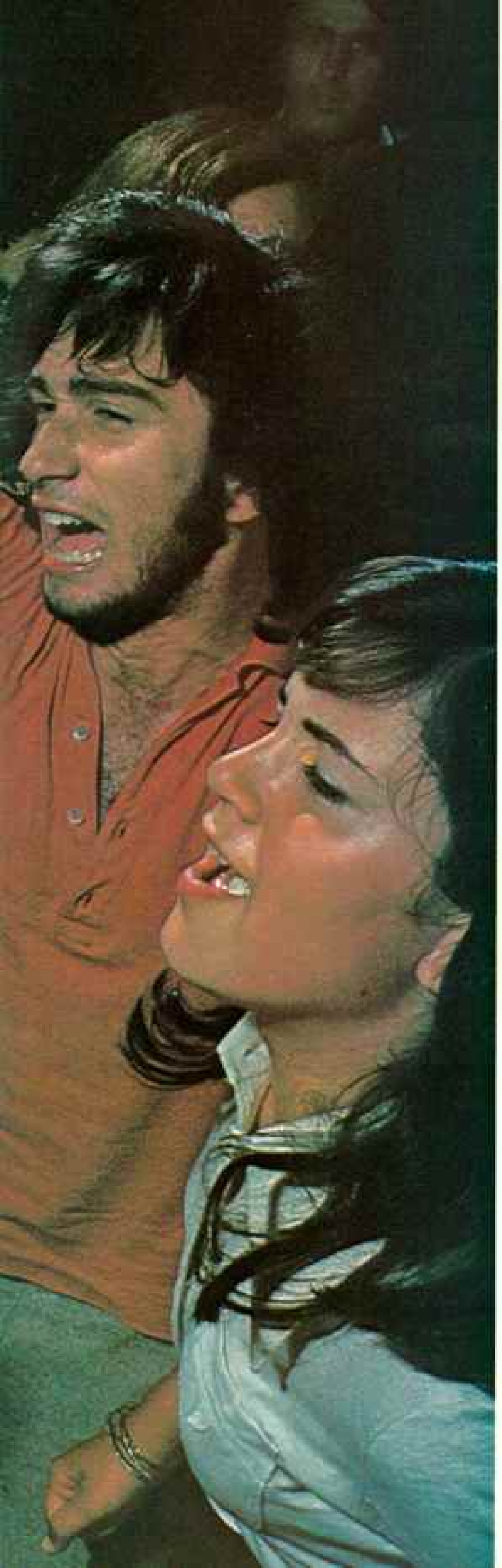
After a while the talk shifted to politics and the future. "If we have freedom," one man said, "the islands can be developed. We are not lazy—we will work all the time."

"We could get good tuna boats," Almerindo said emphatically. "We need new boats with refrigeration and nets like the California fishermen use."

I heard the refrain everywhere. For years Portugal had been "milking the golden cow," Azoreans claimed, exploiting the islands' agricultural abundance, taxing imports and exports heavily, and providing little in return. Then to that was added leftist control.

This long-standing resentment exploded last summer when Azoreans burned a Communist Party headquarters on Terceira, dumped a Communist leader's car into the sea off São Miguel, and demonstrated angrily in major towns. By the end of the summer they had driven virtually every Communist leader to Lisbon and had demanded—and won—the ouster of a number of unpopular Portuguese officials, including a governor.

The cutting edge of the independence movement is the illegal and clandestine Front for the Liberation of the Azores. Since Azoreans assume that Americans are sympathetic, a visitor from the United States has no difficulty meeting FLA members. As I



traveled about the islands, I was continually buttonholed by taxi drivers, office workers, and farmers eager to tell me of their affiliation with the movement.

Clergyman Prepares for Battle

One day I went to a village on São Miguel to visit a priest I'd heard about. I met him in front of his church, a 19th-century building that dominated the whitewashed stone row houses of the village. "How many people live in the village?" I asked.

"Fourteen hundred, approximately," he said with a smile.

"How many are in favor of independence?"

The priest smiled again. "At least eleven hundred, approximately."

In the church annex we sat at a rough wooden table and discussed the independence movement. A dozen men gathered around to listen, their faces intent. "We have suffered too long under Portugal," the priest said. "Books and school supplies are not provided by the government. Most people here have been to school only three or four years; they can barely read and write.

"We have valuable mineral water, but the Portuguese will not allow us to export it—they don't want us to compete with companies in Portugal—and so it goes to waste. For sugar we pay 50 cents a pound because of taxes, even though we grow the sugar beets here. Look at this man," the priest said, pointing at one of the onlookers. "He is a logger, but now he has to log illegally because he has to get a permit from Lisbon to cut the trees, and it takes too long. Portugal has always considered us third-class Portuguese."

The priest pounded his fist on the table. "We have a will to do something! We don't want to fight, but if we have to, we will fight with sticks and stones and plows."

It was clear from the faces of the men who sat around the table that they were ready to follow their priest.

Sensing new rhythms, students writhe to discotheque music at Ponta Delgada. Informal, unchaperoned mingling between unmarried Azorean men and women began in urban areas only in recent years. Many parents still limit courting to doorway conversations and balcony serenades.

As we left, the priest stopped to point something out to me. There, affixed to the wall, were a hammer and a sickle. Crossways between them, as if splitting them asunder, was an Azorean knife, a *podão*.

Home Rule Versus Full Freedom

Not all Azoreans emphatically desired independence. Some feared missteps caused by their own political inexperience, others that political power would be concentrated in the hands of the wealthy. Nonetheless, a group of Azorean officials was preparing a plan for an autonomous Azorean region.

I spoke with a member of the group, José Goulart, an articulate young engineer, in his office in Ponta Delgada. "We are so small," he said, "that in my opinion, we will always feel we need to be included in an economic and political structure that is larger and stronger. We have problems just because we *are* islands, problems of skills and economic development. Anywhere else in the world an area the size of the Azores would need one

airport—we have five now and need more. We can't get along with one port. People think that we need nine of everything."

One of the islands that has no airstrip is four-mile-long Corvo, at the northwestern end of the archipelago. As a link to the other islands, Corvo and its neighbor Flores rely upon a 220-foot steamship, the *Ponta Delgada*, which its captain calls the "bus."

I rode the bus on a 12-hour overnight voyage from Faial, and at dawn I stood beside Capt. Armando Carvalho, a black-bearded compact man, as the steep lava cliffs of Corvo became visible through a fine slanting rain. "Remember that this is the North Atlantic," Captain Carvalho said. "In the winter we have big problems with bad weather. At Corvo and Flores there are no real harbors or piers. The waves get thirty feet high, maybe more. The high wind can be very dangerous —makes more waves, more waves, more waves. Very difficult."

Sometimes, he said, it was hard to know when leaving *(Continued on page 281)*

Queen-size bread loaves—as much as 18 inches across—commemorate in the Feast of the Holy Spirit the charity of Portugal's Queen Isabel (1282-1325). A local girl annually reigns over distribution of the loaves at Ribeiras, Pico. On São Miguel penitents painfully fulfill promises made to Santo Cristo by circling the church square on their knees, a custom now discouraged by some Azorean priests.

VAPOR WREATHES HOUSES *at Furnas, a crater-cupped resort that attracts American and European visitors who hope the spa's steaming mineral waters hold healing power.*

The fertile chalice of an inactive volcano protects crops in Sete Cidades from the sea winds that sweep across São Miguel. Corn planters in the crater pause for lunch (**above**). Where lava once bubbled in this huge caldera, sister lakes (**left**), often of different hues, now draw campers.

Faial whether he'd be able to land passengers and cargo when he reached Corvo and Flores. Even the meteorological stations could not always accurately predict the sea conditions. "But I have a secret," the captain confessed. Before leaving Faial, he telephones an old fisherman on Flores. "If he say come, I come. If he say don't come, I don't come. He never make a mistake, that old man."

As it happened, the old forecaster's prediction was correct on this particular morning—but not by much. By the time we anchored off Corvo, the weather had grown menacing. A few of us made a hair-raising trip by motorboat through breaking waves to a slot cut in the lava cliffs. There we leaped for the shore as our boat rose and fell on the waves. Captain Carvalho, though concerned about the weather, allowed us time enough for a walk through the island's only village, where I saw streets so steep I expected the houses perched along them to come tumbling down. Corvo has fewer than 400 inhabitants and neither a high school nor a doctor. Even here the stone walls bore crudely lettered signs calling for independence.

Leftist Beliefs Arouse Ire

When we reached an anchorage off Flores an hour later, rain was falling hard. The island's cornfields and pastures ascended into banks of dark, obscuring clouds.

In the town of Santa Cruz I had coffee at a small community center where the people gathered to play cards and dominoes. There I met a somber-eyed, bearded young man who told me that he was a university student in Lisbon, home on vacation. He was a member of the MRPP—a Portuguese political party that stands to the left even of the Communists. He opposed the independence movement, he said, because he feared that without Portugal's protection the United States might try to take the islands over. The majority of Azoreans were very poor, he went on, and only through radical change could they better their lives.

As the student spoke, I realized that some men playing dominoes at a nearby table were watching him closely and with evident hostility. After a while the men got up to leave.

The student nodded toward them as they went out the door. "Sooner or later," he said, "some of those men will be waiting for me."

His beliefs were not popular, he explained.

Most Azoreans were looking toward the United States to help them, certainly with moral support, perhaps with economic assistance. "America is like God to us," an Azorean friend told me in Faial, and if he put it more strongly than most, there is no doubt that Azoreans regard the United States warmly.

Azoreans have been emigrating to North America since the 1700's. Several hundred thousand people of Azorean stock live in the United States today, primarily in New England and California.* In search of a higher standard of living than they can achieve in their island villages, about 5,000 move to the United States each year now.

"Family ties are very strong," said Jim Flynn, the young vice-consul at the United States consulate in Ponta Delgada. "When a transplanted Azorean becomes a U. S. citizen, he'll send for his sister, and she takes her husband, and then he sends for his brother, who brings *his* family. . . ."

The Agony of Expectation

One morning I sat in Flynn's office as a stream of visa applicants passed through. Flynn, the man who had the power to fulfill or shatter their dreams, sat at a large desk, flanked by an American flag. As the applicants answered his routine questions—"What relatives do you have there? Do you have an offer of a job?"—they were apprehensive, almost to the point of shock. Their rough farmers' hands twisted in anguish. At the end of each interview Flynn asked the applicant to stand, raise his right hand, and swear that his statements were true. One elderly farmer was so excited he shot both arms straight into the air, as if being held up at gunpoint.

Most applicants are approved. "One of our jobs," said Flynn, "is to make sure that we don't send people who are going to become public charges. But there is very little problem with the Azoreans. Their families in the States will help them, they are hard workers, and they are too proud to accept welfare. These are good people."

The Azores have been a way station for Atlantic travelers ever since their discovery in 1427 by the far-ranging mariners of Prince Henry the Navigator. Christopher Columbus

*O. Louis Mazzatenta described "New England's 'Little Portugal' " in NATIONAL GEOGRAPHIC, January 1975.

Like stoplights signaling the end of life, sun-shaded photographs of the dead mark graves in a Ponta Delgada cemetery. Despite a high birth-rate, Azorean population has declined in recent

years as islanders leave to find jobs on the mainland or in other countries. In poorer communities of the archipelago, "people houses," staffed usually with one trained nurse, provide free medical attention. Supporting such programs without aid from Lisbon could mean financial difficulties for the Azoreans, who admit that they have little experience in self-government.

stopped at Santa Maria on his return from the New World in 1493. Spanish galleons reprovisioned on their voyages back to Spain. In both World Wars the islands played a role in the struggle for control of the Atlantic. Today at Lajes Field on the island of Terceira, C-141 jet transports of the U.S. Air Force land to refuel on their flights between the United States and North Atlantic Treaty Organization bases in Europe (page 266). The United States has kept a contingent at Lajes since World War II to operate what airmen described to me as the "big gas station."

The gas station's strategic importance was underlined during the Middle East war of 1973. With other NATO countries determined to stay uninvolved, Lajes during a 33-day period refueled planes carrying 22,000 tons of equipment and supplies to Israel.

Lajes also is a center of the U.S. Navy's mid-Atlantic antisubmarine-warfare effort. One night I saw the building from which these operations are directed. Behind its heavy locked doors were rooms filled with whirring computers and other electronic equipment.

Lt. Comdr. Bill Dupont told me, "Our primary interest here is in watching Soviet submarines. And if you want to know why it

A harvest too heavy to carry slides to market as tuna fishermen unload their catch at Vila Franca on São Miguel. Modern equipment and a newly founded university—stressing marine, agriculture, and business courses—may increase the tuna catch and provide new job opportunities for such as this Azorean baker boy (**above**).

seems so tense around here tonight, I'll tell you: We're observing one right now—and we don't think he knows he's being watched."

A squadron of Navy P3's—long-range aircraft, chockablock with detection equipment—is based at Lajes. "From here," Dupont said, "we cover three million square miles of the Atlantic. This is a big, fixed aircraft carrier in an important location."

Bullfights With a Different Twist

The island of Terceira is the home of one of the world's more peculiar sporting events, the *tourada à corda*, or bullfight of the rope, a variety far removed from the golden sands, elegant silks, and sophisticated veronicas of the bullring in Madrid. In a Terceira bullfight the entire village is the ring. In keeping with the Azorean trait of amiability, the bull is not killed but returned to his pasture for relaxation and romance between fights. With luck, the bullfighters also survive (pages 264-5).

When I told a friend I wanted to see one of these bullfights, he responded with a bit of advice. "When you see people walking, you can walk," he said. "When you see people go to the barricade, you go to the barricade. But don't go to a *small* barricade. If you see

women and children behind a big barricade, that is where you should go."

My encounter came in the village of Ladeira Grande. The whitewashed houses along the main street were faced with barricades of heavy planks. From behind these the timorous could watch in comparative safety, and village *toureiros* could repair to them when in serious trouble. Mindful of my friend's warning, I picked a barricade that shielded mainly women and girls.

A few minutes later the first bull of the afternoon was released from a crate in the village square. The animal was lean, hard-muscled, and quick. Though its horns had been blunted, it looked as lethal as a shark. The bull was joined by a long rope to five sturdy *pastores*, men who were supposed to keep the bull under some measure of control as it raged off in pursuit of the village blades.

Perhaps a hundred men ran in the streets before the bull. The toureiros flapped red sweaters or blankets. One man took a few passes with an umbrella. As the bull charged, the crowd surged and broke like a wave, the men darting up side alleys and leaping over barricades. The bull had such power that it dragged the pastores behind as if they were on roller skates.

Animals Determine Recess Time

I had seen bullfights before and noted their stylized, balletic precision. The bullfight in Ladeira Grande was not so much a ballet as a kind of slaphappy Charleston. One bull spent five minutes chasing a red hen. Another, thirsty from its exertions, stopped from time to time to drink from a water trough—interruptions that the tired-looking pastores were only too happy to permit.

Between bulls young men strolled about, stopping to chat with and be admired by the girls who hung over the barricades. The men were clearly in the business of winning hearts. In the Azores, where young women make few unchaperoned moves, public social functions like bullfights provide Cupid with opportunities for matchmaking.

The last bull of the afternoon was released. He chased a young man across the square and over our barricade. Frustrated, the bull reared up over the planks, his horns and wild eyes right in front of me. A second later I found myself, along with other fugitives, inside the house behind the barricade. Whether we got inside through the door, the window, or by spiritual levitation, I am not sure. Next to me a man grinned and said, "We Açorianos, we are crazy for the bullfighting."

Island Vineyards Hold Heady Hazards

In order to discuss politics—or anything else—with an Azorean, one must be prepared to "throw the glass." The island most famous for its wine is Pico, and I headed there just as the wine-making season was beginning, traveling on a crowded little passenger boat that links Pico with neighboring Faial.

"The place we are going," said my friend José Gaspar, "is very dangerous. All the people we meet will offer us wine, and they will be offended if we refuse. Yes, yes, we will be lucky to survive the day."

The day proved to be quite as dangerous as Gaspar predicted—that is to say, delightful. Our first stop was at a small family vineyard on the southwest coast. At the *adega*, the stone wine-making shed, we met the owner, Francisco Matos, a powerful man of 60 years. After introductions he produced a jug of colorless liquid and passed it around so that each of us could swig from the bottle. My mouthful seared me to the solar plexus.

"*Bagaço*," said the farmer. This brandy, he explained, is made from the skin and pips of the grapes after the juice has been drawn off.

While the women—Matos's wife, sister-in-law, daughters, and cousins—crushed grapes in a hand-cranked press, Matos explained that they were making *vinho de cheiro*, the fragrant "wine of smell" that is the table drink of ordinary Azoreans. Made in September, it is ready for drinking by early November. But it was possible to drink the wine before that. Matos had a cask at hand, eight days old. Would I like to try some?

Making wine for the family table, a farmer of Pico presses grapes grown in his small vineyard, filtering the juice through wicker woven on the island. After a brief aging, part of the fragrant beverage may be sold. These self-reliant islanders face with confidence the prospect of a future under their own control.

When I drank the wine from the earthen cup he offered me, the fragrance enveloped my senses. The taste, however, was grapy and strong and made the mouth pucker.

Now it was essential, Gaspar said, to visit some friends of his who make a wine called *angelica*. And so near the village of Bandeiras we met Antonio da Silva and his wife, Francisca, a handsome couple who divide a century and a half between them.

While we sipped their angelica—delicate and sweet, as the name implies—Francisca badgered her husband to change his shirt and put on his suspenders in honor of their guests.

"Oh, all my whiskers and my hair will fall out," grumbled the old man, "and my feet will stick straight up in the air, and I will go mad if you don't stop bothering me with details."

Then he prepared a cigarette from tobacco he had grown and cured himself, rolling it in a dried corn husk. He took from his pocket a piece of steel, a tiny flint, and a twist of charred cloth. With a few deft strokes he flicked sparks onto the cloth until it began to glow, then solemnly lit his cigarette from the smoldering cloth. He puffed and smiled at me as if to say, "I'll bet you never saw anything like that before, young fellow."

As the old man smoked, Francisca told us something about her life. In the old times, she said, everyone knew her as the woman who took beautiful fruit to sell on Faial. She used to play the violin, and their house was the happiest in the village. They worked all day, and in the evening they sang and played, and other families came from all over the village. But then the great sadness came as the young people began to emigrate. Now half the houses in the village were empty.

"Punishment" Shattered Normal Calm

Those who remained did not believe in God the way people used to, she said. They received money and clothes from relatives in America, and they thought only about money. She pointed to cracks in the whitewashed walls of the house. "That is why God sent the punishment," she said.

The punishment? I did not understand until Gaspar explained. For seven months in 1973 and 1974, Pico was rocked by more than a thousand earth tremors. The old woman believed that God was punishing the islanders for their sins. But for all the number of quakes and the extent of the damage, not a single fatality was recorded.

The Azores have often betrayed their turbulent geologic origins. On September 27, 1957, a new volcano began to emerge from the sea off the westerly tip of Faial. Off and on for more than a year the volcano vomited ash and lava. Entire villages were blanketed by ash, as much as five feet a day. Earthquakes shook the island; in one three-day period, more than 450 quakes demolished the villages of Praia do Norte and Ribeira Funda. Some people slept in the fields and marched in processions to pray in the churches. Incredibly, not one person was killed here during the island's year of geologic violence. If the islanders were being punished by God, the punishment was restrained, as befits the modest sins of Azorean villagers.

Facing Tomorrow With Quiet Strength

Isolated and vulnerable, dwelling precariously on their restless mid-ocean volcanoes, the Azoreans face an uncertain future. They lack trained technicians and administrators. Their physical resources are limited. Their transportation lines are long. But Azoreans do have some important things in their favor: a will to prevail, a knotty durability.

I recall one evening in Calheta when I met a villager fishing along the lava seawall. Nearly 70, he was tall and broad-shouldered and his arms were roped with muscle. In big callused hands he held a slender bamboo pole tipped with a sliver of cow horn that gave a telltale quiver whenever a fish nibbled at his hook. From time to time as we sat talking, he twitched the pole and brought up golden fish, about six inches long, which he called *boga*.

José da Silva had gone to the whales for 37 years, 28 of them as a harpooner. He had killed more than 400 whales and had sometimes come near being killed himself.

"Whaling is the passion of my heart," he said, but he was too old. Now when the boats went out, he went to the little taberna to listen to the shortwave radio as the lookouts talked with the whalers. He spoke with no hint of self-pity.

As I left the oceanfront, I looked back and saw the old harpooner still sitting there on the seawall, timeless and indestructible as the lava itself, totally absorbed in catching the tiny golden fish. □

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WASHINGTON, D. C.

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BOTH BY DES AND JEN BARTLETT

In Patagonia's wondrous wilds

WHETHER BRAVING a 35-ton right whale close up (**above**) or composing the portrait of a two-ounce common egret chick (**left**), the husband-wife team of Des and Jen Bartlett brings a compelling personal vision to the art of wildlife photography. Their photo essays on snow geese and beavers have delighted GEOGRAPHIC readers in recent years. In next month's issue the feast continues with spectacular color photographs of the right whale and other of the often bizarre, always fascinating wildlife of Argentina's remote Patagonian coast—where parched desert and life-teeming sea come together. Let friends and relatives share such looks at the world. Nominate them for membership below.

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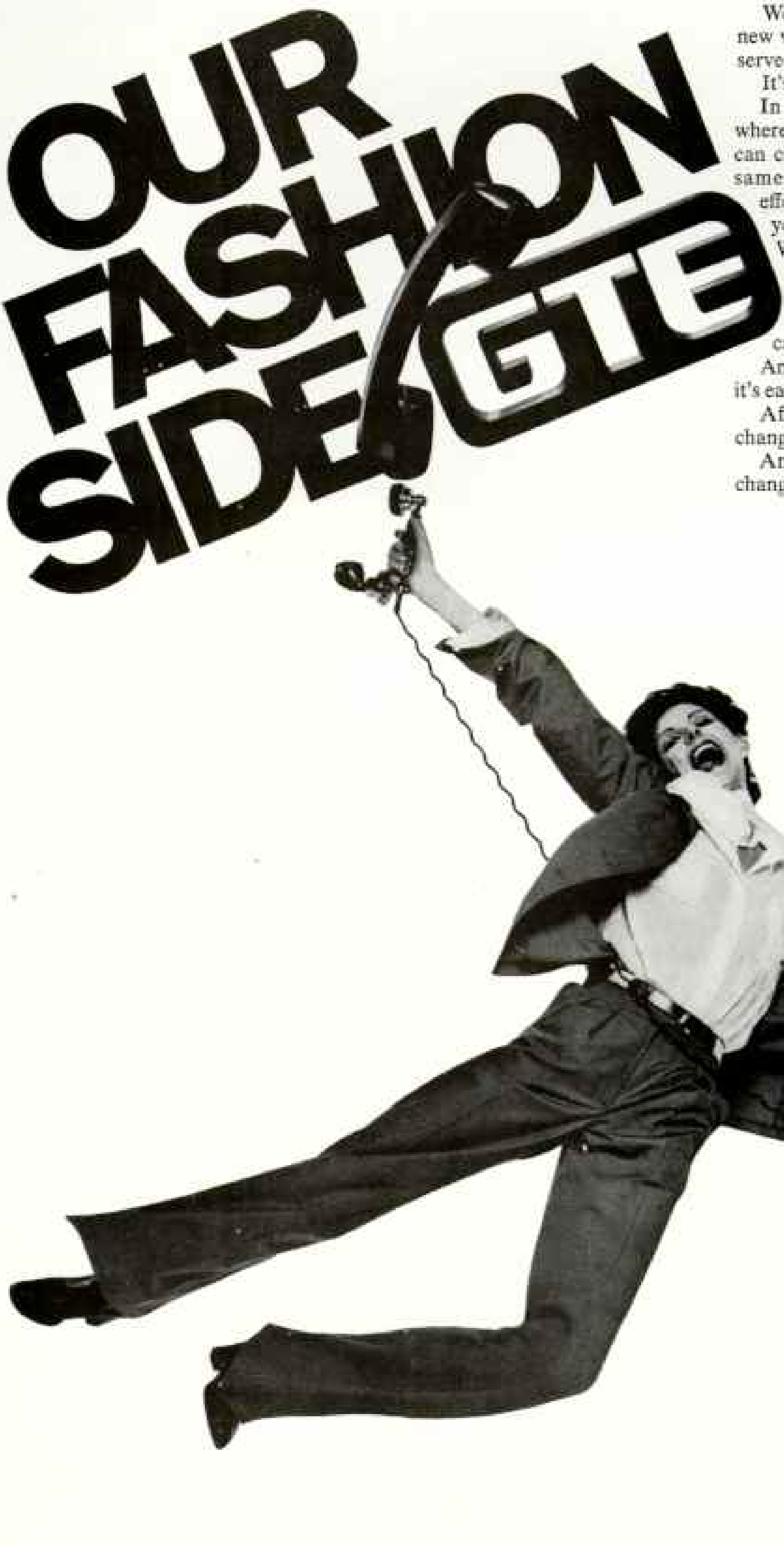
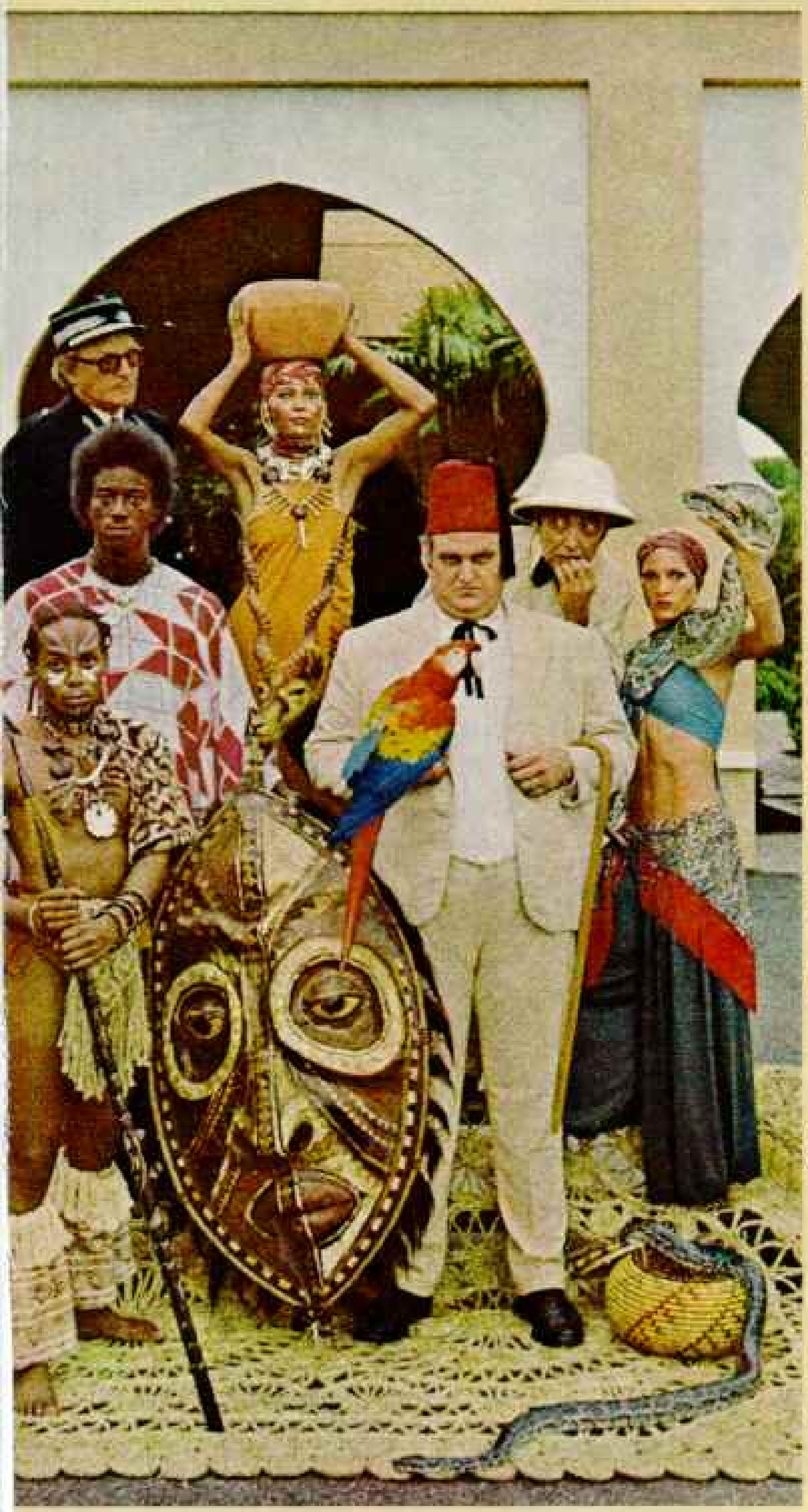


INSTEAD OF A ZOO, WE CREATED A CONTINENT.



Until 1910—since few men had set foot beyond Timbuktu—Africa was considered the Dark Continent, filled mostly with animals.

Then explorers discovered there was a lot more to Africa than animals.

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FIGUREHEAD OF JOSEPH CONRAD AT MARINE HISTORICAL ASSOCIATION, MYSTIC, CONN.

Woodcarver's art rode with captains courageous in the days of sail.

Figureheads are almost as old as sailing itself. Early Egyptians used them. So did Phoenicians and Vikings. They decorated prows of their ships with carved heads of horses, birds, and wild-eyed dragons. These, the ancient mariners believed, invoked the protection of guiding spirits.

Dawned the age of exploration, the spirits were largely forgotten. But not the figureheads. In England trained hands carved everything from Poseidon with his trident to St. George in wooden armor.

Colonial craftsmen brought the skills to America. In a vacant sail loft near the wharf the shipbuilder would chalk on the floor full-scale plans for the figurehead he envisioned below the bowsprit. The carver marked out the design on a block of seasoned wood and shaped it with mallet and chisel. Some figureheads he drew from live models, perhaps the shipowner's daughter.

Often a carving personified the ship's name—*Twin Sisters*, for example. Or *Joseph Conrad*, whose figurehead is portrayed here.

A tribute to the renowned writer-seaman by another of the same breed, the magnificent head came into being shortly after Capt. Alan Villiers acquired the old Danish square-rigger *Georg Stage* and renamed her in honor of Captain Conrad.

"A sailing ship had to have a figurehead," he declared. "The lovely sweeping lines of her cutwater looked wrong without one." So he asked his friend Bruce Rogers, the renowned typographer, to carve the bearded likeness.

Captain Villiers sailed *Joseph Conrad* around the world—a 57,800-mile voyage that lasted 555 days. He followed in the wake of early navigators, rounding Cape Horn under sail, as they did, and with their zest for exploration.

Villiers described the voyage in the February, 1937, GEOGRAPHIC, echoing a haunting passage from an even earlier issue: "The unchangeable sea preserves for one the sense of its past, the memory of things accomplished by wisdom and daring among its restless waves."

The writer? Joseph Conrad. To Conrad those restless waves were peopled "with unforgettable shades of the masters in the calling which . . . was to be mine, too."

And so they also are to Captain Villiers, as witness his many adventure-filled narratives about men, ships, and the sea. In August, 1968, he took GEOGRAPHIC readers to Mystic Seaport, Connecticut, living museum of America's sailing past.

"I rubbed my eyes and looked again," he wrote. Among a maze of spars and rigging he had spied the jutting figurehead of the *Joseph Conrad*, now permanently moored as a training vessel.

It was a memorable moment he shared, this sequel to a saga that appeared more than 30 years ago. But such moments have come to be expected in the pages of NATIONAL GEOGRAPHIC.

The East African Wildlife Society

announces

THE OFFICIAL AFRICAN WILDLIFE BRONZES

THE LION - ACTUAL SIZE.

The Official African Wildlife Bronzes

THE ELEPHANT - FULL FIGURE ACTUAL SIZE, DETAIL ENLARGED.

Six magnificent animal sculptures created exclusively for this limited edition

There will be only one edition of The Official African Wildlife Bronzes.
Available by advance subscription only.
Limit: one subscription per person.
Subscription rolls close: February 29, 1976.

IN THE ENDLESS SUMMER of East Africa's Serengeti Plain, survival belongs to the strong and the swift. To the lion and the antelope. The elephant and the giraffe. The rhinoceros and the cheetah.

Since the beginnings of time, the magnificent wild animals of Africa have challenged the imagination of artists. And no artistic medium has proved better suited to capturing the power and grace of these animals than bronze sculpture.

The tradition of bronze animal sculpture is one of the great traditions in the history of art—one that has come to be increasingly valued in our own time.

Now, in this great tradition, The East African Wildlife Society is proud to announce an extraordinary series of bronzes—created expressly for this limited edition collection by Don Polland, one of the most noted sculptors in the world today.

The Official African Wildlife Bronzes

To create these sculptures, the artist traveled to Africa so that he could study the animals in their native habitat. Each sculpture is accurate to the most minute detail. Each is a superb original work of art, capturing the wild animal in a moment characteristic of its life in nature.

The Lion pauses in mid-motion. His limbs are stretched to the full, the long muscles sharply defined. His teeth are bared, his claws extended, and he is ready to break into the fearsome attack that has made him lord of the plains.

The Greater Kudu—a large African antelope with sharp, twisting horns—stands poised for flight, head turned to the wind. The carriage of his head, his flared nostrils, his taut leg muscles—all are captured with remarkable skill.

The Elephant is charging, ears out, trunk raised, turning as he comes. His tusks have all the power of his mighty body behind them. You can almost hear him trumpeting his anger.

The Giraffe has just heard some distant sound across the plain. He stands tall and attentive, head cocked, ready to break into a run or to defend himself with his powerful legs and hooves.

The Rhinoceros stands ready for battle. He fears no other creature. Descendant of the dinosaurs, his hide is like armor-plate, and his short legs can carry his bulk with surprising speed. Irritable, near-sighted, he lowers his formidable head with its dreaded horn, which was long thought to have magical properties.

The Cheetah—fastest of all animals—seems to flow over the ground. He is captured in a running bound, in the intensity of his pursuit.

Each sculpture is completely true to life, sculptured in superb and authentic detail. The hairs of the elephant's tail, and the markings of his hide . . . the serrations of the kudu's horns . . . the extended claws of the lion . . . each fine detail is sculptured with absolute fidelity.

Individually hand-cast in bronze

Each of these bronze sculptures will be individually hand-cast by the ancient "lost wax" *(cire perdue)* process. This "lost wax" casting technique is an art which has been passed from father to son through the generations. It is the same painstaking, time-consuming method that was used by Cellini, by Rodin, by Frederic Remington.

After casting, each bronze will be individually finished by hand. This hand-finishing imparts a special, characteristic patina to the bronze sculpture, and calls for meticulous craftsmanship.

Because each bronze will be produced to order, it will take several months to complete the work. Therefore the six sculptures in the complete collection will be produced and delivered as a series, at the rate of one every three months.

A single, strictly limited edition

There will be only one edition of The Official African Wildlife Bronzes. The sculptures will be issued *solely and exclusively to original subscribers.* No one else will be given the opportunity to acquire this collection. The sculptures will not be available individually, and they will not be sold through art galleries or stores. They are available *only* by direct, advance subscription.

The absolute closing date for all subscriptions is February 29, 1976. And there is an absolute limit of one collection per subscriber.

The advance subscribers will be *the only people in the world* to acquire these bronzes at the original issue price. Those who later desire to acquire the collection can only hope to obtain it from one of these original subscribers.

The East African Wildlife Society has appointed The Franklin Mint, world-renowned for the quality and artistry of its limited edition collectibles, to direct the creation and production of these sculptures and to service all subscriptions.

Because of the extensive handwork involved in the making of these bronze sculptures, The Franklin Mint must reserve the right to limit the number of subscriptions that will be accepted. Therefore, all subscription applications are subject to acceptance by The Franklin Mint.

The subscription plan

The first sculpture in the collection will be completed and sent to subscribers approximately eight to ten weeks after subscription rolls close. The remaining five sculptures will be issued thereafter at the rate of one every third month.

The official issue price is $120 for each sculpture, payable in three equal monthly installments of $40 each.

Thus, you will be able to acquire this extraordinary collection of limited edition bronze sculpture on a convenient monthly basis.

Please note carefully that this is *the first and only time* The Official African Wildlife Bronzes will ever be offered. All subscriptions must be postmarked by February 29, 1976, to be eligible for acceptance. The total edition will be permanently limited to the number of subscriptions postmarked by that date and accepted by The Franklin Mint. Subscription applications will be accepted in order of receipt, and it may be necessary to close the subscription rolls before February 29, 1976. It is therefore suggested that applications be entered promptly.

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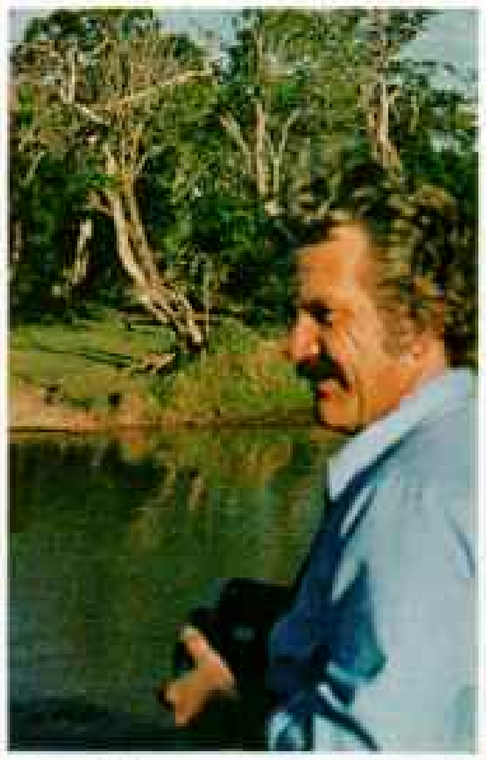
NATIONAL GEOGRAPHIC

THE GREATER KUDU - DETAIL ENLARGED

Don Polland on safari with camera and sketchpad



As the first step in the creation of The Official African Wildlife Bronzes, sculptor Don Polland went on safari to East Africa.

He filled scores of sketchpads with on-the-spot drawings and studies of the animals he would soon be sculpting. "I sketched from the back of a Land Rover, in boats, on rocks . . . anywhere I could get to for a clear look at the animals," Polland reported.

"What I wanted was the emotional reaction of these animals. How each one would react to different situations. I wanted to see how they move. How they stand. How they express their emotions through their entire bodies.

"There's all the difference in the world between these animals in the wild, and the same animals in a zoo. Their bodies are far leaner and more muscular. Their facial expressions are different. They move differently.

"And it's the essential quality of these animals *in the wild* that I have attempted to capture in my bronze sculptures."

Sculptures in bronze have been Don Polland's chosen medium since his teenage years. Like many of the great sculptors of the past, he often casts his bronze sculptures himself. His bronzes have been acquired by major private and public collections, both in the United States and abroad.

The East African Wildlife Society is an international organization headquartered in Nairobi. The organization's principal purpose is to safeguard the wildlife and environment of East Africa.

The Official African Wildlife Bronzes is the first sculpture collection ever sponsored by the Society.

THE FRANKLIN MINT
Franklin Center, Pennsylvania 19091

"We must preserve natural forests."

"We must have more wood."

Many Americans say our forests are a priceless national heritage to be preserved forever. Other people think these trees should be harvested for houses, paper and other wood products. Both views seem right, but contradictory.

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But these same forests are sources of essential raw materials for paper, furniture, homes. Chemicals for industry. Waxes, adhesives. Cellulose derivatives for clear coatings. Wood flour for plastic fillers. Our forest product needs will double in 25 years.

What to do? Cut? Or let stand? The answer may lie in the forests themselves.

They are a marvelously renewable resource. When cut, they can be regrown for harvest again. We can balance our need for wilderness and parks—for great forests—with our need for wood products. Forever.

But it takes responsible forest management. Today, managed forest industry lands produce about twice the wood of non-industry lands. We need to bring this kind of management to more forest lands. To restock idle scrub, to make wider use of genetically superior trees. To encourage tree farming.

These measures will both increase wood production and broaden forest lands.

Caterpillar machines work our forests: in land preparation, clearing, building roads, fighting fires, replanting, harvesting. We know how important forests are to our way of life.

There are no simple solutions. Only intelligent choices.

CATERPILLAR

"Pandamonium" reigns in the Nation's Capital. Hsing-Hsing, shown nibbling a stalk of bamboo, and his look-alike, Ling-Ling, are packing them in at the Washington Zoo. First giant pandas seen in America in 20 years, they came as ambassadors of goodwill from the People's Republic of China. In return, the United States sent two musk-oxen—Milton and Matilda—to Peking. Rare as moon rocks, pandas in captivity number fewer than 20, most of them in China. It is hoped that the Washington pair will increase the number when they reach maturity in 1976. Now two-year-plus juveniles, they frolic and fatten in separate quarters, eyeing each other through mesh fencing. To meet these and other exotic creatures, readers regularly turn to the pages of NATIONAL GEOGRAPHIC.

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But then, Pontiac doesn't design cars to stand still. No matter how great they look. Take our small cars, like the classy new Sunbird. Or the sporty little Astre. Both our subcompacts were designed to look terrific. Both were Pontiac engineered to give you great gas mileage. Both our subcompacts were EPA rated at 35 mpg highway, 22 mpg city, using our available 140-cu.-in. 2-bbl. L-4 engine and manual transmission.* Of course, all EPA figures are estimates. The mileage you get may vary according to how and where you drive, your car's condition and available equipment.

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There's only one official National Bicentennial Medal. Choose those which please you best. Or invest in them all.

Medals not shown actual size.

AMERICAN REVOLUTION BICENTENNIAL 1776-19[illegible]

The most dramatic medal collection in American history

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First gold medal offered for sale to the public under specific Congressional authorization. Companion pieces in silver, bronze and gold-plated bronze.

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.900-inch gold		$100	
3-inch silver		$150	
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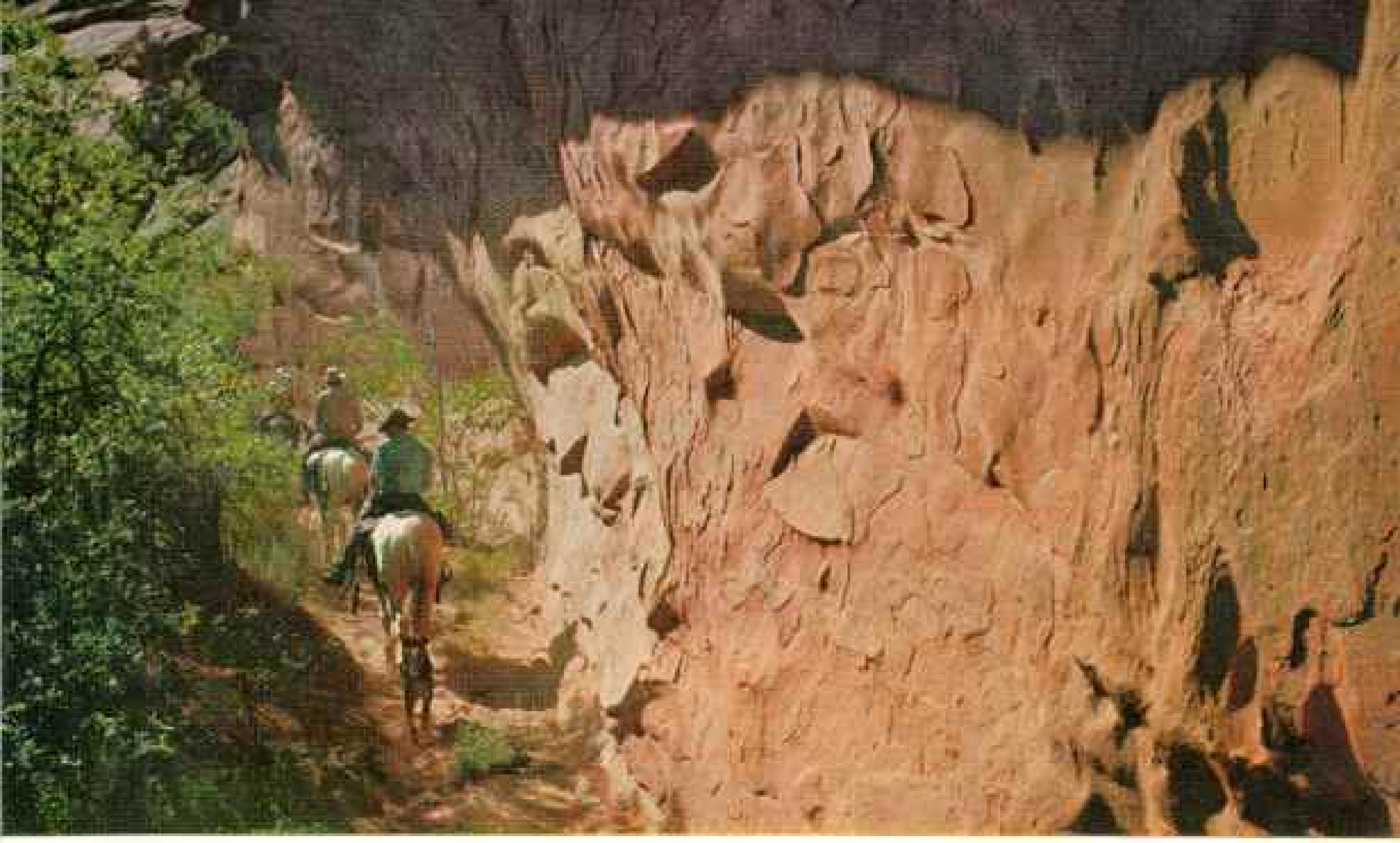

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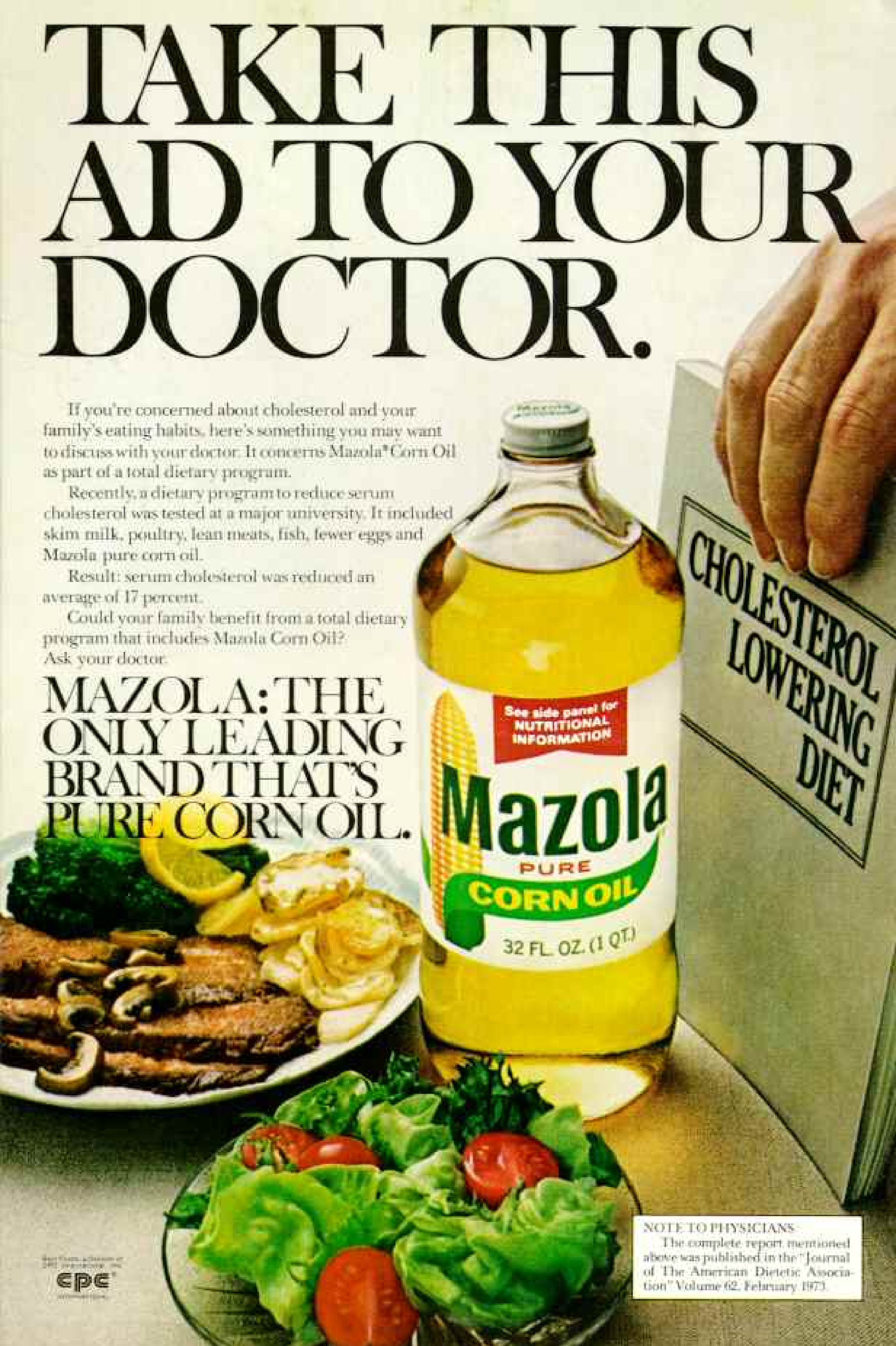

NOTE TO PHYSICIANS
The complete report mentioned above was published in the "Journal of The American Dietetic Association" Volume 62, February 1973.

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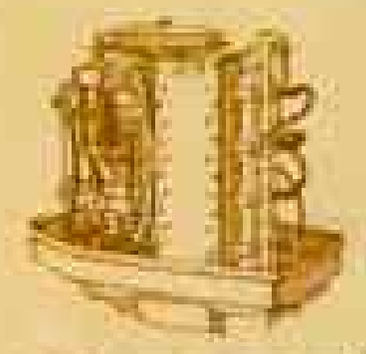

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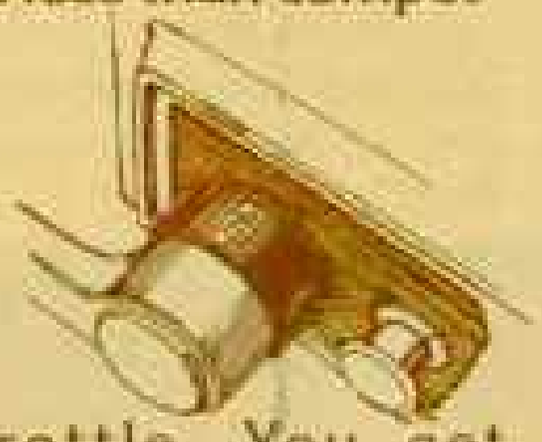

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