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FOR YEARS it has been the vogue in the United States to refer to our drug subculture. A recent report by 11 U. S. government agencies makes it clear we can drop the "sub." We are a drug culture.

The estimated consumption of illegal drugs in the U. S. in 1983 was staggering:

Marijuana: 30 million pounds (which might make 30 *billion* "joints"—125 for each man, woman, and child in the nation).

Cocaine: 110 to 130 thousand pounds (as many as a billion "snorts").

Heroin: 9,000 pounds (140 million "hits").

Add to this close to 500 million gallons of the socially acceptable and legal drug alcohol in beer, wine, and liquor, and the even more devastating use of tobacco.

Man's fascination with mind-warping and body-wrecking drugs is not a new fad. It predates written history. The ancient Minoan poppy goddess wore a tiara decorated with three pods of the poppy flower.

Before they became controlled substances in 1914, medicines that contained cannabis, cocaine, opium, and morphine were widely sold. The 1896 Sears, Roebuck catalog offered "pills and granules" for humans containing mixes of the above, and also morphine tablets for animals. Ironically, the 1899 catalog also offered a "Cure for the Opium and Morphia Habit" for 75 cents.

Today all such medicines are by prescription only, but the illicit traffic in drugs is a huge industry in states such as Florida and California. Not since Prohibition have so many fortunes been made in illegal trade.

Arguments can be made for decriminalizing drug use. Providing cheap—or even free—drugs to registered addicts would eliminate the pusher, exorbitant street prices, and, presumably, the rampant crime traced to addicts. Realistically, I think the market is too lucrative for dealers and too abhorrent to others for it ever to be legalized.

Drug abuse will never be eliminated, but we must increase young people's sensitivity to the difference between constructive use of drugs and destructive abuse, and maximum effort must be applied to enforce present laws and treaties. In his article on the Jekyll-Hyde nature of the poppy, our ever positive-thinking Peter White has, unlike most authors, pointed out its virtues, but neither he nor statistics such as those above leave any doubt about its potential for evil.

Wilbur E. Garrett

EDITOR

NATIONAL GEOGRAPHIC

February 1985

The Poppy—For Good and Evil 143

Peter T. White and photographer Steve Raymer report on Papaver somniferum, the source of untold suffering, unrivaled pain relief—and the seeds on your dinner roll.

Mummies of Qilakitsoq 191

Startlingly well preserved, 500-year-old Inuit bodies offer new insights into the life of the early Greenlanders. By Jens P. Hart Hansen, Jørgen Meldgaard, and Jørgen Nordqvist.

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Threading harbors, inlets, and islands, David Jeffery and Kevin Fleming meet the lobstermen, boatbuilders, and entrepreneurs who carve a living from this granite shore.

Northern Approaches Map

From early exploration and settlement to fishing, farming, and industry in the 1980s, a detailed look at America's northeast coast.

Time Catches Up With Mongolia 242

Former masters of Asia, Mongolians reach for industrial strength under Soviet guidance. Thomas B. Allen and photographer Dean Conger document some time warps.

The Long, Lonely Flight 270

First transatlantic solo balloonist, Joe W. Kittinger, Jr., describes the three and a half days aloft that won him that title as well as the record for solo flight distance.

COVER: *Doll-like child was one of eight mummies found in Greenland. Photo by John Lee, National Museum, Copenhagen.*

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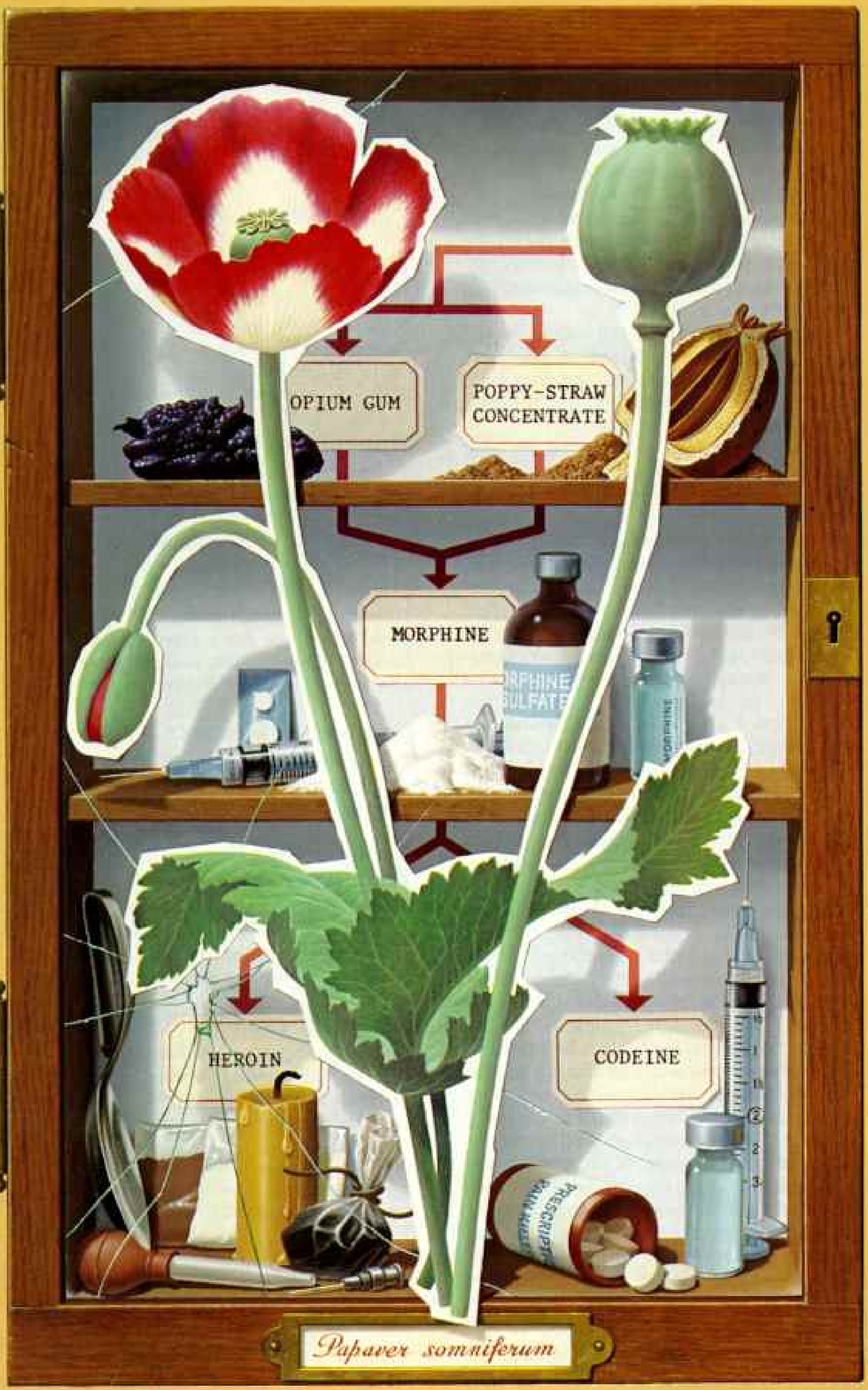

OPIUM GUM
POPPY-STRAW CONCENTRATE
MORPHINE
HEROIN
CODEINE
Papaver somniferum

THE POPPY

By PETER T. WHITE
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by STEVE RAYMER
NATIONAL GEOGRAPHIC PHOTOGRAPHER

Blessing and curse, *the opium poppy offers mankind freedom from pain but, in misuse, also enslaves. Ancient cultures valued opium for medicine and religious ritual, but knew its addictive, even lethal, nature as well.*

Nineteenth-century scientists isolated and intensified the poppy's strengths. Opium gum and poppy-straw concentrate hold the natural alkaloid morphine, still regarded as unsurpassed in treating violent pain. Codeine, a weaker opiate, relieves moderate pain and coughs. Heroin, chemically treated morphine, is now a worldwide problem as a street drug that claims countless addicts, wrecks lives, and deals death.

Poppies of many species blanket the world with floral beauty, but only Papaver somniferum *yields such great potential for good and evil.*

NATIONAL GEOGRAPHIC ARTIST WILLIAM SEIDLER

AMONG the 400,000 or so species of plants known in the world today, *Papaver somniferum*—that pretty little poppy whose petals may be white or red or mauve or purple—is unique in its profound and far-reaching effects on humanity, both good and evil.

That's hardly the way Mrs. Ouida Parsons saw it when police pulled up and burned the poppies in her garden in Tecumseh, Oklahoma. "My land," she said, "I've never seen such a to-do over a bunch of flowers." True, those were opium poppies, illegal in the United States. But she'd been growing some for 40 years. "I never did pay it a bit of mind, that opium business."

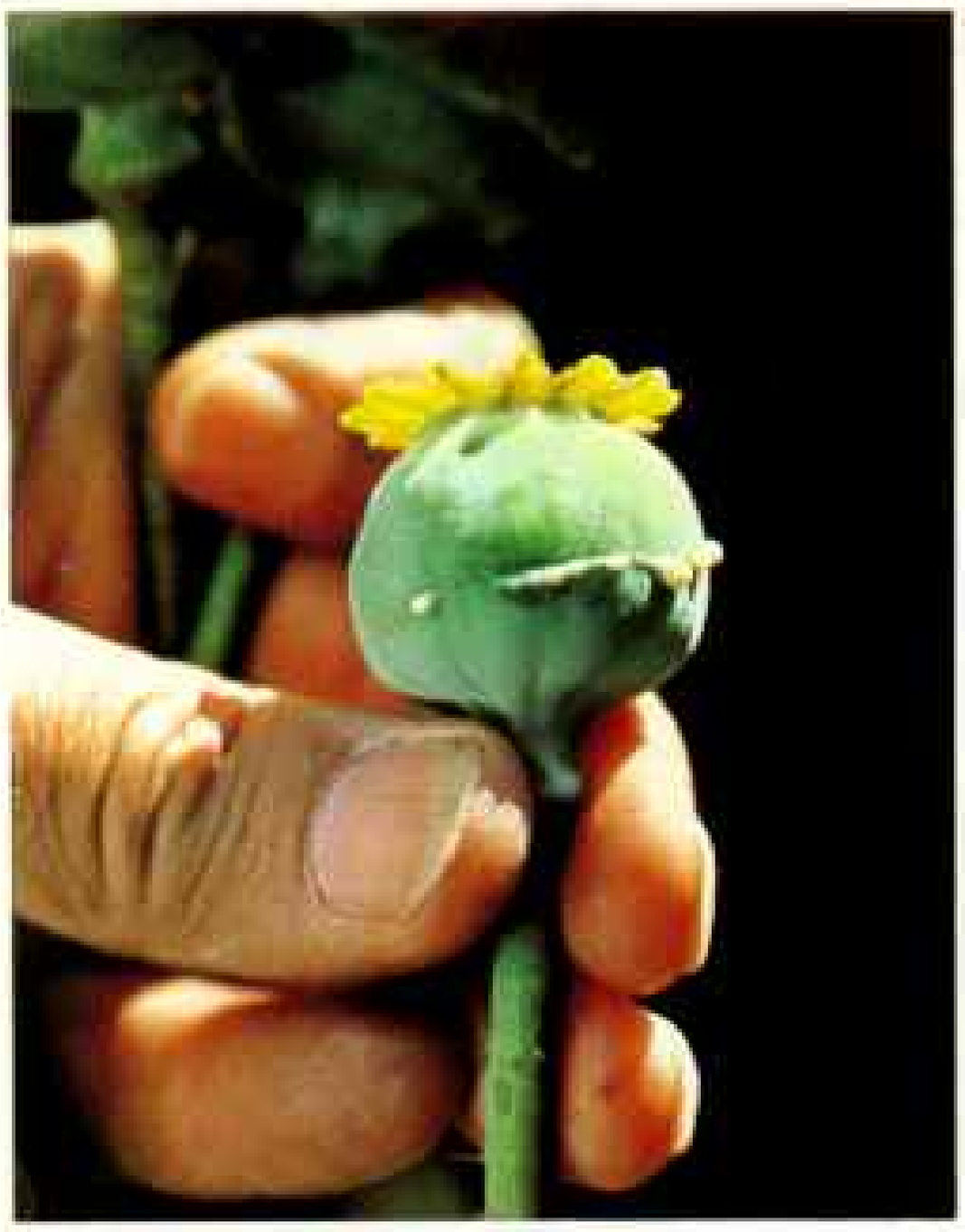
Yet what awesome business it is, the opium poppy and all that comes from it—and how closely it touches so many of us.

For example, the drug codeine. It comes in pills to relieve pain after operations or tooth extractions, in syrups to soothe coughs. In 1983, the most recent year for which such figures are available, codeine was the key ingredient in 65 million prescriptions dispensed by American drugstores; among all the new prescriptions filled, Tylenol with codeine was number one. If there's codeine in your medicine cabinet, chances are two to one it was processed by a government-authorized company from black opium gum imported from India, where tens of thousands of farmers raise poppies under licenses from *their* government. All perfectly legal, a good thing for everyone involved.

But from *Papaver somniferum* also comes the drug heroin—usually a powder, white or beige or chocolate brown, nearly all produced by outlaws, primarily from poppies illicitly grown in remote corners of Asia or Mexico. Smuggled into the U. S., it reaches nearly every community and every level of society, bringing addiction and misery to hundreds of thousands. Theft committed for money to buy heroin is a major cause of crime in American cities.

Incidentally, in case you're wondering about poppy growing in a neighbor's garden: That may be the corn poppy, *Papaver rhoeas*, the species that impressed the poet John McCrae in Flanders fields; or, most likely, the Oriental poppy, *Papaver orientale;* perhaps the California poppy, *Eschscholtzia californica,* the state flower of California. Nothing illegal about those.

Papaver somniferum resembles them all but is crucially different and—for a variety of reasons, as we shall see—of considerable



Harvest of opium *begins with incising the poppy's unripened seed capsule to release the alkaloid-rich latex soon after the petals fall* ***(above)****. Within 24 hours the gum darkens and is scraped off* ***(below)****. It can be stored and retain its potency for years. Even with successive lancings, each capsule yields only a small amount of opium. It takes nearly 3,000 poppies to produce a joi—1.6 kilograms (3.5 pounds)—a standard trading weight of Southeast Asia. The joi being weighed by a Thai trader near the Burma border* ***(facing page)*** *will sell for about $170 and will most likely end up as heroin.*

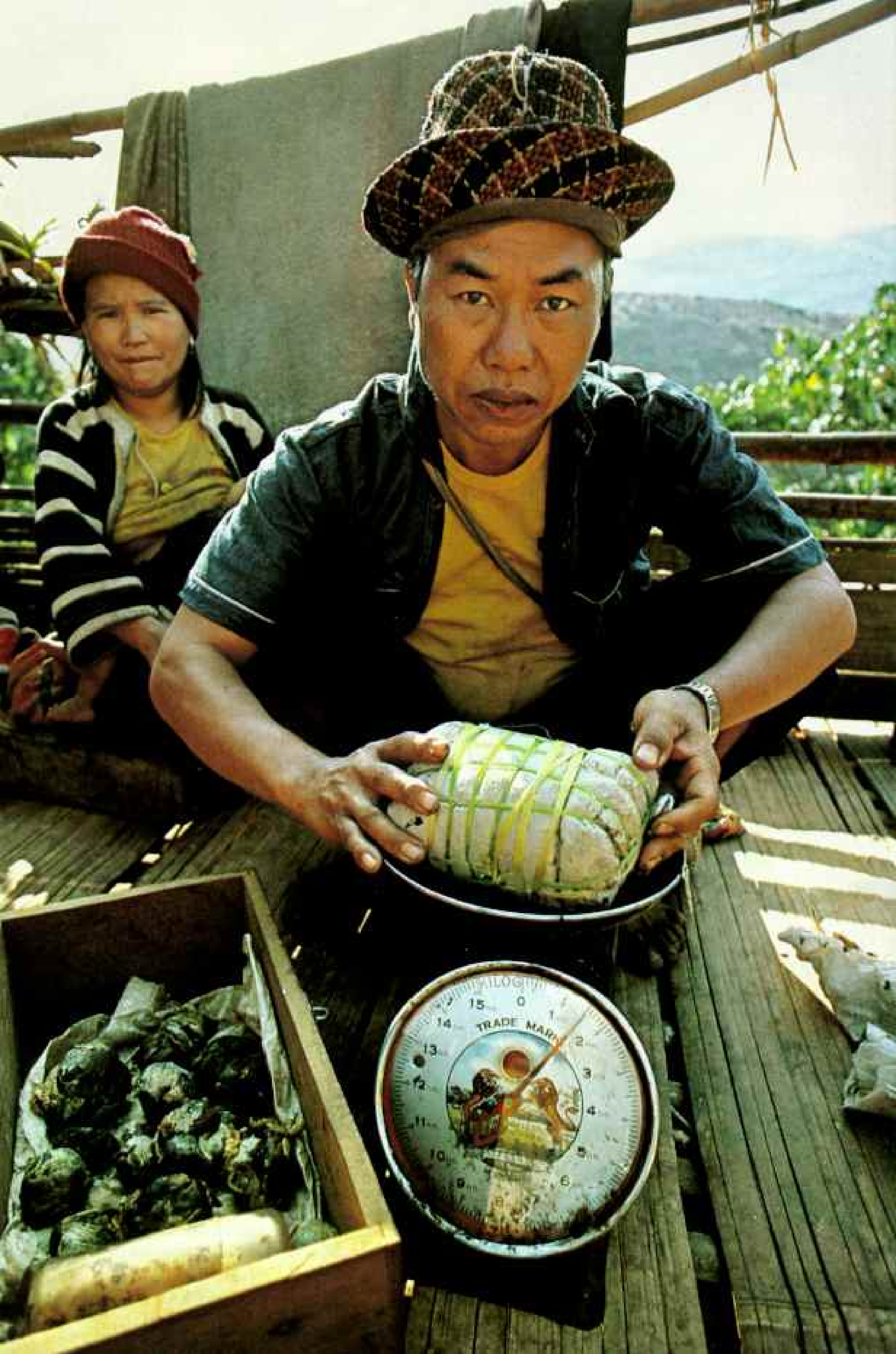
concern to a great many people around the world. To Turkish farmwives, say, and to the premier of Tasmania. To grade-schoolers in China and Iran's Ayatollah Khomeini. To a warlord in Southeast Asia; to scientists of many countries now looking deeply into the workings of the brain. . . .

WHAT GIVES the opium poppy its power for good or ill? First off, it's chemistry: Day and night certain nitrogen-containing compounds, or alkaloids, are produced by the plant and stored in its cells. After the petals fall, the seed capsule swells; if the capsule is shallowly incised while still green and unripe, a milky, alkaloid-rich sap seeps from tiny tubes in the capsule wall. It dries, darkens, turns gummy—that's opium. In its long recorded history it initially appears as an accessory of magic and religious ritual, as a sedative and sleeping potion.

Among the exhibits devoted to medicine in the Science Museum in London I see five-inch-high ceramic jugs shaped like poppy capsules, one with stylized incision marks. They are from Cyprus, late Bronze Age, circa 1500 B.C.—presumably to hold opium dissolved in water or wine, for export to Egypt. Soon Egypt grew poppies too. They figure on Greek coins, pottery, and jewelry, on Roman statuary and tombs.

In Homer's *Odyssey* the potion Helen of Troy mixes—"to quiet all pain and strife, and bring forgetfulness of every ill"—is thought to have contained opium. There has even been speculation about the "vinegar mingled with gall" offered to Christ on the Cross (Matthew 27:34); the ancient Hebrew word for gall, *rôsh*, means opium.

Certain is that from the fourth century B.C. onward the fathers of Western medicine recognized it as a pain reliever—Hippocrates, Dioscorides, Galen. Around 1530 Paracelsus is said to have dissolved it in alcohol; this tincture of opium became known as laudanum. The Science Museum has scores of old medicine chests, and almost all have laudanum in them, says a curator, it was so widely used. By 1815 a German pharmacist, F. Sertürner, had isolated the principal opium alkaloid—$C_{17}H_{19}NO_3$—and named it for Morpheus, the Greek god of dreams. Hence morphine, to this day in every U. S.


TRADE MARK

Forbidden fields *of poppies alternate with wheat in Pakistan's North-West Frontier Province. In 1979, when opium was declared illegal, 32,376 hectares (80,000 acres) were planted. In 1984 fewer than 2,500 hectares were said to remain. Since 1981 aggressive crop-replacement programs funded largely by the United States have offered villages improved roads, water, and electricity if they abandon poppies for such*

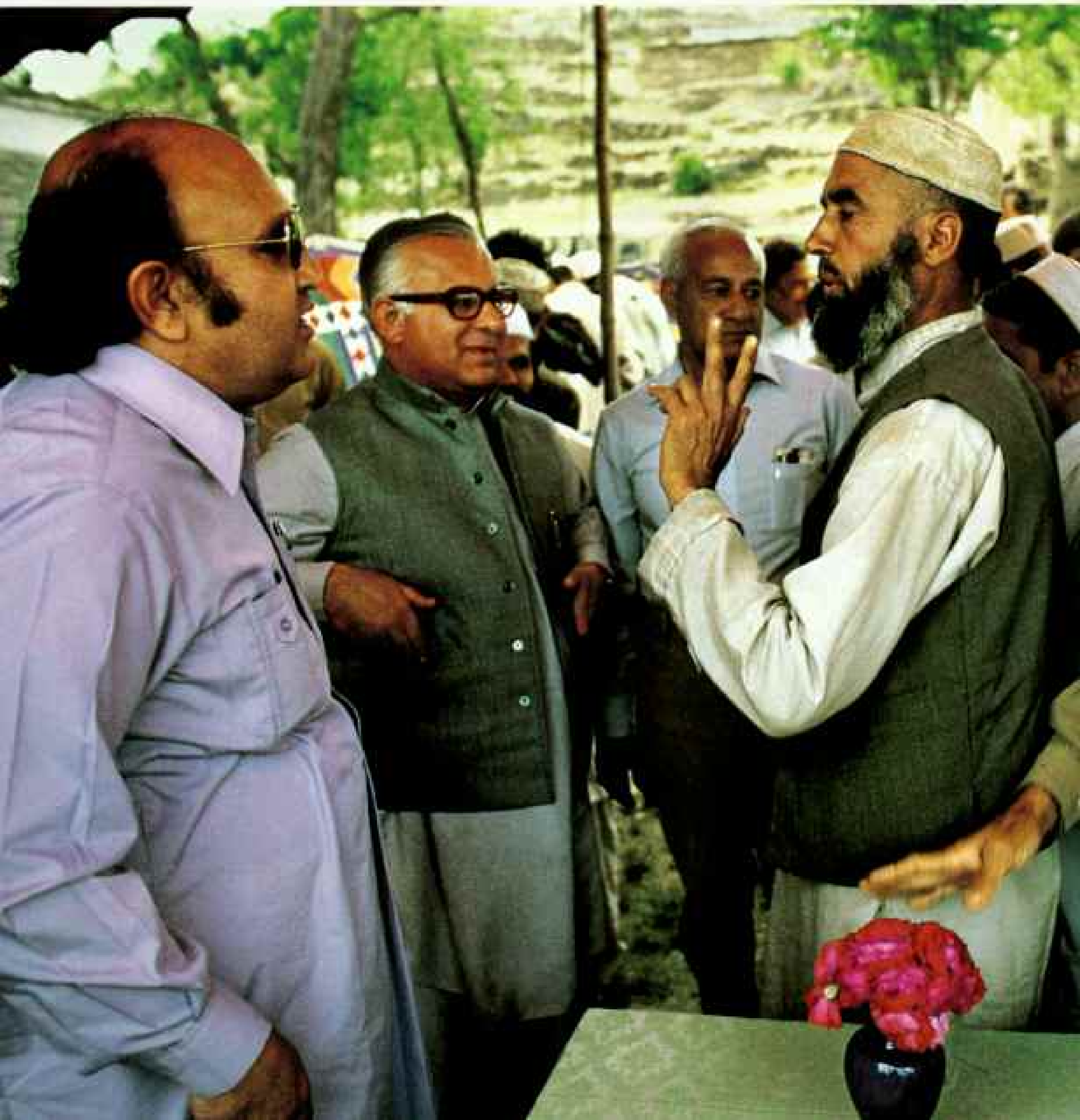
cash crops as wheat, barley, potatoes, and apples. Despite these efforts, in the past five years Pakistan has become the world's major exporter of heroin. Opium from Pakistan and Afghanistan, formerly converted to heroin in Iran, is now mainly processed along the Afghan border and smuggled out through Pakistan. Increasingly it stays there; heroin addicts, once virtually unknown in Pakistan, are now estimated to number 150,000.

hospital pharmacy; it is the modern world's standard against which all pain medicines are measured.

My doctor tells me that for the worst sort of acute pain—a kidney stone, acute pancreatitis—morphine is unequaled. Ambulances carry it in case someone is severely burned or pinned in a wreck; and especially for cases of congestive heart failure—morphine dilates blood vessels, preventing fluid from backing up into the lungs. In every U. S. Army infantry platoon the aidman's kit holds morphine; a badly wounded soldier may get it injected into a muscle right through his clothing. That's why opium and morphine are in the U. S. Strategic and Critical Materials Stockpile.

But a long time ago, too, it was found that too much opium, drunk or eaten, can kill. Too much laudanum, taken too long, can bring misery, as it did to the 19th-century writer Thomas De Quincey. In *The Confessions of an English Opium-Eater* he tells how he at first experienced music like perfume, living a hundred years in one night, ecstasies of divine enjoyment. But eventually, addiction and horror—thousands of years in stone coffins, cancerous kisses from crocodiles.

Similarly, morphine could also become a



problem, especially after the hypodermic needle, invented in 1853, facilitated shortcuts to euphoria. In 1898 came the marketing of heroin—morphine to which has been added one of certain chemicals related to acetic acid, increasing its strength as an analgesic, or pain killer, about two and a half times. Introduced in Germany as a remedy for cough and diarrhea, heroin was also proposed as a morphine substitute, less likely to lead to addiction. The opposite proved true.

In the human body, heroin is rapidly decomposed into morphine again; but when heroin is injected directly into a vein, the first effect is a rush, an overpowering sensation of pleasure. The long-term effects tend to be devastating: addiction, or dependence, of a double sort. Physical—if you don't have it, you get sick, nauseated, hurting all over; that can be overcome in a week. And psychological—you want it more than anything else; that may stay with you for life.

Many addicted to morphine or heroin will do almost anything to get it—lie, steal, prostitute themselves. The writer William Burroughs, formerly hooked himself, calls it the ultimate merchandise. "The client will crawl through a sewer," he says, "and beg to buy." That, plus human greed, can make the poppy so formidable a troublemaker.

Current U. S. government estimates of consumption of illegal drugs, and the wholesale and retail prices they bring, suggest that Americans spend four billion dollars a year for heroin. For other illicit drugs not related to the poppy, it's more: 18 billion for cocaine, refined from the leaves of the coca shrub; 44 billion for marijuana, the dried leaves and flowers of the cannabis plant. But compare the markup as these drugs pass from wholesaler to consumer. For cocaine and marijuana, as much as 200 percent. For heroin, 900 percent!

Heroin smuggled into the U. S. runs to about four metric tons a year, according to DEA, the Drug Enforcement Administration; nearly half has its roots in the land of the rifle-carrying Pathans that straddles the border of Afghanistan and Pakistan.

AND NOW I am in Pakistan's North-West Frontier Province for the opium harvest in April. In the Dir district, along the road at 2,200 feet elevation in the Shewa Khwar Valley, poppies are still in bloom—white, pink, scarlet; they sway in the wind. Over the mountains to the west is Afghanistan. Water rushes over rocks. A cock crows. It's idyllic.

I branch off *(Continued on page 155)*

"**Give us one more year** *to grow poppies," plead village elders to unyielding Pakistani officials, left, who promise them aid to develop alternate crops. When poppies were planted again, local militia plowed up the fields, sparking a violent protest.*

LEGAL CULTIVATION

Opium

Poppy straw

Poppy seeds

ILLEGAL CULTIVATION

Opium

Heroin smuggling routes

Figures shown are in hectares.
One hectare equals 2.47 acres.

To U. S. from Hong Kong and Singapore

Los Angeles
Tijuana
UNITED STATES
CANADA
MEXICO
Houston
Chicago
Detroit
Montreal
New York
NORTH KOREA
U.S.S.R.
Amsterdam
NETHERLANDS
UNITED KINGDOM
London
To U. S. and Canada
EAST GERMANY
POLAND
HUNGARY
CZECH.
YUGOSLAVIA
ROMANIA
BULGARIA
FRANCE
SPAIN
ITALY
TURKEY
LEBANON
EGYPT
EQUATOR
Atlantic Ocean
To U. S.
SOUTH AMERICA
AFRICA
NIGERIA
Lagos

POLAND 15,000

EAST GERMANY 4,500

CZECHOSLOVAKIA 12,000

HUNGARY 5,000

NETHERLANDS 2,400*

YUGOSLAVIA 3,000

SPAIN 3,380

U.S.S.R. 15,000

FRANCE 4,200

TURKEY 22,950

BULGARIA 2,300

ROMANIA 12,300

AUSTRALIA (Tasmania) 6,050

*Netherlands government figure

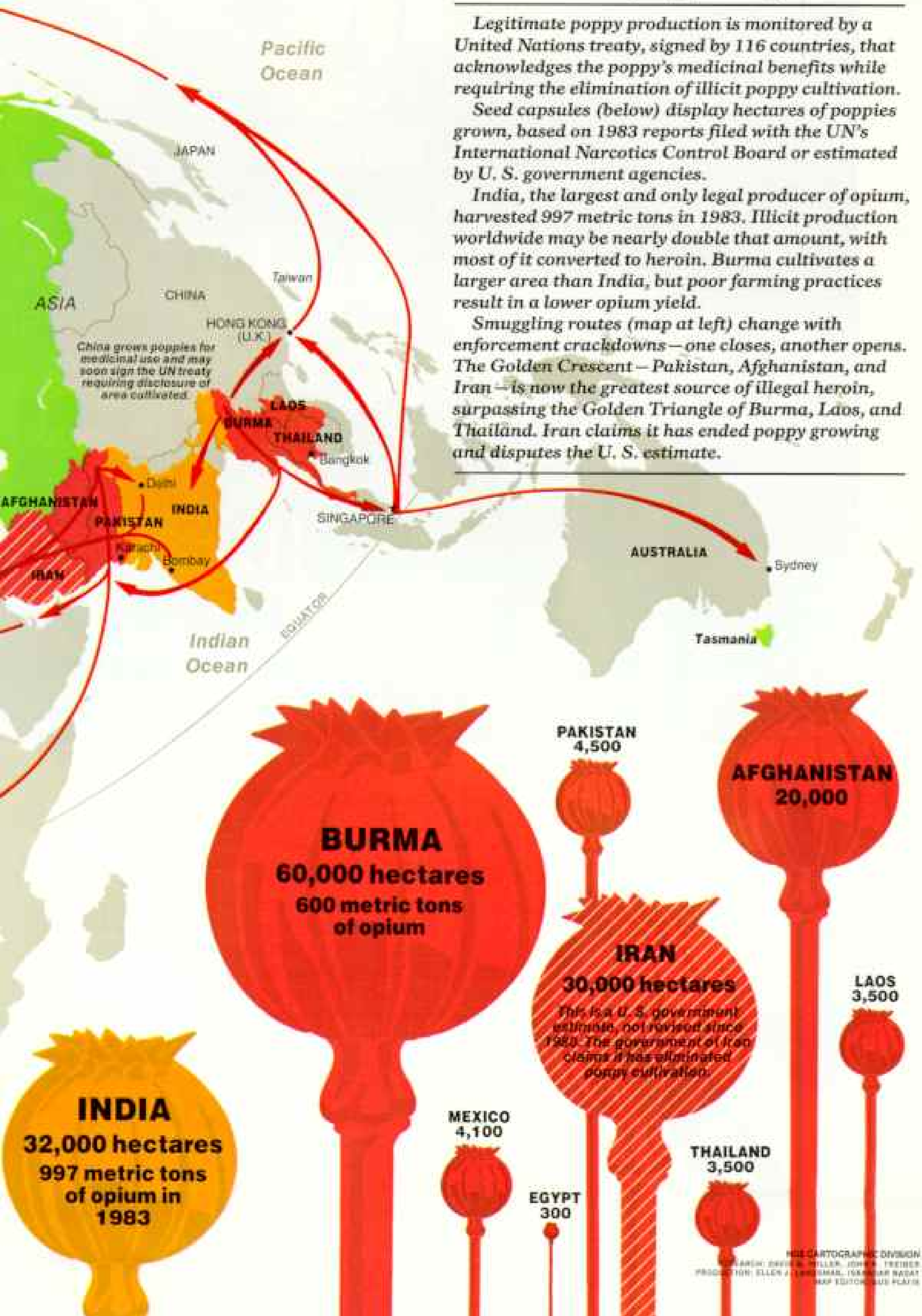
Where the poppies grow

Legitimate poppy production is monitored by a United Nations treaty, signed by 116 countries, that acknowledges the poppy's medicinal benefits while requiring the elimination of illicit poppy cultivation.

Seed capsules (below) display hectares of poppies grown, based on 1983 reports filed with the UN's International Narcotics Control Board or estimated by U. S. government agencies.

India, the largest and only legal producer of opium, harvested 997 metric tons in 1983. Illicit production worldwide may be nearly double that amount, with most of it converted to heroin. Burma cultivates a larger area than India, but poor farming practices result in a lower opium yield.

Smuggling routes (map at left) change with enforcement crackdowns—one closes, another opens. The Golden Crescent—Pakistan, Afghanistan, and Iran—is now the greatest source of illegal heroin, surpassing the Golden Triangle of Burma, Laos, and Thailand. Iran claims it has ended poppy growing and disputes the U. S. estimate.



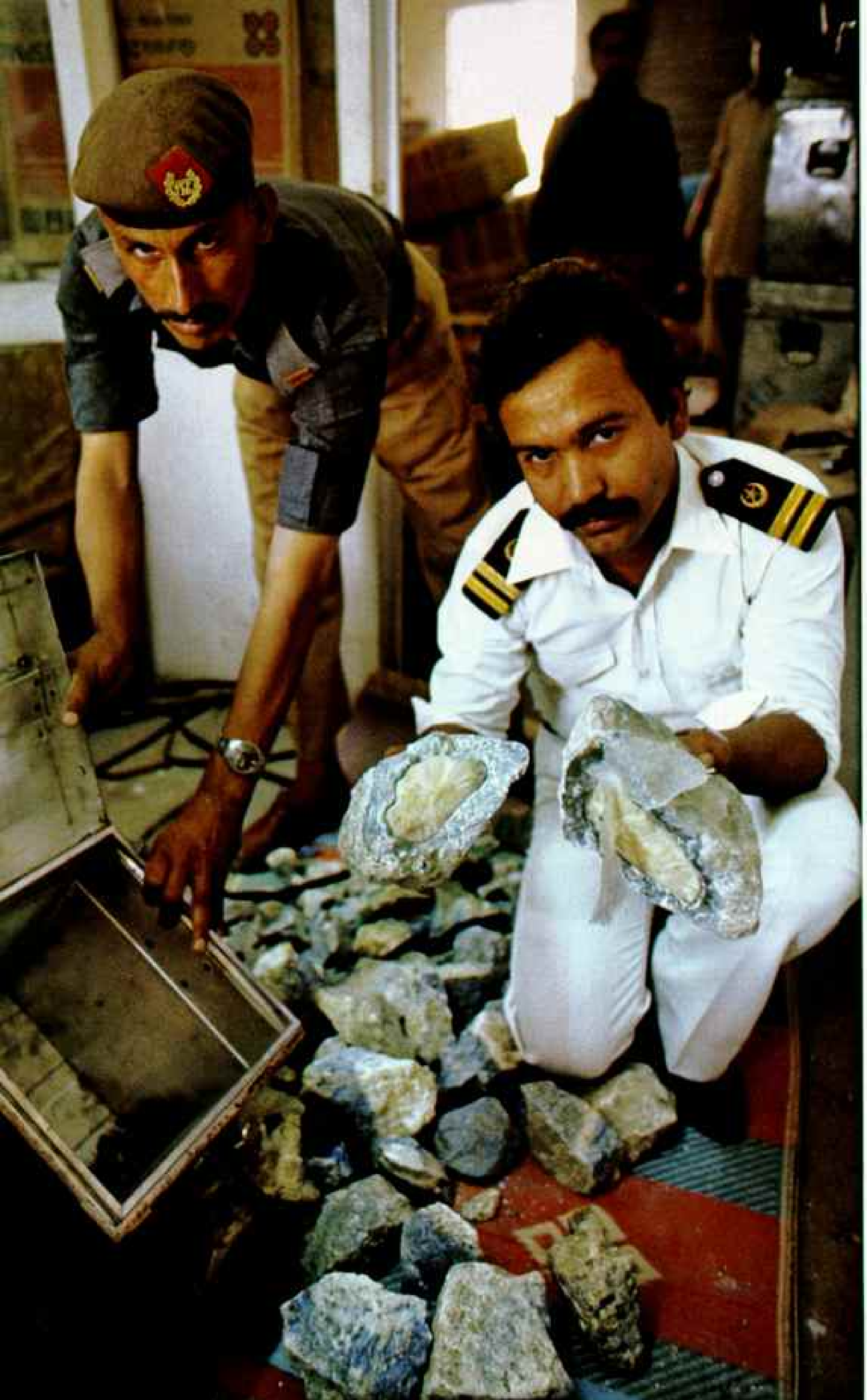
NGS CARTOGRAPHIC DIVISION

CLAY JUG AT PETRIE MUSEUM, UNIVERSITY COLLEGE, LONDON; IVORY PIPE AT CYPRUS MUSEUM, NICOSIA

"Subtle and mighty opium." *Thus English essayist Thomas De Quincey described the drug known to man throughout history. Traders from Cyprus carried opium mixed with wine or water to Egypt in a 1300 B.C. clay jug* ***(far left)****. Opium fumes were inhaled with a 12th-century B.C. ivory pipe* ***(left)*** *found in a temple on Cyprus. A marble child atop a third-century A.D. Roman sarcophagus* ***(right)*** *holds poppies, symbolizing release from life's pain.*

Poppies, thought to be native to the eastern Mediterranean, probably spread east with Arabic traders to India around the seventh century. By the 17th century opium was being smoked in China, scene of the Opium War of 1840-1842. Defying a Chinese edict, foreign merchants imported the drug in exchange for silver. When the Chinese destroyed opium stocks near Canton, the British attacked. An English painting ***(above)*** *portrays the capture of Dinghai in 1840. The subsequent Treaty of Nanking ceded Hong Kong to the British and opened main Chinese ports to other foreigners.*

NATIONAL ARMY MUSEUM, LONDON (ABOVE); SARCOPHAGUS AT MUSEI CAPITOLINI, ROME (BELOW)



(Continued from page 149) into the Siah Valley at 3,000 feet; terraces are dotted white up to 7,000 feet. Villagers say they grew even more when the opium price was higher; it's down to 400 rupees a kilogram, about $30.00—would I like to buy some?

Opium was banned here in 1979, when a new government in Islamabad declared it incompatible with Islamic law, which forbids all intoxicants; but officials tell me that these Pathans are tough, and independence-minded too, so the government has to move cautiously. In the Buner subdivision the poppies are gone—thanks to government firmness and money for rural development from the United Nations Fund for Drug Abuse Control. A similar program is nearing completion in the Malakand area with funds from INM, the U. S. State Department's Bureau of International Narcotics Matters. At the village of Kot, I watch as the provincial minister of agriculture meets the farmers (pages 148-9).

You must stop growing poppies, he says; grow apples and pomegranates instead.

We will, they say, but give us what we've been promised—tube wells, electricity, fertilizer, cheap loans.

The minister says you'll get them.

They say let's have them, then we'll stop growing poppies.

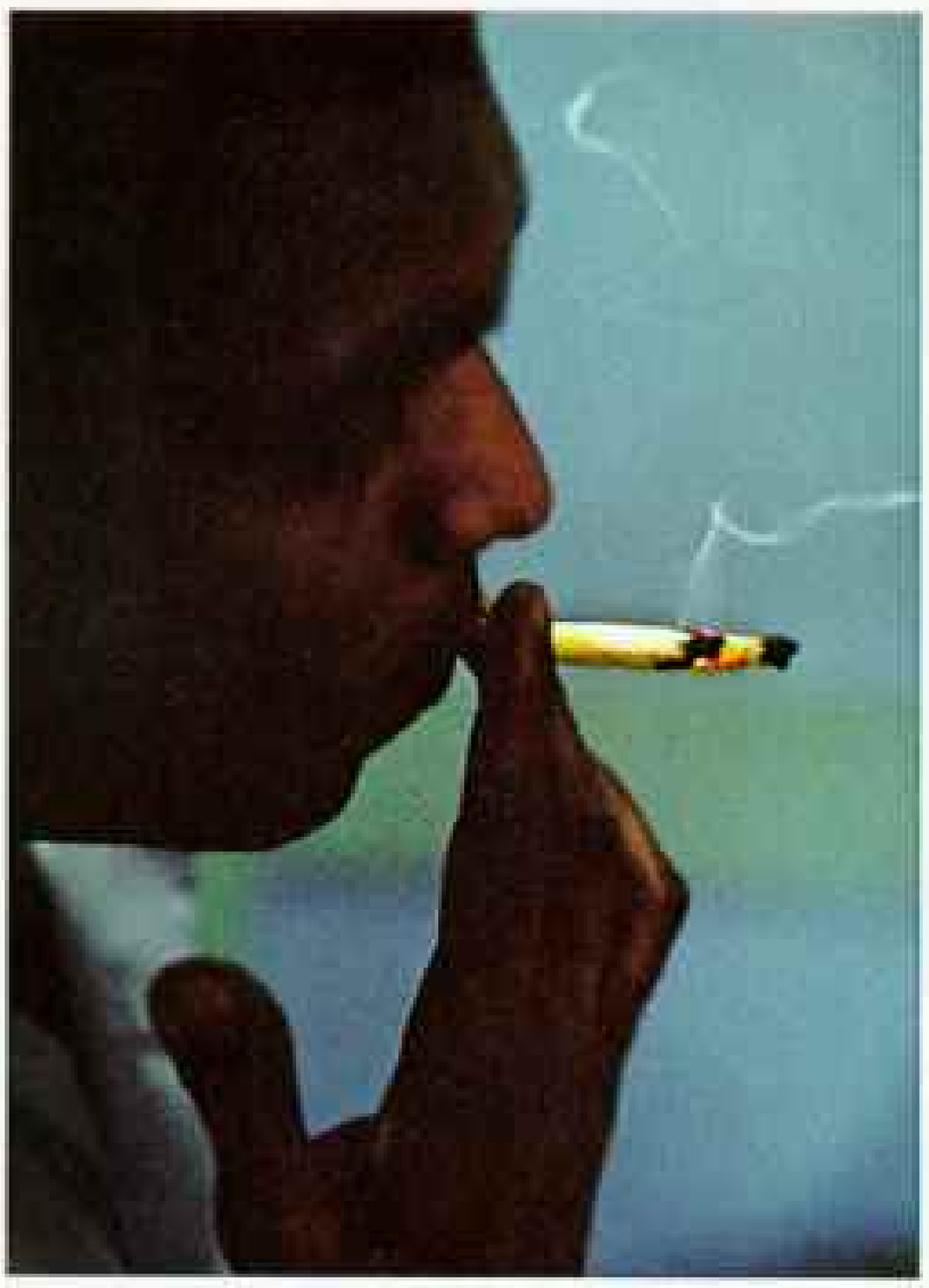
Around here the flowers are mostly gone. The incising of capsules has begun, with homemade multibladed knives; the opium will be collected tomorrow. Even at present prices it will pay at least five times better than anything else that could be grown here. And for what other crop would a buyer pay half in advance?

IN 1979 Pakistan had a bumper crop. Stuck with lots of opium, enterprising Pathans said why not turn it into heroin for Europe and America? It's not too difficult. Dissolve 10 or 12 kilos of opium, add a precipitating agent, and press—the particles left amount to about one kilo of crude morphine, called morphine base. Treat that with acetic anhydride, and it's one kilo of "powder," as heroin is called here.

I see the modest laboratory paraphernalia—basins, tubing, bottles of chemicals on a collapsible picnic table, a simple press. This is in the little town of Landi Kotal, in the Khyber Pass, a so-called tribal area, quasi-autonomous; here, by tradition, the government's resident political agent may deal with the tribesmen only through their councils of elders. The political agent explains that after intense persuasion the local elders agreed to hand over dozens of labs. Venerable elders tell me they care about ethics, not money. They are proud to have ordered an end to the making of powder here.

In Peshawar, the booming provincial capital, a prominent physician tells me don't be naive. "When the economic interest comes, when the windfall profits accrue, who listens to the elders? Foreigners have such illusions."

What about government claims of opium



Ingenious smugglers *concealed a kilogram of top-grade heroin in lapis lazuli* ***(facing page)*** *bound from Peshawar, Pakistan, to Amsterdam. Its ultimate street value? Perhaps one million dollars. Golden Crescent heroin is increasingly smuggled through India, where local use has grown. A New Delhi student* ***(above)*** *adds the cheap, abundant drug to a cigarette—a slow but certain route to addiction.*

cultivation drastically cut since 1979? True, he says, but everybody knows opium is available from Afghanistan; it is even cheaper there. And labs are still around—farther off the road, perhaps, or over in Afghanistan. "For a Pathan, that border doesn't exist."

Certainly the weekly heroin seizures are unprecedented, astronomical, and rising. Customs officers show me an oil truck that carried 490 kilos of heroin. In a police safe, 1,000 kilos; abroad, that could bring a quarter of a billion dollars, *wholesale*.

A DEA man stationed in Islamabad says the biggest stream of morphine base and heroin now loosed on the Western world comes from or through Pakistan. Most of it goes out from Karachi by ship, and by air courier to London and Frankfurt, to New York, Chicago, Houston, Montreal. Now Pakistan has tens of thousands of heroin addicts too. In 1979 there were hardly any.

PAPAVER SOMNIFERUM is cultivated in dozens of varieties adapted to do well in various climes and soils—from the latitude of southern Sweden to the Equator, in the mild spring of English gardens or the scorching pre-monsoon heat of lowland India. About ten varieties grow in India, capsules shaped from oblong to elongate, yielding sap that's white or pink.

India is the world's biggest poppy grower, eager to export opium for medicines. Nowhere else does poppy culture mean so much to so many. How much hand labor it takes to obtain opium comes home to me in Rajasthan, where each capsule is incised, or lanced, four or five times.

Villagers tell me the second lancing yields better than the first, the third is best, the fourth and fifth very poor; but every little bit is wanted. The morning after each lancing, the congealed blackish opium must be scraped off with an iron scoop before the heat makes it stick too tightly. Thus each capsule may be handled ten times.

I notice that people light incense sticks and remove their sandals before entering a poppy field. Pious Hindus do that in Rajasthan, says a district opium officer—out of respect for the goddess Kali. Mother Kali. Opium is a bounty from her. Not only is it the best cash crop. Your opium-growing license is a status symbol—you want your daughters to marry into a family that also has one; it certifies a man as hardworking and honest. How so? Well, if you don't produce enough, or are suspected of not selling all your opium to the government, as required, you'll be de-licensed.

Another good thing about poppies. They condition the soil especially well for maize, the staple here. "Rotate maize and opium, and you'll have both food and income."

Licenses for small plots have been granted to 170,000 families in India, in 6,900 villages; so, given the usual family size, at least a million people are directly involved. Beyond that, laborers hired for the harvest also benefit, like a certain Mrs. Sitabai who works at it every year. She gets ten rupees, about 95 cents, for three hours in the morning and three in the afternoon—maybe 200 rupees a season, or $18. It really helps, she tells me; her children need clothes, and it's 50 rupees for trousers, 35 for a petticoat.

As we talk, a little green parrot watches from a tree, waiting for us to go. Then he'll dive, make off with a capsule, and eat the wet white seed inside. The freshly collected opium smells like new-mown grass.

I see more patient handwork in the Government Opium and Alkaloid Works at Nimach in Madhya Pradesh. Eight hundred rectangular pans, each filled with about 35 kilos of opium, sit in the sun. Every half hour or so each pan is stirred by two men with wooden paddles. The opium is shiny, like blackish chocolate icing (following pages).

When raw opium comes in, says the superintendent, it's about 70 percent solids, 30 percent water. Eight to twenty days of stirring, depending on the sun, will make it 90 percent *(Continued on page 162)*

Giving thanks for the bounty *of the Hindu goddess Kali, farmers in Rajasthan celebrate the beginning of the opium harvest. India licenses 170,000 growers, who must sell their opium to the government. Because the price is currently depressed —about $15 per kilogram—some farmers earn more by selling the poppy seed.*

Stirring a legal brew, *workers at India's Ghazipur processing plant, built by the British in 1820, wield wooden paddles in trays of raw opium* ***(above)****. The gum dries in the sun for eight to twenty days to reduce the water content from 30 to 10 percent. When dried, the opium is formed into five-kilo loaves* ***(below)****.*

Tray upon tray, each holding 35 kilograms (77 pounds) of opium, fill the yard at the Indian government's other plant in Nimach ***(right)****. Guards patrol constantly to deter diversion to the illicit drug market. Workers must shower at the end of the day to remove traces from their clothes and bodies, and opium is then extracted from the runoff water. The author and photographer were required to clean their shoes before leaving the plant.*

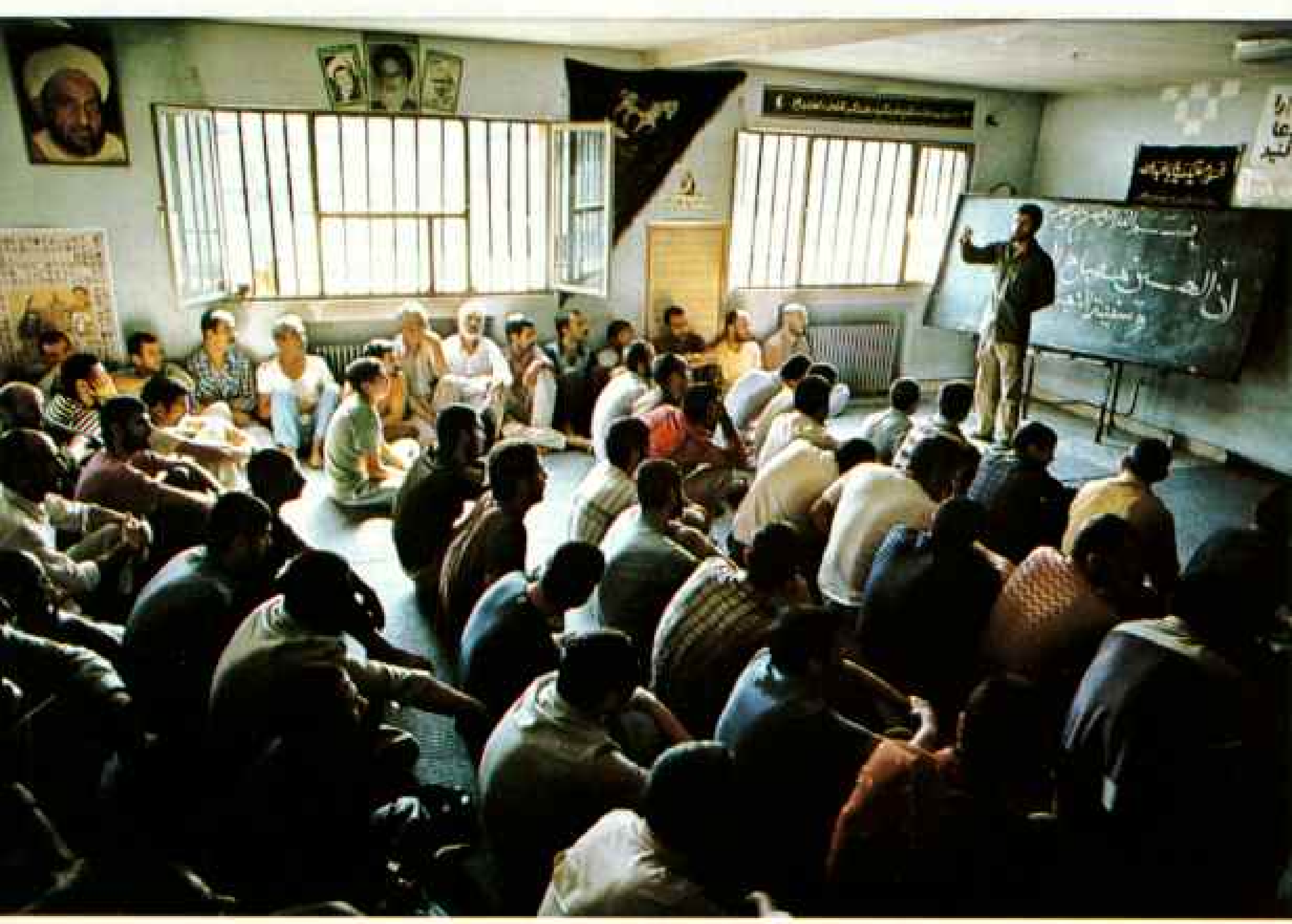
India supplies two-thirds of the opiates required annually by pharmaceutical companies in the United States, its best customer. It also sells to the U.S.S.R., France, the United Kingdom, and Japan.

پخش هروئین در سراسر کشور براساس توطئه‌ای است
«امام خمینی»

روابط عمومی دادسرای انقلاب اسلامی مبارزه بامواد مخدر مرکز

*"**You are Muslims** and your country needs you." With heavy doses of religion and patriotism, Iran treats opium and heroin addicts in a Tehran rehabilitation center (**below**). Traffickers face execution. Despite a crackdown on poppy growing, Iran still has one of the world's highest addiction rates, fed by drugs from Afghanistan and Pakistan. A poster (**left**) bears Ayatollah Khomeini's charge that the U. S. conspires to distribute heroin in Iran—an accusation also leveled at the Soviet-bloc nations.*

*In traditional Iranian style, an opium-smoking doll in a Tehran hotel gift shop (**right**) heats his pipe bowl with charcoal to release the drug's essence. The shah outlawed opium in 1955 in an attempt to modernize the country and increase efficiency. In 1969 the ban was lifted, growers were licensed, and opium became legal for registered addicts. The 1979 revolution declared all intoxicants illegal.*



solids—that's export quality. "We do it this way because we want to be labor-intensive, we want to provide jobs."

Those pans in front of me hold nearly 40 tons of opium. Indoors I see great concrete tanks, black up to the top. One is ten feet deep, as big as a backyard swimming pool—for 450 tons, the world's largest opium receptacle. That one's empty, ready for the current crop. How much is in storage here? "About a thousand tons."

At a second factory, in the Ganges Plain at Ghazipur, it's 1,500 tons! Workers are smeared with opium; after they shower and wash their clothes, watched by men from the Central Industrial Security Force, that opium will be recovered from the runoff.

DESPITE the Indian government's best efforts, some opium leaks to an illicit domestic market. After all, it's long been used in India.

Opium was given to war elephants of the Mogul Empire—and to Indian soldiers under the British—to make them brave and feel less pain if hurt. Inside the Taj Mahal, built by the Emperor Shah Jahan as a tomb for his favorite wife, I see his marble cenotaph inlaid with carnelian poppies; he drank opium in his wine.

Today construction workers and wheat harvesters will put a tiny ball of opium—a *goli*—under the tongue and drink it down with tea; they say it gives endurance and cures their ills. In Calcutta a goli seller says wherever there are long-distance truckers there's a supplier. They'll drive 200 miles on the Great Trunk Road, sleep a few hours, have a woman, take opium, and go again—a thousand miles to the Punjab; in the long run their health will deteriorate, but they say if they have opium, they'll be all right.

And of course opium is legally available to doctors of India's ancient Ayurvedic medicine, for sprue, asthma, scorpion bites. A noted practitioner in Varanasi (Banaras) tells me he mixes herbal juices into his opium medicine to counteract the bad side effects, such as constipation; he'll adjust the dosage downward without telling the patient, so when the treatment ends, there'll be no withdrawal sickness, no addiction. . . .

That old redbrick factory in Ghazipur, built by the British East India Company, now ships opium in five-kilo polyethylene bags, 12 bags per chest, to Britain and the U.S.S.R., to St. Louis and to Newark; beginning in the 1820s it packed opium for China, and thereby hangs a fateful tale, a piece of history that has cast a long shadow.

Here's that tale.

Dutch sailors introduced tobacco smoking to Formosa (now Taiwan) in the 1600s; Chinese colonists there mixed tobacco with opium and introduced that mixture to the mainland, where tobacco was dropped and opium smoked alone. This became crucial in the China trade. Foreigners wanted Chinese silks and tea; the emperor permitted them to come, to the port of Canton—but Chinese demand for foreign goods was small, so traders had to pay with silver, increasingly expensive, a problem. The solution was opium, brought by American ships from Turkey, by Britishers from India. The emperor in Peking had forbidden opium, but mandarins at Canton could be persuaded. . . .

Opium smoking spread, and the mandarins became tougher, so the foreigners moored storage ships in the mouth of the Pearl River, just outside Chinese jurisdiction. As more opium poured in, Chinese smugglers had to pay for it with more and more silver. For the product of the poppy keeps increasing the demand for it.

And so the British East India Company grew ever more poppies in India, for opium to be auctioned in Calcutta. Then, swift opium clippers carried it 3,700 miles to those storage ships off Canton. About a sixth of India's revenues and, via Britain's import tax on tea, much of the money for the Royal Navy came from the opium trade. A British historian says it was probably the largest commerce of its time in any commodity.

As the flood of opium imports kept rising, China was drained of silver, and the emperor decreed drastic countermeasures. He sent an incorruptible commissioner, Lin Tse-hsü, who took the foreign merchants in Canton hostage until they turned over all their stored opium. He destroyed it. Thereupon the British sent warships and troops. The Chinese defenders were crushed.

Results of the fateful Opium War: First off, the Treaty of Nanking, 1842, giving Hong Kong to Britain, plus vast indemnity payments and the opening of more ports to

foreigners. Eventually, foreign-ruled enclaves, or "concessions"—British, French, German. And lasting bitterness in China—a virulent ingredient in the social and political ferment that would lead to one of the most momentous upheavals of the 20th century.

IN Canton, now Guangzhou, in the place where those foreign merchants' houses stood on Thirteen Trading Company Street, I find a cultural park with Chinese opera and chess, a video arcade, an anticorruption exhibit.

And three hours' drive to the southeast, near Taiping, close to the mouth of the Pearl River, now the Zhu, I visit the Resist-British-Imperialism museum. Here Commissioner Lin had two basins dug on Humen beach; the confiscated opium—1,126,681 kilos from the British, 61,446 from Americans—was put in, with lime. What was left was flushed out to sea. The museum director says the Opium War marks the beginning of modern Chinese history. And also—he points to a quote from Chairman Mao on the wall—the start of the Chinese people's revolution against imperialism and feudalism.

Outside, hundreds of schoolchildren arrive with flags, trumpets, and drums. Before a commemorative obelisk, a teacher barks commands. All freeze for three minutes of silence. Then a troop of ten-year-olds, wearing the red scarves of the Young Pioneers, recites a poem honoring heroes of the Opium War. "Our red color is dyed by your death blood. . . ." All pledge allegiance to the motherland and to the Communist Party, and march off to tour the forts that fired in vain against the British men-of-war.

In Taipei, on the island of Taiwan—now the anti-Communist Republic of China—I ask at the Academia Sinica how members of its Institute of Modern History look on the Opium War. "Mention the words to anyone on the street and photograph the faces," says a research fellow. "You'll see expressions of being offended, humiliated, a memory one cannot forget." He says it's an overwhelming psychological factor for Chinese here, on the mainland, everywhere. The institute director mentions a Chinese motto, that hardship and disaster will stimulate a country to do better.

The opium-fed China trade made fortunes for Englishmen, Scotsmen, Parsis in India. Also for Americans, from families subsequently prominent in Boston, Philadelphia, Baltimore. In the time of the slave trade, it was to many just another business, no worse than dealing in alcoholic spirits. In the Baker Library at the Harvard Graduate School of Business Administration, I read correspondence of Russell & Co., the biggest American opium-trading firm in the 1830s.

Old habits die hard *in the Golden Triangle, where a Lisu man in a Thailand village smokes opium to celebrate the Chinese Lunar New Year. A cross indicates that this may have been a Christian home. The Thai government and international agencies promise aid if hill villages substitute such crops as coffee and mushrooms for poppies. But official pressure is lax in this region, where insurgent groups often hold sway.*

Surprise visit by Thai rangers *found Hmong harvesting opium, despite an agreement to stop commercial poppy growing. But government assistance*

Among its partners then: Joseph Coolidge, Robert Bennett Forbes, Warren Delano, Jr.

Sometimes opium profits contributed to excellent causes, such as the founding of Girard College for orphan boys in Philadelphia. Some were eventually invested in transcontinental railroads and industrial expansion after the Civil War. And, sometimes, perhaps, there was remorse. It's been said that when T. H. Perkins lost his eyesight, he thought it punishment for his opium trading; in any case, he gave handsomely to what is now Boston's Perkins School for the Blind. Helen Keller studied there.

Moreover, the United States government, spurred by anti-opium sentiment rising in the late 19th century, joined with China in seeking controls on opium. The U. S. has been the moving force behind all such efforts since—from the International Opium Commission that met in Shanghai in 1909 to the worldwide treaty now in force. It's known as the Single Convention on Narcotic Drugs. The 116 parties agree "that the medical use of narcotic drugs continues to be indispensable for the relief of pain and suffering"; that adequate amounts must be kept available; but "that addiction to narcotic drugs constitutes a serious evil for the individual . . . a social and economic danger to mankind." This treaty calls for international cooperation against drug abuse, within the framework of the United Nations.

During the biennial meeting of the UN

*was not withdrawn, since they had reduced their crop by half. On a hill known as Poppy Mountain, Lisu women also collect opium (**above**).*

Commission on Narcotic Drugs, in Vienna, I hear of global heroin availability up alarmingly; seizures have doubled in Spain and in Australia; heroin trafficking around the world is at an all-time high. Debate on what to do about it reflects differing casts of mind. The U. S. delegate urges reduction of supply—we should give priority to eradication of illicit poppies. Governments must demonstrate the necessary political will! Norway and Sweden talk of reduction of demand—make people stop wanting heroin, through psychiatric treatment for addicts, more education about the dangers of addiction. The U.S.S.R. says no, anti-drug propaganda only arouses more interest in drugs, we just forbid them. . . .

IN VIENNA the Islamic Republic of Iran said it has big problems with opium and heroin and is fighting them sincerely. I ask, may I visit to learn more? The answer is yes, and now I am in Tehran with a colonel of the gendarmerie.

He says the action is near the eastern frontier. Smugglers from Afghanistan and Pakistan bring the stuff over the mountains at night so the gendarmerie helicopters can't see them, and bury it in the desert until a deal is made. They come with jeeps. Or with camels that have been fed opium and conditioned to follow a special route to get more; thus they'll keep running all by themselves.

Won't somebody hijack those unattended opium-addicted camels?

Jungle refinery *for converting raw opium into morphine base is dismantled by a contingent of the Thai Border Patrol Police* ***(above)****. A few crude pots, simple chemicals, and a source of fresh water are all that is needed to create this substance from which illicit heroin is made. About ten kilograms of opium make one of base, which is compacted into a cake in a press* ***(right)****, also found in the camp. The lid bears the number 999, once the trademark of a Golden Triangle dealer. Drug enforcement officials say the number does not indicate 99.9 percent purity, but usually does signify high quality.*

The mark is now ubiquitous, appearing on a block of morphine base ***(facing page)*** *seized with a huge drug shipment on the Thai-Malaysian border. The contraband being examined by Thai National Police was found in March 1983 in the false bottom of a van that had been tracked from northern Thailand for 800 miles. The second largest seizure in more than five years, valued at more than $500,000, it contained 233 kilograms of raw opium, 72.6 kilograms of morphine base, and a small quantity of processed heroin.*

Heroin is created by treating morphine base with a chemical, acetic anhydride. More potent than morphine, heroin commands more money for the same amount of powder. Heroin was first marketed in 1898 as a cough and diarrhea remedy and falsely hailed as a morphine substitute less likely to cause addiction. Interestingly, once in the body heroin converts back to morphine.

Spectacular treatment *of addicts at Tham Krabok Monastery north of Bangkok* ***(left)*** *results in a 70 percent success rate, according to its records. The ten-day free treatment begins with a vow to Buddha never to use narcotics again. Then patients are given herbal medicine that makes them vomit immediately* ***(below left)****. The monks, who have treated 80,000 since 1959, say the medicine "clears poisonous drug residue from the body and helps eliminate the physical desire for drugs." Herbal steam baths, milder tonics, and herbal pills, along with continuous counseling, are part of the regimen. Most of the 100,000 to 300,000 heroin addicts in Thailand inject the drug. Easily purchased, it is sold in colored tubes* ***(below)*** *for less than one dollar each.*

Malaysia, one of the largest importers of Golden Triangle heroin, now counts 350,000 addicts. Herbal teas are also part of the cure dispensed by a Malay healer called a bomoh, who paints Islamic verses on the chests of his patients ***(right)****. Some 25 bomohs treat addiction in Malaysia, and authorities say the cure rate is about 60 percent.*

No, the smugglers have binoculars and they're heavily armed. "We go after them with armored vehicles." Even so, gendarmes have died.

A police colonel says his men just made a gigantic catch at the edge of the desert near Yazd: in a truck, under eight tons of onions, 1,050 kilos of morphine base! Bound for conversion into heroin at a clandestine lab near the Turkish border—half to go via Turkey to Europe, half to stay in Iran. There are an estimated 150,000 heroin addicts in the country, and 450,000 on opium.

I am told that Iran has a centuries-long history of opium—until the fall of the shah, opium smoking after dinner was acceptable in circles high and low; registered addicts could get legally produced opium cheap. The revolution made that *haram*—sinful, forbidden—and heroin spread, being easier to hide. Now this is seen as a political problem. I read the all-powerful words of Imam Khomeini: It's a plot, a conspiracy of the West and East to addict Iranian youth so they will be useless to the economy and in the war against Iraq. Victims must be cured and reeducated, he said, it's a religious duty.

Behind steel doors at Tehran's Bahar Addict Center, inmates from 13 to 60 stay two months—no medicine, plenty of pep talk. I listen to a bearded revolutionary guard in green fatigues: "If you could topple a regime supported by the superpowers, you can also defeat your habit, with determination. . . . You are Muslims, society accepts you, you can do it!" And a hundred men pray, then chant, "Allah is Great! Khomeini is our leader! Death to America, to the Soviet Union, Saddam of Iraq, Israel!" If after release they don't shape up, they go to jail.

For traffickers it's different, says Hojatoleslam Ahmad Zargar of the Revolutionary Court for Narcotic Crimes in Tehran. Every Iranian city has one. If they've done it before, and the evidence is clear, and the High Judicial Court approves, they're executed. This morning in Qasr Prison seventeen men and four women were hanged.

In the first year of chaos after the revolution of 1979, Iranian poppy planting rose dramatically, to 30,000 hectares. Then, clampdown. In Khorramabad, in Lorestan Province, I meet gendarmerie Capt. Ahmad Maleki who directed the destruction of 12,000 hectares in 1980—with tractors, in 500 villages. Now he drives me through the dusty mountainous region that was Iran's prime growing ground. At Noorabad we

visit a new unit to go after heroin labs in the mountains; he says they order their opium from Afghanistan by the ton.

Last week in Khorramabad a convicted trafficker was shot as thousands watched.

NEXT I GO to see what's new in the Golden Triangle—the Burma-Thailand-Laos area of Southeast Asia; I've been there repeatedly on other assignments. U. S. government estimates say about 20 percent of the heroin consumed in the U. S. comes from poppies growing here, near hundreds of villages scattered at 3,000 feet or higher, by the mountain people, as they're called in Thailand—the Yao, Hmong, and Akha; the Lahu and Lisu. They produce rice to eat and opium for medicine and for cash, to put into silver bars or ornaments, maybe a good rifle or a radio, or more pigs or a buffalo.

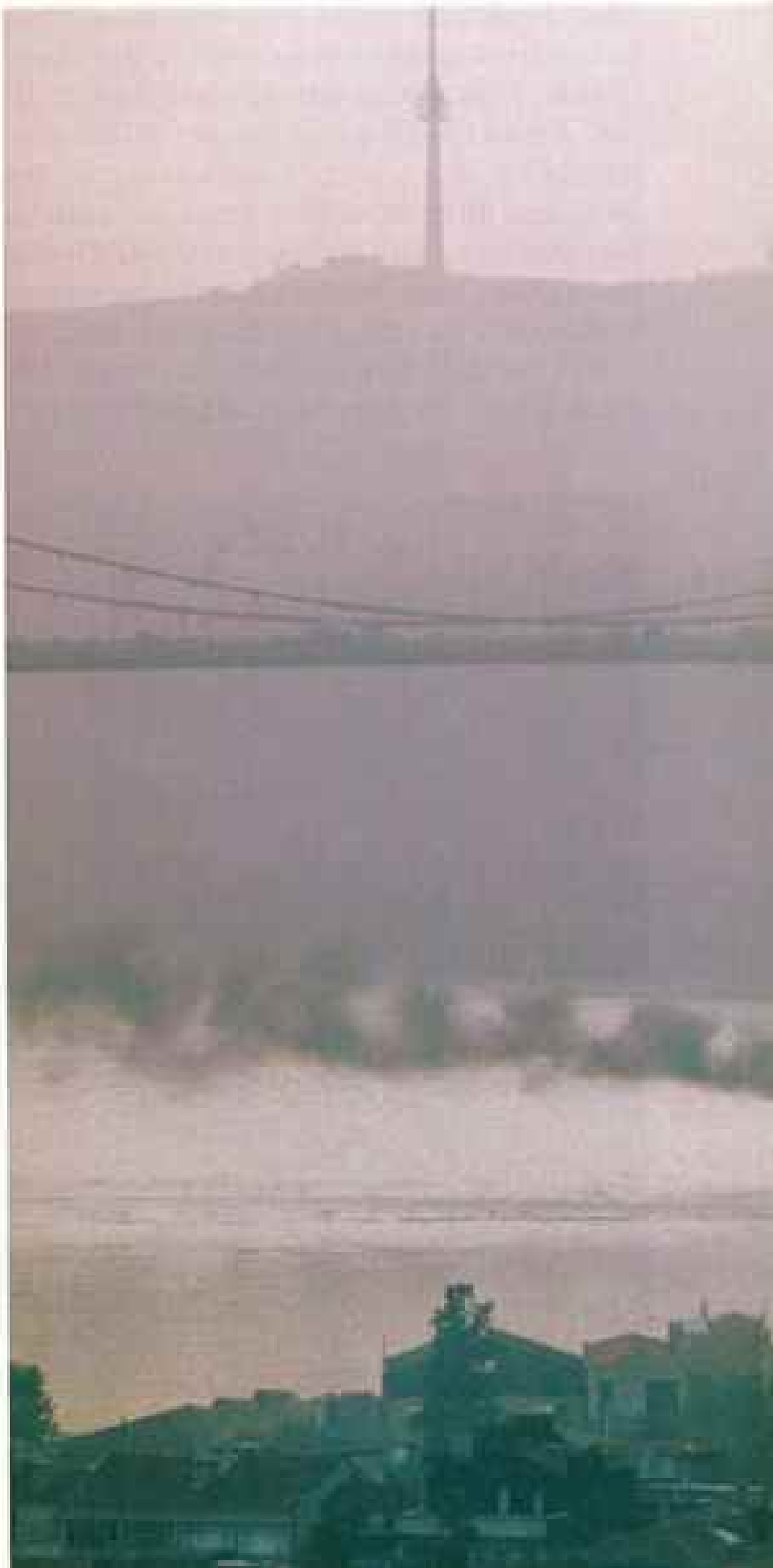
Extensive poppy growing began here in the 19th century. It's a good deal: If you grow something else to trade, you might have to carry it for two days' walking; for opium, the trader comes to you. You might even have one right in your village.

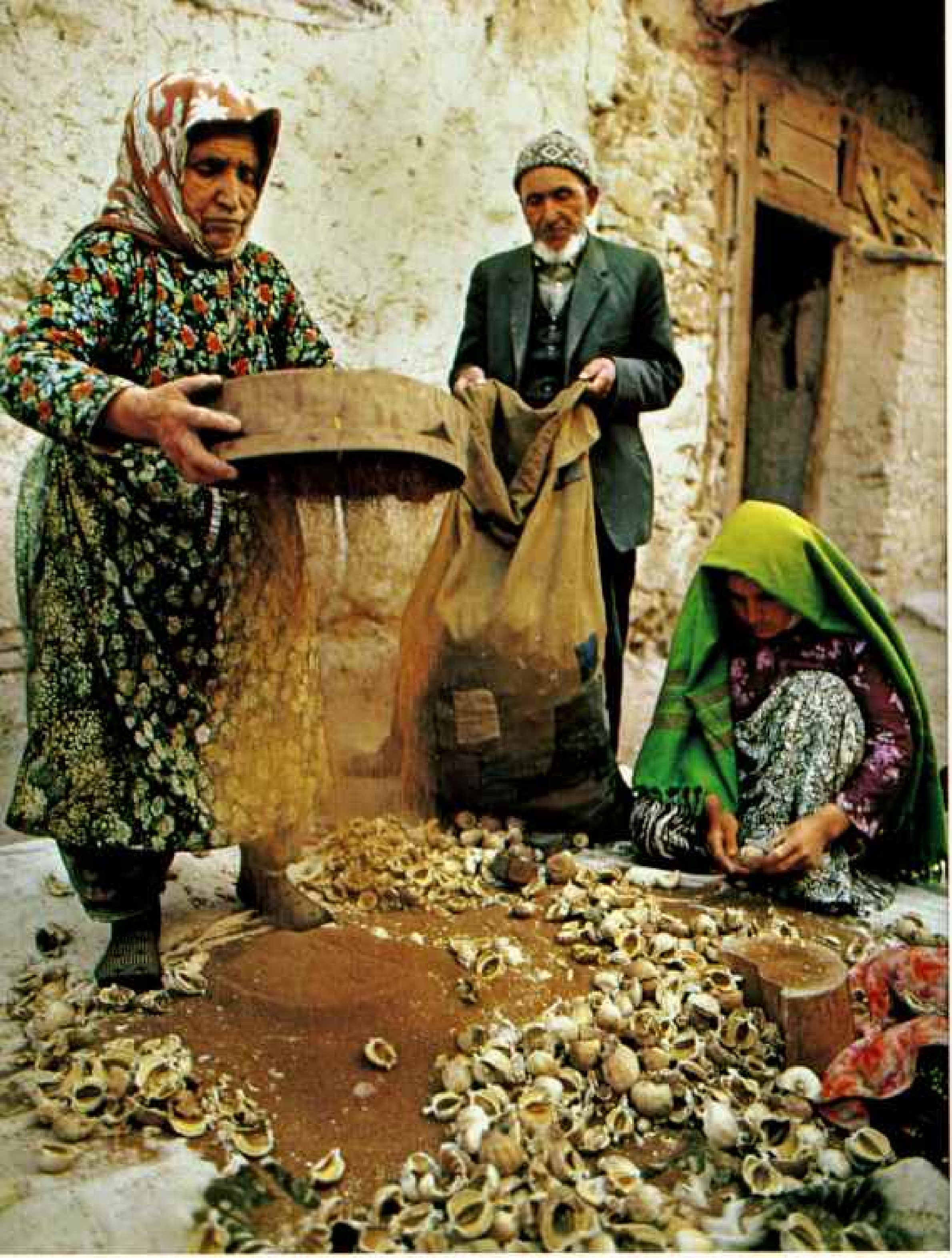
Taking the opium to laboratories—to be turned into morphine base or heroin—makes for a lot of coming and going by caravans of pack mules. I remember the first one I saw on a mountain trail, led by a friendly-faced fat fellow on a little horse, escorted by men on foot armed with automatic rifles and percussion grenades. This is a hallmark of Golden Triangle traffic: the involvement of sizable forces of armed outlaws. They're from minorities in revolt against the Burma government, such as SUA, the Shan United Army. And the KMT, or Kuomintang soldiers—remnants of anti-Communist armies that left China after Mao's victory, now settled in northern Thailand.

One day in 1967 at the place where Burma, Thailand, and Laos meet—a conjunction that gives the Golden Triangle its name—an SUA caravan with 16 tons of opium, coming south from Burma, sought to avoid paying the customary tax to the KMT. So the SUA crossed the Mekong River into Laos; the KMT gave chase. At the height of the fight, at the village of Ban Khwan, Lao warplanes swooped in, dropping bombs. Then came Lao paratroopers, seizing the

Dried on the stem, *capsules harvested from a Turkish field* ***(right)*** *are known as poppy straw and can yield no opium, only poppy-straw concentrate (PSC). Turkey banned poppy growing in 1971 under U. S. pressure. To satisfy unhappy farmers, it began licensing growers in 1974, but only to produce poppy straw for sale to a government factory, whose technology is required to convert it to PSC and then morphine and codeine.*

Even so, Turkey is still a conduit for illicit heroin traffic. Officials cannot inspect the thousands of vehicles that each month cross the Bosporus bridge ***(below)*** *linking Asia and Europe.*





Extra bonus *for Turkish poppy growers, seed is shaken out before the dried capsules are processed into PSC. This brown seed will be pressed for cooking oil. High-protein cake residue will be fed to cows. Some poppies produce white seeds, a favorite in Scandinavia, but blue poppy seeds* **(top right)** *bring the highest price on the international spice market. A heavy dusting covers bagels* **(center)** *in New York City. Turkey, the Netherlands, and the Australian state of Tasmania are the top suppliers of blue seed to the U. S. Each capsule may hold 800 to 2,000*

seeds, although the botanist Linnaeus once counted 32,000.

*Poppy-seed oil, for sale in a Rome art-supply store (**above**), has been prized by artists since the Renaissance as an oil-paint thinner that dries more slowly and yellows less than linseed oil.*

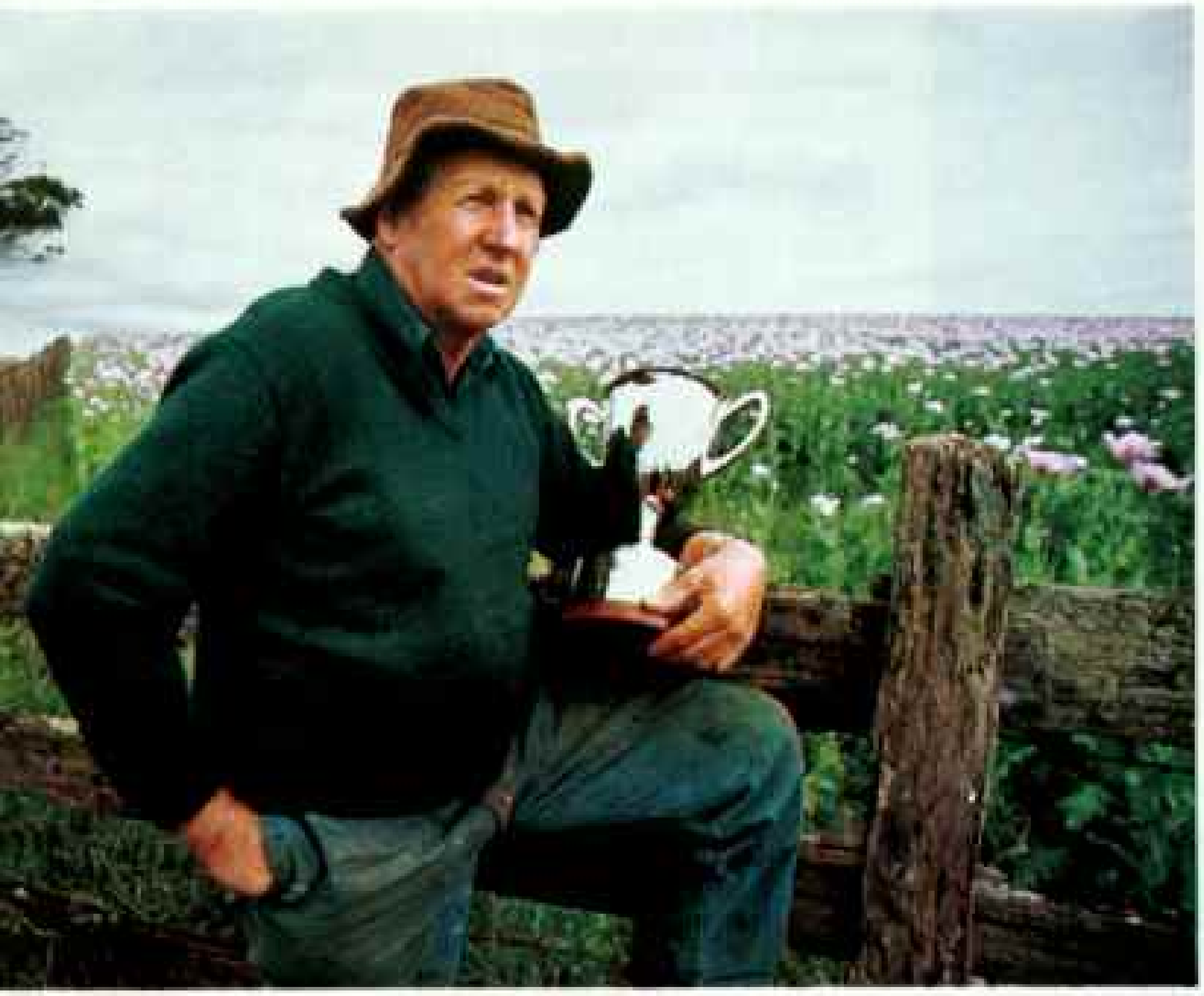
opium; it went to the commander in chief of the Royal Lao Army, who was in the opium business too. When I got to Ban Khwan, shortly after, all was calm again along the Mekong. The noisiest thing around was a work elephant getting his daily bath; as the sun set on the Burma side, the sky turned red and the river turned gold.

The SUA leader in that miniature opium war, Khun Sa, is now the area's top trafficker. He's had battles lately with Thai forces on the Thai-Burma border and has taken his men and his heroin labs farther into Burma. He says he's fighting for the liberation of the land of the Shan, that modern weapons cost lots of money, and that opium and heroin are his only way to get it. He repeatedly offered to sell all his opium to the U. S. government, finally for 36 million dollars. President Carter said no.

American Embassy officials in Bangkok tell me Khun Sa is strictly out for the money. Thailand's annual opium production, as high as 180 tons in the 1960s, declined as the Thai government pushed economic development to counter the threat of insurgency; it's now about 40 tons. Laos produces about 50 tons. The main problem is Burma—another bumper crop, more than 600 tons, the biggest illicit opium harvest in the world. The government there seeks to eradicate poppies but can't do much in areas it doesn't control. And so heroin continues to flow south to Bangkok, to Malaysia, to India, and to Hong Kong—thence to Europe and the U. S., Canada, and Australia. Thailand has hundreds of thousands of addicts.

HAS ILLICIT OPIUM ever been done away with without doing away with *Papaver somniferum?* Yes, it has. It's August, and I'm in Turkey for poppy harvesting, new style.

Turkish for poppy is *haş-haş*, pronounced hash-hash, and opium is *afyon*, plentiful here since antiquity. Until the early 1970s morphine base from Turkish black-market opium was refined in Marseille for heroin of the infamous French connection. That collapsed when Turkey, under U. S. pressure, banned all growing in 1971. There was much resentment, and since 1974 there is haş-haş again, but under firm new rules. No afyon! "Not one gram," says the general



Newcomer to poppy growing, *Tasmania now holds the record yield per hectare for morphine, meeting perhaps 20 percent of the world's codeine needs. Experimental fields of poppy straw in the mid-1960s have blossomed into 6,050 hectares, largely on the island's north coast* ***(right)****. Agricultural research and sophisticated cultivation boost the region's natural advantage in poppy production—long daylight hours during the growing season. Two pharmaceutical companies contract the crop from licensed growers. North-coast farmer Les Richardson* ***(above)*** *took top honors from the Glaxo company for his 1983 yield. As harvest nears, state police inspect fields to ensure crop security* ***(below)****.*

director of TMO, the government soil products organization, which buys all agricultural products—wheat, barley, rye. And dry poppy capsules. "No incising is allowed."

When capsules thus ripen without incisions, the morphine stays in the capsule walls. It can be efficiently extracted only in a sophisticated factory. Turkey has built one, at enormous expense. "We have done all this for humanitarian reasons, for our friends in the Western world."

At the huge new alkaloid factory at Bolvadin, in Afyon Province on the eastern Anatolian plateau, dry poppy capsules—called poppy straw—are crushed and dissolved in stainless-steel tanks. Out comes darkish liquid. More tanks, more acids, out come wet crystals for drying in a centrifuge, then in ovens. Now it's ivory-colored powder. More dissolving, filtering, centrifuging, and there it is—white poppy-straw concentrate, or PSC, crude morphine.

Armored cars will take it to Izmir for export. Most will be processed into codeine.

In a village 20 miles away a TMO poppy control officer has certified permission to "break"—to harvest. Baggy-trousered women with red and blue blouses are busy in a dozen little fields of beige shoulder-high poppies, snapping off capsules that are rock hard and dry as walnuts. Snap, rustle, snap, snap, one a second, into the apron.

"Now we grow haş-haş only because of the oil," says the village headman—barley would pay better, but the women insist. Wheat, salt, and poppy-seed oil—that's tradition here, and women are tradition minded. A young farmer tells me his mother enjoys the harvesting, but his wife, 23, does it only because she must; she'd rather be home with her TV.

Farmers split their capsules for the seed and take the empty halves to TMO. Brown seed is best for oil; blue pays best, for export to the U. S., Germany, and the Netherlands. Scandinavians prefer white. As for me, I like *katmer*, pancakes filled with crushed poppy seed—nutty, delicious. Cows love the cake left after seed has been pressed for oil—it's 30 percent protein and makes for excellent cream. By the way, experts tend to agree there's no morphine in the mature seed of *Papaver somniferum*—hence none in the poppy seed on your spice shelf.

In numerous villages I see rows of 300-foot-long mounds—poppy straw stored in polyethylene bags with earth on top; warehouses are piled to the rafters. A big expense, a TMO man says, for rent, for guards. Stocks mounted because of delays in opening the factory, so growing has been drastically cut: in the seven provinces allowed to resume growing in 1975, a reduction by two-thirds—to 7,000 hectares and 35,000 farmers. In the city of Afyon I get an earful about that from Halil Arabacıroğlu, fourth-generation poppy-oil presser.

"You Americans, always interfering with other people! We had to stop poppy planting because of you."

I say, but you're planting again.

Yes, but not enough! There is so little seed to press he has to sell detergent powder and macaroni. He stares at me. "How is it you have so much addiction? We have no addiction here. Maybe American youth is too spoiled, you have everything, you look for excitement."

A WORLDWIDE notion for a long time was that heroin is mainly an American problem. But that's been changing. Addiction is rising not only in Thailand and Burma, in Malaysia and Pakistan, but also in Western Europe, and Turkey is on a transit route. On the great suspension bridge across the Bosporus at Istanbul I watch the big trucks heading west. Thousands pass each month. A DEA man says some have compartments in their gas tanks, for heroin to Munich, morphine base to Milan. . . .

I follow them to Bulgaria. In Sofia, at the Hotel Vitosha—notorious rendezvous of arms and drug smugglers—I visit the casino, for foreigners only. How many of these roulette-playing Syrians, Lebanese, Turks are Kintex clients? Ah, well, I really must stop suspecting everybody. . . .

Kintex, the official Bulgarian export-import agency, has been described by U. S. authorities as trading weapons to assorted militants in the Middle East for heroin to be sent on to Western Europe and the U. S. Said to be prominently involved is Bekir Çelenk, from Istanbul, now residing in Sofia. I reach him by telephone. He is indignant in broken German. "Heroin? Never! That's an American thing." Turkish humor, I guess.

Combating chronic pain *is a major concern of Dr. Forest Tennant* ***(top)****, examining a patient who lost her jaw to cancer. He prescribes daily doses of codeine, taken through a stomach tube, so that she can live free of pain. "One of our biggest problems is the reluctance to treat chronic pain with narcotics," says Tennant, who takes patients after other pain-relief efforts have failed.*

A pioneer in pain control, Dr. Cicely Saunders ***(right,*** *at left) founded St. Christopher's Hospice near London in 1967. Most residents are cancer patients, many with severe pain. "The pain can be treated," she says, and the prescription is usually morphine, given orally and carefully tailored to the patient's needs. "You get a feeling of joy at St. Christopher's," says Dr. Saunders. "Not because they're high, but because they're without pain and depression."*

In their last days many cancer patients can't swallow, and Dr. Saunders prescribes heroin injections, legal in the United Kingdom. However, she stresses morphine as a pain reliever for those countries that do not allow heroin.

Mexico's war against the poppy *sends pilots on often perilous herbicide-spraying missions over fields scattered in the western mountains. Vertically mounted cutting blades are designed to snap wire traps stretched across narrow valleys. A second*

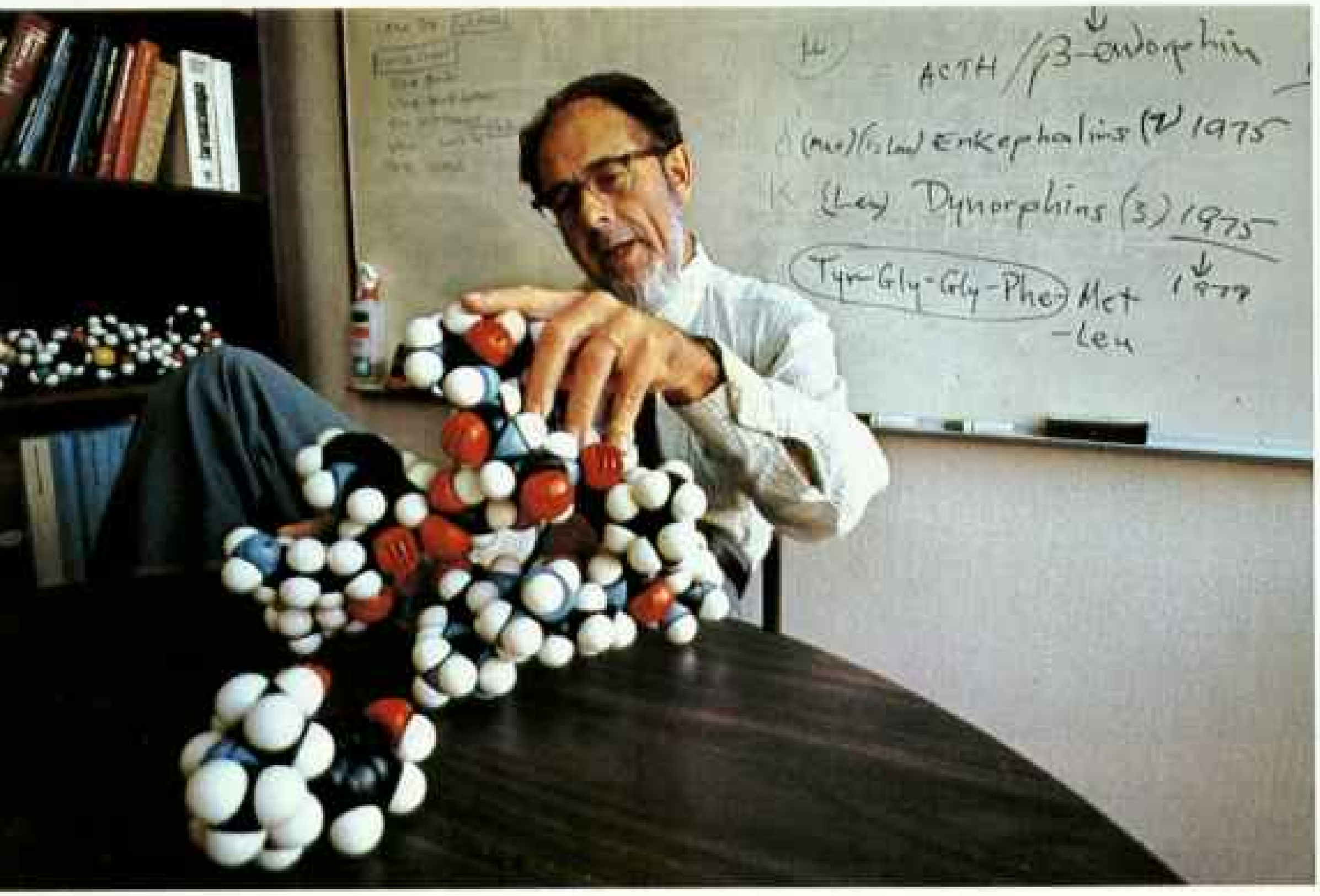
helicopter directs the spraying. Mexico was the source of 80 percent of the heroin in the U. S. when aerial eradication began in 1975. After a dramatic decrease, poppy growing is once more on the upswing, spreading across the country.

IT'S DECEMBER, and *Papaver somniferum* blooms white and mauve on the Australian island of Tasmania, halfway around the world from England; but the scenery here in the Derwent River Valley looks very English indeed—rolling green hills, sheep and Friesian cows, gentlemen at cricket.

Sir Angus Bethune of Dunrobin Farm calls poppies the ideal crop—"relatively little work, financial returns quite substantial." Tasmania's Poppy Advisory and Control Board is careful to call them *oil* poppies; after all, they were hybridized mainly from European varieties primarily grown for oil. Besides, no opium is produced here, only poppy straw. As in Turkey, but with a difference. Here it's a high-technology crop: Precision seeding—a machine inserts anti-fungus-coated seed and fertilizer simultaneously, seven inches apart, two and a half inches down; computer-controlled herbicide spraying—precisely 200 liters per hectare; harvesting with a newly designed comb and knife on a combine to pull the dry poppy capsules down and slice them off.

The entire crop is contracted for by two companies—British-owned Glaxo and Tasmanian Alkaloids, owned by Johnson & Johnson of the U. S.; it's private enterprise, but strictly supervised in keeping with the rules laid down by international agreement. To the premier of Tasmania, Robin Gray, poppies represent an important part of the economy. "Our most progressive farmers grow them."

Why was Tasmania chosen for large-scale poppy cultivation in the early 1970s? Because it's politically stable, hence a reliable supplier. And it's far from the Equator, meaning many daylight hours in the growing season; much sun means much morphine, and that's the name of the game, the aim of extensive research for better poppies. Hormone applications. Genetic engineering. Controlled cross-pollination. In the past five years alone, morphine yield has doubled to ten kilos per hectare, the highest in the world. It's still going up. Click, click, click—a plane has sprayed pellets of nitrogen, now irrigation sprinklers turn. Water will fill the seeds, increase weight. Will nitrogen at this late stage increase the morphine yield? It's an experiment, we'll see.



What causes addiction? *Looking for answers, scientists in the early 1970s discovered natural receptor sites for morphine in the brain, spine, and intestines. Further investigation led to the discovery that the body produces its own morphine-like substances, known as endorphins, that regulate mood and appetite and relieve pain. Dr. Avram Goldstein* ***(left)****, discoverer of one family of endorphins, compares the complicated molecular model of dynorphin A with a model of morphine in the foreground. The hope that endorphins could be nonaddictive replacements for morphine was dashed when experimental injections led to addiction and withdrawal symptoms.*

The body's natural receptor sites came to light as scientists developed antidotes that can reverse the effects of a narcotic overdose. At a National Institute of Drug Abuse research center, sections of the small intestine of a guinea pig ***(top right)****, containing receptor sites, will be placed in saline solution and attached to an oscillograph. Electrical impulses induce the intestine's natural twitching action that is in turn suppressed by doses of morphine.*

Pharmacologists Dr. Charles Gorodetzky and Dr. Tsung-Ping Su ***(right)*** *monitor the revival reaction as the antidote naloxone is added to counteract the morphine.*

FOR MY LAST FORAY in pursuit of *Papaver somniferum* I'm in Mexico, in a helicopter over the rugged mountains of the Sierra Madre Occidental where the states of Sinaloa, Durango, and Chihuahua meet. According to the current "Narcotics Intelligence Estimate," summarizing the best information available to the U. S. government, about a third of the heroin entering the country is estimated to come from illicitly planted Mexican poppies; we're out to destroy some, with herbicide spray. It's called *campaña permanente contra narcotráfico*. The U. S. government supplied most of the aircraft, Mexican pilots and navigators do the work. It's the most strenuous anti-poppy effort anywhere. The U. S. investment so far is more than 110 million dollars, Mexico's more than twice that.

The helicopters work in pairs—one low, spraying; the other higher, directing (pages 178-9). "A little more to the left . . . do the part near the stream again . . . climb a little, there's another field. . . ." The spray copter banks, turns, slows to spray, rises, turns again sharply, barely clearing a tree—all in a narrow valley with steep slopes. It's *riesgoso*, risky.

Mexico doesn't really have a tradition of poppy growing. Chinese laborers planted some in Sinaloa in the 1920s, to get opium for smoking. During World War II, American gangsters—fearing a cutoff of the morphine and heroin they were smuggling from overseas—promoted large-scale planting. By 1951 there were newspaper headlines in major U. S. cities about heroin from Mexico, as there are now.

I am surprised to see from the air how small the fields are—some less than a third of an acre; the growers have dispersed them widely of late, to make the spraying harder.

We land in successive fields so I can see how sophisticated these growers have become. What are those hoses emerging from a stream? We follow one, on a downslope. Affixed to its end, on top of a shoulder-high tripod made of tree limbs, sits a green plastic detergent bottle, punched full of holes. It's a gravity-fed irrigation system! Other tripods hold green branches, for camouflage.

I see plants at all stages—some only a foot high; taller ones, blooming red; quite a few ready for lancing. Some are twisted, drooping, dead. That's the work of the herbicide 2, 4-D. It speeds growth—so much so that the plant quickly dies.

What we don't see are growers, for good reason. We circle high before landing, so they can get away. "We are armed and they are armed," says the pilot, "and we don't want to meet. We're not out to catch people,

Nose for narcotics *sends a U. S. Customs Service dog along a conveyor belt at New York's John F. Kennedy International Airport. Dogs trained to detect heroin, cocaine, and marijuana cover major ports of entry, sniffing luggage and planes after passengers disembark.*

Federal authorities annually spend nearly 1.5 billion dollars on all drug enforcement. Yet they estimate they seize less than a tenth of the heroin entering the U. S.—believed to be more than four metric tons each year.

The El Paso Intelligence

that's a job for informers and the police."

In Culiacán, the capital of Sinaloa, the commandant of the federal judicial police shows me something new: Heroin so dark it's almost black, made in the mountains, nearly 100 percent pure! Also new is that poppy growing has spread over much of the country; Mexican opium output, after dropping steadily under the impact of helicopter spraying, is once more on the rise.

What I'll remember most vividly from Culiacán are the *corridos*, ballads performed by so-called *norteño* bands—accordion, guitar, drum, and bass. Corridos usually deal with real people and real events, and a while ago Los Bravos del Norte had a hit with this one about heroin traffickers:

"In Culiacán many brave men have been killed, some Mafia big shots, some government men . . . the famous gunmen are disappearing, some killed, some imprisoned, the Mafia is dying." And this refrain, referring to a part of town favored by heroin traffickers: "Tierra Blanca is desolate, no new cars, no longer the roar of machine guns, the beautiful mansions are abandoned."

More recently, Los Intocables del Norte had another big hit: "Those brave men are back, looking for the ones who betrayed them . . . the betrayers don't sleep easily, the gunmen are after them, they're watching the roads." And this refrain: "Tierra Blanca is full of traffic again, full of brand-new cars, you hear again the roar of the machine guns, and the beautiful mansions are no longer abandoned."

I must add that guns firing in Culiacán don't always mean killing. More often it's shooting into the air, for fun, say for a *fiesta quinceañera*, a girl's 15th birthday.

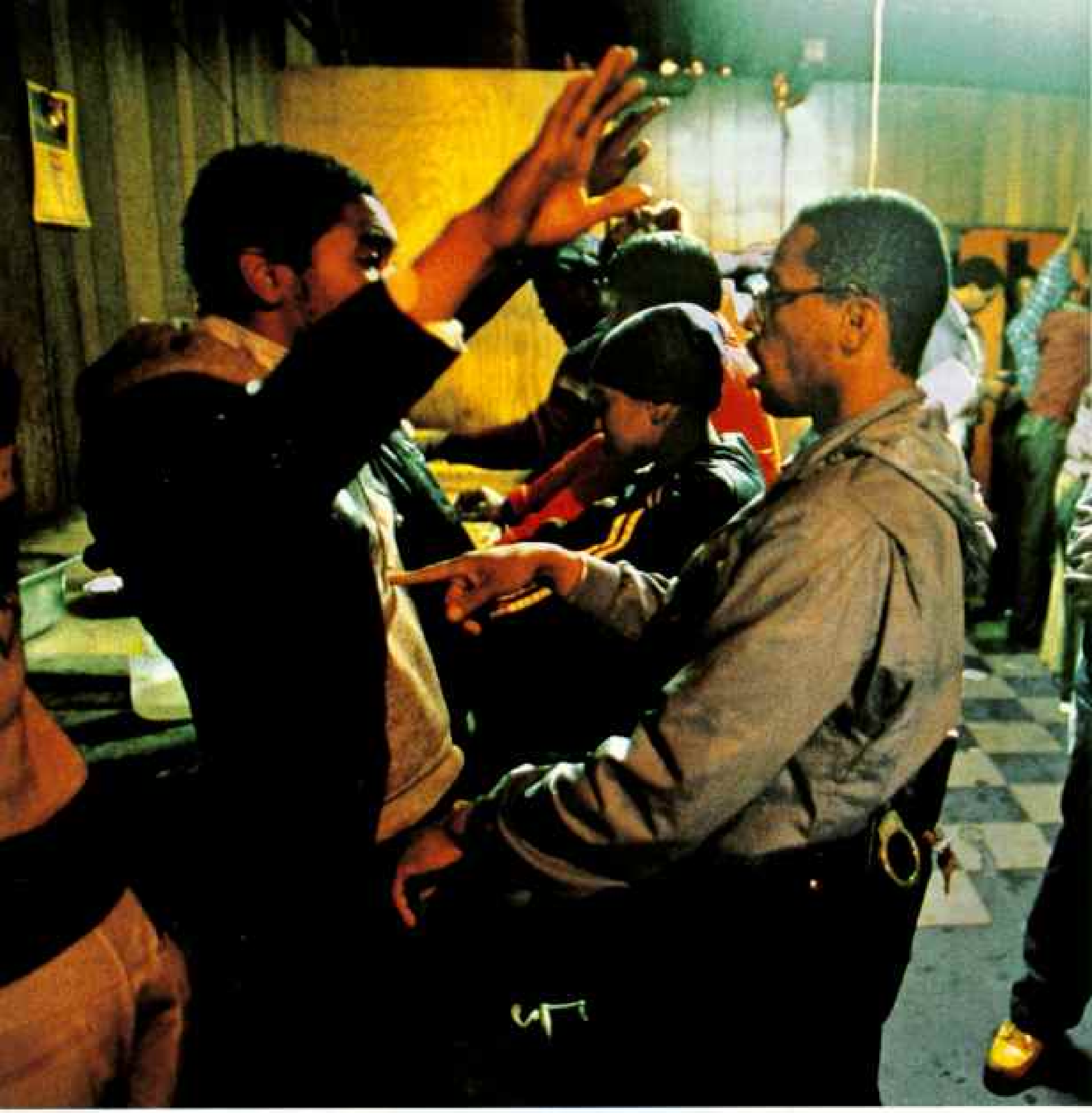
MORE TRAVEL NOTES from the poppy trail:

• Amsterdam. Formerly a distribution hub for Golden Triangle heroin sent via Hong Kong to local Chinese; now massively supplied from Pakistan. Knife-carrying street dealers, many from Suriname, operate not only on notorious Zeedijk Street downtown, but lately also from apartments in residential districts. City council decides to give heroin gratis to registered addicts in special cases. Conservatives in Parliament disapprove.

• Switzerland. Court report from St. Gallen: A man and woman bought one ounce in Bangkok; it turned out to be detergent powder, but they *thought* they were smuggling heroin—so, 15 and 12 months respectively. Suspended, that is.

• West Berlin. Sri Lankan couriers land at

Center in Texas was created in 1974 to deter the renewed influx of heroin from Mexico, following the severing of the trade that led from Turkey through Marseille, France, to the U. S.—the so-called French Connection. The center now collects and dispenses worldwide narcotics information. A member of the Coast Guard (right) helps man the watch room, staffed seven days a week, 24 hours a day by U. S. agencies—Immigration, FBI, FAA, Internal Revenue, Drug Enforcement, Marshals Service, and Customs.



East Berlin airport with bags of heroin in their stomachs, then take the train to West Berlin. If a bag bursts, the courier dies.

• France. Seizures by customs doubled in a year. The head of a new interministerial anti-drug commission calls heroin a serious problem in "all classes in our society."

• Italy. Vast revenues from heroin refining for the New York market sparked building and banking boom in Palermo. Mafia competitors killed one another, also a general of police and a judge; scores sentenced for trafficking. In Rome angry mothers in the low-income Primavalle section campaign against dealers, use special mailbox to inform police. Two mothers, in desperation, killed their addicted sons.

• Poland. For a Christmas Eve treat, people soak crushed seeds overnight in milk, add honey, raisins, nuts. Poland legally plants 15,000 hectares of poppy for seed, but nowadays antisocial elements get poppy capsules from farmers, crush and boil them, add chemicals—it's heroin of sorts. Addicts number in the thousands; a few lurk in Warsaw hallways and stairwells, injecting.

• Ireland. Militants in a Dublin housing project threw three pushers out of their flats;

Raid on a "shooting gallery" *by Washington, D. C., police (**left**) yields no arrests. Suspects must be caught with drugs or paraphernalia on their person; all evidence had been quickly dropped to the floor (**below**). Two dollars is the average admission price to a gallery; two dollars more may buy a syringe. But the heroin—about $35 a dose—is usually bought on the street. Most raids are aimed at dealers. "We're successful," says one officer. "But there's so much money in it, someone else always moves in." New York City, Los Angeles, and Detroit suffer higher abuse rates, but one trend is national: Heroin purity is up, a sure sign of abundance.*

then dealers in other projects were invited to appear before meetings, confronted with evidence, and told to stop or get out. Dublin's heroin tide rose from a handful of addicts to several thousand in a couple of years. Can it be turned back?

IN LIVERPOOL the smoking and sniffing of heroin is spreading among young people; police report a big seizure aboard a Pakistani ship. A BBC-TV survey of health authorities from Dundee in Scotland south to Wessex on the English Channel, from Great Yarmouth west to Holyhead in Wales reveals that yes, it's there too. Unheard of, until recently.

But in England I also learn about what is, to me, a truly heartwarming effect of *Papaver somniferum*. My mentor is a forceful, green-eyed lady, Dr. Cicely Saunders, pioneer of a blessed medical innovation known as the modern hospice movement.

The subject is pain, the severe unrelieved sort of pain that occurs in perhaps two or three out of ten cases of terminal cancer. Alas, I've seen it in my family. Someone you love lies in a hospital bed, in agony, and the nurse says sorry, not time yet for your

medicine. . . . And then, when the medicine is given, the fear of the pain returning, again and again.

Quite unnecessary, says Dr. Saunders. That's a basic precept in a hospice, a place for the terminally ill where hospital routine is de-emphasized and the final period of life made as full as possible—as at St. Christopher's Hospice near London, where she is in charge. Patients can have friends and grandchildren visit whenever they want, also their dogs.

For that essential part of hospice work—pain control—morphine is top of the list, says Dr. Saunders. No synthetic analgesic has yet been made that deserves to replace it; it's the drug of choice. In the right amounts, of course.

"It's similar to what's done with diabetes and insulin—you don't wait for somebody to go into a diabetic coma before you give the next insulin. You use it to prevent that from ever happening. And it's absolutely simple and basic to do the same for pain control. You adjust the dosage to each patient's changing needs.

"Basically, patients here have a four-hour routine drug round," Dr. Saunders says. "If we've got it right, they won't have pain by the time the next drug round comes. The public has the myth that the pain of cancer cannot be controlled, that's why people are so frightened of it. Or they think you can have relief only at the price of being knocked out. Go around, you'll see patients free of pain, alert and cheerful with their families."

Morphine is given by mouth, but for a small proportion of patients, perhaps one in five, there'll be heroin, injected. In Britain it is legal for carefully controlled medical use.

"Many people can't swallow near the end. At that point we switch to heroin; because it's more soluble, you can have a lot in a small amount of water. It's the equivalent of about two and a half times the same amount of morphine. So for the occasional patient who needs a big dose, you can give it in smaller volume. But usually morphine by mouth is sufficient." In the U. S., she adds, in place of heroin the equally soluble opium derivative Dilaudid would be suitable.

I mention that many U. S. doctors seem reluctant to give sufficient morphine and abhor heroin.

"Nothing but nonsense, myth. That you'll make patients into junkies. But taking drugs for kicks and to control pain are entirely different things. If you're addicted, you yearn for the drug all the time. But in your last days you have better things to think about. And so when patients get their drugs to prevent pain from ever happening, they don't have that terrible fear. It can make such a difference. It can save memories."

Memories?

"You see, we're not simply relieving pain for the sake of relieving pain. We do it also because of what the patient and the family can do with the time given them once the burden of pain is taken away."

What happens?

"Family reconciliation, sorting out problems that may have been hanging on for years. Being able to say sorry, and thank you. Remembering that amid sadness there was courage, and understanding, so that you'll remain proud of those days."

The Queen has made Dr. Saunders a Dame Commander of the Order of the British Empire. I think she should also be made a saint. And maybe someday, somewhere, in some hospice garden, there'll be a little piece of modern sculpture to honor the plant that in such adversity can bring such a boon.

Dame Cicely's gospel, I'm glad to say, has spread to America. Scores of hospices now operate in the U. S. and Canada, many extending hospice-style pain control to patients in their homes. Best of all, it's also finding its way, slowly, into U. S. hospital practice. Within the past 14 months both the American Medical Association and the American College of Physicians—the principal organization of internists, including cancer specialists—have urged doctors to stop the underutilization of drugs for severe chronic pain in cancer and in all terminal illnesses. Morphine, they say, is the drug of choice, the mainstay.

AND NOW I'm home, mulling over some of the things I've learned. One is that in heroin matters there's a lot of uncertainty.

How much came into the U. S. in 1983—4.12 tons, as officially estimated, or 6 tons, or 10? Nobody really knows. What proportion of the inflow is seized? Two percent, 5

percent, 10 percent? Again, nobody can say—and no wonder, when every day some 31,000 cars come in from Mexico at Tijuana alone, when international flights bring a daily average of 60,000 passengers. Who could search them all?

Also, who can say how many heroin addicts there really are in the United States? NIDA, the National Institute of Drug Abuse, estimates 500,000. That's extrapolated from the number of people who come to the attention of health authorities and police. But, says NIDA, "the extent to which these are representative of all users in the community is unknown."

Then there's disagreement over the best ways to help addicts. Giving them inexpensive daily doses of the synthetic drug methadone, a morphine substitute, is widely favored now in the U. S. But numerous therapists say that's just substituting one addiction for another—far better to enforce complete drug abstinence in highly motivated rehabilitation communities.

Some things, on the other hand, are emerging clearly. As a senior UN official put it in Vienna, heroin increasingly figures as a medium of exchange, a sort of illicit currency for shady dealings on a large scale; there's growing evidence of close links in many parts of the world between drug trafficking and arms smuggling, subversion, and international terrorism. A former narcotics commissioner of Hong Kong told me bluntly that what greases the channels of drug trafficking is official corruption in all countries.

And this is a rule I was given in one country after another: As soon as one trafficking route is put under pressure, a new one takes over; if supply is reduced from one area, it will be replaced from another. I call it squeeze and effect. Take a pillow or a half-inflated balloon, squeeze it here, and it pops out there.

IS IT DIFFERENT here at home? I mean in the parts of town evoked by those new American ballads called rap songs, where there are, "Junkies in the alley with a baseball bat." Where pushers are the big money makers, "driving big cars, spending 20s and 10s, and you want to grow up to be just like them."

In New York, police saturated a hotbed of heroin dealing on the Lower East Side; I could see patrolmen, in pairs, on practically every other corner. They called it Operation Pressure Point. So a lot of dealers went elsewhere in the city.

A dozen blocks from my office in Washington, D. C., police crashed into a "shooting gallery," a place where people can inject heroin as soon as they buy it. A week later that place was boarded up, and I followed police crashing into another.

Squeeze and effect.

Does this mean that all the anti-heroin measures—from aerial poppy surveys to

Going for the jugular, *a Washington, D. C., heroin user puffs her cheek to force blood into a major neck vein, one of hundreds that users tap. Heroin addicts may number 500,000 in the U. S.*

heroin-sniffing dogs—are useless? That those millions of taxpayers' dollars spent here and abroad have been wasted? Wouldn't it make more sense, as quite a few advocate, simply to legalize the stuff?

Not at all, says Dr. Robert DuPont, formerly head of NIDA, now president of the American Council for Drug Education. "If we didn't have the efforts we make against heroin, we wouldn't have 500,000 addicts, we'd have 20 million."

I believe he may be right. I also believe what some of us were taught in religion class, what most of us learn by just living. That the fight between good and evil has no end. It's a part of existence. And when seen in that light, isn't *Papaver somniferum*, bringing both good and evil, another symbol of life?

LET ME CLOSE with something new from the good side.

How morphine does its work in the human body has begun to be reasonably well understood only since 1973. The brain, the spinal cord, and the intestines have so-called opioid receptors that may be thought of as locks into which morphine fits like a key, to alleviate pain and fear. In fact, the brain itself makes morphine-like substances called endorphins that also do that. This discovery has not necessarily brought us closer to an ideal nonaddictive painkiller—endorphins, if used as drugs, might be as addictive as morphine itself—but it is leading to valuable insights nevertheless. Dr. William Pollin, currently director of NIDA, calls it a major breakthrough:

"We have begun to understand that the brain is as much a pharmaceutical factory as a switchboard. Behavior that up to now has seemed capricious, a weakness of the human character, is becoming intelligible. Our studies of opium have led us to new vistas of how the mind works—of the biological basis for motivation."

Scientists and pharmaceutical firms around the world excitedly look forward to new drugs that may at last deal effectively with old problems bedeviling millions of people—obesity, nicotine addiction, impotence. Imagine, a key to youthful thinking, *the* answer to depression!

Let's hope it won't be long. □

Changing face of addiction, *heroin use grows in middle and upper economic classes. A California woman who took heroin for six years drops by a Los Angeles clinic (**right**) for a daily dose of methadone, a legally dispensed morphine-like synthetic, also addictive.*

*At Via Avanta—The Way Forward—a residential treatment center in Los Angeles, therapist Lynn Smart (**below,** at left) leads a parenting session for addicts and their children, a vivid example of the poppy's ultimate harvest. As a 16th-century botanist proclaimed: "It mitigateth all kinds of paines, but it leaveth behinde it oftentimes a mischiefe woorse than the disease itselfe."*

The Mummies of Qilakitsoq

THE CHILD was probably a boy, but we shall never know. Even in death the small figure (*left*) was too delicate, too haunting to be probed and examined like some corpse in a medical laboratory. We merely studied the outer clothing, which seemed to be that of a boy, and left the child undisturbed. Nature had done the same for 500 years.

Since that first look we have learned a great deal about the child, beginning with its age: approximately six months. Sometime around the year 1475 the youngster died at the small Inuit settlement of Qilakitsoq on the west coast of Greenland. The child was buried in a common grave with four other Eskimo bodies, possibly all at different times. A second grave beside the first contained the remains of three more Inuit, bringing the total of bodies to eight.

By a combination of low temperature and lack of moisture the bodies were slowly mummified almost as completely as if they had been embalmed. Once preserved, they remained virtually unchanged over the next five centuries. Their discovery in 1972 ranks as one of the most valuable finds of human remains and clothing ever made in the arctic region.

Like many historic discoveries, the one at Qilakitsoq was overlooked for a time. The bodies were discovered by two Greenlanders, Hans and Jokum Grønvold, from the nearby town of Uummannaq. The brothers were hunting for ptarmigan near the long-abandoned settlement of Qilakitsoq when Hans's eye caught an unusual arrangement of stones on the ground. Lifting several stones, the Grønvolds found the remarkably preserved Inuit bodies underneath and promptly reclosed the graves. Later they returned to the site and took several pictures as a record of the find.

The Grønvolds duly reported their discovery to the Greenland authorities, but no one seemed interested. Finally in 1977 Jens Rosing, the newly appointed director of the Greenland Museum at Nuuk (Godthåb), the capital, saw the Grønvolds' pictures and

By JENS P. HART HANSEN
JØRGEN MELDGAARD
and JØRGEN NORDQVIST

became fascinated. Soon afterward the bodies were removed from Qilakitsoq.

Despite a deep interest in its cultural past, Greenland lacked the facilities for technical analysis of its archaeological finds. Once the bodies at Qilakitsoq had been recovered, the authorities in Greenland sent them to the Archaeological Conservation Department of the National Museum in Copenhagen with a request that the department carry out conservation of the finds, the costs to be borne by Greenland. Any information gained from their study would be shared with the world. It was to prove a historic gift.

The authors played principal roles among more than 50 scientists who contributed to research on the historic finds at Qilakitsoq. **Jens P. Hart Hansen** is Chief of Pathology at Gentofte Hospital in Copenhagen, **Jørgen Meldgaard** is Chief Curator of the Inuit Collection of Denmark's National Museum in Copenhagen, and **Jørgen Nordqvist** is Chief of the Archaeological Conservation Department of the museum. All members of the research team served voluntarily and without pay. The photographs accompanying this article were taken by the team. A book by the authors, *Qilakitsoq*, was recently published by Christian Ejlers Forlag of Copenhagen.

MUMMIFIED BODIES are nothing new to Denmark; the country's peat bogs contain many human remains preserved by tannin in the peat. Such bodies are probably those of executed criminals or victims of murder, for they were thrown into the bogs rather than given proper burial.

The mummies from Qilakitsoq were plainly of a different sort. To begin with, they had been given proper if not elaborate burial, and, more important, there were no signs of violence on any of the bodies. Whether the eight people died together or separately is still uncertain, but several clues suggest the latter.

Our initial plan merely to conserve the bodies and clothing from Qilakitsoq

gradually expanded to include analysis of all aspects of the finds. One of our first tasks at the museum was to date the remains by the carbon-14 method, and thanks to Inuit burial practices, we had ample material to test. The early Inuit believed that the journey to the Land of the Dead was long and cold, a trip that required not only warm clothing but also extra skins and furs for emergencies. Lucky travelers eventually reached Inuit heaven, where game was plentiful, but less fortunate souls ended up in hell. This region was known as the Land of the Gloomy, where the condemned sat through eternity, listlessly snapping at butterflies, the only available food.

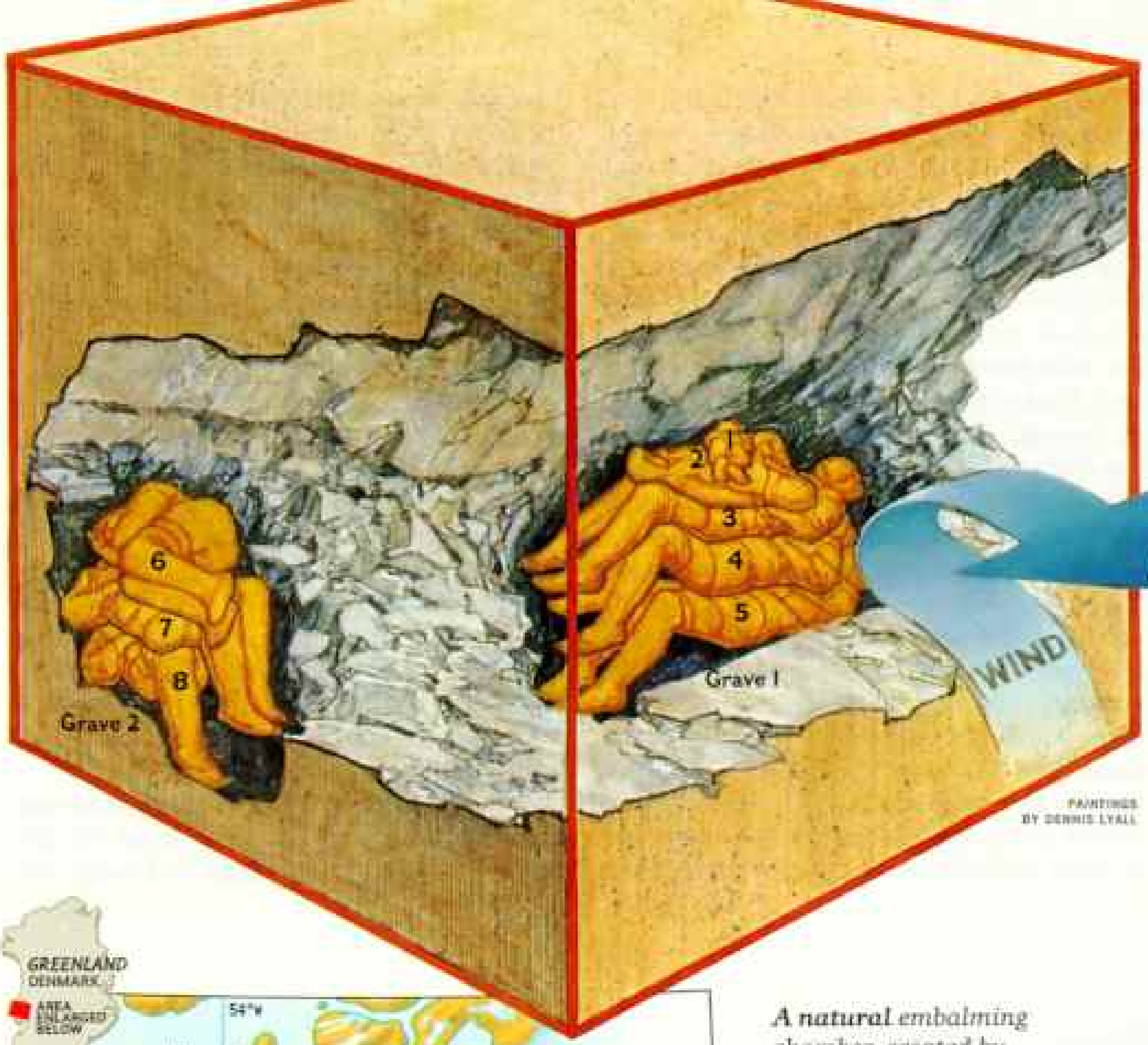
The bodies at Qilakitsoq had been well prepared for the afterlife, dressed in heavy sealskin trousers, anoraks, and *kamiks*—high boots stuffed with insulating grass (page 204). Whoever buried the bodies had added extra sealskins at the top and bottom of each grave. Assuming that the two layers of skins represented the earliest and latest possible times of burial, we took samples from the skins and carbon-dated them. All results pointed to the year 1475, with a possible error of 50 years on either side.

In both graves the bodies had been placed one atop another, five in the first grave and three in the second. In the larger grave the topmost body was that of the six-month-old child, the best preserved of all the remains.

That fact is not surprising, for in the early stages of decomposition body heat is a key factor. The higher the body's inside temperature, the greater the bacterial action and consequent breakdown of tissue. Thus, people who die with high fever tend to decompose rapidly, as do overweight people, whose insulating layer of fat retains body heat for a longer period. Children tend to decompose the most slowly, for their body volume is small compared with the skin area, providing for rapid dissipation of heat.

So well preserved was the body of the six-month-old child that in describing the discovery of the graves Hans Grønvold had

Dressed for a journey *to the Land of the Dead, a young Inuit woman* ***(left)*** *and seven companions were laid in two graves on the west coast of Greenland during the era of Christopher Columbus. As empires rose and fell, her hair separated from her scalp and her skin turned to parchment—minor ravages, considering the length of time. Though the causes of death are unknown, carbon dating has fixed the time to 1475, plus or minus 50 years, making the Qilakitsoq mummies among the oldest known well-preserved humans in the Arctic.*



PAINTINGS BY DENNIS LYALL

A natural *embalming chamber, created by dehydrating winds and low temperatures and protected from rain, snow, and sun by overhanging rock, held eight bodies, probably buried over a period of time. Two Greenlanders hunting ptarmigan found the site.*

Two of the dead were children, both in Grave 1 (**above**). *The four-year-old was identified as a male; the infant is thought also to have been male. The adults were apparently all female, ranging in age from about 18 to 50. The bodies were interlayered with skins, and the bottom of each grave was lined with flat stones and grass.*

Graveside view, *the Uummannaq fjord unfolds from a small inlet* (**opposite**) *at the abandoned Qilakitsoq settlement, 280 miles north of the Arctic Circle. The standing rock at left probably held spiritual significance for the Inuit—descendants of the Thule Eskimos, who arrived in Greenland around A.D. 1000 and settled most of its coastline. By 1500 the Norse who had been living on Greenland's southwest coast for nearly five centuries had died out or abandoned the island. Greenland was solely Inuit domain for two centuries, until recolonization by the Danes and Norwegians in the early 18th century.*

reported: " . . . and then we saw a doll that had fallen to the side, a doll that turned out to be a little child."

For purposes of identification we numbered the bodies, beginning with the child as Mummy 1 at the top of the first grave and so on down to Mummy 5 at the bottom. Similarly the bodies in the second grave were numbered 6 through 8.

Our next step was to determine the age and sex of the bodies, a process requiring several months and the help of specialists in various fields. Sex was determined either by the remains of genitals or by X-ray examination of pelvises and other bones. At a later stage we found additional evidence of the mummies' sex in the form of facial tattoos, an adornment usually restricted to adult women among early Greenland Inuit. Ages of the bodies were determined by dental development and other physical features. In several cases the bodies were so well preserved that we were able to obtain readable prints from fingers, palms, and soles of feet.

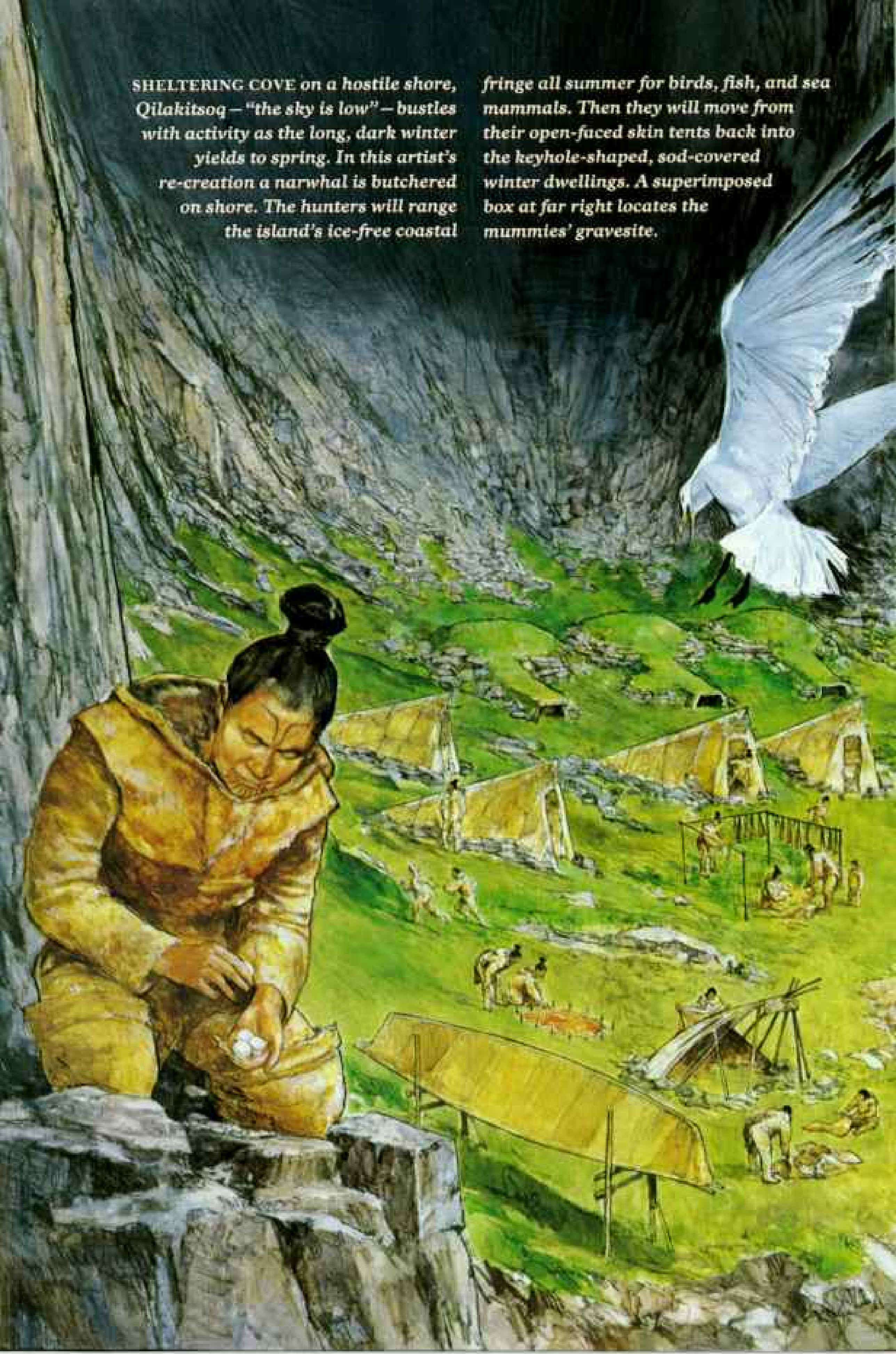
AS THE TEST RESULTS came in, the bodies began to take on individual character, like slowly developing images in a photographic darkroom. Each new feature provided fascinating clues to life—and occasionally to death—half a millennium ago.

In all, the pair of graves contained the bodies of six women and two children. Mummy 2, the body lying directly beneath the infant, proved to be a second youngster, a boy of about four. The adults ranged in age from Mummy 7, who was a young woman in her late teens or early 20s, to Mummies 5, 6, and 8, all of whom were about 50.

Two individuals, the four-year-old and Mummy 8, obviously suffered considerable pain in life and may have died from their infirmities. X rays of the boy's pelvis showed it to be misshapen in a manner often seen among Down's syndrome children, and it is likely the boy suffered from that condition. If so, he may have been deliberately killed by being "set out" to die of exposure—a not uncommon practice among early Eskimos with children they could no longer support.

The same fate sometimes befell even normal children whose mothers died within a year or two of childbirth, leaving their offspring as helpless burdens on the family or village. We cannot rule out the possibility that Mummy 1, the beautiful small child, was a victim of such circumstances.

Mummy 8, one of the 50-year-old women, was notable both for her ailments and for her obvious endurance. Close examination showed that she had suffered from illness or malnutrition as a child, resulting in periods of arrested bone growth. In addition the woman had broken her left collarbone at some stage in life, and the bone had never knit (page 203), causing impaired function of her left arm and probable chronic pain.



SHELTERING COVE *on a hostile shore, Qilakitsoq—"the sky is low"—bustles with activity as the long, dark winter yields to spring. In this artist's re-creation a narwhal is butchered on shore. The hunters will range the island's ice-free coastal fringe all summer for birds, fish, and sea mammals. Then they will move from their open-faced skin tents back into the keyhole-shaped, sod-covered winter dwellings. A superimposed box at far right locates the mummies' gravesite.*

She had also lost her lower front teeth, doubtless from lifelong chewing of skins and from holding various items she was working on between her jaws like a vise.

These ailments were minor, however, compared with what we found in her skull. Destruction of its base revealed that a cancer in the back of the nasal passage had spread to surrounding areas, apparently blinding the woman in her left eye, rendering her deaf, and no doubt causing her pain.

Yet she never gave in. A series of grooves on the surface of her left thumbnail, caused by cutting sinew thread against the nail with a knife, showed that the woman had continued to work even during her final days. Whether she ultimately died of the cancer or some other cause, one can only admire her courage and endurance.

THROUGHOUT many months of examining the mummies we constantly sought clues to the causes of death. Despite the boy's and the older woman's severe ailments, we found no conclusive proof of any kind. Yet the size and location of the graves, plus the nature of Qilakitsoq itself, shed some light on the question.

Qilakitsoq was principally a winter camp for hunting. The several stone-and-turf structures composing the settlement probably held no more than 30 people in peak season. During summer the area was foggy and bleak, giving rise to the name Qilakitsoq—literally, "the sky is low"—a reference to the surrounding cliffs and frequent fog.

In winter Qilakitsoq was alive with game, including seal, beluga, walrus, polar bear, narwhal, reindeer, and ptarmigan. The people of Qilakitsoq were Inuit of the Thule culture, superb hunters who had replaced the earlier Dorset culture in the Canadian high Arctic around A.D. 1000 and who had spread eastward to occupy Greenland.

One of the haunting and as yet unanswered questions about the bodies at Qilakitsoq is whether the people died together and were buried simultaneously. There are other graves at Qilakitsoq, but most of them are single chambers located next to the settlement. By contrast, the eight bodies were buried in two graves some 200 meters from the nearest structure. And none of the bodies is that of an adult male.

First mistaken for a doll, *Mummy 1 (**opposite** and **below**) was judged to be a boy by the cut of his anorak (**above**). About six months old, he was the best preserved, probably because rapid loss of body heat causes infants to decompose more slowly than adults. Perhaps, say the authors, he was "set out" to die after his mother's death, according to custom.*

One theory holds that they drowned and washed ashore near the gravesite. As hunters, the people of Qilakitsoq were constant users of skin boats, both the single-place kayak and the larger umiak for cargo and passengers that was rowed by women. The six women and two children could conceivably have capsized in an umiak and drowned in their heavy clothing, later to be washed ashore. If they had done so, however, there would surely have been sand and gravel from the beach in their clothing, and our tests revealed no such material.

At least one Greenland authority scoffs at the idea of a drowning. Joas Andersen, a former hunter from Uummannaq now in his 80s, points to the graves themselves as proof that the victims could not have drowned.

"There are too many things showing that these people didn't die because their boat capsized," Joas declares. "For example, there are no traces of the women's boat—no skins or wood—in the graves. The custom of our forefathers was to cover the dead with the skin of the boat, because boats, kayaks, and tools linked with death could not be used again—if you used the implements of the dead, you too would meet misfortune."

Did the eight people starve to death? The answer seems almost certainly no. There were no traces of gnawed skins or clothing in the graves, typical evidence of famine.

Expressive even in death, *the mummies' hands defied decay especially well. As the skin shrank, however, the nails seemed to lengthen (***left***). Removed from the graves, the bodies were besieged by organisms, like the fungi peppering Mummy 4's clothing (***opposite***). To prevent decomposition, researchers purified the mummies with gamma rays. Dishes (***below left***) show cultures of pre- and post-radiated tissue.*

Moreover, the layers of subcutaneous fat in several of the mummies indicated normal levels of nutrition. Finally, the lower intestine of Mummy 7, the woman in her late teens or early 20s, contained a sizable amount of digested food, an unexpected windfall for our dietary experts. When later analyzed, the material offered insights not only into the life of the young woman herself but also into those of her companions.

ONE QUITE INTERESTING sidelight emerged from our examination of Mummy 7: She had extraordinarily high levels of soot in her lungs, far higher than those of modern city dwellers who breathe a constant blend of auto fumes and industrial smoke. The answer, of course, is the seal-blubber lamp, the traditional instrument for lighting and heating early Inuit households. Women were required to tend and fuel the lamps during long periods in closed quarters while their men hunted in the open air.

None of the mummies, however, showed signs of tuberculosis, one of the principal killers of Greenlanders in recent generations. Nor do the women and two children appear to have died in an epidemic of dysentery or smallpox, such as are known to have ravaged Greenland in the past. Our examinations showed no evidence of any infectious diseases, though the tests were not absolutely foolproof.

Food poisoning is a possibility, for botulism caused by consumption of rotten meat is a common danger among arctic peoples. Finally, one frequent cause of death in polar latitudes leaves virtually no trace: It is entirely possible that the six women and two children of Qilakitsoq froze to death.

All these theories, however, depend on a basic premise: that the eight people died together and were buried at the same time. At least one bit of evidence suggests otherwise. Close examination of Mummy 2, the four-year-old boy, revealed that 11 of his teeth had fallen out after death and had become imbedded in his body. This could only have occurred before the body mummified and the skin turned almost as hard as wood.

The conclusion is that the boy's body was moved at least once after burial. Since Mummy 1, the six-month-old child, lay above him, it seems likely the two were buried at separate times.

Were any of the women and children related? Again, we cannot be certain, but tests

of tissue types among the bodies do not rule out the possibility. Thus, either Mummy 3 or 4, both women about 30, could have been the mother of the four-year-old buried above them. Another possibility is that Mummy 8—the 50-year-old woman with cancer—may have been the sister of Mummy 5, a woman of about the same age buried in the other grave. Not only do the tissue types allow for the relationship, but the two women also wore identical decorations in the form of tattoos.

FACIAL TATTOOS were a popular adornment among adult Eskimo women in Greenland from prehistoric times almost down to this century. When the bodies from Qilakitsoq arrived in Copenhagen, we at first saw no evidence of tattooing. But under infrared light, which penetrates human tissue below the epidermis, distinctive tattoos instantly stood out on the faces of five of the women (page 207). Only the face of the youngest woman was unadorned.

The tattooing technique was both simple and extremely painful, involving stitching beneath the skin with a needle and sinew thread dipped in soot, ashes, the juice of certain plants, or, in more recent times, gunpowder. To modern experts of tattooing, the style of any artist is almost as distinctive as that of a painter on canvas.

After examination of the bodies from Qilakitsoq, our experts determined that the tattoos on Mummies 5 and 8 were not only identical in design but possibly had also been produced by the same artist. Thus, it seems likely that the two women were from the same community and, according to their tissue type, may well have been sisters.

By contrast, the tattoo on Mummy 6 is totally different in style and workmanship from those on 5 and 8. The contrast is so great that our experts believe Mummy 6 probably came from a completely different region and married into the Qilakitsoq community.

As for the mummies' other type of adornment, their clothing, it tells us almost as much about the Inuit of Qilakitsoq as do the bodies themselves. To be sure, we have paintings of Eskimo clothing dating back almost to the 15th century. But in every instance we have had to rely on the artist's memory or sense of detail for an accurate representation.

Now at last from Qilakitsoq we have beautifully preserved samples of the clothing, *still being worn by the owners*. What the samples tell us is that the early artists were fairly accurate and that Inuit clothing has remained practical and virtually unchanged over a period of five centuries.

What is surprising about the clothes on the mummies, however, is not their practicality but their obvious sense of style and beauty. For example, a pair of short sealskin trousers that might easily have been made with skins of the same color instead displays an intricate pattern of light and dark shades that can only have been for ornamental purposes (page 204). Similarly, the sealskin anoraks featured stylishly narrow open necks and "tails," or strips of skin, dangling from the hems.

Sometimes superstition dictated the makeup of a particular garment. We found several anoraks whose linings contained small inserts of skin from unborn seals, a material traditionally believed to have magical protective powers.

Among the clothing we found a solitary bee, hidden in the fold of an anorak and preserved by the same process of dehydration as the mummies (page 206). The bee had arrived after the burial, as evidenced by a hive found built into the grave. Such hives are not uncommon in Greenland burial sites, perhaps accounting for the bee's association in Inuit mythology with magical powers.

IT REMAINED for Mummy 7, the young woman, to provide us with some of the most fascinating information as well as the most intriguing puzzles. She still had traces of food in her body, the fecal material in her lower intestine. The material was exhaustively analyzed by experts for clues to the long-ago diet and regimen of the people of Qilakitsoq.

To no one's surprise the fecal material contained samples of hair from seals, reindeer, and arctic hare, as well as bits of feathers of ptarmigan and dovekie—all common animals in the diet of an arctic people. There were also lice and samples of pollen from a number of arctic plants, some of them edible, such as the mountain sorrel.

POSTMORTEM — 500 YEARS LATER. *Four of the mummies were so well preserved that researchers decided to limit their examinations to X rays and other nondisruptive methods, thus leaving them dressed and intact for display at the Greenland Museum in Nuuk. Mummy 3 (right), though of relatively large stature, was judged to be a woman between the ages of 20 and 30.*

Thorough autopsies were performed on the other four mummies. The internal organs of Mummy 7 were remarkably preserved, particularly the heart (top). Dark deposits of soot, seen in a rehydrated section of her lungs (middle), were attributed to the inhalation of smoke from seal-blubber lamps. Studies revealed that Mummy 8, a 50-year-old woman, had been suffering from a malignant tumor as well as an unmended broken collarbone (above).

A legendary "Skraeling"—*as he would have been called by the Norsemen with whom he once shared his island—is depicted in a gold-and-silver miniature (**left**), wrought in the mid-17th century for King Frederick III of Denmark. Inspired by a painting of a decade earlier, when a Danish expedition brought four native Greenlanders to Denmark, the sculpture's depiction of native garb corresponds dramatically to costumes worn by the Qilakitsoq mummies. Artistic license, however, put women's clothing on a male figure, whose spear is actually the tooth of a narwhal, one of Greenland's most prized treasures.*

In cold storage *for five centuries, the remarkably preserved clothing from the Qilakitsoq graves has proved a notable find in itself. A surprising attention to fashion was apparent in many garments, like these shorts (**middle right**) whose sinew stitching (**right**) joins multicolored patches of fur. All eight mummies wore traditional kamiks—skin boots (**top right**) that combine warmth with an ability to "breathe," allowing body moisture to escape. Between the waterproof outer boot of scraped "water skin" and a reindeer-skin liner lies a layer of insulating grass.*

Good as new *after restoration, a tight-waisted anorak from the second grave reveals a genuine flair for style. While light belly skins were used for the side and shoulder pieces, the ornamental backpiece was taken from the back of a ringed seal—one of five seal species that early Greenland Eskimos might have used. Like the human skins they adorned, the animal skins of Qilakitsoq were preserved by the dry cold of the graves. Many of the 78 garments found there had retained enough of their natural protein that the skins could be made soft and supple again. All were cleaned, and those removed from the mummies were tanned and stretched to complete restoration.*

If the woman had picked the sorrel and eaten it directly, it would mean she died in midsummer, for that is when the plant blooms. Unfortunately she could as easily have ingested a flower that had been preserved in seal oil long after the blooming season, or she could have consumed the pollen through the medium of some animal that had eaten it months earlier.

If several other mummies had had sorrel pollen in their systems, it would be an indication that all had died in midsummer, presumably of some common cause. But once again no such evidence exists.

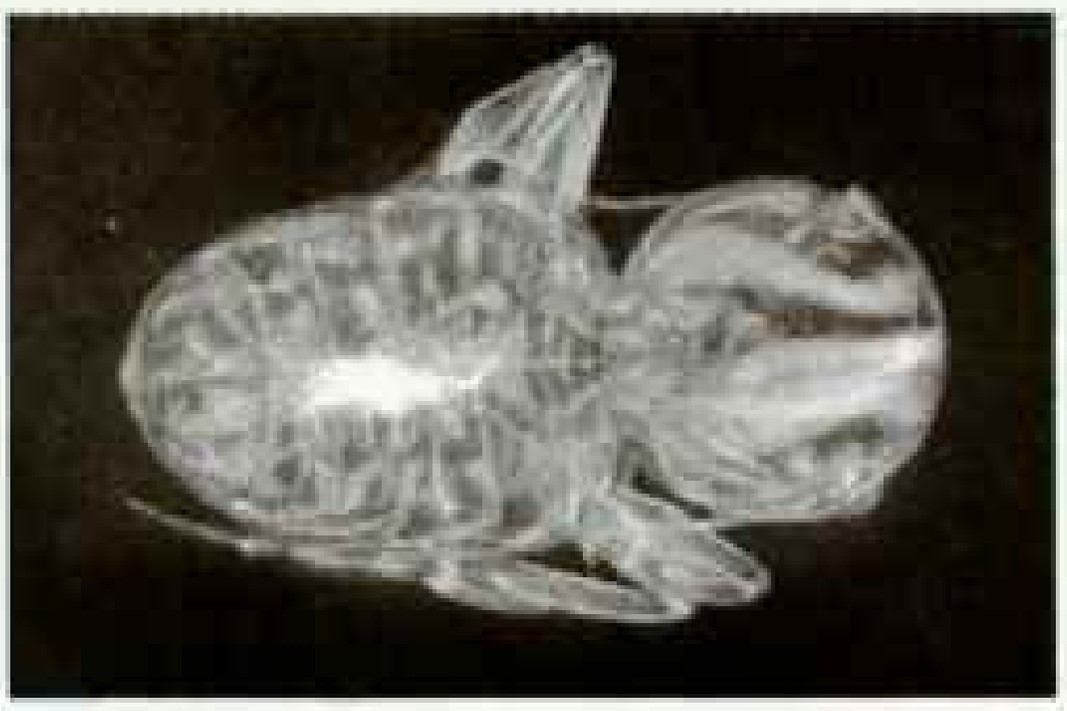
One startling discovery in the fecal matter was microscopic fragments of evergreen wood, some of them burned. There is not an evergreen tree in all of Greenland, and the mystery is how the fragments reached Qilakitsoq. Some may be splinters from wooden bowls made of driftwood; others may have arrived as ash carried by high winds from Canada across Baffin Bay to Greenland's west coast.

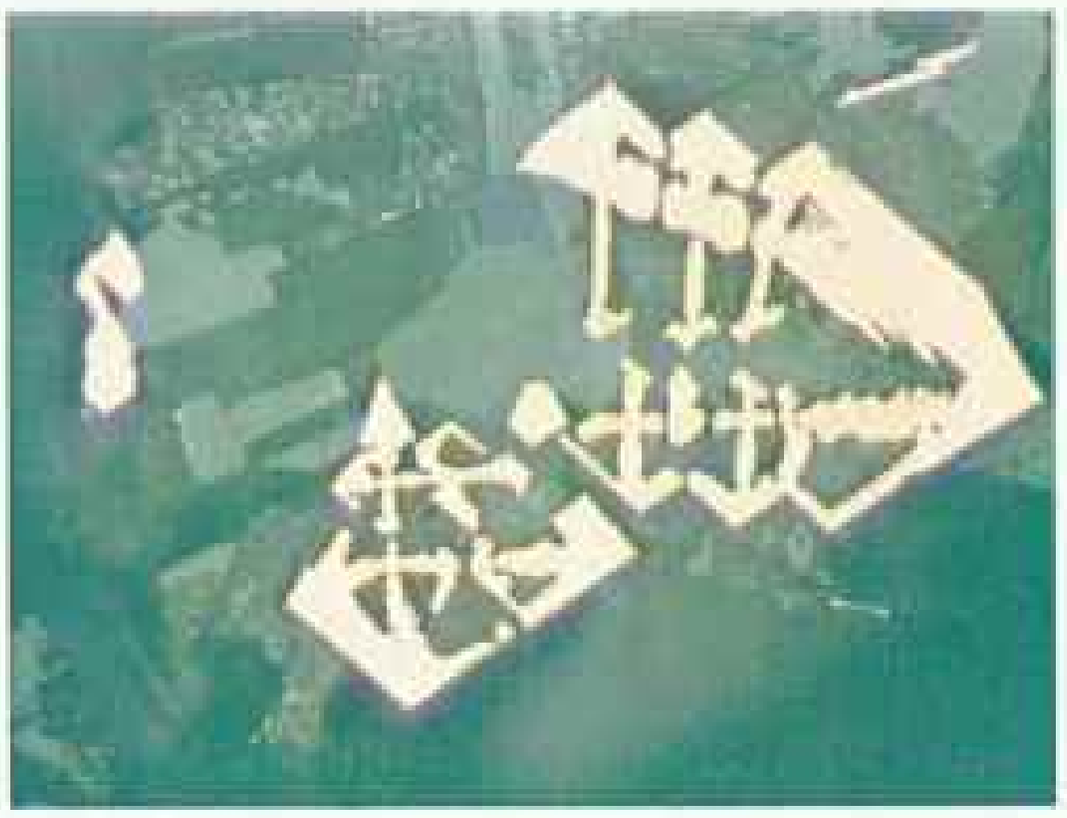
COLLECTIVELY as well as separately the mummies tell us a good deal about their environment compared with that of present-day Greenland. Analysis of hair samples revealed that the bodies contained comparatively low levels of such potentially harmful substances as mercury and lead. Modern Greenlanders have three times the mercury and eight times the lead in their systems as did the people of Qilakitsoq. Yet Greenland today is considered a relatively unpolluted area of the world.

The mummies continue to provide us with information, for research is still proceeding. We have now established a foundation called the Qilakitsoq Fund to promote further multidisciplinary research on archaeological finds from Greenland.

In time new scientific techniques and materials may provide some of the answers that have so far eluded us. Perhaps one day we shall know more about how the mummies lived, whether they were related, and possibly even how they died.

Meanwhile four of the mummies, including the small child, have been returned to Greenland. There they are on display at the museum in Nuuk—a human memorial to one of the great peoples of arctic history. □





No stone was left unturned *in the study of grave contents. Finds ranged from mummified insects, like this bee* (**middle**), *to mineral traces* (**above**) *that indicate some of the Qilakitsoq people had been on the tip of the Nuussuaq Peninsula before their death. A theory that they had drowned together near Qilakitsoq was discarded, partly because no sand was found matching the local beach. Starvation was ruled out, at least for one mummy, whose intestines contained, among other foods that early Inuit were known to relish, head lice such as this one* (**top**).

Skin-deep clue *to her marriage status, a nearly invisible tattoo is detected on Mummy 4 by dermatologist Niels Kromann (**above**) at the Danish National Museum in Copenhagen. Seen best under infrared light (**right**), tattoos were found on all but the youngest of the adults; by early custom most married women were tattooed. Made by drawing a needle and stained thread through the skin, tattoos also help identify the various communities of Greenland's early Eskimos—who, though far-flung along a vast coastline, were one people sharing one language.*

Maine's Working

By DAVID JEFFERY NATIONAL GEOGRAPHIC SENIOR STAFF

Coast

Photographs by KEVIN FLEMING

***Winter seas** break under the bow of the Casey Ann, a lobster boat running traps off Monhegan Island. Fiberglass hulls, electronics, mechanical pot haulers, Styrofoam buoys, and wire traps have changed the technology of lobstering. What remains constant is raw work in all weather for uncertain rewards.*

WITH HOE FOR DIGGING *and roller for carrying, a clammer works the mud flats of Beals Island at low tide. When times were worse—the unemployment rate on the Maine coast is now lower than the national average—one tide's harvest of clams was equated with fare for a bus ticket out of the state. That pattern has been reversed, and more are moving to the coast than are leaving it.*

THE MAY DAWN turned a bright orange spotlight on the rim of Casco Bay. It shone on what appeared, at first glance, to be a traditional Maine scene. Jeff Sawyer swung aboard the *Island Romance* at Cliff Island. He had piloted this boat and her sister ships through storms, snows, "blue dungeon" fogs, and those terrors of summer—pleasure boaters. He had run his courses through twisting, rock-bordered channels "in any combination of weather you care to choose."

Another day's work was under way on the Maine coast, but Sawyer was no longer a skipper for Casco Bay Lines. He now worked in marine electronics for a ship chandlery. He was a passenger on his old ferryboat, a commuter.

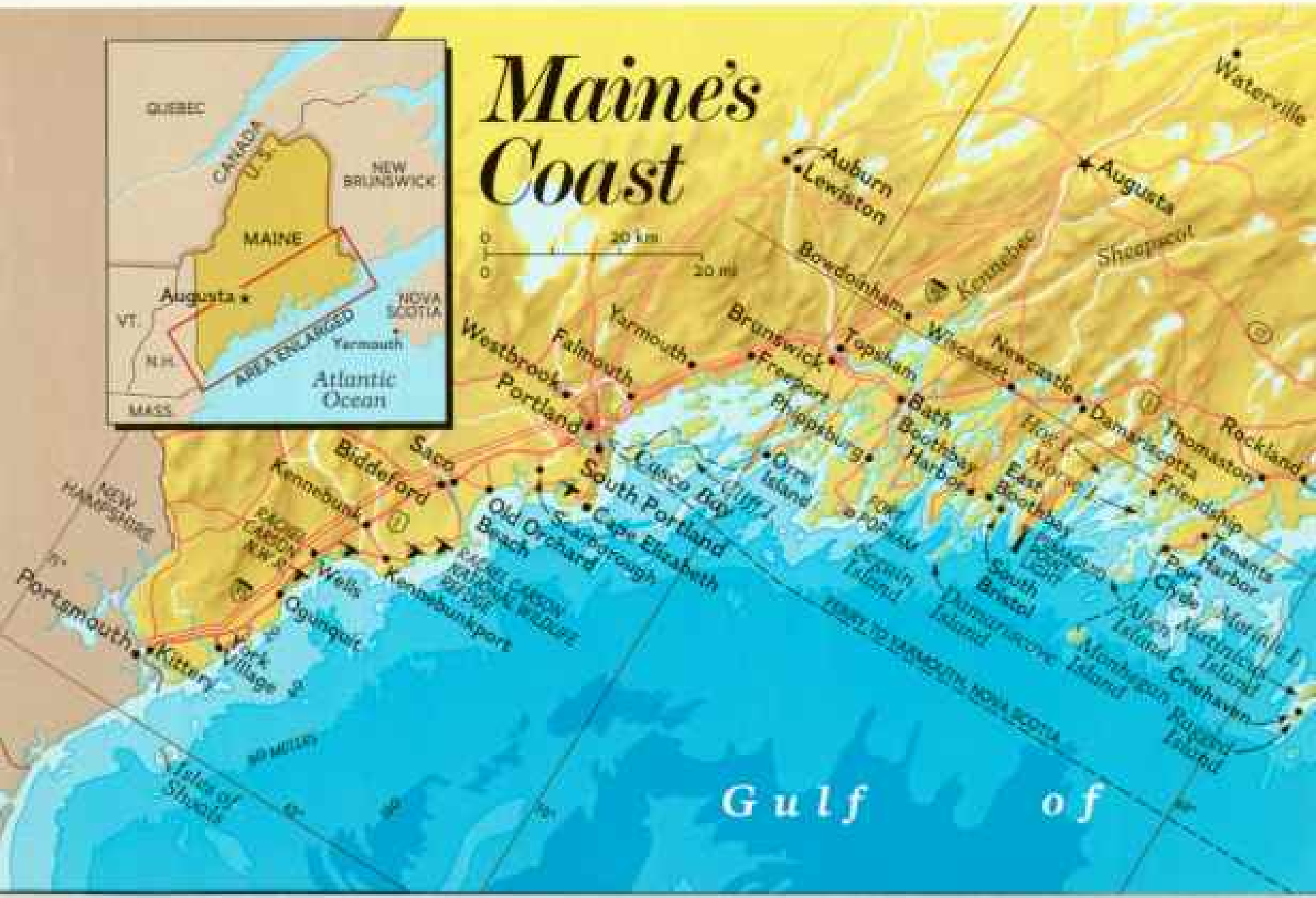
Nor was Sawyer's home, Cliff Island with its 90 year-round residents and one-room schoolhouse, truly remote. It is a part of Portland, Maine's largest city, an offshore neighborhood with municipal complaints about trash removal and rising taxes.

If you look at it as theater, the Maine coast is a stage full of anachronisms. Scenes and props from the 19th and 20th centuries are jumbled together. The theme of this drama is people at work. The plot is simple. It carries you along U. S. Route 1 from Kittery to Calais, going from up west to Down East and from the spillover of fringe megalopolis to blueberries, herring, and hard times—except for the Indians. The action tends to wander in digressions down rivers and peninsulas, around coves and bays, and offshore among some 3,000 islands.

The cast is tourists, summer people, transplants "from away," and natives. Each looks at the place in a different way. What do rocks mean to summer people and sunshine visitors who climb over them as waves splash and glitter? What do they mean to fishermen chugging along in fog who cannot see them at all?

If you look seaward on a brilliant summer day, a mirage may appear: distant islands set inverted on the horizon's backdrop. Another illusion is casting yourself in a permanent role: Why don't I live in this beautiful place? I could move here and find work, I guess, and. . . .

Bill Cannell's boat shed is on the National Register of Historic Places. It slants downhill to Camden's harbor. Cannell builds and restores classic wooden boats (he used to build fiberglass surfboards in South Africa), hauling them up the slope with a gasoline engine installed in 1906. Many come by to look for work at Cannell's.



"In the old days," he said, "boatbuilding was one of the best paying jobs around here. Now people who bang nails into houses can make twice as much. People work at wooden boats for other reasons. They are better educated and interested in the romance of it." Cannell had two good workers, one a former designer of electrical systems for nuclear power plants, another who taught mathematics. Cannell said that they couldn't afford to keep on with boats for $7 an hour and drifted off.

Philip Pasho found a way around that sort of dilemma. A manager for Fairchild Semiconductor in South Portland, he wanted to stay in Maine—three moves to California were enough. His experience as an entrepreneur had been limited to childhood, when he took canned goods out of the family kitchen and sold them to indulgent parents. Yet he put together a team, raised venture capital, and founded Vortech Corporation in 1983.

In a year Pasho's company was expanding past 20 employees. "As it grows, the company will stabilize and mature. I'll be working six-and-a-half-day weeks instead of eight," he said. Vortech tests semiconductor products, such as programmable array logic, for other firms by using exotic technologies.

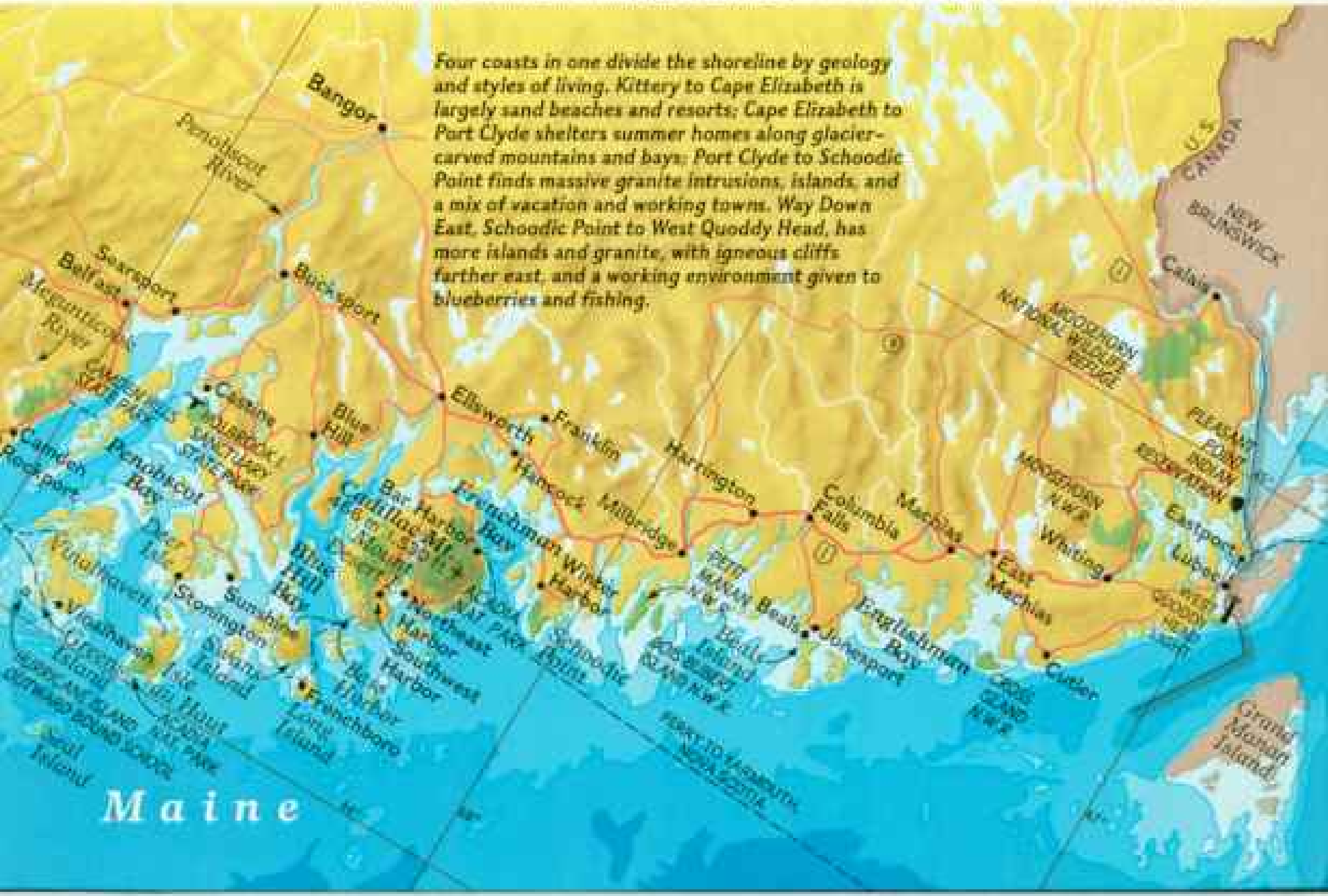
The kind of technology Havilah Hawkins uses to heat his Camden loft is an "automatic-feed, alder-burning wood stove." He spaces chunks of alder along a slow-moving electrically driven conveyor belt that dumps them into the stove by way of a chute.

Hawkins also has his own generator to produce electricity. He has set a water turbine to tap the potential of an old millpond where the Megunticook River goes placid before rattling over boulders and into the head of Camden's harbor. The generator wails away in a cellar tucked beside the pond, a dank space lit by naked bulbs that throw fantastical shadows across dungeonish walls. "Down here," Hawkins says, "I feel like the Phantom of the Opera."

One of Hawkins's current projects is test sailing his windmill-powered boat (page 224). He hopes that will lead to a 150-foot prototype for larger cargo ships.

AS THE CURTAIN was going up on launch day for the U.S.S. *Elrod*, a guided-missile frigate at Bath Iron Works (BIW), rain was coming down in quilts. By 4:30 a.m. "the rally" was in full swing as some hundred three-person teams drove their rams into wedges. The wedges forced a cradle of timbers against the hull of

NGS CARTOGRAPHIC DIVISION. DESIGN: CHRISTOPHER A. KLEIN. RESEARCH: MARGUERITE B. HOEKEN. PRODUCTION: RAMSEY MURRAY



the 453-foot, 3,800-ton vessel, lifting it perhaps a thirty-second of an inch. As that was done, workers moved under the hull and removed blocks; the cradle took up the strain. In the dripping predawn, spotlights shone on a hard-hatted operatic chorus, pounding and pausing and pounding.

The rally crew were paid volunteers from the 7,300 workers that make BIW the state's largest private employer, one proud of turning out ships ahead of schedule and under budget. BIW credits the welders, shipfitters, electricians, crane operators, and the rest for a large part in that—the vigor of the Maine work ethic being a theme sounded all up and down the coast.

At 10 a.m. William Rich had a roomful of tugboat captains paying respectful attention as he chalked their launch positions. Retired as a destroyer and minesweeper captain with combat time, he was now BIW port captain and pilot, and he would ride the *Elrod* down the ways and into the Kennebec River, in command until the tugs eased the ship into a berth and she was secured.

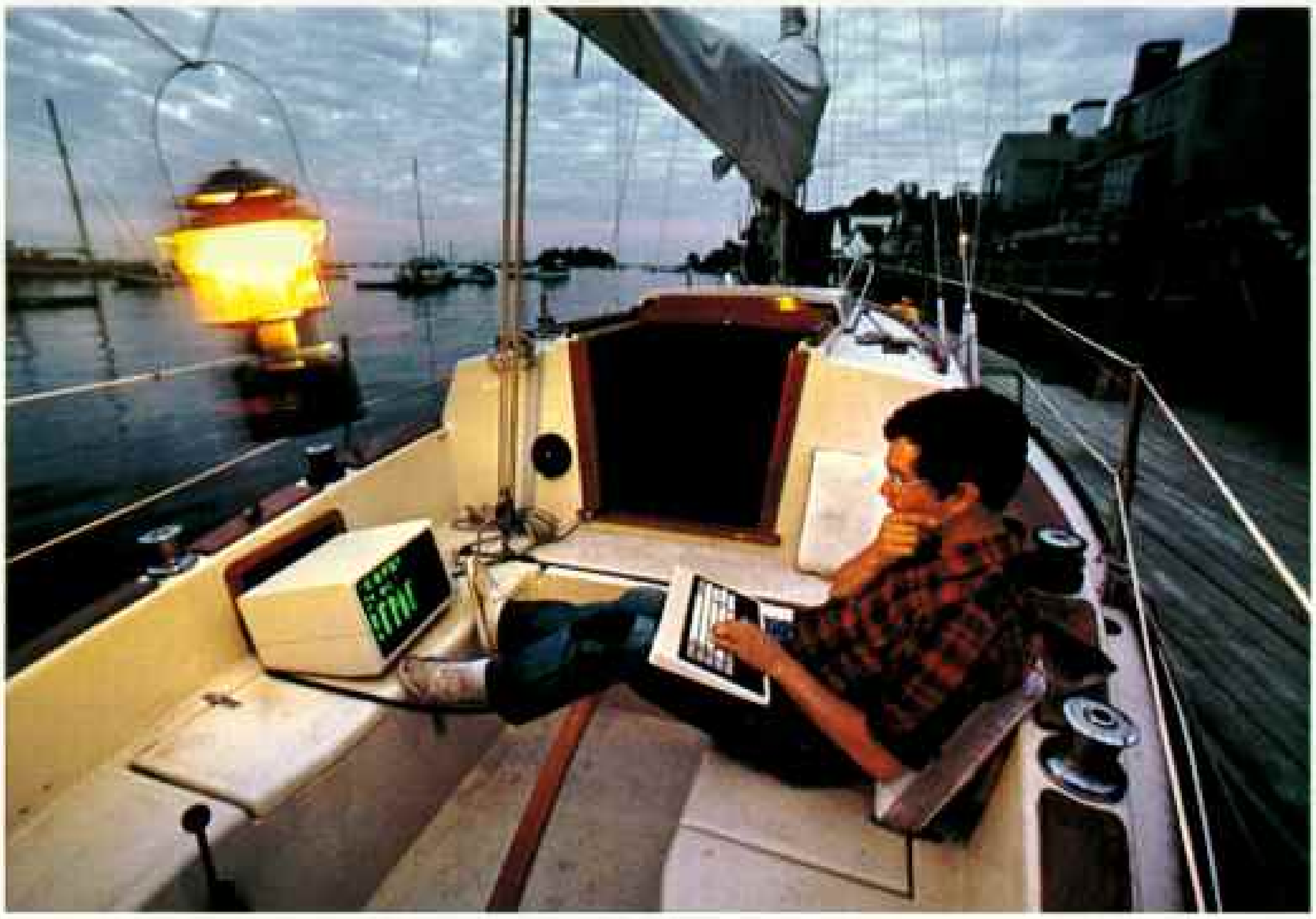
Bristling with antimissile, antiaircraft, antiship, and antisubmarine gear, the *Elrod* waited on a cradle that could have been the largest antique in Maine. Launch was to be at slack high tide—bands, speeches, or dignitaries to the contrary.

Radio talk crackled back and forth from Rich and his crew on the bridge to the ground crew under the arcing loom of the hull. Word came that the champagne bottle was ready. A klaxon blared. Restraints were thrown. She moved. She rushed. Cradle and ship rumbled and hissed. The hull raced overhead like steel scud.

"She's off!"

The band played "Anchors Aweigh."

NO BAND, no champagne, and no spectators marked the departure from Bath of *Chance*, a 31-foot Friendship sloop built by Wilbur Morse in



The coast life computes *for more and more professionals. Jeff Zurkow* ***(above)*** *brought his software business from Delaware to Camden, naming it after his sloop Avocet, where on a mild evening he writes programs for new products. Over Hurricane Sound* ***(left)****, Alabama native Jim Rutland commutes in his home-built airplane from his Youngtown Inn to Boston, where he flies for Delta Air Lines.*

"Poverty crates" *is what 84-year-old Isle au Haut lobsterman Skeet MacDonald calls his traps. He repaired that "pretty tender old gear" with soft spruce slats*

1916 for lobstering under sail. *Chance* nosed out at 6:44 a.m. to catch the tide. The day was gray as a whale, and fog was making up.

Our idea was to voyage in a Maine-type, Maine-built vessel down the Kennebec and through passages between mainland and islands, sometimes called thorofares and collectively the principal coastal highway before landlocked U. S. 1.

Two of the crew could not be faulted. What better pilot than Bill Rich, who moves the U. S. Navy over these parts for BIW? Or better skipper than seasoned sailor, author of books on boats, resourceful chef, and GEOGRAPHIC colleague Jan Adkins?

We began under power, the engine an anachronism if it ran and ballast if it didn't. Within two miles below Bath—one of the nation's premier shipbuilders in the 1800s—the Kennebec turns 90 degrees twice, then flows dead south. Rich checked our compass on Doubling Point Range. He knew these waters like no one else. "This river's deep where it's deep and not where it's not."

We fell with the tide, passing banks thick green with the appearance of wilderness, the odd summer house, the postcard village of Phippsburg, and Fort Popham. Near there the first recorded English settlement in New England, the Popham Colony, had stood the winter of 1607. It was abandoned soon after leader George Popham died, and the rest lacked heart to continue. Yet they had built the pinnace *Virginia*, the first English vessel launched from the colonial mainland.

With a fresh southwest breeze against the

rather than the usual tough oak, thinking he wouldn't have much time left to fish. But, he says, "Don't know but what I'm going to outlive 'em now."

tide, seas were piling up into steep, distorted pyramids as we raised *Chance*'s mainsail with one reef tied in. She promptly started pitching, digging her bowsprit under and taking water over the bow; then she rolled, dragging her boom in the chop.

Close by lay an island, Seguin, but our plan was to head east in open ocean for Damariscove Island. That sliver of rock was used seasonally by European fishermen before such early explorers as Champlain, Weymouth, Popham, or John Smith reached these waters. When Pilgrims at Plymouth ran short of food, it was those fishermen who provided. The Nature Conservancy, largest private holder of Maine islands, manages deserted Damariscove as a preserve.

Chance continued to pitch and roll badly. Seas were running at least ten feet. The weather was deteriorating, not yet "thick-o-fog," but closing in, and not yet "blowing like stink," but coming on. Damariscove seemed to recede as we studied the chart. There, off the island's only good harbor—a wind funnel in a southwest breeze—was a keel-ripper of a ledge called the Motions.

When in the Navy, Bill Rich had once steamed into "a storm with 105-mile-an-hour winds. It wasn't a hurricane but a collision of two fronts. It was like falling off a cliff." He had directed his ship to answer distress calls, one to locate an oyster boat. "We found her deckhouse, floating."

If Rich thought we should alter course, we would, and like "the prudent mariner," that character to whom nautical charts direct

their cautionary messages, we turned up the Sheepscot River, down through Townsend Gut, and into Boothbay Harbor, arriving to the flash, crack, and drench of a thunder-squall. We went ashore, and after supper Bill Rich had to say good-bye.

THE NEXT DAY we left a ledge known as the Hypocrites to starboard on our way up to East Boothbay, where new crewman Philip Conkling came aboard. After passing through the Gut at South Bristol (as perfect a small village as any itinerant artist might find to paint in Maine), we entered Johns Bay, turned to roughly parallel a channel called the Thread of Life, and ran down to Pemaquid Point.

That point reaches into the ocean like a deeply veined stone paw whose limb stretches back into forest and a crouching granite beast. Its lighthouse is among Maine's most famous, and despite fog we made out small forms clambering over the great paw as we sailed into foamy outwash from breakers.

It was, as Conkling said, "a bold shore." Conkling had come to Maine to work as a timber cruiser, been an instructor for the Hurricane Island Outward Bound School, written a thoughtful book on Maine islands, *Islands in Time*, and had recently become executive director of the newly formed Island Institute, a division of the school.

By the thousands or one by one, *Nikki Schumann and her husband, Anthony Giachetti* ***(left)****, pursue their crafts in East Boothbay—she as a designer and publisher of calendars, he as a cabinet designer and maker. He builds such pieces as this native and French walnut "butterfly" sideboard so that "it will not be trendy but make sense over time." Her work is necessarily dated.*

On a coast that may have as many professional craftspeople as full-time lobstermen, painters range from Sunday daubers to such illustrious artists as Jamie Wyeth ***(below)****, who paints on Monhegan Island. His work, including Maine scenes and portraits, was recently shown as a major retrospective in the Portland Museum of Art's new wing.*

The institute was founded to help revive the sense of community among islands and islanders that had been strong from early settlement and into the present century. While 3,000 may seem like islands enough for everyone, various interests are in at least potential conflict. Developers, private owners, conservation groups, government agencies, cruising boaters, and day-trippers have stakes in the islands' future. As do, above all, year-round islanders.

Conkling said that in the past two centuries many Maine islands were well populated and used for farms, timbering, quarrying granite, boatbuilding, fish ports, fish processing, or other trades of self-sufficiency. Some still are. Yet as communication and trade by water gave way to the railroads and roads of the mainland, the old island-to-island culture spiraled into decline.

Conkling cited the history of Criehaven on Ragged Island.

"In 1925 the islanders decided to deorganize as a town. That ended town meetings. Then the crisis of World War II hit. Since there was a shortage of teachers, children had to be sent to school on the mainland. Within a year their mothers followed.

"The island's store closed, and the men spent more time ashore. For lack of traffic, ferry service was suspended, and with that a 150-year-old settlement disappeared."

CHANCE was at her best the next day in a smart following breeze as the dense spruces of Hog Island came abeam. Where pork was once the prime wildlife, the National Audubon Society now conducts a summer ecology camp.

If smuggling is an industry—importing alcohol from Canada was big business during Prohibition—marijuana smuggling in bulk has revived it. Tens of tons are seized yearly, but the tonnage is falling. Either law enforcement is improving, or smugglers are. Conkling pointed out a nearby wharf, "where they had a large pot bust one winter; Colombians were running through the snow, so cold they wanted to be captured."

Though the coast is far from the southern sluices of drug traffic, its coves, channels, cuts, thorofares, and inshore islands weave a labyrinth of evasion further obscured by the layering on of fogs.

Which item came rolling in as we turned toward Friendship, *Chance's* ancestral home. The long late Wilbur Morse built her here, and the Lash Brothers Boatyard has also launched sloops of her type.

If Winfield, patriarch of the Lash clan with 40 years in the yard, had looked out through the fog and seen *Chance* ghosting by, it is unlikely a lump would have come to his throat. He had earlier said, "I've been sailing a few times, but I didn't like to go. It's a waste of time. I'd rather have an engine."

Past Friendship Harbor we had to strike *Chance's* jammed foresail; beyond Morse Island the engine quit. It was as if Lash and Morse were having an old argument about boats and each had scored a telling point.

After sorting out, the next morning we moored at a 450-acre experiment. Allen Island had once supported a farm but was later abandoned to spruces. With the cooperation of new owner Betsy Wyeth, a lobsterman and a woodcutter had built a wharf, the first necessity for a working island. Timber was cut for a workshop. Up a rise past the site of the pre-Revolutionary Allen farm, the woods opened into pasture and a sweeping view of Penobscot Bay.

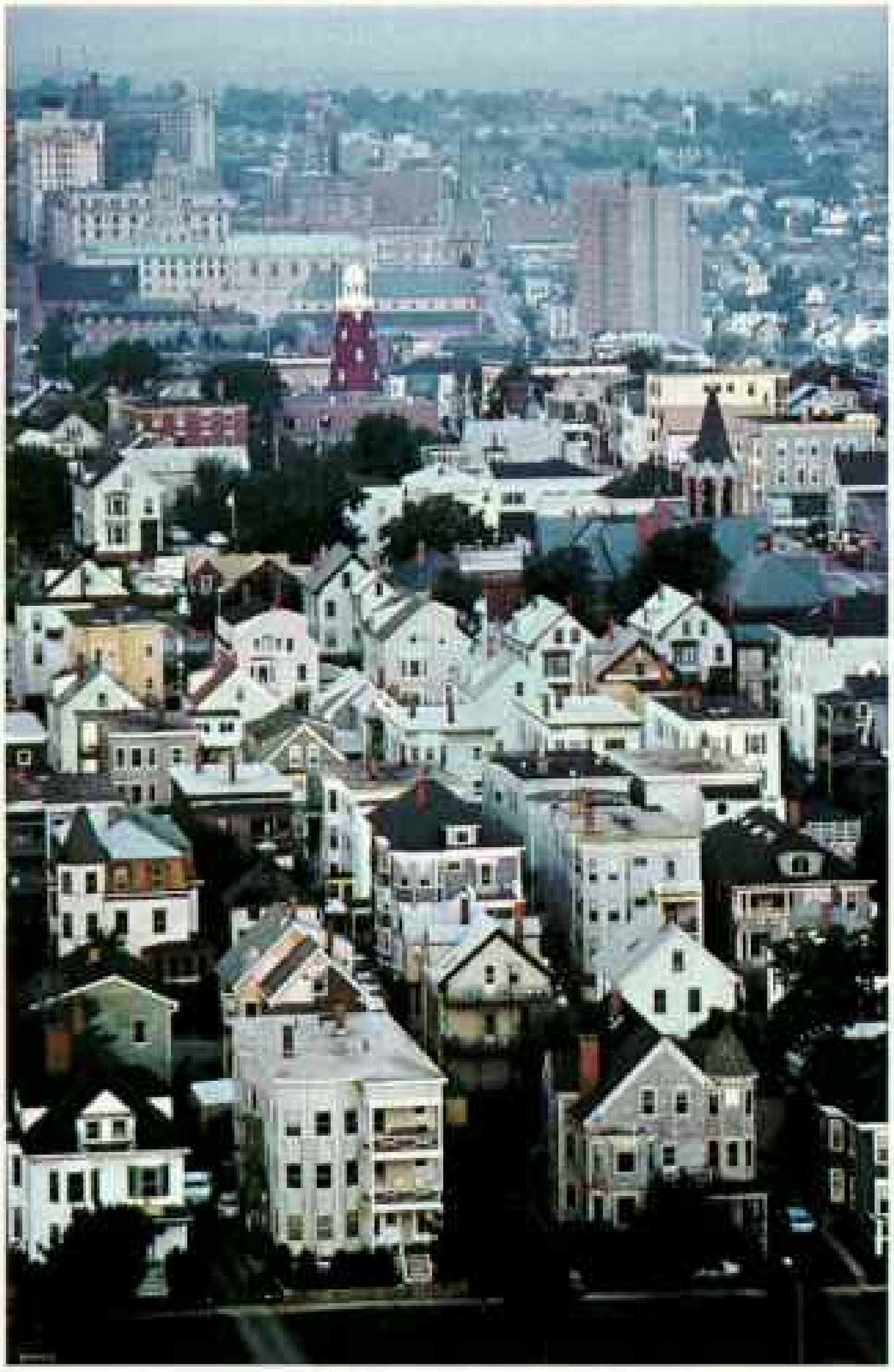
Conkling said that "500 cords of wood were cut on this point in 1981. Some was taken to Monhegan Island for firewood when its oil service was suspended."

In place of scraggly birch and spruce a flock of sheep nibbled on tender shoots, although they had missed some spruce seedlings. These would have to be cut to keep the pasture open, or "spruced up."

Down the west flank of the pasture and across the mouth of a cove, a group in slickers and wool shirts dug carefully with trowels despite light rain. Arthur Spiess, who under a fedora had a slightly Indiana Jones air about him, was supervising the excavation of a seasonal Indian site for the Maine Historic Preservation Commission.

Items from their catalog *fill L. L. Bean's giant warehouse* ***(above)****. The Freeport store of the outdoors outfitter never closes, and some 2,500,000 shop there yearly. Bill Crampton* ***(facing page)*** *chisels the schooner Dayspring's stem. High taxes drove him out of his own yard in Ireland to Maine, which he calls "the world's wooden boatbuilding capital."*

Houses drowse before dawn *under the white cupola of Portland Observatory* ***(below)****, built in 1807 to watch for shipping. Don Heller* ***(right)*** *wheels a mannequin on a 19th-century medical table to his Milk Street Antiques in the Old Port Exchange area. Heller travels widely on buying trips but says of Portland, "There's no other place I'd choose to live."*



The work had turned up a cobble floor, flaked stones, bones of birds, codfish, and an extinct mink, and, lower down, evidence suggesting occupation 2,000 years ago.

Fragments of European clay pipes intrigued Spiess most. "This site is important because it may turn out to be a key piece in the puzzle of early Indian-European contact. It's a humdinger!"

Up a rise from the dig, a granite cross near the wharf promotes the idea that explorer George Weymouth, diarist James Rosier, and the crew from the *Archangel* were the first Europeans to stop here. They are said to have celebrated Pentecost Sunday in 1605.

We left that island, so rich in beginnings, and set out across Penobscot Bay. Past a lather of breakers frothing the flanks of Roaring Bull rock, we made for Metinic Island, where generations have worked for more than 200 years; the current family descends from the first.

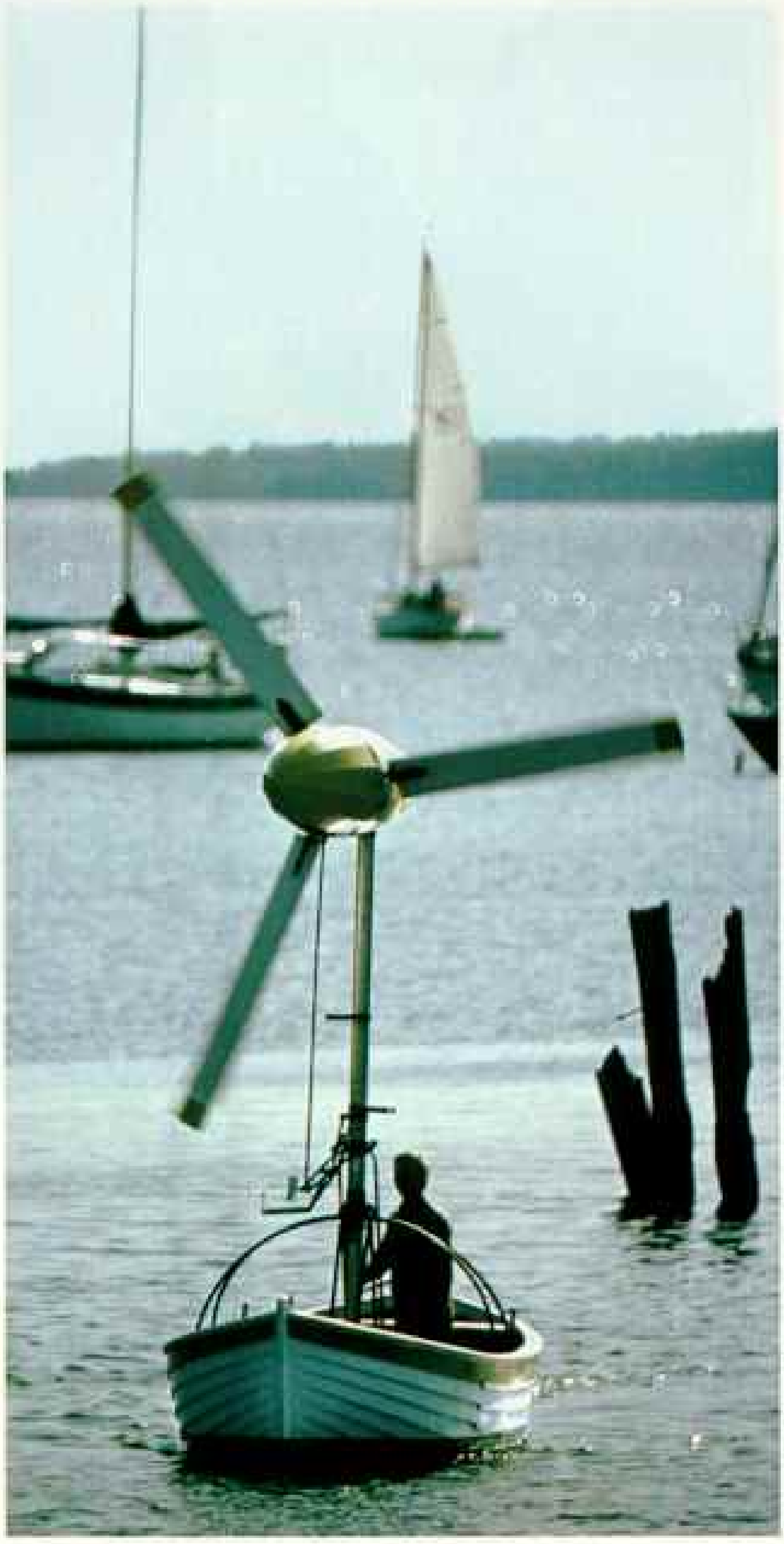
Morning was *sunny* as we poked into a cove of Greens Island called the Tombs. A sailing scow, little more elaborate than a heavily timbered raft with a simple gaff rig, was tied to a wharf. It was part of the life Bill and Elaine Drury had made from an overgrown farmstead by cutting, clearing, planting, and building over three summers, living the while in a tepee now used as fair-weather guest quarters and a playhouse for their children, Rebecca and Jamus.

Their house was up and mostly insulated, and, Drury said, they had turned to using the island's natural resources. "This magical place offers us everything we need, really. You have seaweed for fertilizer, wild fruit, and fish. If you do it right, you can make a good living out here."

Realists, they also had pigs, sheep, the garden, as well as their sailing scow, portable sawmill, and a draft horse. Drury cuts cleared trees into logs and mills those into

Beating against the breeze *and convention, Havilah Hawkins pilots his windmill boat across Camden Harbor* ***(below)****. Designer and retired master of the schooner Mary Day, Hawkins has "made a living in wind for 32 years" and plotted a singular life's course, declining to fight in wartime or patent his inventions in peacetime.*

Lifting a guided-missile frigate as if it were a dinghy, the floating drydock of Bath Iron Works ***(right)*** *adds new economic clout to Portland's waterfront.*



Adventures in the wind trade *send crewman Jeff Simmons up the Mary Day's foremast to inspect running rigging during a pickup race with schooners* Heritage *and* J. & E. Riggin. *Passengers sign aboard for a week's pleasure cruise, loafing*

or deck crewing, and get a sense of the days when coasters hauled lumber, granite, herring, or coal.

planks for building or for sale. The sawmill comes apart in five pieces. He can take it aboard the scow and sail to jobs on other islands. That work would go easier if he could also take a horse along, but when the scow was ready, Osiris, his 35-year-old Clydesdale, lay down one day and did not get up.

Osiris's replacement, a part Belgian, part Morgan mare named Sadie, has proved herself an "ambitious worker." Still, she has shown no interest in becoming a sea horse. Drury was considering taking her new colt, Jasper, "out on the scow while he's still little to give him a rousing good ride. Then after he gets to be 1,800 pounds and I can't make him move, maybe he'll want to go."

After paying respects at the side-by-side tombs of Joseph and Dorcas Green, who came to farm the island before the Revolution, we went to put the scow on a mooring. Drury took out a cow's horn and trumpeted a bellow on his "official scowboy foghorn." He blew a longer blast and declared with mock solemnity:

"Take the crew away!"

We took ourselves away from Greens, from each other, and from *Chance*.

BACK ON THE MAINLAND, a crowd scene was playing as a cast of thousands inched up U. S. 1, like sticks of alder on the conveyor belt to Havilah Hawkins's stove. Some drop into the hoppers of south coast resorts, pricey ones like Kennebunkport or Ogunquit or like Old Orchard Beach, chockablock with frame houses and raffish charm. Many will bypass Portland on their way north to the rockbound resorts.

Portland, early May. The sky is porcelain blue, the sun warm, the breeze cool. It is a day of visible statistic: Portland has more hours of sunshine than 95 percent of the Northeast. In spring it is a city of ladders; everywhere buildings are being cleaned, painted, patched, gutted for restoration.

Because the city occupies a lobed peninsula, the inevitable freeway was put across the neck, not along the waterfront. Downtown is built on a saddle that rises to the residential neighborhoods of Eastern and Western Promenade. Many fine buildings have been razed, but the city escaped the worst of bulldoze-it-all renewal. What remains is a sampler of 19th-century styles: federal,

Putting patients before bureaucracy, *Dr. Gregory O'Keefe was demoted for refusing a desk-job promotion with the National Health Service Corps. The only physician for the island of Vinalhaven (**below**), O'Keefe also treats patients on other islands; at Greens (**right**) he doctors Rebecca Drury's injured foot. He makes calls with the help of volunteers such as disabled veteran and lobsterman Les Dyer (**far right**). O'Keefe will stay on in private practice, and the islanders will pitch in to support him.*

Shoveling salmon chow, *Jim Miller feeds fish raised in the pens of Ocean Products in Eastport, where netting protects the Atlantic salmon from sea and sky predators. The pellets, containing vitamin-enriched fish meal and ground herring, are*

processed at a failed herring plant. Aquaculture promises more stability for Maine's chronically cyclic fishing industry.

Greek and Gothic Revival, Italianate, Romanesque, and native frame and brick.

All this has not escaped notice. Portland may not yet rank in the top trendy, but it has been discovered by many who would mix urbanity with easy access to coast and countryside. The Yuppies are coming.

DOWN THE COAST (that's up the coast to people "from away") town character changes abruptly. On Penobscot Bay, Rockland is as different from Rockport as fish processing is from yachts at anchor. Camden has nine schooners, crowds, and open-air Shakespeare; Belfast has frozen potato skins, industrial ambition, and one schooner, the *Sylvina W. Beal*. Searsport features flea markets and antiques; Bucksport houses a giant paper mill.

Down in Stonington, lobstermen were hurting. Demand was off. Canadians had dumped large catches on the Boston market. The dock price was a low $2.53 per pound.

As manager of the Stonington Lobster Co-op, Skip Greenlaw deals with the squeeze daily. A woman came in the door. She needed money for her husband's doctor bills and got it right then on her word. That was an expression of the unbroken code that fishermen always help other fishermen in need.

Fishermen and others were also getting squeezed ashore, Greenlaw said. Summer people have been buying houses and waterfront property and "paying prices that reflect their urban incomes." That drives up property valuations and taxes.

"Fewer and fewer fishermen will have waterfront access if they don't have it now. It will be impossible to buy, and that makes it hard on young people just starting out."

Dick Bridges fishes out of Stonington, and he was going out to start bringing in the 800 to 1,000 lobster traps he sets from August to May, when he tends about 450 each day. "Ten years ago," he said, "I thought I had lobsters figured out, but I was wrong. I used to go out 35 to 40 miles, but in the last five years or so they haven't all crawled into deep water, and I've been fishing inshore."

By 4:10 a.m. Bridges had *Sea Queen II* idling at the pier as he and sternman Jon Haskell off-loaded bait not needed. Only a pale rind of light stood in the east as the 42-foot fiberglass hull pushed by a Caterpillar

diesel carved the slick black water. In instrument glow, Bridges's face looked 19th-century with a beard that ran in a neat U from ear along jawline to ear. Islands began to separate from sky as the boat eased through a passage maybe 20 yards from shore rock to ledge nearly awash.

The work began and continued almost without words, which could hardly be heard over the diesel's rumble. As Haskell said, "The commonest word on a boat is *huh?*"

Swing boat to buoy on starboard; lift pot warp (line attached to buoy) with gaff-like crook; lead warp over freewheeling block hung from cabin top; flick warp around pot hauler, a flanged winch run by belt off the engine. Set dripping trap on rail; open; toss crabs, urchins, starfish, and fish overboard —and lobsters, eyeballed short or long.

Turn lobster over; if gravid with eggs throw overboard; otherwise, toss in rubber-band box. Dunk buoy in hot water barrel to remove slime; coil warp. Stack trap (most wire, a few old-style wood) starting at aft end of cockpit. Check lobsters in band box with official brass gauge; if OK slip rubber bands over claws with forceps-like tool. Swing boat up to buoy on starboard. . . .

Repeat 150 times and be back at the pier by 8:30 a.m. Repeat daily for a week and then rig to go gillnetting for cod.

BY AUGUST lobster prices were up in the $3.80 range, and Skeet MacDonald was getting ready to run his traps off Isle au Haut (pages 216-17).

MacDonald began in the trade at about age 12 when "my uncle gave me a dozen old lobster pots and an old rowboat." That was in 1912 or 1913. He also went in his father's Friendship sloop, built by Wilbur Morse in about 1908. "I was seasick every time I went out. I swore I'd never go aboard again."

He came to Isle au Haut in 1921 and worked as engineer on a boat of the wealthy rusticators. In 1922 he went into lobstering full-time, starting in a launch with a "one lunger" make-and-break engine.

"In my lifetime I've only had to go to two people that was robbing my traps. I waited and watched. What you see with your eyes, you can believe.

"I told them that if they wanted to go fishing, they'd better leave me alone. If they didn't, I said, 'You ain't going to fish. You won't have nothing to fish *with*. If you doubt my word, try it just once more.' I meant it too. I never had to go back."

MacDonald now fishes 50 traps with the help of a retired clergyman as volunteer sternman. "He won't take a penny. I love to have him too, and he does a lot of work. I go out about every day that's suitable, but, ye gods, there's nothing to fish for. As a whole, I don't know how the lobsters hang up as

Wrapped in her travels, *an Ohioan finds a patch of solitude where Acadia National Park meets Frenchman Bay. Acadia's four million yearly visitors make it the second most popular national park, after the Great Smokies.*

well as they do. You know, there's a limit to what there is out there in the ocean, and, by God, they're fast depleting it, too."

Last year MacDonald, at age 84, and his boat *Poozie*, at age 35, got put to the test in the Stonington lobster-boat races. MacDonald came in first in his class and won a depth sounder, a coil of rope, and a trophy. He wasn't looking ahead to more racing. "I don't know how much longer they're going to allow me to fish. Old Father Time, he's got a limit on it, I guess."

Time was in short supply as Frank Simon talked in snatches between phone calls. The subject was mussels. "OK," he said, "let's take an end-user look. We had to change the image and packaging. Mussels were considered low class—you used them for bait. They were sold in dirty old onion sacks with rocks and broken shells all mixed in."

Simon and Chip Davison had advanced on all fronts to raise the blue-shelled, blue-collar bivalve from ethnic fare to upscale delicacy. Improve packaging; improve marketing; improve mussels. In the beginning Simon was doing market research, and, at the same time, he was washing select wild mussels and packing them in his basement.

The Great Eastern Mussel Farms Inc., of Tenants Harbor, now annually ships in excess of 100,000 bushels of cultivated mussels. Most are grown from transplants seeded on bottom leased from the state. It also employs 70 to 80 people, including fishermen under company contracts to drag mussels off the leased bottom.

In May, George Larrabee and his wife, Jo, were concerned about mussels, since an

application was pending for a lease just off the cove near Sunshine, where Larrabee clams for a living. If the lease was granted, he feared that mussels would so multiply they would overrun the clam flats shoreward of the lease area.

"You can make good money at clamming. Course, the more you want to drive her, the more you can make," Larrabee said, and he'd been driving—13 straight days on the flats, working every good tide he could.

He digs clams by hand, since "it's easier and you get more. The shells don't get broken, and the clams taste better with no sandy grit in them. The price I get is the same, but they are a better quality clam. That cove is my everything. It's given us the house, the car, the garage."

On the lease question, Jo Larrabee said that the clammers were trying to organize. "It's very difficult, but we're all of the same mind." She didn't sound optimistic, but the lease application was in the end rejected. The cove would still provide.

DISPUTE over the sea's resources is not Frenchboro's problem. That only town on Long Island is trying to avoid going the way of Criehaven in the 1940s, and it needs some more people, working people.

Jim Haskell is town manager for two and a half days a month. He is also director of the Hancock County Planning Commission and a weekend grower, raising old-fashioned varieties of apples on his farm near Franklin. Haskell is trying to put together a development program for Frenchboro.

If he and the town can get a federal grant, then the principal owner of Long Island property, Margaret Rockefeller Dulany, will consider giving 55 acres on which affordable housing for as many as 20 families can be built. Frenchboro needs young families to live in those houses, support a store, and fill the school.

Winter people *on Mount Desert Island cross-country ski or snowmobile on Acadia's Cadillac Mountain. Some people in nearby towns fear that park expansion will remove yet more land from tax rolls.*

The town has 60 residents, who live in modest houses that ring a snug harbor. Deer wander unmolested, browsing through yards and tidying the cemetery. Beyond town, spruce woods slant down to granite shores and the ocean. There's electricity by cable (unless a dragger tears it up while going after scallops). The people seem friendly and accommodating.

But.

Town treasurer Dan Blaszczuk explained that Frenchboro's plan had received some notoriety, including a film clip on NBC, and the town got a hundred inquiry letters.

"We don't want to burst the bubble," he said, "maybe just deflate it a little. The town just can't afford to have a bunch of people arriving here lock, stock, and barrel saying, 'OK, it's wonderful, now what do I do?' They need a working asset."

The ferry to Bass Harbor makes only one round-trip weekly, so commuting is out. So probably is computing; high tides and winds disturb the microwave phone system.

Blaszczuk suggested an established writer who "really publishes."

"And," island historian Vivian Lunt added, "who gets advances."

Most practical is someone who has the gear, experience, and desire to go fishing.

Fishing is an occupation with no guarantees, especially Way Down East.

Avery Kelley of Beals Island said, "We can't find no fish right now. I'm a patient person; that's what you've got to be in this business," seining for small herring. "I can't catch 'em if I ain't got no money for fuel. It's the biggest gamble; it's worse than the roulette wheel out in Vegas. Wicked."

A few years back he'd caught $50,000 worth of fish on one set of his nets, but times between big sets can stretch for years. Even if he gets a big set, the fish may be "feedy," their guts full of food, no good to a cannery or for anything but lobster bait. "There's got to be a way" to purge the fish of food. "Ain't no better way, because you ain't come up with *any* way. My theory—we got to have a powdered laxative, speed the process up to fifteen or twenty minutes, even an hour."

Waiting for the fish, he remembers the grand days of the sardine and herring fishery. "It created business on top of business. There was no end to it." For him the symbol of that age is the *Sylvina W. Beal,* built for his great-grandfather, Charles Henry Beal.

"The *Beal* has been a dear thing to me. I've studied and researched, and I've collected a lot of old pictures on her." His scrapbook shows the *Beal* when she was first under sail, and later under power alone with masts cut away, then finally restored as a knockabout schooner—brought back from the verge of breakup by John Worth to sail out of Belfast with a crew of vacationers.

While Kelley waits, he goes after hard-shell clams called quahogs, while his wife, Diana, weaves "heads," or nets used in lobster traps—16 hours' work for $20. She also picks and packs crabmeat.

"I'll be still picking till four or five in the morning because I got behind. Take me two days to catch up."

"I truthfully think," Kelley said, "they'll be some fish before the year is over."

ROBERT PEACOCK shared that hope. A former owner of the *Sylvina W. Beal* when she was a motorized sardine carrier, he was waiting for fish at his Lubec cannery. "Here it is the 17th of July, and we've only packed two days this year."

Many canneries have not survived. Peacock's is one of two left in Lubec. He can remember nine. Where Maine had 49 in the late 1940s, now there are 12. A shortage of fish, competition from subsidized Canadian fisheries and from other foreign fisheries, these have hurt. So have changing tastes. Peacock said that sardines were "popular with people coming out of cotton fields and coal mines and moving into industrial areas. In one year we sold 55,000 cases to the city of Detroit alone. Every lunchpail had a can of sardines." All that was some time ago.

When the fish did come in, Peacock

All seems tranquil *as Ina May Macomber carries flowers on her daily walk along Castine's Main Street. Yet the town was a killing ground in the 17th and 18th centuries when French and British and, later, British and Continentals fought over its strategic location. Castine's current battle has been to keep developers out.*

would "blow the whistle" and 135 people would show up, hoping to work at least long enough to qualify for unemployment when the fish stopped. "It's a hard, hard old place to make a living."

And it is hard in Eastport where, at 16, John Arsenault couldn't see a future for himself in town. As a summer job he worked for a company restoring an old theater. Restoration along the waterfront, new cargo and fishing piers, salmon aquaculture at Ocean Products, the vocational school that teaches traditional boatbuilding and modern fisheries techniques: These were good signs.

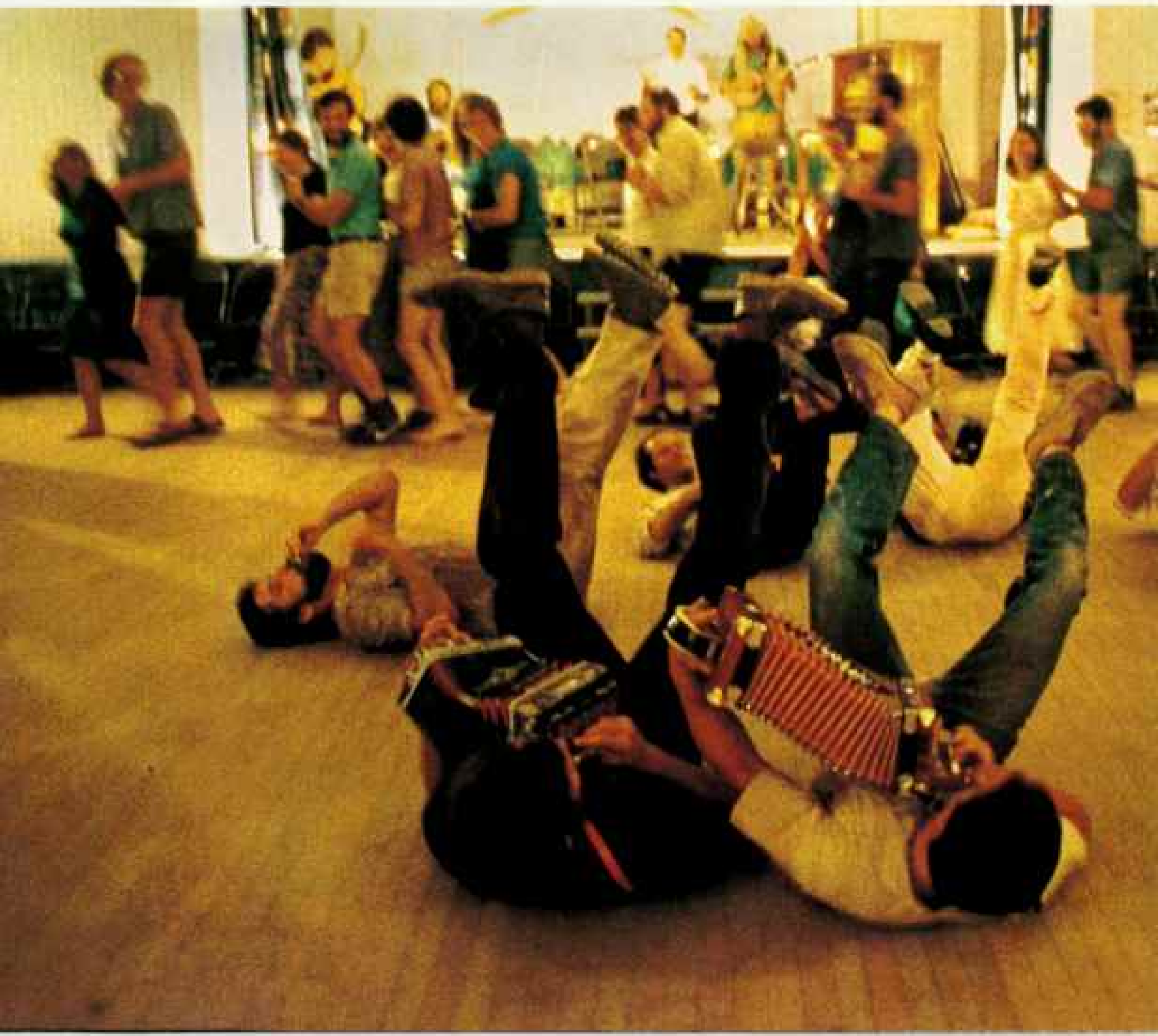
Still, Arsenault thought he would probably go into the Navy for electronics training and use it somewhere else.

"There's nothing to do," he said. "Some kids hang out and get in trouble." As he spoke, kids were congregating in a grocery store parking lot while the sun went down.

The sun has an unfortunate habit of going down on grandiose but failed plans for the economic transformation of Way Down East—the tidal power project of the 1930s, the supertanker port of the 1970s.

ON THE ROAD to Eastport, a cluster of buildings looks like a modest suburban subdivision. It is the Pleasant Point Indian Reservation and home to 600 of the 2,300-member Passamaquoddy tribe, which may accomplish what tides and tankers never had the chance to do.

The Passamaquoddies were long wards of the state, not recognized by the federal government. That has changed, and with the Penobscot Indian Nation of Old Town they share in the proceeds of an old wrong righted. In 1980 their claims under a 1790 statute were at last honored, and the Indians were recompensed with 81.5 million dollars.



The story of how that came to be is long and complex but may be said to turn on two circumstances: the Indians' refusal to accept their condition and the commitment of attorney Thomas Tureen. Working together, Tureen, his colleagues, and the Indians waged an 11-year campaign through the underbrush of the legal and political systems and to the most exalted branches of both.

"We took the claim from a kernel of an idea, which everybody else thought was a joke, and wound up with serious negotiations in the White House. The case cut to the core of the system."

Upon settlement the Indians decided on a strategy. "Their principal objective," Tureen said, "is to eliminate unemployment and become part of the state's economic mainstream. This will change how others look at them and how their children look at themselves. But their agenda includes more than simply the creation of wealth."

Wealth, however, is not being ignored. The Passamaquoddies bought the giant Dragon Cement plant in Thomaston; they have become one of the world's largest producers and packers of wild blueberries. More as a public service than for profit, they are buying the Eastport water system to improve local water quality. (Anyone who has seen a glassful of Eastport water, much less tasted it, will appreciate the need.)

So, in a time when many "from away" are coming to the coast to pursue arts, or crafts, or the building of wooden boats, the Indians are using the tools of big-time corporations. To help both tribes, Daniel Zilkha heads Tribal Assets Management, an in-house investment banking firm. Zilkha comes from a family of Arabic Jews, bankers in Iraq, Lebanon, and Egypt before 1948. He grew up in France and, after taking degrees at

Taking a "break," *the Maine Country Dance Orchestra* ***(left)*** *plays for contra dancers at Bowdoinham Town Hall. Couples move to figures descended from courtly reels and country dances of French Canada, Ireland, and England. The hall also hosts contests* ***(above)****, where a two-person trio of piano, harmonica, and whistling took second.*

Princeton and Harvard, was an investment banker in Switzerland and the U. S.

He assists the Indians in selecting and structuring investments and in employing their capital with maximum leverage. "By the end of the century," he said, "the tribes will own many businesses in various industries throughout the state. And when people think of the who's who of Maine, they will include the paper companies, the banks, the big law firms, and the two tribes."

The Honorable Ralph Dana was running late. "I believe in going out and being in touch with my people. I spend a lot of time out there, and I let this pile up." Governor of the Pleasant Point reservation of the Passamaquoddy tribe, he gestured at paperwork still lurking in the final weeks of his term.

Dana recalled a much different time. "When I was a kid, we drew our water in buckets from wells. The state of Maine came in and closed all the wells, saying they were unfit for human consumption. They may have been right, but there was no other source. My brother and I went in at night to steal the water and fill up barrels and pots and everything we could."

Now he and the Passamaquoddies will be bringing decent water to Eastport and more jobs to the long-depressed region.

IF THE INDIANS are the coast's last act, Alvin Beal of Beals Island might be the epilogue. At 78, he makes models of lobster boats the way he made big ones. He builds a mold, lays an oak keel, and planks them with cedar. Lately, though, he'd been slowed up by gout in his hands.

"It's quite a job to build one of them things, to frame the dadblasted things up and build 'em. It's a lovely old job. I'd like it all right if I had some good hands."

His models, about a yard long, are finely crafted but not fussy. They look rugged, the way a workboat should. One was going to the Maine Maritime Museum in Bath.

"Well," he said, "I got to go in, get ready to get my hair cut." He covered one of the models to keep dust off. Was anyone coming along to learn how to build such boats?

"Not that I know of. I ain't going to learn 'em how to do it. Nosir, they're going to do it themselves. Yuh. Well, old son, that's the best I can do for ya." □

As much in need of shoring *as the Way Down East economy, West Quoddy Head Light* ***(top)*** *undergoes repairs. Guests look on* ***(above)*** *as owners Allen and Gertrude McCue* ***(facing page)*** *raise a centennial toast to Southwest Harbor's Claremont Hotel, where some guests' grandparents came to "rusticate" in elegance.*

Time Catches Up With MONGOLIA

By THOMAS B. ALLEN

Photographs by DEAN CONGER

NATIONAL GEOGRAPHIC PHOTOGRAPHER

WE BOUNCE ALONG the endless steppe, laced in white this frigid New Year's Day. Twenty-seven miles . . . twenty-eight. . . . Measuring solitude, I am making miles of the kilometer numbers spinning on the dashboard dial of the Soviet-built jeep. . . . I have gone twenty-nine miles since the last sign of life. The horses and the camels and the cattle of summer have vanished. The Mongolia of grass and wildflower and sand lies under a thin, brittle crust of winter. The jeep's wheels churn dry snow and drier dust. Thirty miles. . . .

I have played the game of solitude many times on trips through this country, so exotic and yet, unexpectedly, so familiar to my American eyes. Here are the prairies of the Dakotas, the ranges and semiarid land of Nebraska, the flatness and livestock of Kansas, the plains and peaks of Colorado and Wyoming, the big sky of Montana. Add up those states and you have the approximate size and terrain of Mongolia. In those 604,250 square miles live 1.9 million Mongolians—about three per square mile.

Our caravan of three jeeps, without map or compass, is heading for a herder's family somewhere in this vast sameness of western Mongolia. Thirty-one miles. . . . Now we see a herd of ghostly sheep, a few cows turned from the wind, half a dozen horses, their shaggy sides white with frost. We veer across the roadless steppe toward a white dot, the canvas-covered *ger*, or *yurt*, that is the nomadic home of our New Year's host.

The jeeps stop in front of the ger, and we

Proud tradition *of horsemanship endures in Mongolia, where horse breeder Jamsrangyn Lodoi tends a herd*

of more than 500 held collectively under the nation's Communist system. Now firmly in the Soviet sphere, the country that was once the center of an empire that stretched from eastern Europe to the Pacific strives to build an industrial society.

Changing panorama *of Ulan Bator* ***(left)****, Mongolia's capital and only major city, reflects the nation's drive toward modernization. High-rise apartment complexes, built mostly in the past two decades, benefited from Soviet aid, causing some to call them "Brezhnev's Gift." The apartments house the sizable foreign population of Ulan Bator—which means Red Hero—and have proved popular with younger Mongolians. Many older persons in this once largely nomadic country, although residing in the city, still prefer the movable, tentlike dwellings called gers or yurts that dot the foothills beyond.*

Soviet influence is also evident in the widespread study of the Russian language, adoption of the Cyrillic alphabet, and in the dress of Ulan Bator office workers heading home at day's end ***(below)****. Rush hour is no problem in the sparsely populated capital, home to one in four of the nation's 1.9 million citizens. Mongolia counts about three persons per square mile, and livestock outnumbers humans 13 to 1. In centuries past the population remained low because vast numbers of males entered the celibate life of the Lamaist monasteries. Today there is an annual growth rate of 3 percent.*

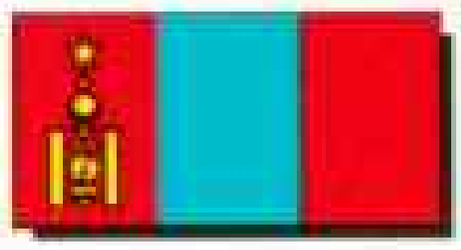
pile out. Interpreter Natalia Bourso-Leland, NATIONAL GEOGRAPHIC photographer Dean Conger, and I are presented to our host, Jamsuren, by the officials who escort us. Jamsuren is a herdsman, and this day, February 2, is Herdsman's New Year. City people celebrate January 1. The two holidays reflect the way Mongolia lives in a nomadic past while trying to build a future of cities and factories.

JAMSUREN and his wife, Udbal, wear traditional dress—graceful, ankle-length silk *dels*, lined with sheepskin for winter. The local officials who led us here also wear dels. Our higher ranking escorts from Ulan Bator, the capital, wear Western-style shirts, ties, suits, overcoats.

Jamsuren (like many Mongolians, he prefers to use only one name) greets his guests ceremonially, a sky-blue scarf of welcome draped across his outstretched arms. We stoop as he ushers us through the ger's brightly painted little door. By long tradition a ger faces south. In the place of honor opposite the entrance, Dean, Natalia, and I are seated on orange four-legged stools. Behind us is an orange chest of drawers. On it are dozens of family photographs. Arrayed around the felt-lined canvas walls are four brass-frame beds and several small chests.

The western side of the ger holds the man's possessions, including Jamsuren's saddle. Udbal's pots and pans and the chests of the family pantry are on the eastern side. The ger's roof flap is open to the cold, gray sky. A black stovepipe carries off the smoke of a stove, where Udbal cooks for the holiday. She opens the stove door and carefully tends a fire of scarce sticks and abundant chips of dung. The ger begins to warm up.

Before that long New Year's Day ended, I had ritualistically sliced and consumed boiled mutton and munched on such delicacies as *urum*, a heavy clotted cream, and *arul*, a hard yellow cheese whose origin can be the milk of a camel, cow, goat, or sheep. From a silver bowl I quaffed warm camel's milk, *arkhi*, a vodka made from grain, and *mongol arkhi*, a strong liquor made by distilling fermented mare's milk. It was served warm with yak butter melted in it. We toasted and talked, sticking by custom to three topics: the weather, the animals, the family.



MONGOLIA

NEXT DOOR TO GIANTS, Mongolia is wedged between two antagonists, China and the Soviet Union. After the decline of the Mongol Empire (**map, right**) the country gradually came under control of the Manchus. In 1911, with Russian encouragement, Mongolia began a struggle for independence that ended with formation of the Mongolian People's Republic in 1924. The Soviets keep 60,000 troops along the Mongolian-Chinese border, and Soviet technologists help Mongolia develop its substantial mineral deposits.

AREA: 1,565,000 sq km. **POP.:** 1,900,000. **CITIES:** Ulan Bator (capital), 435,400; Darhan, 56,400; Erdenet, 38,700. **LANGUAGE:** Predominantly Khalkha Mongol. **GOVERNMENT:** Socialist state. **INDUSTRY:** Animal-derived products, minerals, construction materials. **AGRICULTURE:** Livestock, wheat, oats, potatoes.

Hatgal
Moron
Erdenet
Bulgan
Darhan
Sühbaatar
Ulaanbaatar (Ulan Bator)
Tsetserleg
Karakorum RUIN
Orkhon
Hujirt
Arvayheer
Bayanhongor
Dzuunmod
Mandalgovi
Saynshand
Bayandalay
Dalandzadgad
Noyon
Hanbogd
Dzamin Uud
Onderhaan
Choybalsan
Herlen
Baruun Urt
Tamsagbulag
Ulgii
1,347 m 4,419 ft
1,347 m 4,091 ft
1,718 m 5,632 ft
1,434 m 4,672 ft
1,436 m 4,711 ft
Egiin
Selenge
Kerulen
Tuul
Orkhon
GOBI
0 200 km 0 200 mi
NGS CARTOGRAPHIC DIVISION
DESIGN: JOHN W. LOTHERS
RESEARCH: DAVID C. CHANG, LINDA R. KRUSE
PRODUCTION: JAMES E. MCCLELLAND

LAND USE
- SUMMER ALPINE PASTURE
- MOUNTAIN, STEPPE, AND SEMIDESERT PASTURE
- DESERT PASTURE
- CROPLAND
- FOREST
- SELDOM-USED MOUNTAIN PASTURE

MINERALS
- GOLD
- IRON
- COAL
- LEAD
- FLUORITE
- RARE EARTHS
- PHOSPHATES
- MOLYBDENUM/ COPPER
- WOLFRAMITE

An official named Banchindorj, resplendent in his green del, spoke of Jamsuren's herd of 800 sheep. Laughing, he said, "Tomorrow is the first day of the herdsman's spring, and already there are lambs."

Jamsuren's sheep are organized, as are all animals and people in modern Mongolia. By official count the country, which Jamsuren calls one huge pasture, has 591,500 camels, 1,985,400 horses, 2,397,100 head of cattle, 14,230,700 sheep, and 4,566,700 goats. Like the land itself, the animals are nationalized. So the state controls them, through the Mongolian People's Revolutionary Party—the only party.

Party doctrine calls for making Communists of the nomads. The organizing obviously has been from the top down. When I asked Jamsuren how many times his family moved its summer ger, the answer—"ten times"—came from an official from Ulan Bator, the nation's capital. I asked Jamsuren how he decided when and where to move. The official spoke up again, and, as if reciting from a handbook, said, "More than anything the herders have sheep. So the main question is where is the best grass for sheep. That is how they make their moves." The official smilingly admitted that he had never been a herder.

EACH OF MONGOLIA'S 18 provinces (*aimaks*) is divided into *somons*, each with an administrative center that watches over the co-ops and herders. We had begun our New Year's journey in Uliastay, an aimak capital, and paused at a somon center, a jumble of low wooden buildings and gers. In a boarding school there, the children of the gers, including one of Jamsuren's, were spending the winter.

Sukhe, a 14-year-old, was sitting at a

Wearing her wings, *Osorgarow* ***(above)*** *realized a childhood dream of becoming an airline pilot. Theatrical director Oyun* ***(top right)*** *holds Mongolia's highest artistic prize. Women make up 80 percent of the work force at Georgi Dimitrov Sheepskin Factory* ***(right)****, named for a Bulgarian revolutionary.*

table when I entered the large neat room he shared with four other boys. He popped up from his chair and stood rigidly when I asked him what his most difficult subject is. "I have no difficult subject," he replied.

Seven of ten ger children attend a boarding school, starting, like city kids, at age eight. The student leaves the ger in September and, except for four holidays, stays away until May—or into the summer for Young Pioneers camp. Students who, like Sukhe, want education beyond eighth grade must take competitive tests, which can put bright students on a path to technical and scientific studies, or even universities abroad.

MY TRAVELS were arranged by officials committed to a future full of factories and cities. But their immense land beckoned them as much as me. Journeys took us from the Gobi, a land of magnificent desolation and stark beauty, to a northern lake that could have been in Shangri-la. In snow-swept eastern and western aimaks we visited places never before seen by American journalists.

And we heard Mongolians singing their haunting songs, on theater stages, in schools, in gers, on horseback, in jeeps.

Mongolia has a tradition that its people invented music for the world. I began to believe it after hearing a master at a music school create sweet, sorrowful music by drawing a horsehair bow across the two strings of the revered *morin khour,* a hand-carved instrument. Then I met Oyun—theatrical director, storyteller, laureate, winner of Mongolia's highest artistic prize—and she convinced me that her land was indeed the world's fountainhead of song: "For Mongolians, a person who cannot play a morin khour or sing a song is not a human being."

Oyun told me first about the "long song," so called not because of its length but because the singer draws out the notes, lingering over words with a heartfelt sadness.

"The long song sings about the expanse of Mongolia. . . . Who to talk to? What to talk about? Sometimes the songs would be happy and sometimes sad. . . . The long song sings about the steppes and about life being a very broad, a very wide experience.

"But people can only think of their horses galloping through life. Every song is about

***Music was born** in Mongolia, the nation's enthusiastic performers insist. According to ancient legend, a man whose horse died used its mane and tail to create a stringed instrument called the morin khour. Members of the Mongolian National Orchestra (**right**) produce tones ranging from high whinnies to deep bass with the two-stringed instruments, embellished with carved horse heads.*

*Spontaneous singing is common, and Western visitors are awed by the skill of hoomi singers, men who seem to produce several notes simultaneously. More recent are the sounds of Bayan Mongol (**below**), a big band—trained in Poland—whose repertoire runs from Glenn Miller to Elvis Presley and Chuck Berry.*


БМ

this wonderful horse, flying against the wind like a bird."

And the tradition that here in Mongolia music was born? "That is definite," Oyun said flatly, and she talked about the *hoomi*, eerily beautiful music that only men sing. Hoomi is sung by precisely controlling the larynx, mouth, and abdominal muscles. Several notes seem to be produced simultaneously. The trilling, undulating song is magical. You cannot believe that the song comes from a single voice.

She explained the birth of music: "In the western part of our country there are many mountains and streams. The herder is there. He wants to imitate nature—how the wind blows, how the water gurgles. Hoomi."

THE SOVIET UNION and China, which seal off Mongolia from the world, once were part of the vast Mongol Empire. On a plain west of Ulan Bator, a large stone tortoise marks the site of Karakorum, Genghis Khan's capital. A Chinese army razed it in 1388. Mongols continued raids on China until a Manchu alliance brought them under control in the 1600s.

In 1911 Chinese revolutionaries overthrew their Manchu rulers. The Mongols began their struggle for independence, which tsarist Russia supported. Then Russia and China, through a 1915 treaty, defined two realms—Outer Mongolia, which would become the Mongolian People's Republic, and Inner Mongolia, now the Inner

Mongolia Autonomous Region of China.

Buddhist lamas ran Outer Mongolia, with the Living Buddha as head of state. About 40 percent of Mongolia's adult males were celibate lamas, many of them owners of vast estates worked by serfs. Mongolian Communists, revolting against lama and landowner, found their champions in the Communists who had overthrown the tsar and in 1921 declared independence from Chinese domination.

Rule by lamas lingered until 1924, when the last Living Buddha died. Buddhism itself was also nearly wiped out. All but a few of Mongolia's 750 monasteries closed, and thousands of lamas entered the world beyond the gates. In that world Buddhism was to give way to Communism, just as nomadism was to give way to industrialism. Neither has yet happened. But the official view is toward that new world, and its model is Mongolia's capital, Ulan Bator—Red Hero.

Ulan Bator's most spectacular monument, crowning a mountain with a halo of mosaic and stone, honors Soviet soldiers. Modern Mongolians tie their heritage to Lenin, not Genghis Khan; to the Red Army, not the Golden Horde.

From the mountaintop Soviet monument my escorts pointed out residential and industrial zones, all part of an urban plan that flowed along both sides of the Tuul River. Apartment buildings towered over new neighborhoods. But gers, clustered

Snug cocoon *of blankets makes for easy handling of infants at an Ulan Bator maternity hospital (**left**). With visits to mothers strictly prohibited, a beaming father learns of the birth of his daughter in a note from his wife delivered to the waiting room (**above**). Births are blessed events not only for parents but also for state planners, who see population growth as crucial to national development. Couples are rewarded with subsidies for large families. A mother with ten children earns as much as a full-time factory worker.*

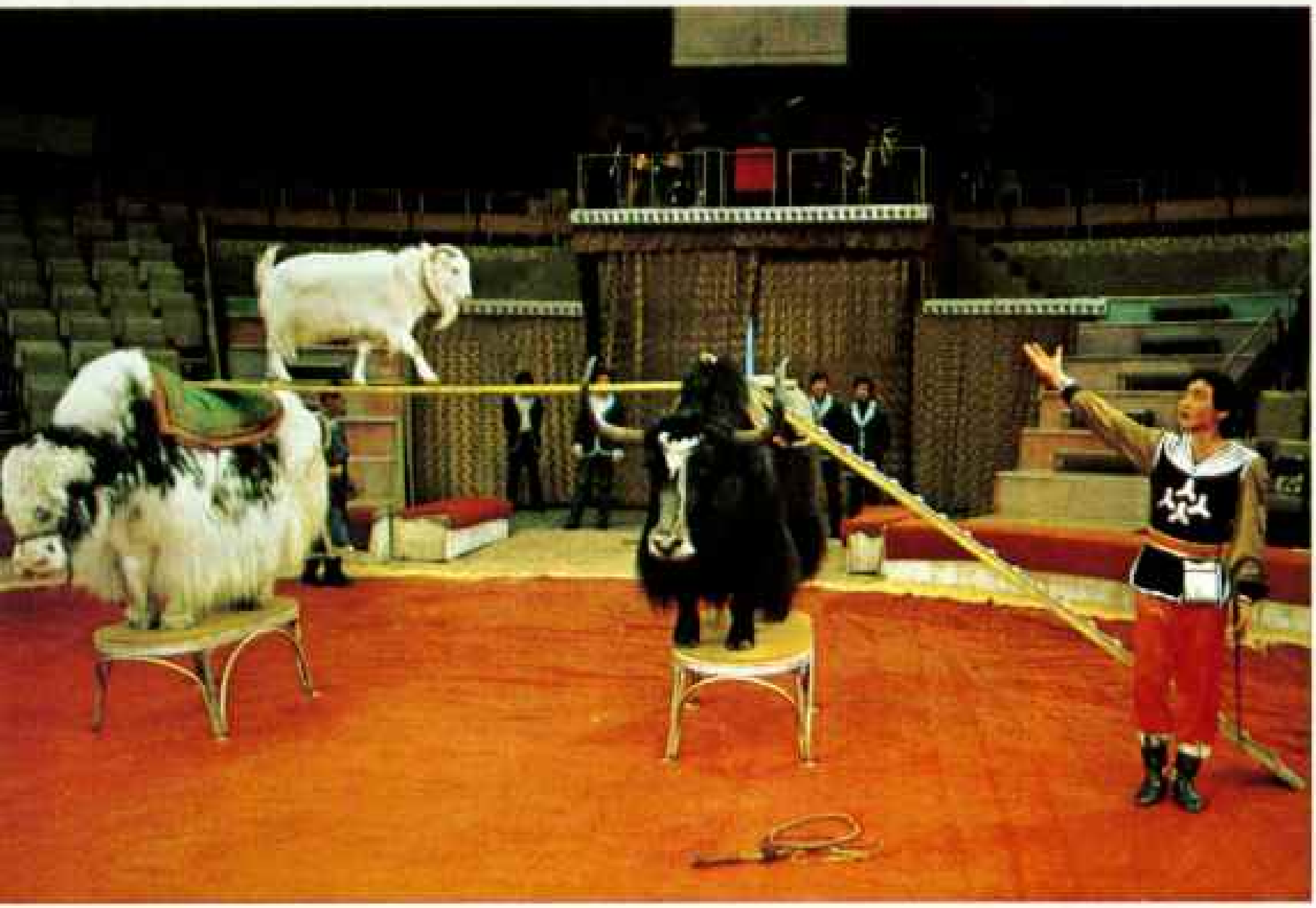
behind high wooden fences, stubbornly sprouted here and there in what is to be the model city of a nation transformed.

Later we drove along a wide boulevard lined with new high rises. "The Russians helped us so much with these buildings that we call them Brezhnev's Gift," said English-speaking Altan, one of our constant escorts. The Soviet leader's name personifies the help his country has given Mongolia, a one-time ward that became a dependent able to provide her Soviet benefactor with such dividends as copper, wheat, and a campground for some 60,000 Soviet troops along the Mongolian-Chinese border.

THE TRANSFORMATION of Mongolia accelerated in 1962, when it became a member of the Communist bloc's Council for Mutual Economic Assistance. Other CMEA countries build factories here, train Mongolians to work in them, and, in payment, receive the finished products. The investing country usually bestows a name upon the plant. The Wilhelm Pieck Carpet Factory (the name commemorates an East German political hero) typifies many I saw.

In the carpet factory, blond-haired, blue-eyed East German technicians tinkered with looms clanking out cascades of colorful wools and synthetics bearing the whorls and zigzags of traditional Mongolian designs.

More than 80 percent of the workers were young women. "There are two shifts," the factory director said, "each of eight hours, but mothers of small children cannot work the night shift. Workers' children get free day care or boarding care." The mothers of boarding children bring them in on Monday morning and pick them up on Saturday, after the six-hour shift that ends



Supporting cast *of two yaks backs up a goat going through its paces (***above***) before the Mongolian State Circus embarks on a nationwide tour. Circus performers known as "plastic acrobats" (***right***) execute a bizarre pas de deux. Her torso bent into a question mark, one contortionist balances on her partner who is curled in the ultimate back bend, toes grasped in her hands.*

Mongolia's standard 46-hour workweek.

As modern Mongolia spreads across the land, factories are becoming magnets for the young. But the city and the factory still cast weak shadows on the land and on the living heritage of nomad and herd, of horse and rider flying like centaurs across the steppes.

Beyond the traffic of Ulan Bator the horse endures. In cities and towns I saw horses tethered at the doors of apartment houses and trotting past people waiting for buses. Even if horses get crowded out of the city, however, they seem destined to persist, and not just for riding. More horses than people live in Mongolia because everyone, young and old, drinks *airak*, and there cannot be airak without horses, for the national drink is made from fermented mare's milk.

Walking through the twilight of a long summer day in Moron, a northern town with a movie theater, a couple of factories, many new apartments, and no private telephones, I noticed groups of young boys and girls heading from apartment houses toward what looked like a vacant lot. There I found a yellow tank truck surrounded by children with metal pails, getting airak pumped through a hose. Somewhere out on the steppe, a herdsman's wife was milking mares for people without a herd or a ger.

IF THE PAST lives on the steppe and the future in the city, Mongolians are almost perfectly poised between eras. By official figures, half of all Mongolians now live in a town or city.

When the Soviet Union and China were friends, both countries poured men and money into Mongolia. Brigades of Chinese workers in blue uniforms—Mongolians called them blue bees—swarmed through Ulan Bator, building a department store, a sports stadium, a hospital, a hotel, housing. Thousands of Chinese settled in the city.

Venerable guardians *of a dwindling faith, lamas breakfast in Ulan Bator's Gandan Monastery, the last of 750 monasteries that once housed 40 percent of the male population when Lamaism ruled the country prior to the revolution. Today a community of 100 lamas, Gandan accepts only one in five applicants.*

In the 1960s, when the two giants began arguing with each other in public, the Soviet Union emerged as Mongolia's sole protector, and Chinese residents started a mass exodus. When I was in Mongolia, several thousand Chinese, given the choice of working as farmers or leaving the country, chose to take the train to China.

Mongolia's connection to the outside world—international mail, phone calls, and cables—is through the Soviet Union. Most of Mongolia's wool is processed in Soviet-built factories. The Soviet Union also introduced large-scale farming to Mongolia, a nation with no agricultural tradition.

Vegetables rarely appear in hotel restaurants or gers. I often ate lamb three times a day, and when I remarked on the diet, I was served an adage: "Meat for men and grass for animals."

Soviet experts taught Mongolians to irrigate and strip-crop to preserve soil that in places is as rich as the Ukraine's. The grainfields, broad stripes of vibrant green and dormant brown, stretch mile after mile in an aimak near the Soviet border.

In that same aimak more than grain is growing. Soviet-bloc capital and Mongolian labor have built Darhan, a city where the harvests come from mines and factories. The journey to Darhan, 190 kilometers north of Ulan Bator, is along one of the few blacktop roads. A broad dark path through a wilderness, it courses untamed valleys and plains roamed by nomads and their herds.

As soon as the jeep passes through the outskirts of the capital, the land suddenly opens, and, as far as I can see, a realm of greens rises to distant blue mountains—light green, dark green, blue-green, shadowed green, sun-bathed green. Sometimes the greens blend in long, shallow valleys, sometimes in broad meadows, sometimes in rumpled hollows that seem young and restless, not yet deeply rooted to the earth. Close up I see the brushstrokes on the landscape—the blades of many grasses and the yellows, blues, purples, whites, and reds of wildflowers. And then, as suddenly as Ulan Bator had disappeared, the smoke-daubed skyline of Darhan appeared.

Until 1961 this had been a village that happened to be near the railroad the Russians built between the border and the capital. Then planners put a city here and began to fill it with people and factories. Here, though, the past is never far away. Horses trot by high rises, and many factory workers go home to gers when work is done.

In Darhan's oldest neighborhoods, gers squat behind fences on dusty, unpaved streets. Sukhe, one of Darhan's founders and now a city official, was my guide, proudly showing off the place he had helped to build. Like our escorts in Ulan Bator, he steered me away from the gers and toward the new. "Twenty years ago people were riding horses here. And now they are operating lathes," Sukhe said in his farewell speech on the steps of a modern hotel.

A little later, as we drove out of the city, I saw a lone horseman clattering across the stone courtyard of a new technical school. Mongolians are not yet all operating lathes.

MONGOLIAN STEPPES have nurtured a nomadic culture since the Stone Age, horsemen for 3,000 years. Has the socialism of co-op and nationalized animals put down roots in this restless land? I got an answer one day when, 32 kilometers from the nearest settlement, I saw a truck unloading the makings of a ger. For centuries families have moved about the land with their herds, hauling their dismantled gers on beasts or wagons. Now co-op trucks often do the hauling.

By the time we approached, a lattice-like wall had gone up, encircling the central poles of the ger, and bright red ribs were being set in place. The work suddenly stopped. Young men rode up from a nearby horse herd. A naked toddler and his slightly bigger sister shyly eyed us. A boy showed us a fluffy new kid, plucked from the family's herd of goats and sheep. A woman placed a mat outside the skeleton of the ger, arranged little orange stools before a low chest, and, this time under the sky, we became guests to be filled with airak, arkhi, and arul.

On another day, deep in the Gobi, I talked to a man with the frequently heard name of Bator. He told how he and other local party officials were teaching traditional herders to become modern herders.

My route to the Bayandalay cooperative, where I met Bator, was roundabout. I first flew from Ulan Bator to the Gobi. The green

Keeping one foot in the old world *while testing the new, residents of Hatgal in the far north dwell in a nascent form of suburbia* ***(above)****. Giving up nomadic ways to accept jobs at a nearby sawmill, many still live in gers or rustic cabins. Fences preserve some measure of the privacy that was formerly afforded by the distances that separate gers on the steppe. Residents are charged for electricity but pay no rent, making the accommodations cheaper than apartments. Many enjoy the comparatively new luxury of television.*

Pausing in the vast Gobi while taking his visiting friends back to their home, the owner of a motorcycle with sidecar scans the desert scenery with a monocular ***(left)****. Increasingly popular, motorcycles now rival horses in some villages.*

south of the capital faded into lighter greens, then browns, then tans. Below there was nothing but land—no towns, no people, no roads. Now and then I saw a tracery of trails scratched in the green-flecked flatness. Then more lines appeared, the network of trails became denser, and the Mongolian Airlines plane bounded to a landing at Dalandzadgad, a windblown town about 530 kilometers southwest of Ulan Bator.

JUST as Mongolian jeep drivers need no roads, so Mongolian pilots need no runways. Concrete would be a luxury, for the land is flat, relatively smooth, and rarely gets wet enough to be muddy. The land, though, is not desert.

The Gobi is mostly flat land with scarce vegetation—not desert. Less than 15 percent of Mongolia consists of desert, and little of that is sandy. "Please tell the truth about the Gobi," an official said during negotiations over where we could and could not go.

The truth is that the Gobi has become a tourist attraction. Planes full of tourists fly from Ulan Bator to what an English-language brochure called an international yurt camp in the southern Gobi. (Yurt is Russian for ger.) The camp consists of a large restaurant and neat rows of gers. I stayed there en route to Bayandalay.

Tourists include Japanese, champion workers on subsidized vacations from Communist countries, and American and European hunters heading for the high mountains of the Gobi. The hunters pay as much as $16,000 for the state-run tourist agency's package deal: guides, a hunting ger complete with cook, a jeep and driver, and a guaranteed kill of an ibex and a wild sheep.

In a state-run sales trailer near the restaurant, foreign currency could buy, at bargain prices, Christian Dior soap, Johnny Walker scotch, and Tuborg beer. Wells as deep as 200 meters (650 feet) provided water for Mongolian rarities—hot showers and flush toilets. Each ger had an electric light.

When night came, I turned my back on the yurt camp and walked into the darkness until I could not hear the sounds of the electric generator or the water pumps. The stillness, like the starry sky above me, was immense. Modern Mongolia was behind me, and nothing but land and sky before me.

Pride of their teachers, *Oyunbeleg, 9, at left, and her sister, Davasuren, 13, rank as the top students in a western province school. Though Mongols have had a written language since the 13th century, formal education centered around the monasteries until the revolution. Today 70 percent of ger children attend boarding school for at least eight years, and national literacy is at least 80 percent.*

Some small animal of the night scurried over the flinty stones at my feet. I felt I was now truly in the Gobi.

THE NEXT MORNING we set off for the cooperative across a flat, stone-strewn land, jouncing, as usual, on ruts and scars but never on a road. We climbed slowly onto a ridge, and it seemed that I was traveling across a place of perfect balance—half earth, half sky. I understood why the Mongols who rode that balanced line once believed that what they saw was all there was of the world.

Our path ended at the agricultural cooperative in the village of Bayandalay, two rows of drab, one-story buildings facing on a wide, unpaved square with an outhouse in the middle. Co-op headquarters was in one of the buildings, the guesthouse in another. It was there that I met Bator, a tall, dignified man with the look of a Plains Indian.

Bator began talking about the winds of spring—the hot wind and the dust wind, which sometimes churns into sandstorms that last for days. But he said that if there had been a bad storm, there would not have been any problems.

Bator is the deputy chairman of the party here, and, as I learned often in Mongolia, party leaders do not have problems. Only solutions. One solution is the cooperative.

Bator said an executive committee administers the co-op's agricultural work and a range of other activities. Besides the boarding school, there are clubs, a library, and movies for the 1,500 far-flung people managed by the committee. Jeeps and trucks round up ger dwellers who live too far away for an evening trip by horse or motorcycle.

The cooperative also has a small, frontier-style hospital. To prevent a possibly risky birth in a ger, a woman expecting a baby is taken to the hospital 14 days before the baby is due and is kept in the hospital for as long as a doctor deems necessary.

The party, Bator said, handles ideology, and that includes telling herders, who are also called breeders, what they must do. I asked whether an old-time breeder would accept orders. Bator said I would soon find out for myself. He sent us off in a jeep caravan of co-op officials.

We were told we were being taken to the

ger of a typical camel breeder. On the way Dean saw a camel herd and routinely asked his driver to make a photo stop. When the rest of us, including a scowling man from the co-op, got out of the jeeps, the herdsman's wife was tugging on a noose and pulling a camel from the dusty corral.

She wrapped a rope around the camel's back legs and tightened the rope by bracing her knee against the camel's rump. She led a nursing camel up to the female and, as soon as the baby camel began nursing, yanked it away. The woman then began milking the camel, squirting the milk into a dirty tin can.

The scowling co-op man walked over to the herdsman and said a few words. I asked him what he had told the herdsman.

"I said the man was a very bad herdsman, that his camels were not being cared for," the official said. "The camels do not get enough food. I told him to leave tomorrow for better grass."

And if he does not move?

The official smiled. "That will not happen," he said.

AT THE CAMP of Adja, the good camel breeder, I could see that the camels looked healthier. Adja and his wife have a son, two daughters, and 300 camels. The family gets all the camel milk it wants, transmuting much of it into airak and arul. The family can also claim all camel dung, which keeps the ger fires burning in this land of few trees. A camel produces about 500 pounds of fuel a year.

A camel's contributions to the co-op begin with hair; the hair is combed out regularly and woven elsewhere into one of Mongolia's luxurious exports. When a camel is butchered, the meat goes to the co-op.

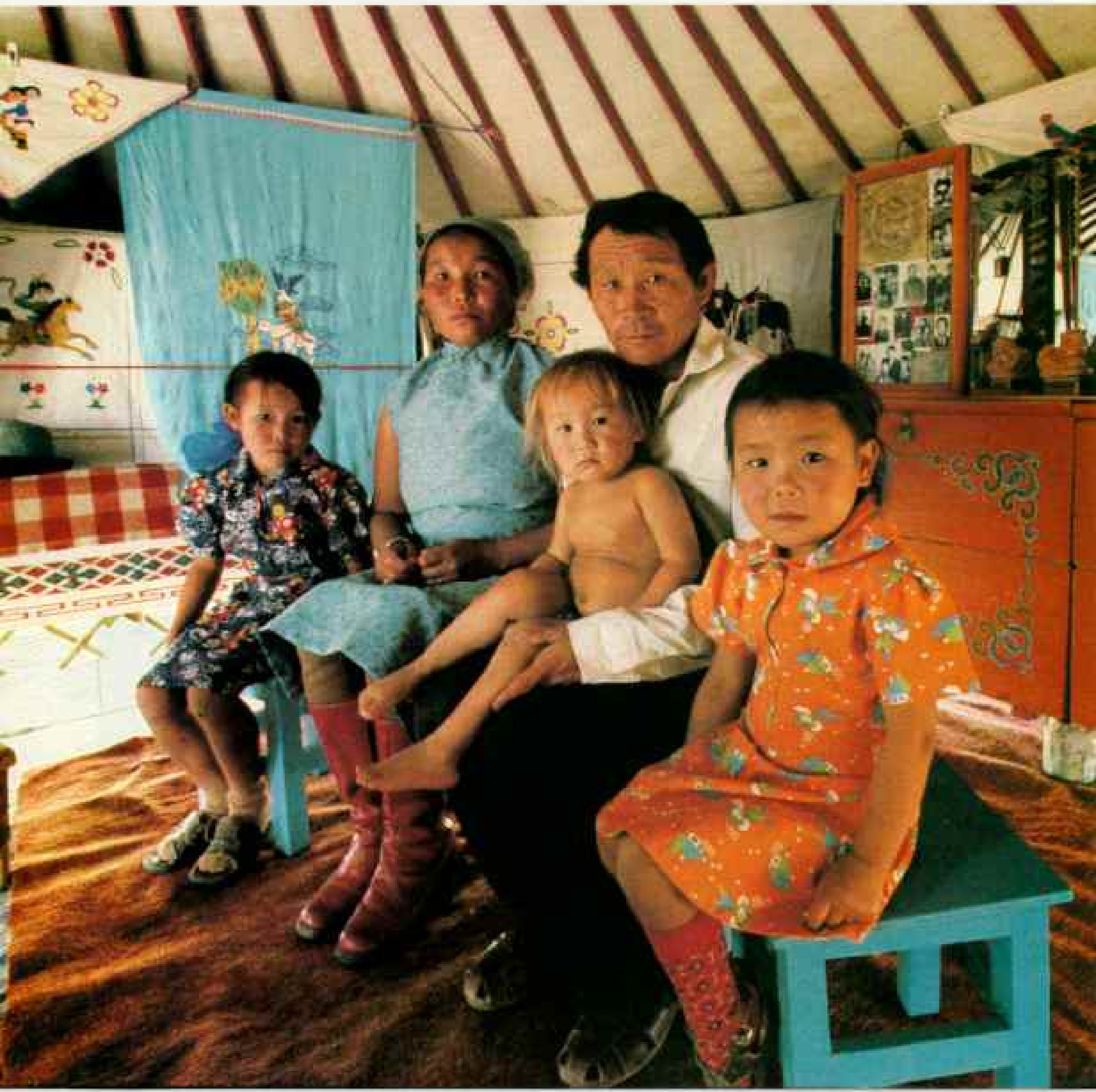
Adja owns 15 private camels, whose products he can keep or sell to the co-op. He can also keep the camels that his camels produce, and, like a capitalist, he can live on dividends or sell off capital for quick earnings. His income is substantially lower than a typical factory worker's. But Altan, my escort, had been eyeing a motorcycle parked next to one of Adja's two well-appointed gers. "Breeders," Altan said later, "are the richest people in Mongolia."

Speaking like the city dweller he is, Altan ticked off the free items: "Rent, fuel, milk.

***Tot-size car** gets retrieved from the baggage area after a flight to the northern town of Moron. Here and elsewhere, the hard, level earth provides crude but adequate landing strips in lieu of paved runways, found only in Ulan Bator. Blacktop highways are few, and motorists face the challenge of crossing vast steppes marked only by washed-out ruts.*

Razor-sharp crests *carved by the wind, the Hongorin Els dunes tower over herders' gers in the Gobi desert (**above**). Such sandy areas make up only a small fraction of the Gobi, which is mostly bare rock and gravelly scrubland of sparse grass and low bushes.*

*Although camels, horses, goats, and sheep are herded in the Gobi, the more barren areas are left mainly to wild inhabitants such as the ibex and fleet gazelles (**right**), clocked by the author at 65 kilometers per hour.*



***Rich grassland** in the Bogd Mountains (**left**) near Ulan Bator nourishes 500 wild deer confined to Swift River State Deer Farm. Antlers are periodically sawed off and dried, then ground to powder and sold as an aphrodisiac.*

*Adja and his family (**below**) decorate their ger in the Gobi with family pictures and a Buddhist shrine. Adja raises 15 camels for himself and 285 for his collective. The camels provide most family necessities: meat, milk, and income from the sale of animals from the family herd. Even camel dung proves useful in the treeless Gobi, providing fuel for heat and cooking.*

The richest are the camel breeders. And probably a son in a city getting a degree."

Bayandalay disappeared in a plume of dust as we roared off one day in search of sand dunes. Our two jeeps never touched a road in the 150-kilometer, bone-banging journey. At times we sped along the Mongolian version of an eight-lane thruway. It begins one year with one driver making one trail. Rains come, and the trail turns into a rut, and, over the years, across a broad swath of Gobi landscape, the thruway expands: trail, rut, trail, rut, trail. . . .

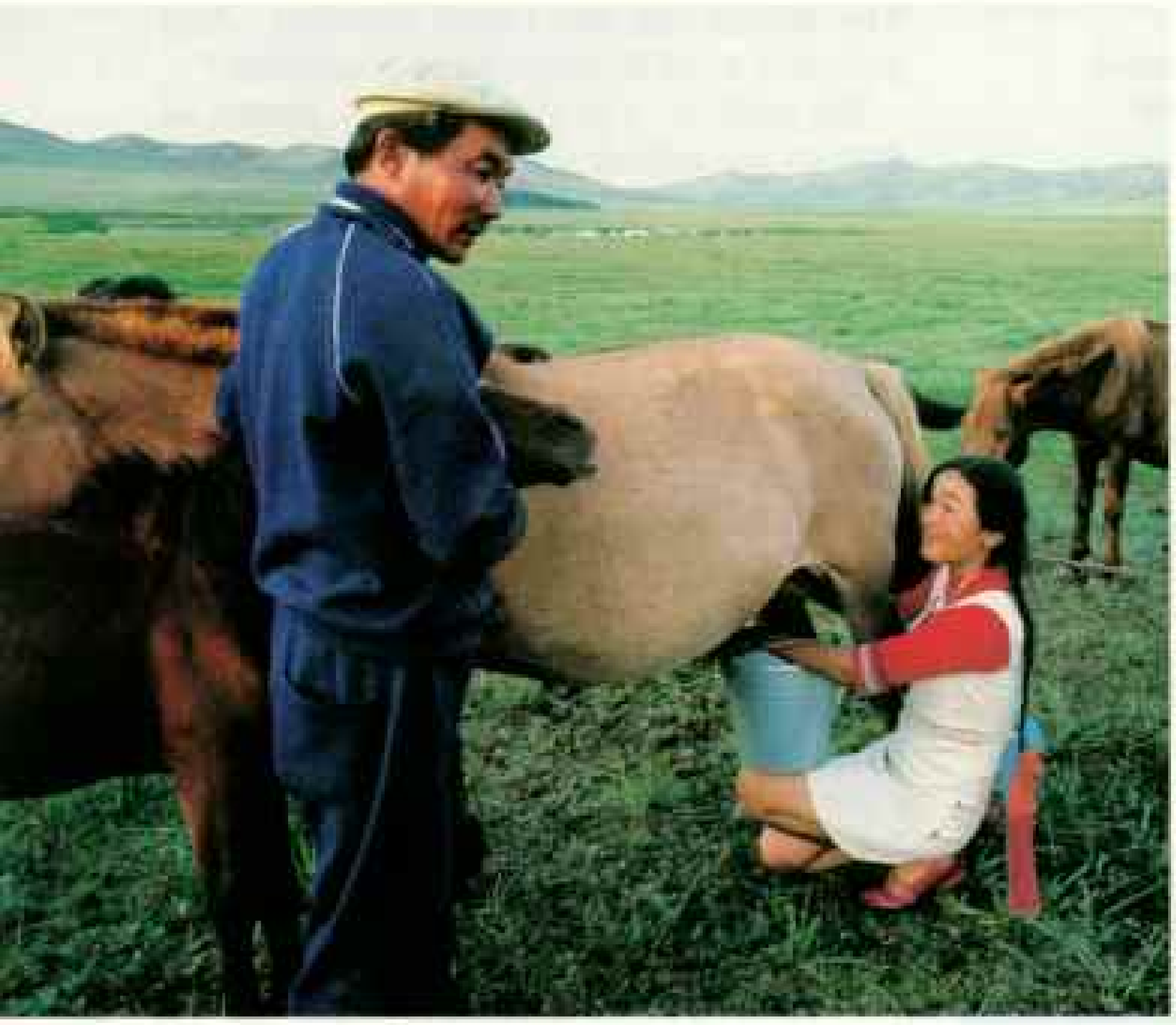
We bounded over gullies, bounced along the beds of dried streams, skidded along rare patches of mud, churned through sand and, in the fading light of day, reached the ultimate dune. The dunes had emerged miles before, but the jeeps did not stop until we reached the grandest of all.

Shaped by the wind into countless curves and bathed in countless shadows, the dune rose in marvelous mystery (pages 262-3). Sand but not desert, high but not mountain, this ultimate dune towered well over 300 meters (1,000 feet), its slopes merged into an edge that gleamed like a blade. I climbed the knife edge, breathing hard after a hundred yards because each step upward plunged my foot deeper into the fine sand. I felt as if I were struggling with the stuff of time in a giant hourglass. My footsteps faded away in a living metaphor of human passage upon this land.

MONGOLS once believed that mountains had the sacred purpose of bridging earth and sky, the eternal heaven. When Buddhism entered the Mongol Empire, lamas merged their beliefs with the old, continuing to preach against the digging of wells or mines, lest they disturb the spirits of the earth.

The revolution all but wiped out Buddhism and yanked up its deeper, primitive roots. But old notions persist. In ger after ger I saw small statues or images of Buddha. Next to one was a drawing of Lenin.

Religion, but not superstition, has a place in the new Mongolia, I was told. Officials took me to the Gandan Monastery in Ulan Bator, a walled complex of pagoda-roofed buildings. It is the only functioning Buddhist monastery in Mongolia. Monks—old



Backbone of a nation, *the horse does more than provide transportation; mare's milk becomes a fermented beverage called* atrak, *praised for its healthful qualities. To draw milk from a mare, a foal is allowed to begin nursing, then pulled away and held beside its mother* ***(top)****. The milk is poured into rawhide bags and stirred*

*every few hours as it sits for perhaps three days. The taste of the effervescent drink, served in small bowls (**left**), has been described as "a cross between buttermilk and champagne." Caught without an urga, a long pole with a loop at the end, two boys eager for a ride attempt to snare a mount with bridles (**above**).*

Bathed in the glow of sunlight *streaming into their grandmother's ger near Moron, two girls playfully jostle with their baby sister as their mother sits nearby. For excellence in livestock breeding, their grandmother, Echenkorlo, was given the Polar Star, the state's highest award. She manages a herd of 600 horses that*

produce 25 gallons of milk a day. The resulting production of airak is picked up by tank trucks, another sign that Mongolia's purely pastoral days are over.

ones tonsured by age, young ones by razor—shuffled by in yellow or saffron robes.

Passing through the courtyard on my way to an audience with the deputy abbot, I saw the same vignette again and again: a stooped grandmother, clutching a grandchild's hand, slowly walking toward a temple. Other Mongolians, most of them venerably old, prostrated themselves on praying boards or spun prayer wheels on a temple wall.

We were led through a wooden gate to an inner courtyard and then into a ger, large and softly lighted. Gold and silver gleamed in the shadows of a wooden cabinet next to the lama.

Speaking through an interpreter from the Foreign Ministry, the Venerable Dambajav quickly made two points: Services conducted at Gandan are "dedicated to meeting the people's demands," and, through the Asian Buddhist Conference for Peace, the religion espouses Soviet views on disarmament.

He talked about the seminary, where young men study for five years to become lamas. "They are watched for certain qualities," he said. "They must, for example, have beautiful hands, because they must make certain hand movements."

ON ANOTHER DAY, instead of seeking an audience, I went to hear and see a living religion. Before I opened the heavy temple door and entered, I could hear chanting that sounded like the distant roll of surf.

Dozens of monks sat in the center of the temple, while the world of tourists and worshipers whirled around them. In a counterpoint of human and sacred sounds, a baby's cries sharply rose and fell against the undulating, ceaseless chanting. A gong throbbed unseen in a mist of incense.

The monks sat in facing rows, eyes fixed on some inner eternity, hands gracefully moving as they told their dark beads and tinkled tiny bells. Many of the monks, in the back rows, were young.

Later the Foreign Ministry interpreter told me that the state had decided that the young monks "are doing useful work." In a land where work means building the nation's destiny, these young men, with chants and graceful hands, are bearing part of the past into the future. □

The Long, Lonely Flight

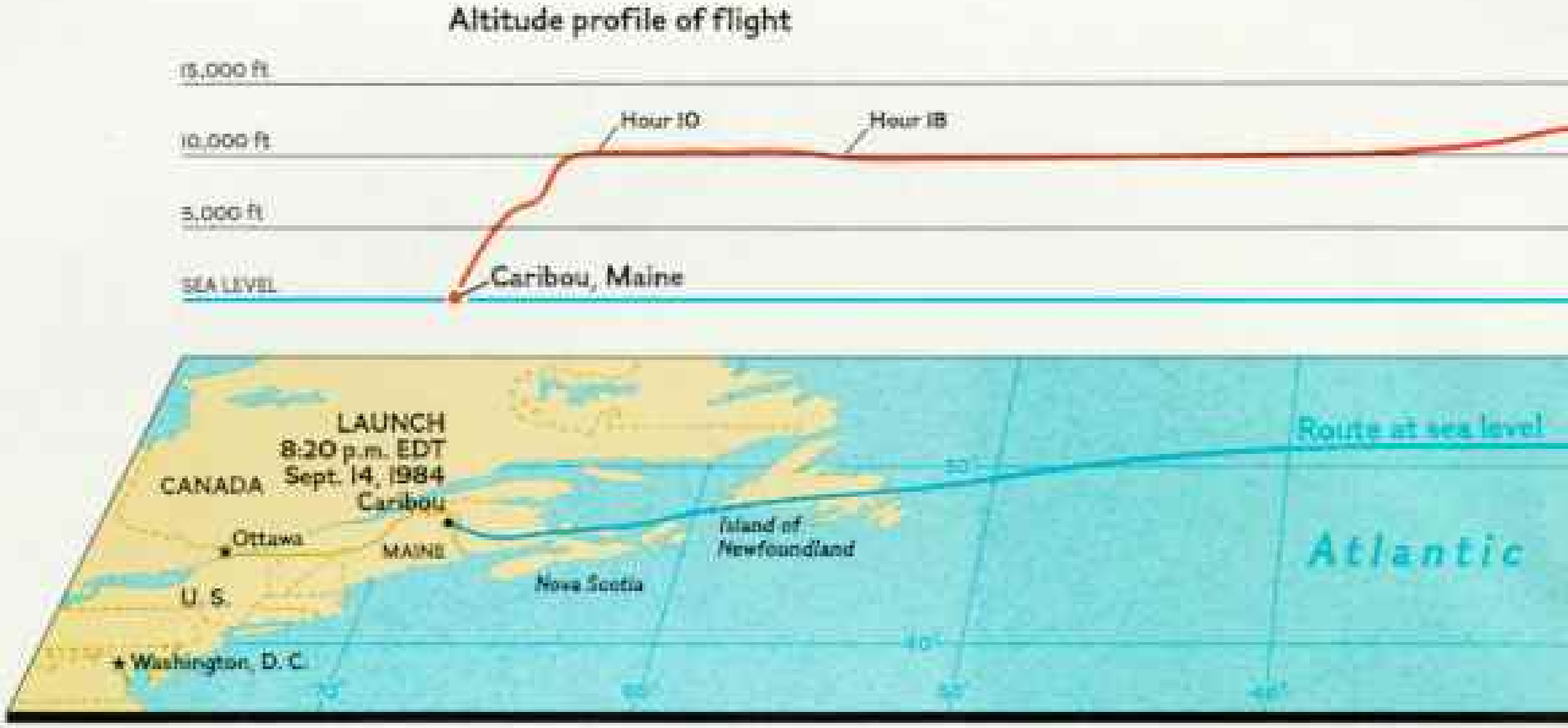
By JOE W. KITTINGER, JR. COLONEL, U.S. AIR FORCE, RETIRED

ADRIFT AMID A SEA of thunderheads, my helium balloon, Rosie O'Grady, skims eastward 1,000 feet above Savona, Italy. The date is September 18, 1984, the local time 1:05 p.m.—the final hour of my 3½-day flight. I am tired but elated. Mine is the first solo transatlantic balloon flight and the longest ever made by a single balloonist—3,543 miles.

This helicopter view shows the silver-capped gasbag with its snoutlike "appendix" for release of helium, plus a boat-shaped gondola for possible ditching at sea. Threatened by storms ahead and virtually out of ballast, I decide to land while there is still plenty of daylight.

In less than an hour Rosie O'Grady will touch down in a forest near the town of Cairo Montenotte, to be welcomed by some very surprised woodcutters.

HOLDER OF THE WORLD'S HIGH-ALTITUDE PARACHUTE-JUMP RECORD, THE AUTHOR DESCRIBED THAT "LONG, LONELY LEAP" FROM 102,800 FEET IN THE DECEMBER 1960 NATIONAL GEOGRAPHIC; PHOTOGRAPH BY PETER TURNLEY



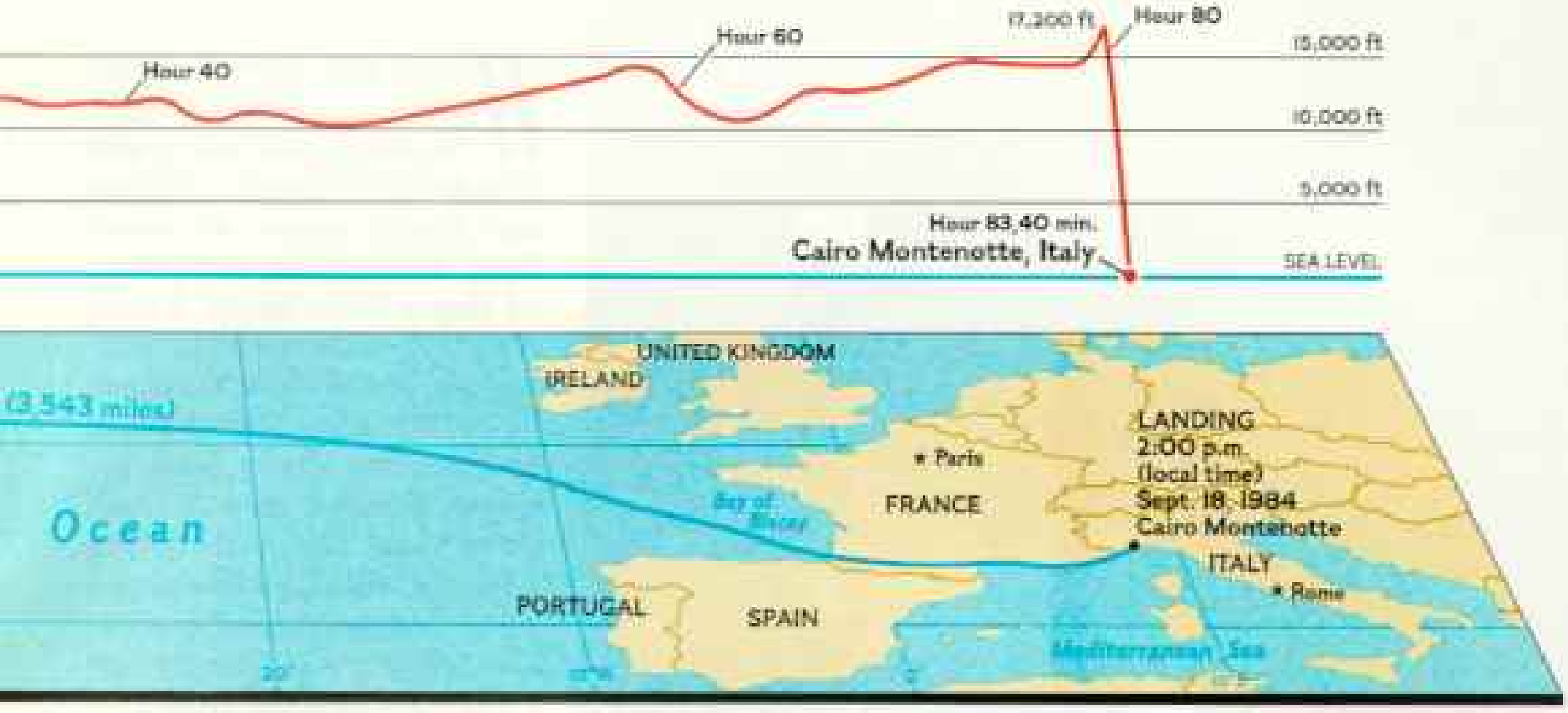
JOSEPH STANCAMPIANO, NATIONAL GEOGRAPHIC STAFF

*LAUNCH minus one hour finds Rosie O'Grady being inflated at Caribou, Maine (**left**), on the evening of September 14. When the 101,480-cubic-foot gasbag is fully inflated, I take to the air, riding a fast-moving barometric high east, in a flight profile (**map, above**) that I manage to keep almost level the entire way.*

***Hour 10:** Leveling off at 10,000 feet, I pick up 57-knot winds that could speed me to Europe in less than two days. Later they slow to 53 knots and finally to 25 off France, delaying me when almost in sight of the continent. Temperatures range from 15°F to minus 5°.*

***Hour 18:** A very close call. As I light the gasoline cooking stove, it erupts in flame, enveloping the rear of the gondola. I manage to douse the fire with an extinguisher. Luckily that works—I'm a long way from a fire station.*

***Hour 40:** Here, and on two later occasions, Rosie O'Grady and I are shaken by sonic booms from high-flying aircraft. The shock waves slam into the balloon without warning, sounding like 100,000 pounds of dynamite going off.*



NGS CARTOGRAPHIC DIVISION

Hour 60: *I take a moment's break over the Bay of Biscay* ***(below)****. So far I have slept in short stretches for a total of less than two hours, but my mind seems clear and reaction time normal. I will need both for the challenge of landing.*

BOTH BY JOE W. KITTINGER, JR.

Hour 80: *The Mediterranean is below* ***(left)*** *as I approach the French-Italian border. My goal is to go as far as possible, hoping to add distance records to the solo transatlantic prize. I have been on oxygen roughly half the flight, not to ease breathing but to help fight fatigue. My ballast is practically gone, and I have jettisoned expendable food, empty oxygen cylinders, and extra clothes. Time to look for a landing site.*

*HOUR 83: Altitude 1,500 feet and dropping (**left**). Surface winds have begun to gust up to 25 knots, making me doubly aware of power lines, autostradas, and forested slopes down below. I have company—four circling helicopters, one of them chartered by NATIONAL GEOGRAPHIC and carrying Sherry Reed, my closest friend, a gesture I will never forget. My charts tell me I am approaching Montenotte. Thunderstorms ahead and forests below: As a veteran balloonist, I choose the latter.*

Touchdown: *83 hours and 40 minutes after launch, Rosie O'Grady returns to earth (**right**), slammed by strong winds into a wooded hillside. The powerful force of the impact hurls me to the ground ten feet below, breaking a bone in my right foot.*

TD plus 10 minutes: *The foot is forgotten in a reunion with Sherry (**below**), whose helicopter had landed nearby. Local woodcutters look on as she expresses the elation of our entire crew: "We made it!"*

JEAN-GUY JULES (TOP); PETER TURNLEY

*TD PLUS 20 minutes: As the foot begins to hemorrhage, fatigue and pain catch up with me (**left**). I have an excellent first-aid kit, complete with painkillers and an inflatable rubber leg splint. But we are only half an hour by helicopter from a large hospital in Nice, France, and I decide to wait.*

In retrospect the flight seems a textbook exercise, with nearly everything going according to plan except for the faulty stove and a few mishaps such as my broken foot. But injuries are to be expected in ballooning, and I have suffered many more in my parachuting career.

Though this was officially a solo flight, it could never have been achieved without all of my support crew: Ed Yost, Rosie O'Grady's builder; meteorologist Bob Rice of Weather Services Corp.; Bob Snow, a major sponsor and owner of Rosie O'Grady's Flying Circus in Orlando, Florida; Gaetan Croteau, our Canadian backer and organizer; my operations chief, D. K. Hargrove; and of course Sherry.

In the moment of success my thoughts turn to others before me who challenged the Atlantic by balloon, including an early attempt in 1873. During the next century five lives were lost before three Americans—Ben Abruzzo, Maxie Anderson, and Larry Newman—succeeded in 1978 in their balloon Double Eagle II. *Tragically, my friend Maxie—after making the first nonstop balloon flight across North America in 1980 with his son, Kristian—was to die in a balloon race in June 1983.**

*NATIONAL GEOGRAPHIC December 1978, August 1980, and December 1983.

BOTH BY PETER TURNLEY

***TD plus 30 minutes:** Like a Roman emperor I am carried in triumph on the shoulders of the woodcutters to a waiting helicopter (**above**). They were so colorfully dressed and so obviously smitten with Sherry that I could only think of Snow White and the Seven Dwarfs.*

After receiving treatment and a cast at the hospital in Nice, I returned that evening with some of our crew to Cairo Montenotte for a victory party. Celebrations followed in Rome, Paris, and my hometown of Orlando, Florida. Through years of planning, our motto had always been "Go for it!" We did, and in the end we succeeded. □

NATIONAL GEOGRAPHIC SOCIETY

WASHINGTON, D. C.

Organized "for the increase and diffusion of geographic knowledge"

GILBERT HOVEY GROSVENOR

Editor, 1899-1954; President, 1920-1954
Chairman of the Board, 1954-1966

THE NATIONAL GEOGRAPHIC SOCIETY is chartered in Washington, D.C., in accordance with the laws of the United States, as a nonprofit scientific and educational organization. Since 1890 the Society has supported more than 2,800 explorations and research projects, adding immeasurably to man's knowledge of earth, sea, and sky.

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Karen and Robert Travis, Sandy, Utah

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So much of Alaska stands out in my mind.

I think of watching the moon shimmering a magical reflection across miles of still water. The untouched beauty spreading in all directions. The gigantic summer blossoms. And the richness of the native art and culture.

But mostly, I think of the people. So friendly. So open. So free with their time. The spirit there is so fresh and alive. Robert is sure that kind of pride and spirit is what our grandparents must have felt years ago.

I think the hard part about dreams that stay with you is when they finally come true, they are oftentimes disappointing. But not Alaska.

All I can tell you about our Alaska dream is that it's more alive than ever now. And we've already begun plans to go back and live it again.

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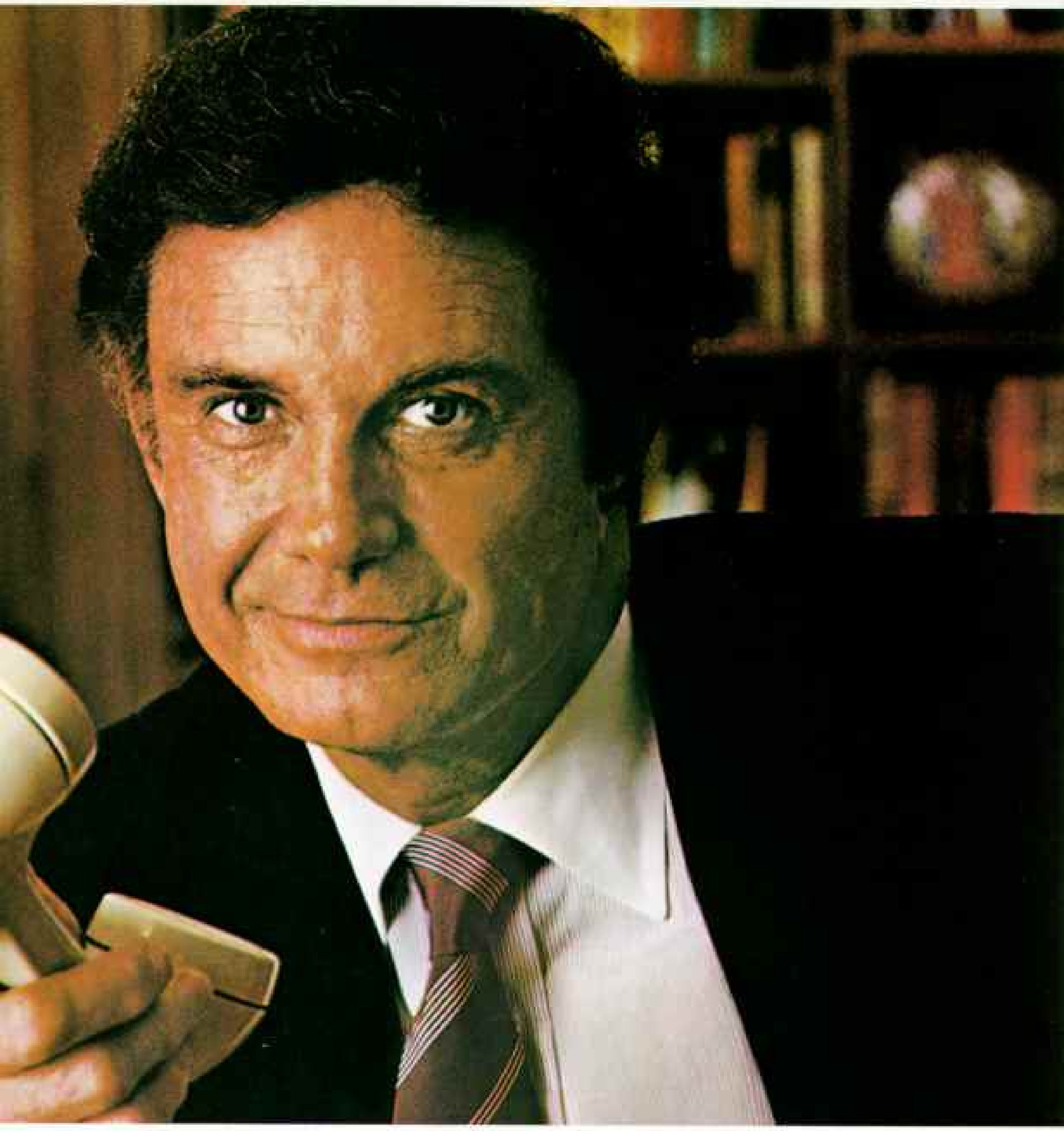

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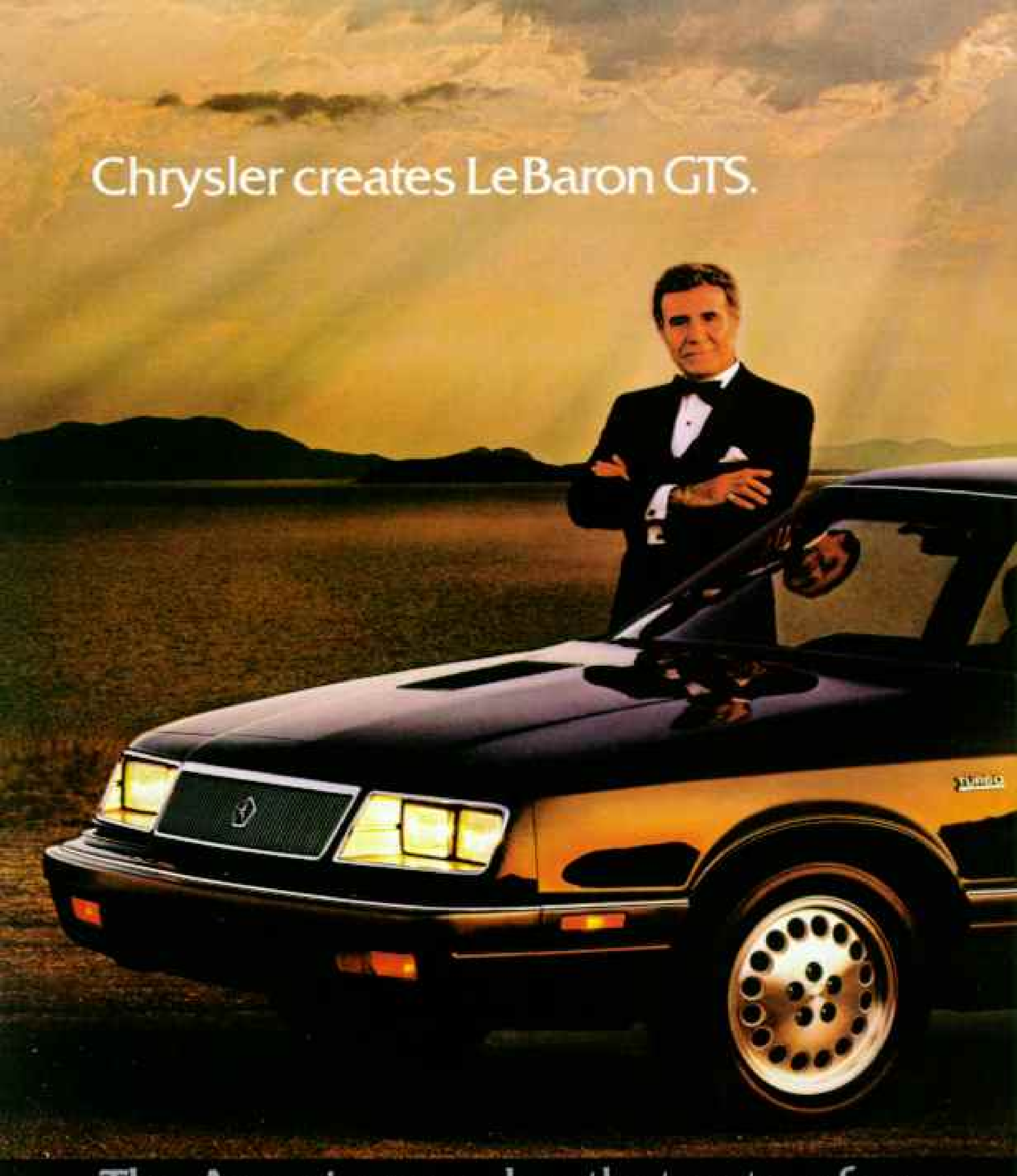

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THE NATIONAL HISTORICAL SOCIETY

CIVIL WAR CHESS SET

A heirloom chess set to be enjoyed for generations.
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This handsome pewter-finished chessboard and fitted presentation case will be provided as part of the set.

THE NATIONAL HISTORICAL SOCIETY is dedicated to bringing the excitement and power of American history—as well as its significance—to people in every part of the land.

It is in keeping with this purpose that the Society is about to issue its own Civil War Chess Set. A dramatic tribute to the heroes of both North and South—and a work all the more intriguing because the playing pieces include richly detailed three-dimensional *portrait sculptures* of the great Generals of Union and Confederacy, captured for the ages in solid pewter, solid brass and fine enamels.

This extraordinary new chess set will be crafted to the highest standards of quality and historical authenticity. The National Historical Society has appointed The Franklin Mint to create the sculptures, each of which will be a new and original design. Some figures will be shown standing, some seated, some kneeling, some mounted on horseback. And each figure will be painstakingly crafted of solid pewter, hand-finished, then set atop a solid brass pedestal base embellished with a circular band of richly colored enamel—*blue* for the soldiers of the North, *gray* for those of the South.

Every sculpture, moreover, will be so rich with authentic detail that only the artists and master craftsmen of The Franklin Mint, steeped as they are in the tradition of *precision coinage*, could have achieved it. Indeed, every nuance of facial expression, uniform and weaponry—right down to the buttons, braiding, sabers and carbines—will be depicted with meticulous accuracy.

Thus, The National Historical Society Civil War Chess Set is also a magnificent *collection*. A triumphant achievement of portrait sculpture—and the ultimate in micro-detailed miniaturization.

A dramatic showpiece for your home or office

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768

That geography attracts such students is a healthy sign

I SHARED my concern here last August for the future of geography in our schools and mentioned in passing the Society's intern program for college and university students. The program was begun in 1981 with the idea that junior and senior geography and cartography majors and master's degree students would benefit from spending three to four months working at the Society.

They could bring their academic training to bear on the real-world problems of map-

NATIONAL GEOGRAPHIC PHOTOGRAPHER JOSEPH H. BAILEY

making and researching, assembling, and even writing geographic information tailored for publication to a wide audience. We hoped that such experience would enrich their educations, and, by all reports, it has. What we did not fully anticipate was how much the interns would help us.

To date 68 students from 51 institutions have served as interns under the direction of Barry C. Bishop (**above,** center), vice chairman of our Committee for Research and Exploration, who holds a Ph.D. in geography. Competition for internships is stiff, and students are chosen based on their records and recommendations of geography professors, including department heads. Those selected are then matched to Society departments based on mutual interests and needs. We provide travel expenses and a modest stipend on which to live; then they are briefed and set to work.

To ensure that students receive individual attention, we limit the number of interns to six or eight in each of three sessions yearly. Interns are not given make-work projects or used as glorified gofers. They become fully active members of the departments to which they are assigned. Research is often among their primary tasks. According to Barry, one of the major things they learn while at the Society is what depth of research is appropriate to a given subject in a particular situation and under deadline. That kind of judgment can be learned only by experience under supportive supervision, and it will stand the interns in good stead whatever their ultimate careers.

One measure of how well the interns have been received by their adoptive departments is the sizable number of bylines they have earned in Society publications. Some have stayed on as free lances to complete projects. Eight have become permanent employees.

Most go on to further education and a great variety of careers, both within and beyond the academic world. As Society alumni, they become part of an informal network that helps us keep in touch with geography in its many manifestations and institutional settings.

I take time to meet informally with each group, and I am always impressed by their intelligence, enthusiasm, and inquisitive minds. That geography attracts such students is a healthy sign. I'm also thankful that I'm not of an age that would make me compete with them for a place in the program.

Gilbert M. Grosvenor

PRESIDENT, NATIONAL GEOGRAPHIC SOCIETY

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THE LONG, LONELY JOURNEY

Pioneering flights have always been risky, demanding the greatest concentration and skill of pilots. With so much at stake, it is no wonder that in the minds of aviation pioneers, carrying souvenirs has never been uppermost and that precious few exist—one of the covers carried across the Atlantic by Charles Lindbergh sold for $35,000 in 1977 and covers carried by the Apollo astronauts to the moon, now sell for as much as several thousand dollars each. Balloon flights are especially weight sensitive, yet Joe Kittinger managed to make room for a limited number of flight covers which, when the flight ended successfully, suddenly became significant pieces of aviation history.

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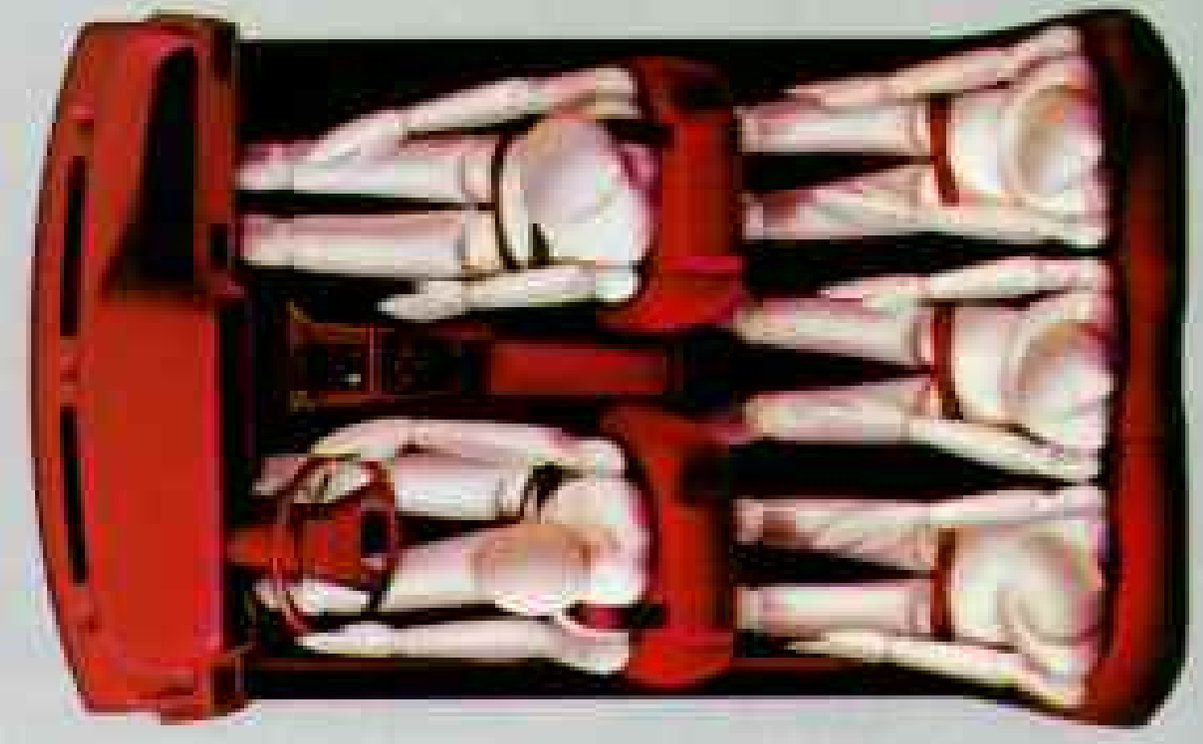

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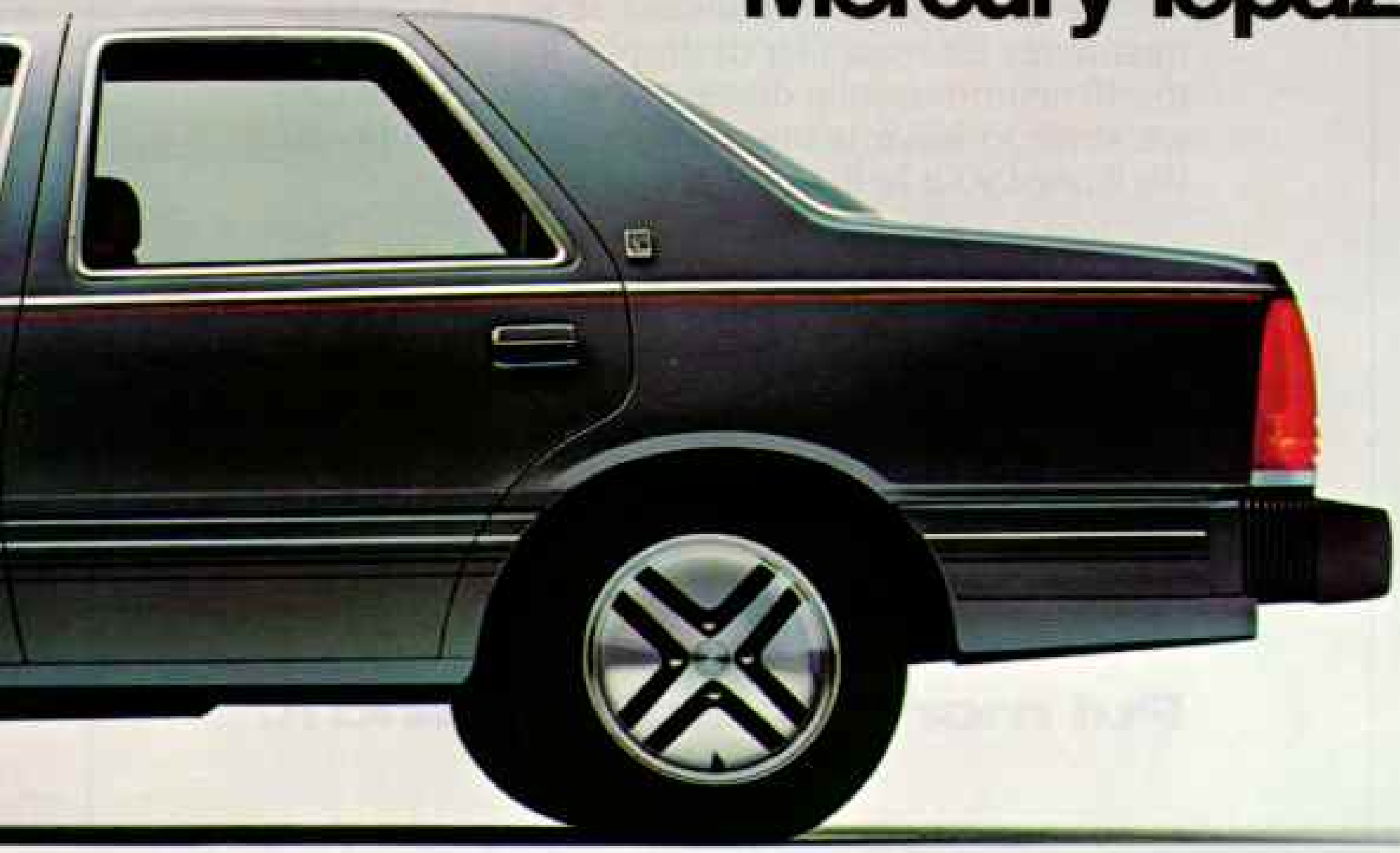
Mercury Topaz



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Members Forum

Pollen

As one of 15 million allergy sufferers, I thoroughly enjoyed at least half of "Pollen: Breath of Life and Sneezes" (October 1984). The text and illustrations were so descriptive that they caused me to have quite a sneezing attack halfway through the article. Perhaps this winter, when the ground is frozen, the trees are barren, and the power of suggestion is not as strong as it is in September, I will be able to complete the remaining pages. AAAHHCHOOOO!!

Alan B. Winn
Baltimore, Maryland

Your story on pollen contained an error. Egyptian tree onions and the potato, or multiplier, onion are the only two varieties of onion regularly reproduced asexually. Garlic would have been a much better example of an asexually reproduced crop. Although it does flower, seed production is rare if not nonexistent.

Nicholas D. Molenaar
Caldwell, Idaho

Garlic certainly could have been included in the short listing of plants—potatoes, onions, bananas—that can reproduce asexually.

A strong point is made of the enduring quality of pollen grains: "[Pollen] may travel two feet or 2,000 miles and settle into the soil, immortalized in the fossil record." With this evidence of indestructibility, how can anyone imagine that he is gaining an energy or nutritional benefit by ingesting pollen?

Dwight J. Boileau
Camarillo, California

It is only the outer shell of the pollen grain that has endured from prehistoric times.

Your article on pollen, like your earlier one on the Shroud of Turin (June 1980), gives the ideas of the late Max Frei more weight than they are worth. Frei thought some of the pollen that he found on the shroud was from Near Eastern plants. You say the possibility of contamination (by pollen brought long distances by wind, for instance) leaves room for doubt. The real reason is that pollen grains are only diagnostic to the level of plant groups, not to individual species. Frei gave four examples of the kind of "Near Eastern" pollen that the shroud has yielded: cherry, *Epimedium*, *Haplophyllum* (closely akin to rue), and

sea blite. But there are species of these in Italy as well as in the Near East, and you cannot tell whether a pollen grain of sea blite, say, came from a Near Eastern species or an Italian species.

Richard H. Eyde
Arlington, Virginia

Cortés

The very interesting and well-documented report "Following the Route of Cortés" (October 1984) contains a very minor flaw. Cortés had been removed by Velásquez from the command of the expedition to explore, conquer, and settle the mainland regions. In a last-minute bout of rashness, Cortés defied the governor's order and sailed. Sometime afterward, in Mexico, he had to face a "punitive expedition" sent after him by Velásquez. That explains the need of founding La Villa Rica de la Vera Cruz, an independent corporation whose authority did not derive from the governor of Cuba but from the crown.

Enrique H. Miyares, Jr.
Buffalo, New York

Velásquez tried to replace Cortés as expedition commander and even ordered his arrest. Cortés never acknowledged the order, and no one was willing or able to enforce it before the expedition set sail. According to Velásquez's instructions, Cortés was authorized to explore and trade but not to colonize. Mr. Wilkerson explained on page 429 that Cortés founded Villa Rica de la Vera Cruz in order to legally circumvent the Cuban governor's restrictions.

I enjoyed your article, but because gold is not much lighter than lead I do not believe that a golden disk with the apparent diameter and thickness of the one in your drawing could be lifted by only two men.

Michael Babilonia
Mayagüez, Puerto Rico

Cortés reported the disk as a large gold wheel weighing only 3,800 pesos de oro *(38 pounds), and for this reason we described it as hammered (i.e., very thin), not solid gold.*

I want to congratulate you for your excellent article on Cortés. Mexico's politicians have trained us to cherish our Indian heritage and despise our Spanish ancestry. Many will write to demerit the article, but there will always be some of us who love our Indian ancestry and yet appreciate the Christianism, language, and blood given to us by our Spanish forefathers.

Raúl A. Cárdenas
Querétaro, Mexico

I was disappointed to see that your fine magazine would publish an article so supportive of and sympathetic to a man who opened the door to the rape and destruction of entire native civilizations. While justly stressing the Spanish repugnance at the human sacrifice practiced by the Indians, your article makes no mention of the butchery of countless Indians and the systematic obliteration of nearly all Aztec cultural, historical, and scientific records by Cortés and his successors.

Anthony J. Cutezo
Morrisdale, Pennsylvania

This article retraced Cortés's march to the Aztec capital and duly recorded the Indians killed en route. The full story of the Spanish treatment of the Aztecs is found in our article on that civilization in the December 1980 NATIONAL GEOGRAPHIC.

Killer Whales

"Plight of the Bluefin Tuna" (August 1982) claims that the bluefin, because of its great speed—capable of bursts up to 55 mph—has only two predators: the mako shark and the killer whale. But in "The Whales Called 'Killer'" (August 1984) you state that killer whales reach estimated speeds of 30 mph. How does a killer whale going 30 mph catch a bluefin tuna doing 55?

Francis Baumli
New Franklin, Missouri

Cagier than the tuna, killer whales, which often hunt in packs, can outmaneuver and catch feeding tuna before they can sprint to safety.

Ants

Bert Hölldobler's article "Ways of the Ant" (June 1984) is a marvelous study of how the evolutionary process has allowed these creatures to survive and thrive employing so many diverse and fascinating adaptations. However, one aspect regarding ant evolution requires clarification. By stating ". . . where sexuals [fertile male and female harvester ants] *from any one colony* instinctively gather each year to mate," the author implies that no genetic traits are ever exchanged between colonies since the sexuals are merely siblings with genetic characteristics derived from a common queen. If true, colonies would be evolutionarily divergent from one another and speciation would occur after so many generations.

Martin Mundry
Calgary, Alberta

We should have said "sexuals from any *colony* in the area *instinctively gather each year to mate."*

Peoples of China

Nowhere does Wong How-Man in his article entitled "Peoples of China's Far Provinces" (March 1984) indicate that Tibetans are facing cultural

genocide. The Scientific Buddhist Association recently presented a report to the UN itemizing how, since the Chinese took control of Tibet in 1950, a million Tibetans have been killed, tens of thousands imprisoned and tortured, all but a handful of the 4,000 Buddhist monasteries embodying Tibet's rich cultural heritage deliberately demolished, traditional ceremonies outlawed, and the Tibetan language progressively replaced by Chinese. Wong How-Man mentions none of these appalling facts.

A. R. Houseman
London, England

The GEOGRAPHIC, in one of the first reports on Tibet in recent times (February 1980), quoted the Dalai Lama's estimate that 87,000 Tibetans had been killed in 1959 and 113,000 more died from later starvation, labor camps, and Cultural Revolution oppression. In July 1984 we published photographs documenting the destruction of the great Tibetan monastery of Xegar, either in 1959 or a decade later.

Río Azul

I am indeed grateful to the National Geographic Society for putting so much interest in the ancient city of Río Azul (Editor's column, August 1984).

Guatemalans expect that, by signing treaties like the one signed with the United States, finally the looting of archaeological treasures will be ended.

Juan José Rodas Martínez
Ambassador of Guatemala in Uruguay

Brazilian Bees

In April 1976 Rick Gore wrote a fascinating article on the Brazilian bees. Dr. Taylor, an entomologist from the University of Kansas, estimated that the bees would reach the United States in the early 1990s. Give me an update on how the progress of the bees is coming along. Are they still a threat to the United States or just California? Are they still as hostile as they were in South America?

Mike Wofford
Santa Monica, California

Dr. Taylor's current prediction is that the bees will reach Brownsville, Texas, by the end of the 1980s and will probably reach California two or three years later. Contrary to reports, he says, their behavior has not changed for the better.

Letters should be addressed to ***Members Forum,*** *National Geographic Magazine, Box 37448, Washington, D. C. 20013, and should include sender's address and telephone number. Not all letters can be used. Those that are will often be edited and excerpted.*

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Your participation will help Kodak meet its pledge to restore the Statue of Liberty.

NOTE: You may submit as many photos as you wish, but 1. Photos (prints only) must be no larger than 8" x 12". 2. Each photo must be accompanied by a separate entry coupon. If several photos are submitted, be sure each is identified. Simply tape coupon to back of each photo. Do not staple. 3. Include $20 check or Money Order for each photo. If several are submitted, write one check for total amount. 4. Kodak not responsible for lost, late or mutilated photos. Protect photos between cardboard inside mailing envelope. We suggest you send duplicate prints only which can be supplied by your photo retailer. 5. Kodak reserves right not to accept photos deemed objectionable or otherwise unsuitable. In such case, your money will be refunded only. 6. Payment must be submitted with photo to be included in Album. 7. You'll receive your membership certificate and an ID card to help locate your photo. Allow 8 weeks for delivery. 8. Non-members will also be welcome at the exhibit. 9. Offer expires December 31, 1986.

WE

Why every kid should ha

Today, there are more Apples in schools than any other computer.

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Which is why it makes good sense to buy your kids an Apple® IIc Personal Computer of their very own.

The IIc is just like the leading computer in education, the Apple IIe. Only smaller. About the size of a three-ring notebook, to be exact.

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Including a free 4-diskette course to teach you how—when your kids get tired of your questions.

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A built-in disk drive that would drive up the price of a less-senior machine.

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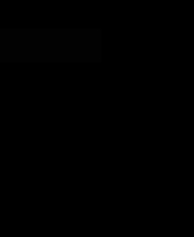
So while your children's shoe sizes and appetites continue to grow at an alarming rate, there's one thing you know can keep up with them. Their Apple IIc.

To learn more about it, visit any authorized Apple dealer. Or talk to your very own computer experts.

As soon as they get home from school.



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Is it too much to ask for space behind the seat so you don't feel cramped? So your tools or sports gear won't need the passenger seat?

The Toyota SR5 XTRACAB doesn't think so. That's why there's extra space behind the seat and, up front, more leg room than in any small truck.

The XTRACAB also has full, rich carpeting, reclining bucket seats and options you wouldn't expect to find in a tough truck. Like an AM/FM/MPX sound system with electronic tuning, cassette and 7-band graphic equalizer that puts others to shame. Like a 4-speed automatic overdrive transmission. Like a 7-way adjustable driver's Sport Seat to indulge you even more.

If this is the kind of equipment you've been looking for in a truck, read on.

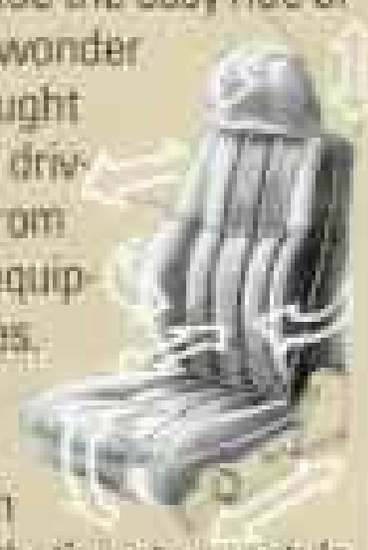
XTRACAB's 2.4 liter engine with 116 hp is the *most powerful* ever built for a truck in its class. And its all-new computer-controlled Electronic Fuel Injection system provides the most power while never taking its eye off economy.

These are more of the special extras you'll find here that make driving there as easy as possible.

OH WHAT A FEELING!

TOYOTA

Once you test glide the easy ride of an XTRACAB, you'll wonder why you always thought trucks were only for drivers delivering logs from the mountains and equipment to building sites.



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TOYOTA TRUCKS. MOST POWERFUL EVER!

THE 1985 TOYOTA SR5 XTRACAB. BECAUSE YOU SHOULDN'T HAVE YOUR BACK UP AGAINST THE WALL.

XTRA!

Photographed by Michael Fogden. *Quetzal: Genus: Pharomachrus Species: mocinno*
Adult size: *35.5—38cm long; male's plume, 58—76cm* ***Adult weight:*** *Approximately 225g*
Habitat: *Cloud forests above 1,300m in southern Mexico and Central America*
Surviving number: *Unknown*

Wildlife as Canon sees it: A photographic heritage for all generations.

Considered sacred and valued more than gold by pre-Columbian Indians, the resplendent quetzal is one of nature's most beautiful birds. In flight, the male's incredibly long tail feathers curve gracefully like streamers of luminescent green ribbons. Today, this unforgettable sight is becoming increasingly rare as the quetzal's cloud forest habitat disappears.

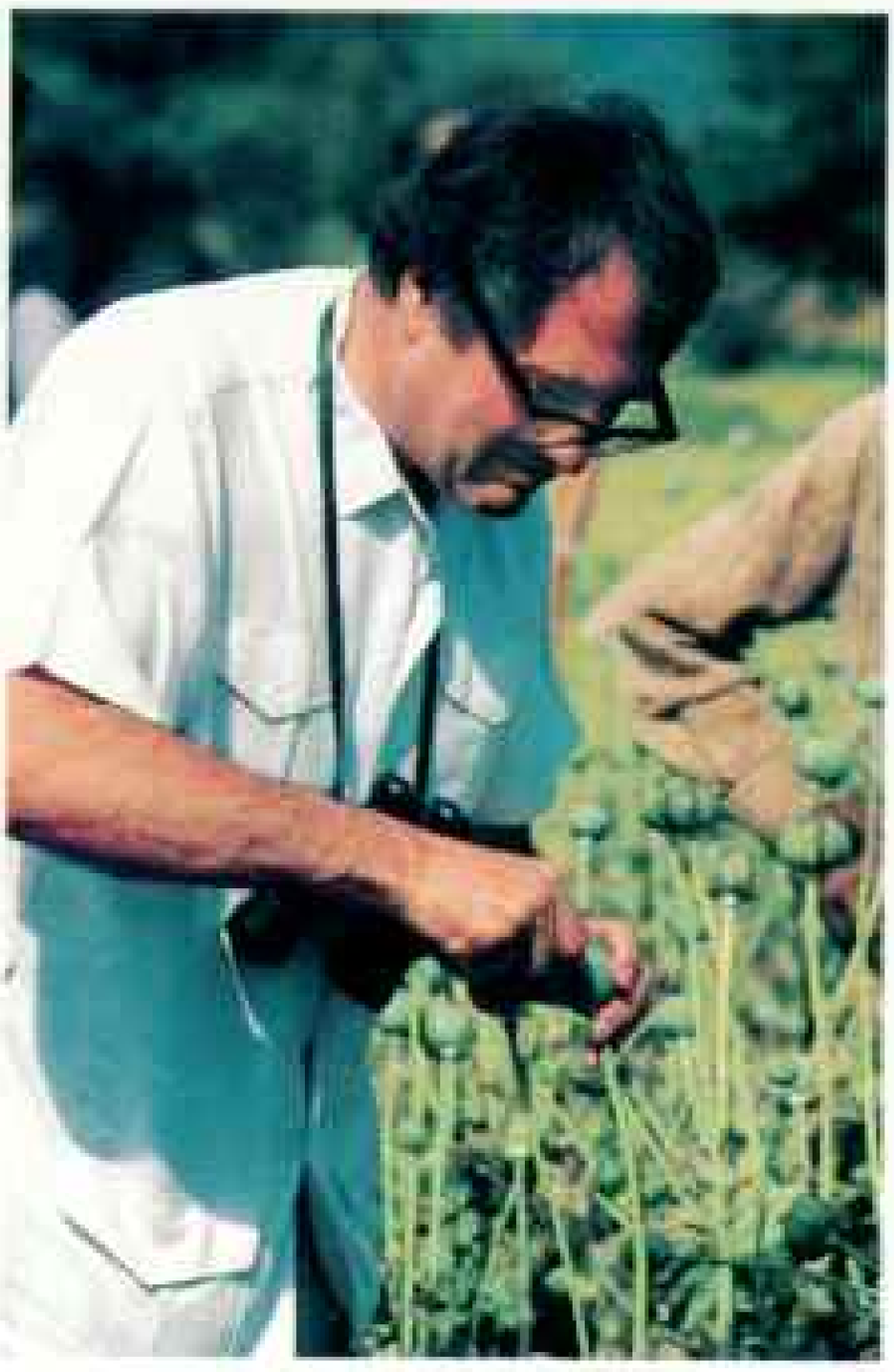
The quetzal could never be brought back should it vanish completely. And while photography can record it for posterity, more importantly photography can help save it and the rest of wildlife.

Through photography, the magnificence of this fabled bird, whose golden-green plumes were among the glittering gifts offered by the Aztec emperor, Montezuma, to Hernándo Cortés, can help draw attention to the need for protecting the mountain forests that are critical to its survival. A photograph of the quetzal can also foster an awareness and understanding of the rich life that abounds in the world's diminishing forests.

And understanding is perhaps the single most important factor in saving the quetzal and all of wildlife.

Canon
Images for all time

On Assignment



PHOTOGRAPH BY STEVE RAYMER (LEFT); BY PETER T. WHITE (ABOVE)

NEVER ONE to report from the sidelines, senior writer ***Peter T. White*** got hands-on experience for his article on the poppy by harvesting opium in Pakistan (***above***). Traveling the world for more than a year, White collected various tools used to incise poppies and scrape off opium. "I was prepared for trouble from customs," he says. But he met resistance only while passing through Bulgaria with traditional Turkish implements. "I gave them a *long* explanation, and they finally let me go."

White investigated the poppy with an eye on more than drug dealing. "Most stories concentrate on heroin, with hardly a word about the legitimate, positive side of the poppy and how important it is to medicine."

A veteran reporter on Southeast Asia and India, White was familiar with much of the poppy's terrain. As a free lance in Mexico in 1950, he covered heroin trafficking in that country. "What struck me going back is that basically the situation hasn't changed. Their poppy-eradication program is a model for the world, but as the enforcement technology improves, growers become more ingenious."

Capturing Mexico's anti-poppy program on film was "a technical challenge," says NATIONAL GEOGRAPHIC photographer ***Steve Raymer,*** who donned a bulletproof vest before flying with helicopter pilots on herbicide spraying missions in western Mexico (***above***). To get the shot he envisioned (pages 178-9), Raymer commissioned a special camera mount—an eight-foot-long boom attached to the landing strut. Riding copilot, Raymer triggered the shutter with an infrared activator as the helicopter swooped through mountain ranges.

A Wisconsin native, Raymer joined the GEOGRAPHIC in 1972 after serving in the Army in Southeast Asia and as a staff photographer for the *Wisconsin State Journal*. Named Magazine Photographer of the Year for his 1975 coverage of world hunger, he won an Overseas Press Club award in 1982 for reporting on illegal wildlife trade. He is currently on leave to study problems of Third World development as a Knight Professional Journalism Fellow at Stanford University.