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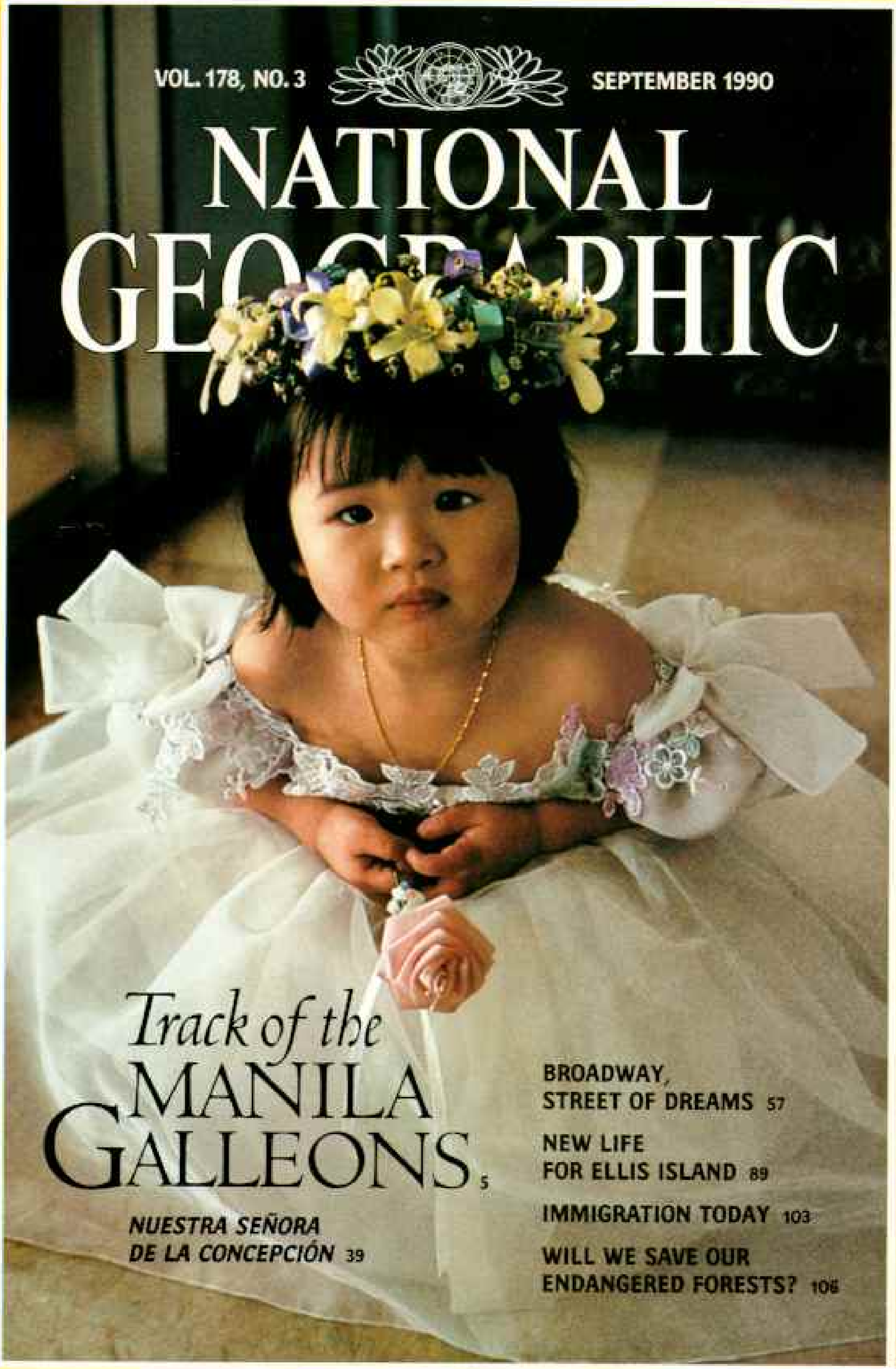

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SEPTEMBER 1990

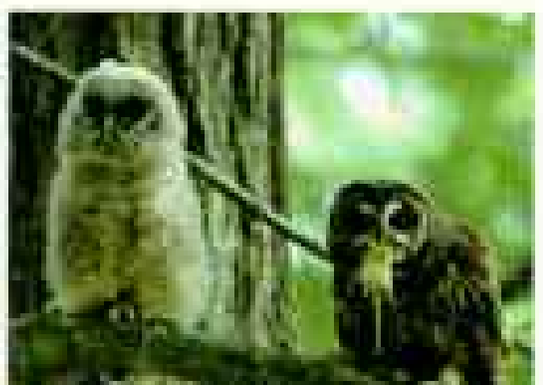
NATIONAL GEOGRAPHIC


CHUUKAN SEAS ON THE OLD MANILA ROUTE


GALLEON TREASURE FROM DAYS OF GOLD


LES MISÉRABLES REHEARSAL


EYE INSPECTION AT ELLIS ISLAND


IMPERILED OWLS OUT ON A LIMB

COVER: *Tiny attendant, from a wedding in Manila, belongs to the Chinese community whose forebears prospered in the Spanish galleon trade as middlemen to China. Photograph by Sisse Brimberg.*

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SPORTS

Hands of the faithful reach for a palanquin holding the image of Our Lady of Porta Vaga in Cavite, the Philippines. Every November the icon is borne across Manila Bay to honor this patron of the galleons. From 1565 to 1815 the Spanish kept up a shuttle of ships between Acapulco and Manila, averaging one round-trip a year. The failure of a galleon to return from Mexico with its cache of silver often meant destitution in Spain's Far East colony.

Track of the MANILA GALLEONS

For 250 years Spain tapped the wealth of the East with great ships that crossed the treacherous Pacific. From New Spain — now Mexico — galleons sailed to the Philippines, where traders from two hemispheres met. Carried by a returning ship that struck a reef, a gold-and-diamond belt ornament rests on a fragrant plumeria blossom. In Acapulco, dancers (following pages) whirl in sequined "China poblana" dresses inspired by the Orient.

By EUGENE LYON

Photographs by SISSE BRIMBERG

IN A CLOUD of piety and incense, the religious image of the great ship was borne in procession around the city walls. Amid a cacophony of bells from the parish churches, the Archbishop of Manila raised his hands to bless the galleon *Magallanes* and all aboard her. Farewell ceremonies came to a climax as the harbor resounded with the firing of seven guns—a lucky number. Every watching Manileño repeated silently the phrase carefully written at the foot of each shipment on the galleon's manifest: "*Dios llevandolo en salvamento*—God bring it to safe harbor."

Sails filling, flags and pennants fluttering, the merchant ship that bore the name of Ferdinand Magellan pulled slowly away from her anchorage. She emerged from the harbor entrance and turned southeastward to begin the tedious passage through the islands of the Philippines, leading out into the open Pacific. There she would set her course for a destination perhaps seven months away, the port of Acapulco in New Spain, today's Mexico.

It was the year 1811. She would return to Manila four years later, having completed the last voyage of the Manila galleons.

For 250 years these ships carried silks and other rich goods of the Orient to exchange for European products and Mexican silver. East met West across the route of the Manila galleons; in its time the galleon road was the most significant pathway for commerce and cultural interchange between Europe and Asia, by way of the Americas. The galleon voyages, some 9,000 nautical miles in each direction, were the world's longest navigation.

By the time Ferdinand Magellan reached the Philippines in 1521, the islands were already a cultural crossroads; for hundreds of years Chinese, Japanese, Malays, and even Hindus had visited and traded there. Now the islands became a center for conflict among European kingdoms.

The Portuguese built trading bases in the Moluccas, or Spice Islands, to the south as European demand grew for clove, pepper, cinnamon, and nutmeg. In February 1508, Spain moved to stake its own claim to the spice trade. King Ferdinand called a meeting in Burgos of renowned navigators, including Amerigo Vespucci, Vicente Yáñez Pinzón, Juan de la Cosa, and Juan Díaz de Solís, to plot ways to outmaneuver the Portuguese. America's Spanish conquerors, among them Hernán Cortés and Pedro de Alvarado, launched their own expeditions westward across the Pacific.

These early forays proved unsuccessful. Ruy López de Villalobos, who sailed from Mexico in 1542, named the Philippines for the Spanish prince who was later to be King Philip II. But he failed, as others had, to find the *tornaviaje*, the return route eastward. He later surrendered to the Portuguese.

A 1564 expedition finally solved the riddle of the eastern route. Philip II had commanded

Unable to weather a reef off Saipan, the galleon Nuestra Señora de la Concepción *runs aground after being hastily repaired following a mutiny attempt (see article, page 39). This 1638 disaster was an extreme example of dangers inherent in the growing galleon trade.*

Historian EUGENE LYON, Ph.D., specializes in Spanish colonial America. His most recent article for NATIONAL GEOGRAPHIC was a profile of Columbus's ship *Niña* in November 1986. Photographer SISSE BRIMBERG has completed more than a dozen assignments for the magazine.

PAINTING BY ROBERT E. MCGINNIS

the New Spain viceroy to settle the Philippines; the viceroy sent a Basque sailor, Miguel López de Legazpi. He was ordered to avoid aggression against the native peoples and to explain to them the "law of Jesus Christ by which they will be saved."

Led by his flagship *San Pedro*, Legazpi's little fleet departed Navidad in Mexico in November and arrived at Cebu in the Philippines in late April 1565.

Legazpi's ships probed the western Pacific winds for the way back to Mexico, working in trial and error as far south as New Guinea. A successful route was finally found by the *San Lucas*, which steered far northward to the latitudes of Japan, thus passing beyond the belt of east-to-west trade winds. There she caught fresh westerlies and was propelled eastward by the Kuroshio current. When she reached the North Pacific current, she was borne onward to California, and then she coasted south to Mexico.

The *San Pablo*, guided by navigator Andrés de Urdaneta, followed the northern route shortly thereafter and arrived in Acapulco in October 1565, a fast four months after leaving Manila. At the Spanish court the following year, Urdaneta—and not the navigator of *San Lucas*—received credit for discovering the powerful wind-and-water

Eyes light up before a fiery Catherine's wheel, named for a martyred saint, following a Mass in Cavite. Conceived for warfare, fireworks were introduced to the Philippines by the Chinese, inventors of gunpowder. In a procession carrying the Porta Vaga icon back to San Roque Church, a softer glow illuminates the details of a fan, once part of a lady's ensemble in Spain and the Philippines.

machine that made the easterly Pacific navigation possible.

Still, the way east was anything but simple. Many subsequent trips, in overloaded galleons, became epics of suffering and endurance that took as long as a year to complete. Deprivation vied with monotony to dispirit the travelers, and for navigators the daily tally of distance sailed was the only yardstick by which those on the galleon could measure the slow passage of an apparently unending voyage. Despite the leagues logged, each new day found the galleon where it had seemingly been for an eternity: struggling or becalmed, on a gray sea, beneath skies of gray.

IN 1571, realizing that they could not sustain their colony on the island of Cebu in the central Philippines, the Spaniards moved north to found and fortify the city of Manila, which has one of the world's superb natural harbors; significantly, Manila Bay faces Asia but is also accessible from the broad Pacific. The city quickly became a center for merchants, soldiers, and clergy, ruled by officials sent out from Spain.

Initially, converting the Filipinos to Christianity was a major motive for royal support. According to a Jesuit priest, "Lord Philip II . . . said that for one sole monastery in the Philippines in which the Holy Name of God was conserved, he would expend all the revenues of his kingdoms." Buddhist influences radiated from China and Japan, and the governors at Manila battled the Muslim Moro, but Christian missionaries soon claimed a half million Filipino converts.

The Spaniards had hoped that the Philippines could become the new Spice Islands, but neither agriculture nor mining appeared promising. Wealth had to be sought elsewhere, and it was soon found in the great mainland empire of China.

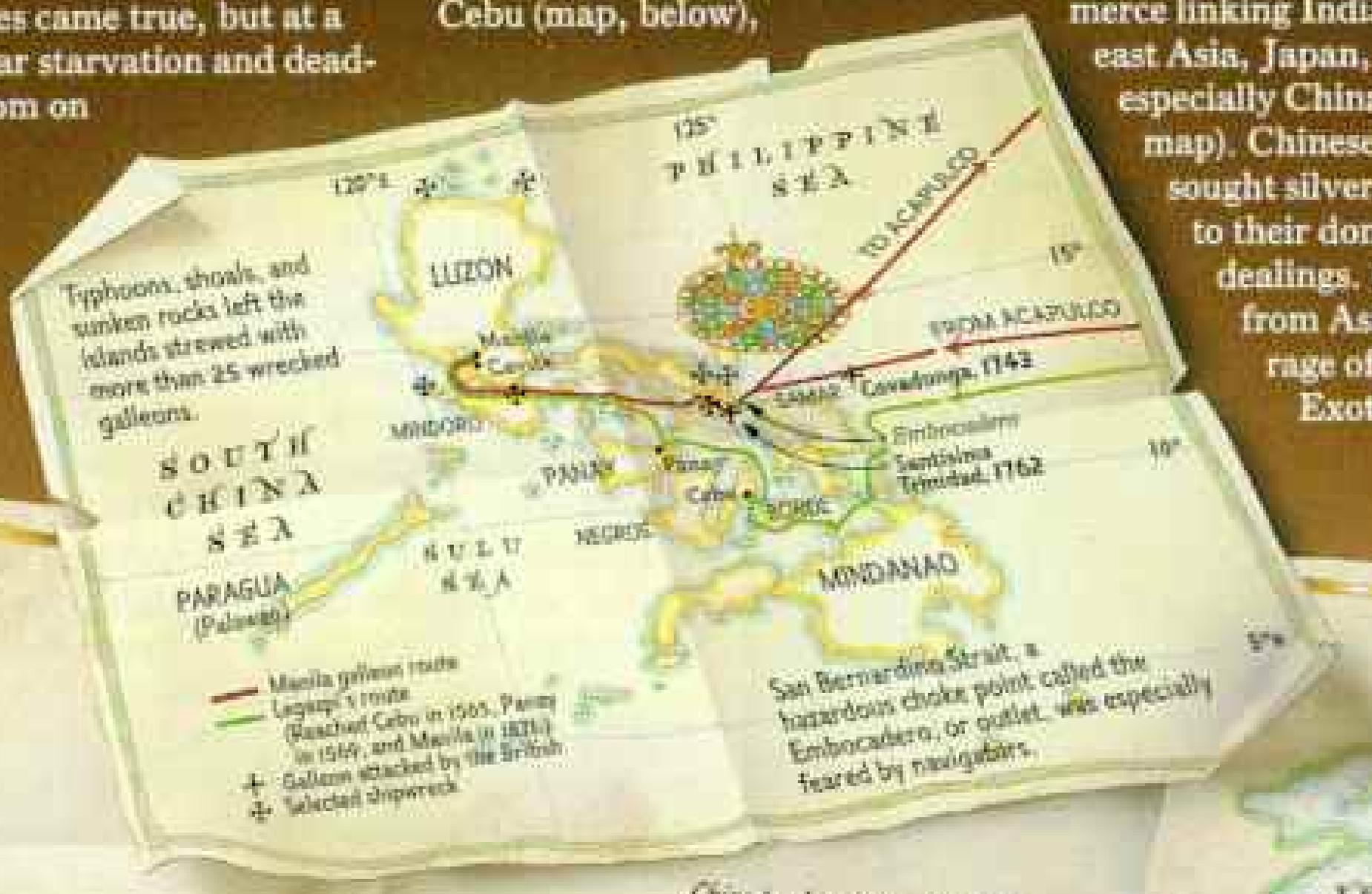
The galleon trade with China began by accident. In 1571 Spaniards rescued some Chinese sailors whose sampan had sunk off the Philippines. The next year another Chinese vessel came to Manila, packed with gifts in gratitude. The Spanish merchants hastened to dispatch a ship east, richly freighted with these silks and other Chinese commodities. It arrived at Acapulco in 1573. Thus the great Pacific trade began, and Manila became the center of a commercial web that drew products from other Pacific islands, from as far away as the Indian subcontinent and Southeast Asia, and from China.

The Philippines themselves furnished some gold, copra, and coconut-shell products, cotton cloth from Ilocos on Luzon, cotton stockings and petticoats, and gauze made in Cebu. They also produced burlap, rope, and hammocks made of hemp. Skilled Chinese and Filipino artisans in Manila wrought delicate filigree jewelry and gold chains.

Route of the treasure fleet

The galleons taught men that impossible dreams of wealth sometimes came true, but at a price: near starvation and deadly boredom on board and violence in newfound lands. Pathfinder for the galleon trade, Ferdinand Magellan claimed the Philippines for Spain in 1521. In 1565 Miguel López de Legazpi landed at Cebu (map, below), then founded Manila in 1571.

By trial and error, navigators found favorable currents to the north and established the eastbound route. Manila became the center of a web of commerce linking India, Southeast Asia, Japan, and especially China (bottom map). Chinese merchants sought silver, crucial to their domestic dealings. Goods from Asia were the rage of Europe. Exotic spices



Cotton, ivory, gemstones, furniture, and woodcarvings were shipped from India.

China traders bartered for silver with silk, porcelain, chinaware, rugs, toys, jade, and furniture.

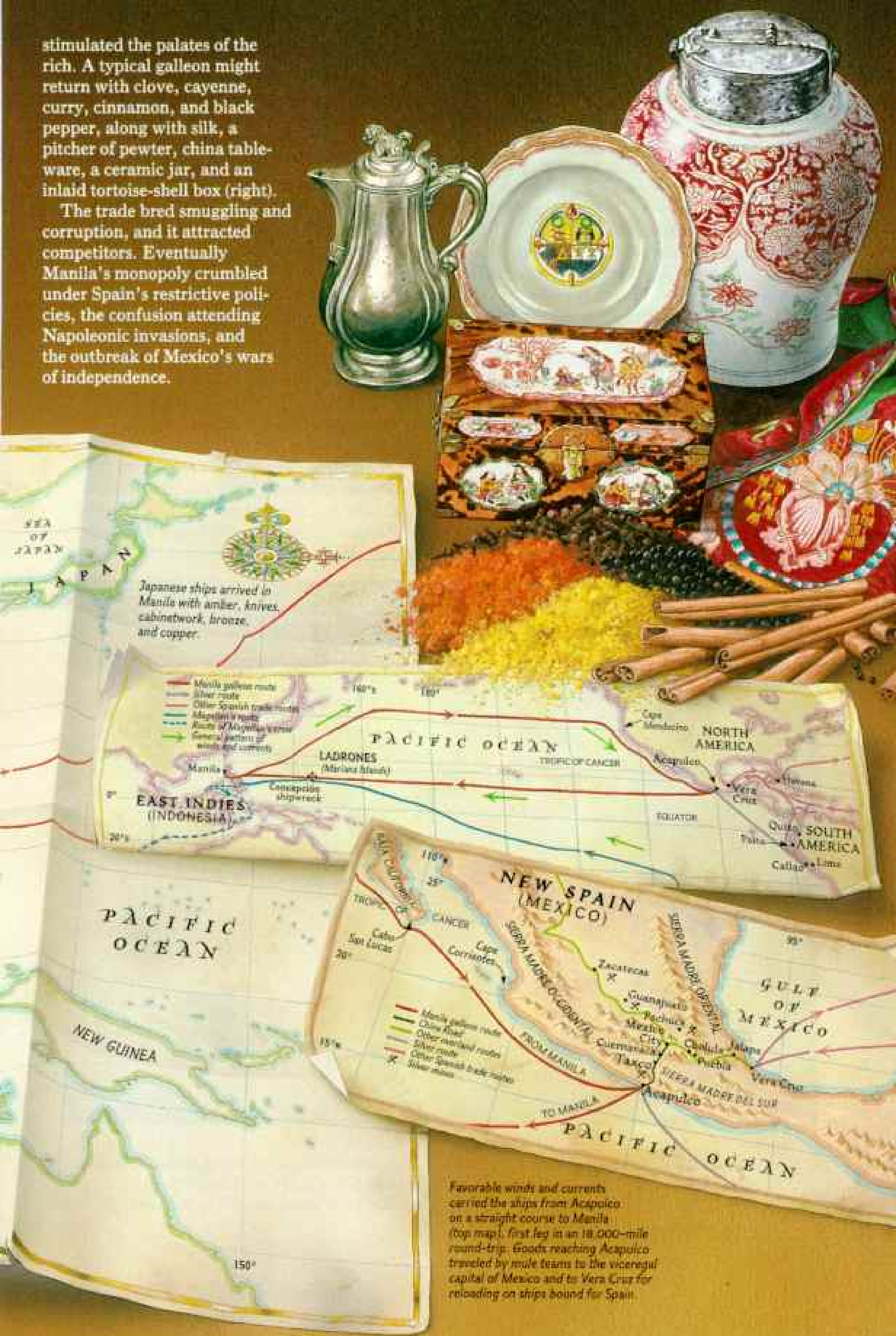
From Siam, now Thailand, came ebony, ivory, musk, rubies, and sapphires.

From Borneo came camphor, ceramic ware, and gemstones.

The Moluccas, then known as the Spice Islands, were a major source of cinnamon, clove, and nutmeg.

stimulated the palates of the rich. A typical galleon might return with clove, cayenne, curry, cinnamon, and black pepper, along with silk, a pitcher of pewter, china tableware, a ceramic jar, and an inlaid tortoise-shell box (right).

The trade bred smuggling and corruption, and it attracted competitors. Eventually Manila's monopoly crumbled under Spain's restrictive policies, the confusion attending Napoleonic invasions, and the outbreak of Mexico's wars of independence.



Favorable winds and currents carried the ships from Acapulco on a straight course to Manila (top map). First leg in an 18,000-mile round-trip. Goods reaching Acapulco traveled by mule teams to the viceregal capital of Mexico and to Vera Cruz for reloading on ships bound for Spain.

Craftsmen from India and Ceylon shipped Bengal taffetas, pearls, diamonds, and topazes, carved ivory chests, fine handkerchiefs, intricate woodcarvings, and bedspreads from Surate. From imperial Japan came amber, wheat flour, suits of armor, *katanas* (samurai swords), knives, saltpeter to make gunpowder, and cabinetwork.

Bezoar stones from Asia, taken from the stomachs of ruminant animals, were sent on the Manila galleons. Europeans believed they could signal the presence of poison in wine.

The Spice Islands supplied clove, cinnamon, and pepper. From Borneo came sago flour, camphor, ceramic wares, and precious gems. Cambodia, Malaya, Siam, and Cochin China provided musk, civet, and other essences, tin, ivory, rubies, and sapphires.

But the most important trade came from the Chinese mainland. For that reason the Spaniards called the Manila galleon *nao de la China*, "the ship of China."

Skeins of raw yellow silk, the finest white silk cloth and the most coarse grogram, richly embroidered satin bedspreads, sumptuous brocades and damasks, linen and satin cloth, costly gold and silver ribbons, painted shawls, and silk stockings arrived from Canton and Amoy on Chinese junks. There were copper kettles, forged ironwork, jade statues, paneled screens, chests of perfumed sandalwood, lacquered writing desks, figurines of carved ivory, delicate paper-and-ivory fans, exquisite Ming and Ching dynasty porcelain wares with rich, deep colors, imaginative designs, and quality glazes. European artisans would not unlock the secret of making porcelain until the 18th century.

As this Oriental ware, called chinoiserie, began to reach the West in quantity, it increasingly influenced European styles. In turn the Chinese began to manufacture specifically for the West: They made altarware and tableware, crucifixes, Christian images, and rosaries. They sent children's toys and virtually every kind of bric-a-brac. They also

Vows of fidelity are spoken beneath the trompe l'oeil embellishments of San Agustin's Church. Built from 1587 to 1606, it was the only building in Intramuros, the walled quarter of colonial Manila, to survive bombing during World War II. A young member of the wedding party embodies the Philippines' Chinese heritage.

shipped gold bullion to Manila to be directly exchanged for silver.

Chinese mercury for refining Mexican silver ores was also sent through Manila. Mercury helped keep the galleon trade cycling. For the Spanish government, taxes on Chinese imports yielded a steady income.

Asia's demand for silver—for exchange, for jewelry, to be hoarded as a store of value—seemed unquenchable. Over the galleon road a stream of silver flowed from where it was cheap and plentiful to where it was highly prized. It sprang from the mines of Zacatecas, Pachuca, and Guanajuato in present-day Mexico, and from the great mountain of silver ore at Potosí in Alto Peru, now Bolivia.

Conditions in the silver mines were appalling. A French authority has written: "[They] were not much different from those tradition attributes to Solomon's slaves in the mines of Manica dug for the Queen of Sheba. Some sections of Peruvian mines—with those black ghosts incessantly going up and down—recall Michelangelo's *Last Judgment*, in which convulsed clusters of human beings seem to form a sinister chain."

The Chinese recast Mexican silver bullion into shoe-shaped ingots, called *sycees*, for further exchange. Spanish coins circulating in China were incised with chop marks, Chinese characters that redefined their value in *taels*, the basic Chinese monetary unit.

The Manila Spaniards briefly maintained a trading station on mainland China but relied mostly on Chinese intermediaries in the Philippines who sold commodities from the 30 or 40 junks that annually arrived.

One such enterprising, if somewhat unrealistic, Chinese trader was described by Diego de Bobadilla: "A Spaniard who had lost his nose through a certain illness, sent for a Chinaman to make him one of wood, in order to hide the deformity. The workman made him so good a nose that the Spaniard in great delight paid him munificently, giving him 20 escudos. The Chinaman, attracted by the ease with which he had made that gain, loaded a fine boatload of wooden noses the next year and returned to Manila."

These merchants, whom the Spaniards called *sangleys* (after "seng-li," the word for trade), were subtle and astute bargainers. They settled outside the walled city of Manila in the Parian, the Filipino word for market. There they flourished and made themselves indispensable to the Spaniards. They furnished shipbuilders and came to dominate many other essential occupations in Manila. Fearful of the sangleys' growing power, the Spaniards attempted to regulate their number with head taxes.

But soon the Chinese outnumbered the small Spanish colony, and two incidents increased tensions: A Chinese pirate named Lin Tao Kien unsuccessfully attacked the city in 1574, and a Manila governor, Gómez Pérez, was assassinated on his galley by Chinese mutineers in 1593. Even though 12,000 Chinese were expelled in 1596, settlers continued to arrive from the mainland. By 1603

CUERNAVACA CATHEDRAL, MEXICO

Death by crucifixion in Nagasaki was the fate of 26 Christian missionaries and native neophytes, after a galleon pilot's bragging made Japan's military ruler suspect a Spanish plot to overthrow him. A fresco (detail above) at Cuernavaca Cathedral in Mexico depicts the 1597 martyrdom.

Manila was polarized into hostile camps, and a multiracial explosion seemed inevitable.

On the third of October, 6,000 armed Chinese moved out from the Parian, set afire the outlying Filipino settlements, and prepared to assault the walls of Manila. After a Spanish sortie ended disastrously, militant Chinese displayed the severed heads of the captured Europeans around the city. Only the coming of a Spanish column from the south turned back the sangleys; the Spaniards then burned the Parian. As they and their Filipino and Japanese allies took their revenge, more than 20,000 Chinese were killed.

In that same calamitous year of 1603, one of the galleons was shipwrecked and another had to return to Manila. Disheartened at these economic losses and the destruction of their city, many Spaniards left the Philippines. But Manila was slowly rebuilt, and its new buildings were made of stone; the sangleys began to return. Although there would be other uprisings, the uneasy partnership of Spaniards and Chinese in the Manila commerce went on.

AND AN IMMENSELY lucrative commerce it was. The freighting of the Manila galleons was a mixed enterprise. The ships themselves were built, owned, and sailed by the Spanish crown, which also regulated the commerce. However, virtually every Spaniard and every institution in the Philippines shared in the venture.

At first the governor allotted galleon shipping space; after 1604 it was apportioned by a commission representing powerful interests in Manila—the civil government, the church, merchants, and the general population. The commission divided the space into *piezas*, or pieces, for which it issued permits, or *boletas*. These were supposed to be chosen equitably, but influence and corruption in the issuance of boletas was a factor from the beginning.

Some who obtained boletas were prosperous merchants with the necessary funds to ship goods. Others—impecunious widows, soldiers, functionaries—sold their boletas for cash, and a brisk trade in the permits sprang up. The church took a significant role in the commerce. The cathedral of Manila was assigned a number of boletas, and the nine *obras pias*, wealthy charitable societies of various religious orders, helped bankroll

Devotion begins at an early age in Manila's Quiapo Church. Spain's lengthy domination gave Roman Catholicism a lasting stronghold in the Philippines. Though Spanish is still spoken by some, the seventh station of the cross is here described in Tagalog, a Philippine language.

the trade. Although individual clergymen were forbidden by law to participate, there were priests, bishops, and even archbishops who consigned merchandise on the galleons. Governors and other officials regularly held valuable interests in the shipments.

The Spaniards, clustered in Manila, lived well on the profits. The wealthier class dressed in costly silks, drove elegant coaches, used the finest porcelain on their tables, and adorned themselves with gold chains and other jewelry made by Chinese artisans. Silver returning from the Mexican treasury undergirded the costs of the Philippine government and funded its defense. An annual subsidy from Spain covered government and church expenses. Thus the failure of even one shipment often spelled disaster, and personal fortunes rose or fell in harmony with the vagaries of the trade.

On more than 40 occasions the ships did not arrive; they were either wrecked or lost at sea. (See *Concepción* article, page 39.) The first was Legazpi's *San Pablo*, wrecked in the Marianas in 1568 while eastbound from Cebu. Fifteen of the lost vessels were westbound silver galleons. In one three-year period alone, 1655-57, four galleons were lost. During the next 150 years sunken galleons were scattered all along the route. Uncounted others were forced back to port.

Spanish authorities and merchants engaged in a perpetual game over the galleon trade: Crown regulations were issued regularly, only to be as regularly broken. Royal commands limited vessel size, put ceilings on the value of annual shipments, and restricted cargo to 4,000 piezas. There were heavy penalties for shipping contraband: confiscation of goods and four years chained to the oar as a galley slave. Yet all these rules were flagrantly, even extravagantly, violated.

Shipments of Oriental goods expanded, as did the returning tide of silver. The ships built in the Philippines grew in size from the allowed 300 tons (500 tons after 1720) to more

Rigging for the galleons was fashioned from hemp, a native Philippine plant still used in cordage. Rice fields (right) furnished the staple preferred by the ships' Asiatic crewmen. Colonists did little to develop Philippine agriculture, and the wealth they dispatched to Spain benefited few except an elite of noblemen, traders, and merchants.

than a thousand. The giant *Santísima Trinidad*, captured by the English in 1762, was almost 2,000 tons burden.

Since authorities seldom opened bales or packages destined for the galleon, shippers habitually swore to falsely low values for their goods. A packet alleged to be worth 125 pesos might really contain a value of 600 or as much as 2,000 pesos. Stashes of unregistered bullion were made in every part of a ship—in hollowed-out timbers, within bales of cloth, even inside the rinds of cheeses.

All this contraband drastically cut royal taxes, but it was obviously tolerated. As in 20th-century drug traffic, swollen profits—100 to 300 percent—invited widespread official corruption. Even the king tacitly recognized the situation, by finally accepting lump-sum settlements in lieu of the evaded taxes.

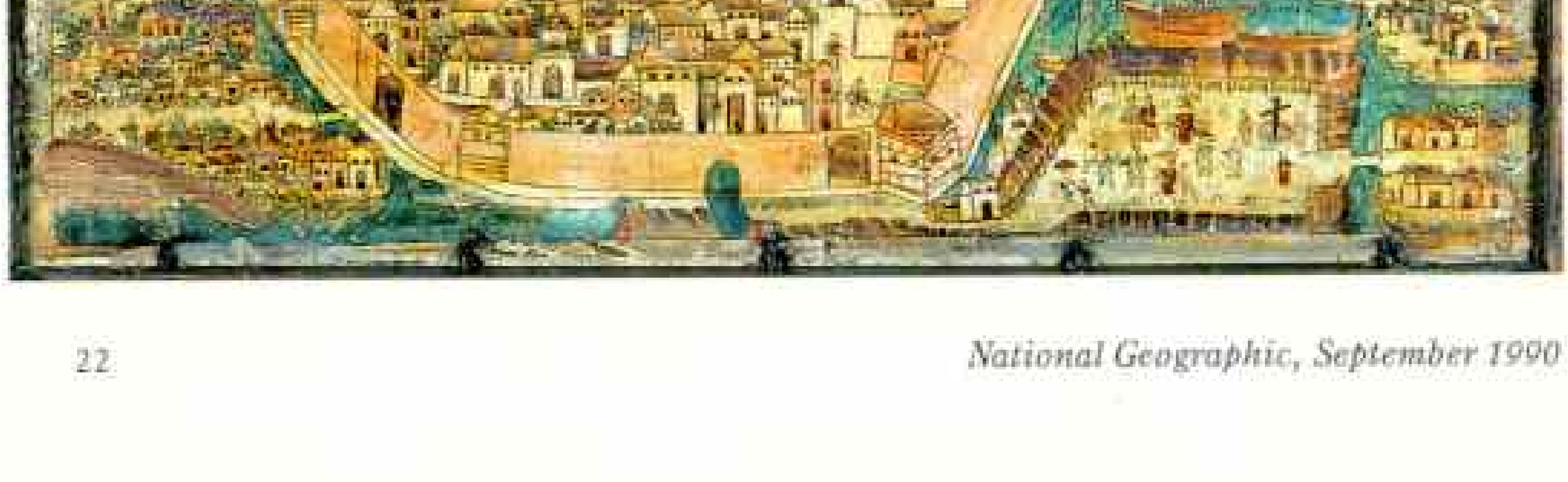
Where a trail rises steep in the isolated realm of the Mangyans on Mindoro Island, four girls paused and carved their names on bamboo in an ancient script (above). Holding a child, an islander (facing page) wears the same sort of loincloth (below) worn when the colonists arrived. Catholic missionaries have worked to protect Mangyan land rights and preserve their culture from the adverse impacts of modernity.

WHILE MANEUVERING between Spain and Portugal over the spice trade continued, Spain's King Charles I haughtily ruled in 1530 that none but Spaniards might sail the Pacific. In the coming years many challengers arose. At the turn of the 17th century, in an explosive expansion of trade and war, sailors from Holland and other breakaway Netherlands provinces of Spain fanned out around the oceans of the world for their share of the eastern bounty. In 1600 a Dutch fleet commanded by Oliver Van Noort of Utrecht rounded Cape Horn, broke into the Pacific, and arrived at San Bernardino Strait in the Philippines on October 14. He hoped, according to Spanish writer Fernández Duro, "to enter Amsterdam with sails lined with silk and a good ballast of Spanish pesos." But the aroused Manileños armed several craft and routed the invaders. As the Spaniards put 25 captured Netherlanders to the garrote, Van Noort limped back to Amsterdam, having found neither booty nor glory.

Two other proud peoples met when Spaniards began to dispute trade and religion with imperial Japan. Through Manila, Spain

On Mindoro the Spanish found junks filled with exotic merchandise—the first evidence of trade between China and the Philippines—and bartered for beeswax and honey. Already exposed to visitors from other lands, Philippine natives escaped the pandemics introduced by Europeans that so devastated Indians in the Americas.

PAINTING BY ROBERT E. MCGINNIS; BELLO MUSEUM, PUEBLA, MEXICO (BELOW); NATIONAL ARCHIVES OF MEXICO (RIGHT)



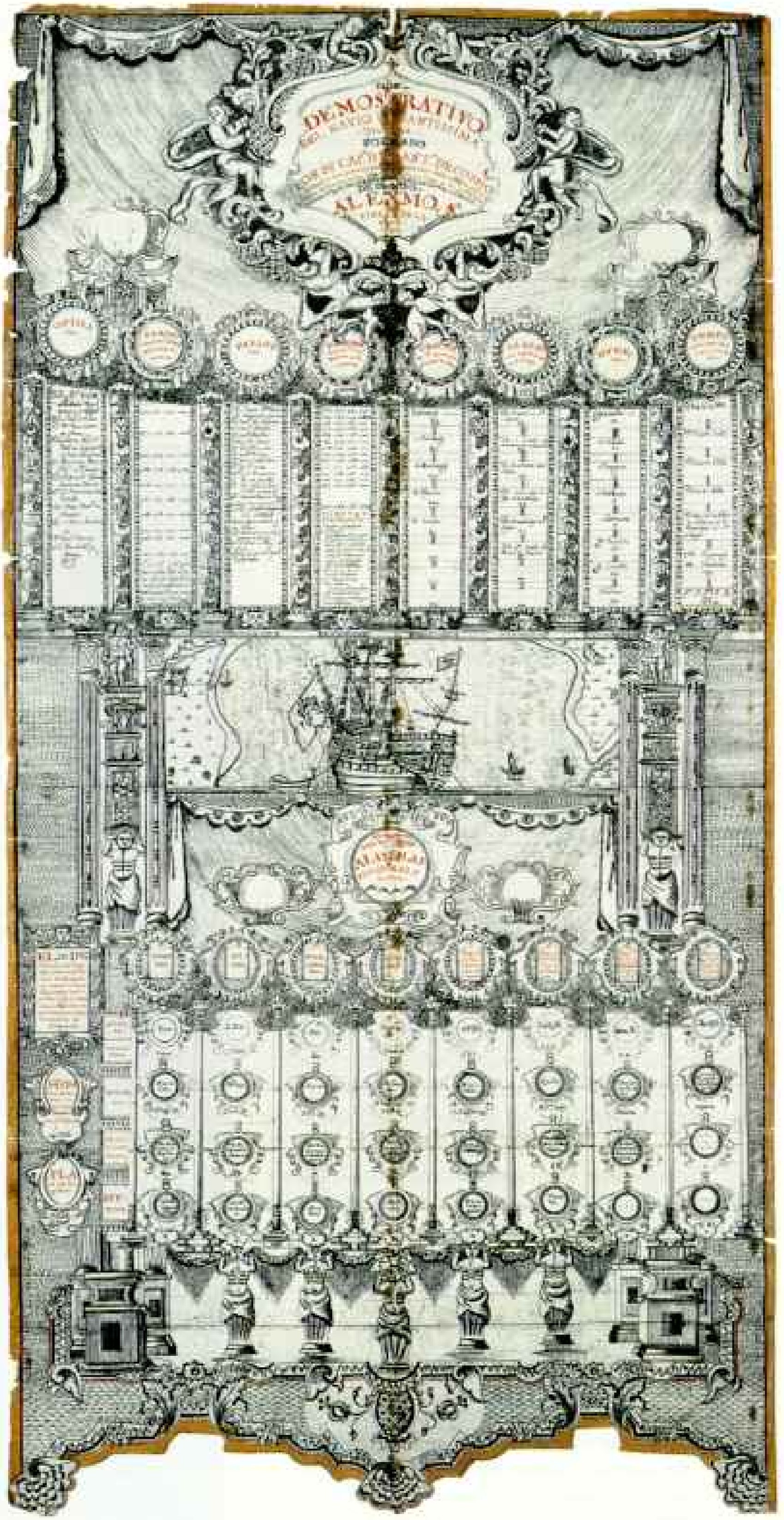
Galleons under fire

Sharpshooters aboard the British warship Centurion *use Brown Bess muskets to pick off crewmen of the silver galleon* Covadonga *in 1743. Overloaded and lightly armed, the* Covadonga *was quickly taken, leaving 70 dead. To Britain's Commodore George Anson the galleon gave up more than a million silver pesos and nearly 36,000 ounces of bullion.*

Measuring nearly three feet long, an account of the 1752 voyage of the Santísima Trinidad *spares no detail (right). The document lists the amount of silver on board, names the officers and ports of call, and notes the severity of storms encountered. Stores included salted meat, biscuits, and 2,094 containers of potable water, all consumed. Of some 400 aboard, 82 died.*

Later captured by Admiral Samuel Cornish, Trinidad *was sailed to England, where it drew curious crowds in Plymouth.*

The lid of a wooden chest bears a map of Intramuros, reserved for Spaniards: the governor and his administrators, friars, merchants, military officials. Outside the walls lived a polyglot community of Filipinos, Chinese, Japanese, and other foreigners.



sought permission for Jesuit missionaries to evangelize freely in Japan. Governor Rodrigo de Vivero, who washed ashore in Japan when his galleon was shipwrecked, asked the Shogun Ieyasu to banish the Dutch from Japan and allow Manila galleons to refit in Nagasaki. As Vivero later wrote to King Philip III, he had envisioned the full opening of Japan to ships from Manila, leading to possible Spanish domination of both Japan and China.

For his part the shogun was torn by conflicting desires; Japan was neatly balanced between expansion and isolation. In an attempt to bypass Manila and open direct trade between Japan and America, he sent an ambassador to the Mexican viceroy on a galleon. But Spain had no intention of encouraging Japanese commercial power. Rebuffed in his hopes, Ieyasu began to withdraw Japan from contact with the West.

By the end of the first quarter of the 17th century, Japanese xenophobia had led to the proscription of Christianity there. A rebellion of Japanese Christians in 1637 was repressed with great cruelty, and in 1638 almost all remaining Christians were massacred. Except for a minor Dutch trading station, Japan then became closed to Western nations, a condition not changed until Commodore Perry's visit in 1856.

IT WAS NOT LONG after establishment of the galleon trade that Englishmen came to dispute and disrupt it. Sir Francis Drake entered the Pacific in 1578 knowing nothing of the commerce, until he captured Spanish merchant ships extravagantly loaded with Oriental goods. To the English a Manila galleon became the world's greatest prize.

Perhaps the most celebrated assault upon a Manila galleon, accomplished after almost inconceivable hardship and privation, was carried out by Commodore George Anson.

In 1739 the British Admiralty planned major naval strikes against its enemy, Spain. Anson was allotted a 60-gun flagship, the *Centurion*, five other men-of-war, and two supply vessels to harass Spanish towns in the Pacific, but his ships were poorly supplied and manned. His complement of almost 2,000 men included many rounded up by naval press-gangs. Anson was assigned 259 aged soldiers from Chelsea Hospital; it had been decided that these pensioners would suffice to get the job done.

During a difficult passage around Cape Horn, one ship was wrecked, while two others turned back. As the remaining ships

Running before a squall, a boatman heads across San Bernardino Strait toward refuge on Samar Island. There the British seized the galleon Santisima Trinidad *in 1762. In these same waters Emperor Hirohito's ships sailed to a showdown with Allied forces at Leyte Gulf, Japan's last naval battle in World War II.*

struggled through more than two months of severe storms, the crews were heavily afflicted with scurvy. When Anson arrived at the Juan Fernández Islands off the Chilean coast, two-thirds of his men had perished.

It was September 1741, and the voyage was already a year old, when the English ships left Juan Fernández for the coast of Peru. After sacking the town of Paita, Anson made for the coast of Mexico but missed the galleon from Manila by three weeks. Only two of Anson's ships now remained.

Resolving to seize the westbound galleon before it reached Manila, Anson struck out for the Orient. But *Gloucester*, his only other remaining ship, began to sink. He ordered her scuttled and transferred her people to *Centurion*, which sailed on alone. The mission appeared doomed; Anson's safest course seemed to be directly back to Great Britain.

But Anson boldly sailed on for the Philippines. By late May 1743 *Centurion* was at anchor by the landfall for the westbound galleons, where she lay in wait for a month. Describing the emotions of the crew, the ship's chaplain wrote: "The *Centurion*'s people were now waiting each hour . . . for the happy crisis which was to balance the account of

PAINTING BY ROBERT E. McGINNIS, NATIONAL MARITIME MUSEUM, LONDON

Journey's welcome end

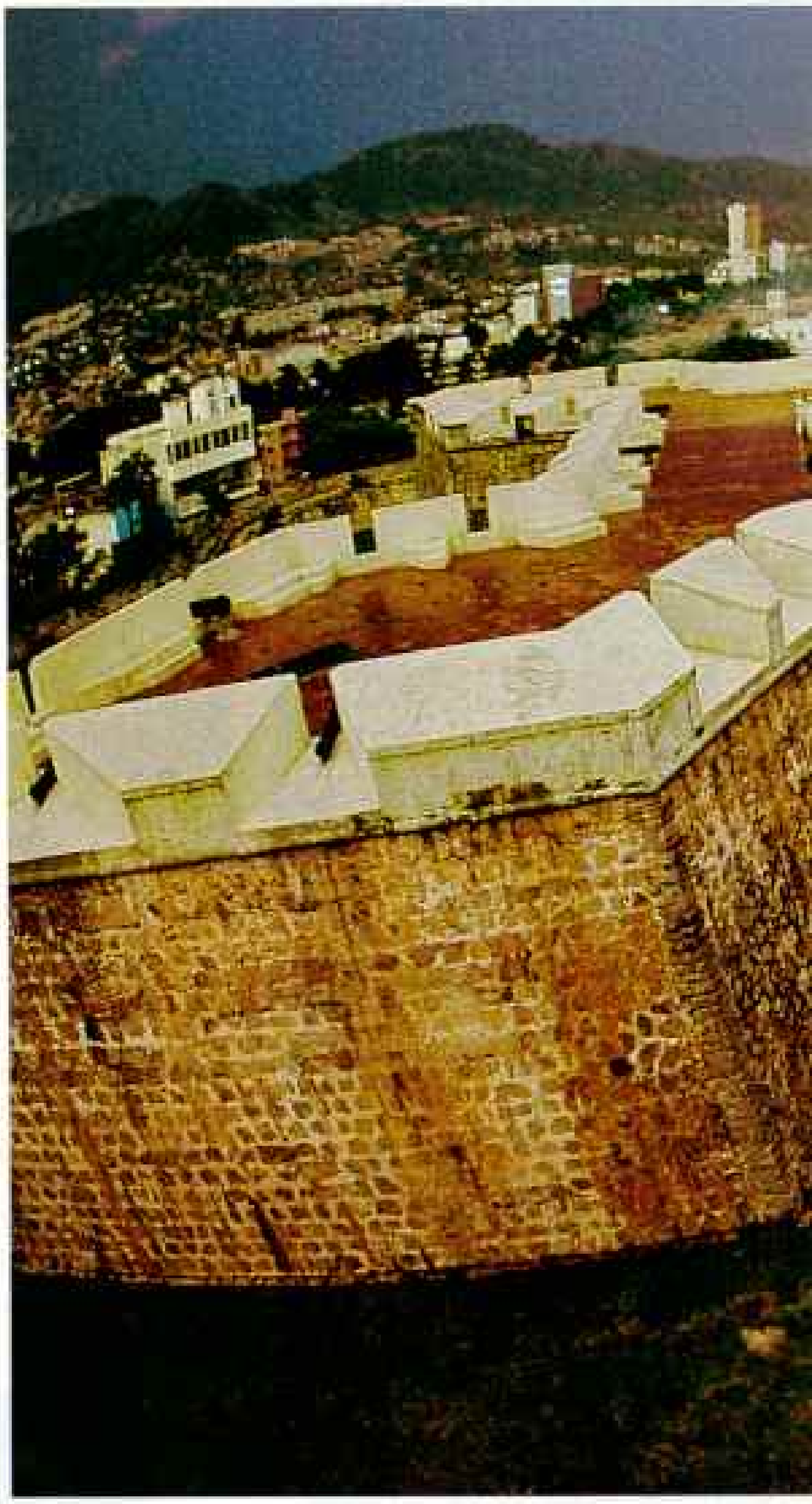
Passengers and crew from Manila reach for oranges and lemons —antidotes to scurvy—brought alongside by New Spain friars. Missions planted citrus groves especially to serve the galleon trade.

As the eastward journey to Acapulco finally neared an end, first landfall was often at Cape Mendocino in California, once thought to be an island (above). To keep his bearings, a traveler used this early 18th-century instrument that combined a compass with a sundial.

FRANZ MAYER MUSEUM, MEXICO CITY

Built as a five-pointed star of defense for Acapulco's inner harbor, Fort San Diego warded off pirates and other enemies, who simply changed tactics and lay in wait as galleons sailed in and out of port.

A ramp (facing page) was used to trundle cannon to their positions above the moat. The stronghold fell to an earthquake in 1776, was rebuilt, and now houses a museum.



all their past calamities . . . It is sufficiently evident how completely the treasure of the galleons had engrossed their imagination."

And finally, at dawn on June 20, a sail was sighted in the southeast. It was the *Nuestra Señora de Covadonga*. The outcome of the battle was foreordained. The British—lean, hungry, almost desperate after years of hardship—shared an overriding purpose. The overloaded Spanish galleon was ill-prepared and lightly armed. At short range *Centurion*'s 60 guns could batter and pierce any ship's hull.

Anson had stationed his best marksmen in the tops; as his cannon kept up a constant raking fire, the sharpshooters felled all the Spanish officers but one. When British boarders swarmed over the galleon's deck, the Spaniards struck their colors. *Covadonga*'s hull had taken more than 150 hits. She reported 70 dead and 61 wounded; the British losses were two dead and 17 wounded.

Anson discovered an immense treasure in Mexican silver aboard the Spanish galleon. During the voyage to Canton with his prize, contraband was found in almost every corner of the ship. The final tally was 1,313,843 silver pesos and 35,682 ounces of silver bullion. He transferred the silver to *Centurion*, sold the galleon in China, and set sail once more for England.

Of eight ships only *Centurion* remained. More than 1,300 of his men had died. But it required 32 wagons to transport the treasure from Spithead to London.

LIKE THE MANILA trade itself, the ships built for the Pacific voyage at the Cavite shipyards were a synthesis of Europe and the Orient. Designed in Spain, the ships were strongly built of durable tropical hardwoods, cut by laborers from outlying islands who worked for rice rations and a meager wage.

Anchor lines and rigging were of Manila hemp; sails were sewn in nearby Ilocos. Fastenings were forged by Spanish, Chinese, or Malay smiths; the iron came from China and Japan. The galleons carried quantities of Spanish *botijas*, terra-cotta containers for water, wine, honey, and oil, together with large ceramic supply jars made in Asia.

Once the cargoes, registered or illicit, were safely stowed aboard the eastbound galleon, ship's stores were loaded, and the officers, passengers, and crew came aboard. At Cavite, botijas were filled for the long journey.

The eastbound galleons were, in principle, scheduled to leave Manila by July of each year and to sail westward from Acapulco as early as possible the next year. Ideally two

PAINTING BY ROBERT C. McGINNIS

Foreign goods to build an empire

The dealing begins as a galleon lies at anchor off Acapulco, a town that existed only for trade. A ship's arrival ended anxious speculation about the perilous eastbound voyage, which could take seven months or longer.

A clerk checks an inventory over a stack of silver bars while two traders negotiate the price of ceramics. Awnings protect the array of silks, carpets, and other goods as a Jesuit priest, at right, examines religious jewelry.

Most galleons were constructed in Cavite, where good timber, especially teak, was abundant. The Spanish in Acapulco called them the China ships, testimony to the popularity of Chinese goods in New Spain, where sales generated enormous profits for merchants back in Manila.

Chinese artisans began manufacturing items tailored to European tastes. The porcelains that ended up in New Spain and Europe were produced during the last years of the Ming dynasty and much of the Ching, generating a tradition still practiced by Mexican artisans. A peg-leg Chinese sailor stands with his crutch on a vase (left) made recently in Puebla, which lay on the overland route from Acapulco to Vera Cruz. Even sherds of porcelain were valued, becoming decorative accents in monuments called riscos. *Masons pressed entire plates into wet plaster to embellish a fountain (right) at Casa del Risco in San Angel, a village of cobblestone streets now completely surrounded by Mexico City's sprawl.*

would depart Acapulco each January, while a third remained in reserve in the Mexican port. Meanwhile, three other ships would be in Cavite. In practice, in many years only a single ship sailed in each direction.

For westbound galleons it was often like a lengthy pleasure cruise. Dropping south from Acapulco, they sailed due west near the 13th parallel, pushed by steady trade winds straight across the Pacific through quiet seas, often in less than 60 days. Eventually they changed course to reach the Marianas. By then they had to hurry to reach the Philippines before the contrary winds of the autumn monsoon. The whole voyage often required only three months.

In contrast the eastbound ordeal was described by a 1697 traveler: "The voyage from the Philippine Islands to America may be call'd the longest and most dreadful of any in the world, as well because of the vast ocean to be cros'd, being almost the one half of the terraqueous globe, with the wind always a-head; as for the terrible tempests that happen there, one upon the back of another . . . ."

After leaving Cavite, a ship bound for Acapulco required several weeks to thread the tortuous inter-island passage, breasting strong currents and avoiding reefs and shoals. At last the galleon passed through San Bernardino Strait, the outlet called the Embocadero, into the open Pacific.

COINS (FACING PAGE) BANK OF MEXICO

Twin towers of the Church of Santa Prisca, built by a silver baron in the 1750s, rise in Taxco near the old road from Acapulco to Mexico City. Taxco remains an important center for mining and silversmithing. Pieces of eight minted in Mexico (left) bear chop marks incised in the Far East to validate the coins for trade there.

It took another month to reach the latitude of the most northerly Marianas. From there the ship headed above the 35th degree of latitude, where it would pick up fresh westerly winds and currents. Under the best circumstances the open ocean passage took another three months. But circumstances were seldom good.

Each galleon formed its own isolated microcosm of the Spanish empire. Crowded aboard ship were more than 300 people—government and military officials and the vessel's infantry contingent. The ship's company included officers and petty officers and a large crew of gunners, seamen, apprentices, and pages. The mariners were a polyglot group, speaking Spanish, Malay, Tagalog, and Mandarin. Passengers ran the social gamut from noblewomen, missionaries, secular priests, and nuns to chained *reos*, or condemned prisoners.

Along with sea biscuits and wine, essential rations included salted or dried pork, beef, or fish, olive oil, garbanzos, and garlic used to make the basic Spanish *cocido*, a stew. The supply of chickens and hogs, fruits and vegetables was soon exhausted. For the privileged, there were luxuries: sweetmeats, nuts,

raisins, honey. Water was strictly rationed, being controlled by the official named *alguacil de agua*, or water constable. But as the water clouded and fouled and dwindled, the galleon began to depend upon rainfall. Mats were spread to funnel rainwater into jars. At times a storm was a godsend.

The journey was also hazardous because ships in distress had no haven anywhere along their long route. The Hawaiian Islands were never discovered by the Spaniards; the chain lay south of the normal sailing track.

VICEROYALTY MUSEUM, TEPOTZOTLAN, MEXICO

Gold leaf embellishes a wooden mantle framing Our Lady of Guadalupe. The face and hands, made of ivory by Chinese craftsmen, lend an Oriental air. The statue was created in the late 1600s, probably in response to accounts of an appearance of the Virgin in Mexico in the 1530s, an event that sped the conversion of the Indians.

AFTER ALMOST four months at sea, the ship's sails and rigging required constant repair and replacement. The stresses on the galleon's closely packed human cargo were not as easily reparable. As one monotonous day succeeded another, some lapsed into apathy. Others, seized by a fever for gaming, played endlessly at cards or dice or wagered on the outcome of every conceivable happening.

Like a penance, storms and occasional Pacific typhoons lashed the little galleon community. If there seemed to be real danger of foundering, the voyagers vowed to Christ, the Virgin, or to the saints that if they survived, they would go on pilgrimages. The ship's religious image was brought out for supplication. Those who belonged to lay orders put on their order's habit, so that they might die in more sanctity. Ordained clergy aboard were busy hearing confessions, for if a Spaniard were to drown at sea without absolution, the salvation of his soul was doubtful.

As the journey lengthened and the stores of fresh fruits and vegetables dwindled, disease festered. Scurvy, which Spaniards called the "Dutch disease," began to spread. Victims' arms, legs, and trunks became covered with bruises and livid spots; swollen gums began to bleed, teeth fell out. Advancing malnutrition also resulted in beriberi, which was accompanied by numbness, swelling, and paralysis of the extremities. Diarrhea and dysentery, caused by poor sanitation practices, compounded the misery.

Wrote a 17th-century Italian, Giovanni Francesco Gemelli Careri, of his trip from Manila to Acapulco: "There is hunger, thirst, sickness, cold, continual watching, and other sufferings. . . . Abundance of flies fall into the dishes of broth, in which there also swim worms of several sorts. . . . On fish days the common diet was old rank fish boil'd in fair water and salt; at noon we had *mongos*, something like kidney beans, in which there were so many maggots, that they swam at top of the broth, and the quantity was so great, that besides the loathing they caus'd, I doubted whether the dinner was fish or flesh."

Spaniards dreaded their ship's approach to

a certain spot on the chart that they called "the place of death," where many prominent passengers had died. It was specifically named for Doña María de la Jara, a noblewoman who had jumped overboard there.

In the last and most critical phase, lookouts anxiously searched for the *señas*, or signs, of land: often lively seals swimming around the ship, then *porras*, long floating strands of yellowish kelp. Finally, as they neared land, whole matted masses of reeds from some California river floated by.

To celebrate, the crew staged a ceremony much like that of King Neptune, observed for centuries aboard ships that crossed the Equator. The president and judges of the señas court, outlandishly dressed, called the ship's captain, other officers, and passengers to judgment, fining the defendants for their alleged misdeeds.

First landfall, which seemed like a dream after so many months at sea, was often Cape Mendocino in northern California. Skirting the foggy, rockbound cape, the galleon pilots sighted Point Reyes, from which they steered offshore again to avoid the Farallons, passing Point Pinos at the south end of Monterey Bay. They traversed the Santa Barbara Channel and the Channel Islands, sailed along Baja California to Cape Corrientes and on south to their destination at Acapulco.

In this homestretch, people weakened by disease began to die in large numbers. In one 17th-century galleon three or four deaths a day occurred after the señas. Then, as the rhythm of mortality increased, 92 died in 15 days. When they at last arrived at Acapulco, only 192 of the 400 who had embarked in Cavite remained alive; many of them were woefully weak. But there were worse tales.

In the mid-17th century, sailors on a ship from Acapulco sighted a galleon drifting off the Mexican coast, sails slatting in the wind. This was the *San José*, which had departed Manila over a year before. Every last soul had perished of starvation or disease. The ship was a floating bier of silks and corpses.

LIKE MANILA, Acapulco was located on a fine harbor, deep and extensive enough to shelter a fleet. Since the bay's steep rocky shores made land access difficult and its hinterland was sterile, the town owed its life to the galleon traffic. It came alive only to receive, outfit, and dispatch the galleons, to act as a stage for the Manila galleon fair, and to serve as way station for the transshipment of the goods and monies traded there.

Unloading began in a web of fraud and bureaucratic collusion. Treasury officials balanced the incoming galleon's formal manifest against the official annual limit of a Manila shipment. More often than not, one

COLLECTION OF RODRIGO RIVERA LAKE

Christ as the tender of his flock finds ivory expression in a shepherd boy, his repose inspired by images of Buddha and the infant Krishna. This artistic tradition flourished in Goa, the Portuguese colony in India, where missionaries commissioned works for buyers in Europe and the New World.

Nature and faith raised three landmarks at Cholula near Puebla. A volcano stands beyond Santuario de Nuestra Señora de los Remedios, built upon the overgrown hulk of the world's largest pyramid by volume, mistaken by the Spanish for a mountain. Thus did the Spanish crown proclaim dominion over a land that they in turn would lose.

set of figures had little to do with the other. But in payment for allowing the masses of contraband to land, Acapulco officials required that 10 percent of its value be deposited in their treasury. Then, as cargoes were unloaded and the goods hauled into the warehouses, buyers arrived from Mexico City and Lima. The Acapulco fair could begin.

It was a motley and colorful bazaar, with Americans, Europeans, and Asians offering their continents' goods in abundance. Stacks of silver ingots and chests of coin, outputs of the mines and mints of the two Americas, were ready for the bartering.

From Acapulco, Peruvian ships left for South America with cargo and contraband to enrich church treasuries and noble houses with silver and gilded altarware and tableware; in Lima and Quito, Indians, mestizos, and Europeans alike wore cotton from the Philippines and India and silk from China. By the mid-17th century Oriental goods had reached most of Spanish America.

Products destined for Mexico City and Europe were loaded on mules for the arduous route through the Sierra Madre del Sur called the China Road. In 1679 a priest named Cubero wrote, "This is one of the roughest roads I have ever traveled, for it consists of canyons, forests, crags, and cliffs as steep and deep as any in the world."

Across the mountains, at the fair in Jalapa, representatives from the merchants' guilds of Seville and Cádiz traded European goods—wine, books, iron tools, and Spanish, French, and English cloth—for Manila wares and for the gold, silver, indigo, and cochineal of Mexico. These were again packed for shipment, to be consigned at Vera Cruz on ships bound for the Spanish homeland.

In Acapulco the outgoing galleon's silvermaster opened his manifest for Manila. The Philippines' silver subsidy and the accumulated fruits of the Acapulco fair, stored in a thousand or so wooden chests, were brought aboard. Cases of books from Spain were loaded. Soon the westbound galleon raised sails and anchors, and the great transpacific cycle began again.

THUS MANILA became a link in an economic chain that spanned much of the globe. It was the guarantor of a ship bridge, across which were exchanged the ideas and treasures of three worlds. Through her galleons Spain fulfilled the dream of Marco Polo and Columbus: to reach, tap, and exploit the riches of Asia.

According to a French historian, Manila became the base for the "first world economy directed from Europe . . . throughout the greatest of the oceans."

In time the galleon trade lost its vitality: Spaniards in Manila, Mexico, and the homeland quarreled over profits; other nations entered the China trade; Napoleon's invasion of Spain left her in confusion; wars of independence broke the chain in Mexico.

In the century after the last of the galleons sailed, the Orient was exploited in turn by France and the British Empire and by an eager and expanding United States of America. Now the western rim of the greatest ocean is studded with independent Asian states: the Philippines themselves, Malaysia, Indonesia. Prodigious economic power resides in Japan, South Korea, Hong Kong, Taiwan, and Singapore.

But the Spanish left their indelible mark in forming the modern Pacific world. Well into the 20th century the Mexican silver dollar was the preferred currency of the China trade. The Manila galleons were a catalyst in those centuries of change. Vanished now but for their sunken remains, they sailed through a quarter millennium of human endeavor. □

Ominous clouds mask a setting sun off the western Pacific island of Saipan. It was here on September 20, 1638, that the Nuestra Señora de la Concepción, *a Spanish galleon plying the lucrative trade route between Manila in the Philippines and the New World port of Acapulco, foundered in bad weather and was hurled onto a reef. Most of the 400 people on board perished, and her precious cargo from the Orient spilled into the sea. No manner of precaution, prayer, or icon — such as this diamond-and-gold cross — guaranteed safe passage along this perilous route.*

Nuestra Señora de la CONCEPCIÓN

By WILLIAM M. MATHERS Photographs by SISSE BRIMBERG

A galleon's last days

Staking a claim over the reef that destroyed the Spanish galleon Concepción, *the author's recovery vessel,* Tengar, *served as both living quarters for its crew of 30 and laboratory for their salvage operation. Over a two-year period the team combed a half-square-mile area, salvaging, among other things, more than 1,300 pieces of gold jewelry, 156 storage jars, and a few hundred cannonballs.*

Not long into its voyage, a mutiny arose on the Concepción *over the inexperience of her commander, the young nephew of Manila's governor. Refusing to obey orders, several officers each tried to gain control of the ship. Amid the confusion, the galleon broached in severe weather. With sails caught*

STRUGGLING in the sea's turbulence, I almost overlook the golden lady. We've been 15 feet underwater for nearly an hour, battered by waves and scraped by coral as we dig through a layer of sand and rocks in a narrow channel of a tropical reef. Fatigue is starting to set in.

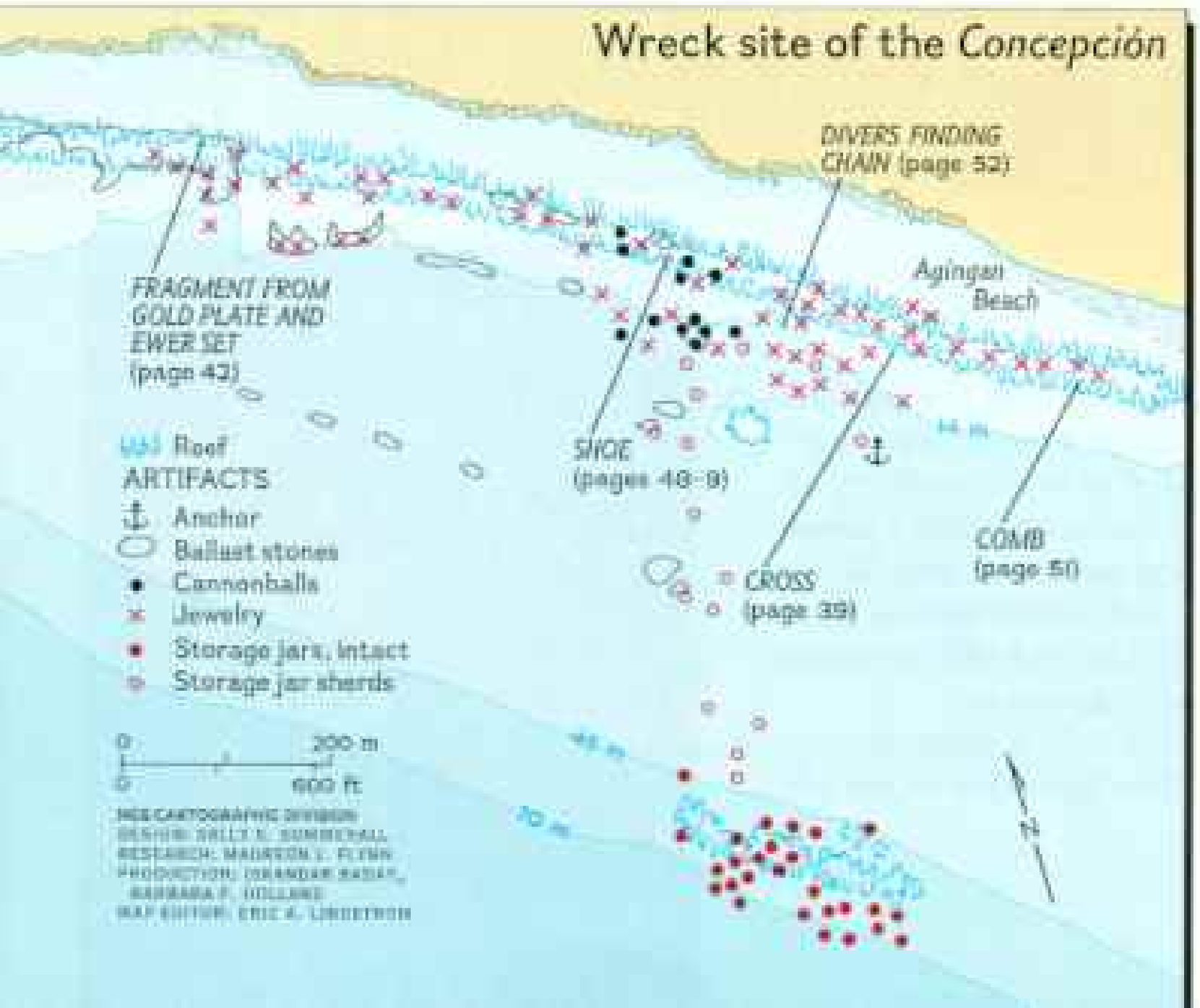
We are in Saipan, in the Northern Mariana Islands, searching for the remains of a Manila galleon, one of the grand Spanish merchant ships that plied the Pacific between the Philippine Islands and Mexico for 250 years.

The galleon *Nuestra Señora de la Concepción* was wrecked through mishandling in these waters (map) on September 20, 1638, en route east from Manila with a cargo of Oriental silks, porcelain, ivory, and precious jewels. But so far today's dive has turned up only ballast stones.

And then I catch a glimpse of metal—a small, luminous object poking from the sand. Probing carefully, I uncover a three-inch-wide fragment of hand-tooled gold plate. I am captivated by the image on the fragment: A woman in a swirling gown cradles a vase of flowers. Her left hand holds a cluster of roses. A small dog springs up at her feet. Floral designs embellish the fragment's border.

My heart jumps. According to documents in the Archive of the Indies in Seville, the *Concepción* carried a solid-gold plate and ewer set, thought to be a gift from the King of Spain to the Emperor of Japan. Following a 1644 inquiry into the *Concepción*'s loss, Spanish officials charged that Manila's colonial governor, Don Sebastián Hurtado de Corcuera, had misappropriated these items in the Philippines and was shipping them back to Spain as personal cargo. We had already found

WILLIAM H. HAWKINS



aback, high winds snapped the masts, sending them overboard in a tangle of rigging. Wind and currents drove the crippled ship off course and onto a reef off Saipan, second largest island in the Marianas.

The author's team plotted the location of each artifact on archaeological site maps and proposed a sequence by which the Concepción *first ran aground, emptied her ballast, and then strewed her cargo across the jagged reef (chart, left).*

Ships of plenty

Most of the galleons were built in the bustling port of Cavite on Manila Bay. It was there too that the rich cargoes were usually loaded, as in this rendering of Chinese traders on junks, Spanish priests and merchants, and Filipino laborers and seamen making the Concepción *ready for her voyage eastward to Acapulco.*

With the welfare of the entire colony often depending on just one

PAINTING BY ROGER MORRIS

shipment a year, the temptation to overload vessels was overwhelming. Graft and the shipment of contraband went hand in hand with lax enforcement of regulations. Bundles were expertly compressed and packed, usually by Chinese, and then wedged into place. Cannon were often stored in holds, making more room on deck for merchandise but leaving the ship open to attack. Hundreds of storage jars containing fresh water were secured below deck, while others hung overhead, lashed tightly to rigging made of Manila hemp.

And the cargo itself? The Orient opened its doors and out poured cinnamon and pepper and clove from the Spice Islands, delicate porcelains and finely woven rugs from China, cotton cloth from India, ivory from Cambodia, camphor from Borneo, and jewelry set with precious gems from Burma, Ceylon, and Siam. Most in demand, however, were Chinese silks, made of every imaginable weave and manufacture.

Because of an interruption in trade, the Concepción *brimmed with a backlog of such treasures when she broke apart. A fragment (left), perhaps from a gold ewer, testifies to the perils of the reef upon which she met her fate.*

most of the rim of a heavy gold plate, nearly nine inches wide. Could the lady with the roses be part of the same set, a remnant of a waylaid royal gift?

Turning to my diving partner, Vichai Prommi, a burly but gentle Thai, I hold up the find. Vichai's topside job is assistant cook, but he takes his turn on the dig with a "hookah"—a mouthpiece attached to an air hose from the ship's diving compressor. Vichai's eyes widen behind his face mask, and he gives me a congratulatory thumbs-up.

Suddenly a four-foot wave sweeps into the channel, slamming us rudely into the abrasive coral. The reef is riddled with these "surge" channels, formed by coral outcroppings alternating with deep grooves. Incoming waves are funneled into the grooves, leaving eroded coral rubble and sediment.

The work here is hazardous, but we expect to find more artifacts in these layers; the ballast stones suggest that this is where the galleon first struck the reef, tearing out her bottom. But progress is slow.

THE MANILA galleon trade was one of the most persistent, perilous, and profitable commercial enterprises in European colonial history. Between 1565 and 1815 it carried the treasures of the Orient to the West via Mexico in exchange for New World silver and the manufactured goods of Europe. More than 40 galleons were lost in treacherous seas over the centuries, but the search for their remains has traditionally focused on the Atlantic and Caribbean legs of the trip. Operating out of Singapore, our underwater recovery group, Pacific Sea Resources, is the first archaeological team to excavate the remnants of a Manila galleon.

As a student of Asian history at Yale, a former U. S. Navy salvage officer in Vietnam, and a marine construction manager in Asia since the war, I have long been fascinated with this rich exchange of goods and cultures. I had determined that if we found a Manila galleon, the excavation—although handled by a commercial recovery company—would be conducted under rigorous archaeological standards, and with the advice and cooperation of academicians throughout the world.

Basic research on the *Concepción* took two years, as we pored through archives in Seville, Rome, Guam, Mexico City, the United States, and Manila itself. Our study suggested that the *Concepción* was the largest Spanish ship built up to her time—between 140 and 160 feet long and displacing some 2,000 tons, with a loaded draft of between 18 and 22 feet. The *Concepción* was also one of the richest galleons of her day, with cargo valued at four million pesos, worth tens of millions of dollars today. The general site of her remains was known, for much of the *Concepción*'s cargo and fittings had been salvaged from the shallow waters of the

An enemy called weather claimed many more galleons than did pirates roaming the Pacific. Useless against both wind and wave, cannonballs from the Concepción *lie corroded and encrusted with coral as they await recovery off the coast of Saipan (right).*

In a warehouse in Singapore, the author (opposite) holds one of 156 clay storage jars found intact. With this one exception—an earthenware olive jar from Europe—all were found to be stoneware from the Orient. In all, divers uncovered eight different types, most bearing marks representing either their owner or their contents.

Such jars once held water, wine, oil, and other vital supplies for the hazardous voyage east to Acapulco.

WILLIAM SPURLOCK

Since the Concepción *was barely a month out of port, most of these jars would have been full at the time of the wreck. Amazingly, two containers still held their original contents of aromatic resins. After the removal of coral encrustations, each jar spent as long as six weeks in a barrel of fresh water to extract damaging salts.*

Marianas by islanders. Nearly half a century after the wreck, in 1684, the Spanish recovered 35 of the 36 lost cannons and seven of eight anchors. Remaining artifacts lay strewed across the dangerous reefs and out in deeper water.

The voyage and loss of the *Concepción* were particularly notorious because of a continuing dispute between Manila merchants, including the corrupt Governor Corcuera, and Mexican customs officials. In 1636 a newly appointed customs agent named Quiroga began closely inspecting incoming galleons to see if the Manila merchants were loading more than the registers showed. The indignant merchants, long used to lax enforcement of regulations, retaliated by refusing to supply manifests for the voyages. In a letter of July 31, 1638, Corcuera himself informed King Philip IV that the *Concepción* would sail without a register because of Quiroga's unfair treatment.

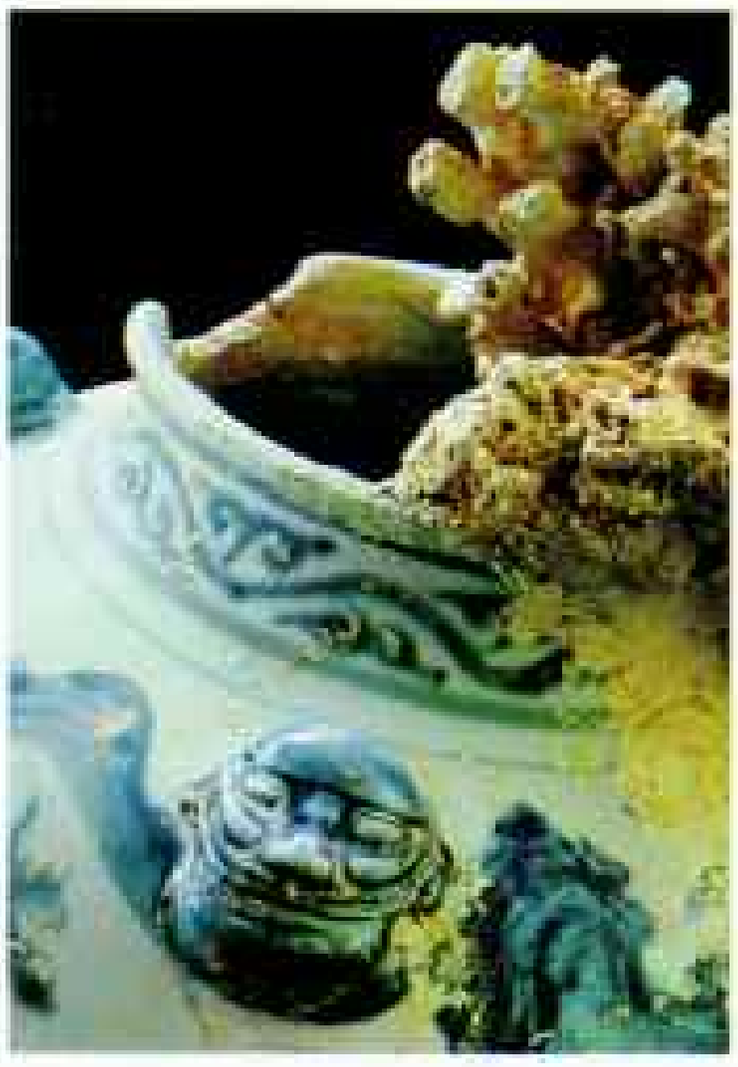
Contemporary documents also point to a clandestine cargo. According to the account of a chronicler, Casimiro Díaz, in 1718, Governor Corcuera was a man "whose greed was great." Among the 59 charges brought against Corcuera during the official inquiry in 1644 was the accusation that Corcuera routinely shipped ill-gotten personal booty on eastbound Manila galleons including the *Concepción*—treasures of gold and jewelry procured as bribes for granting special favors and appointments.

Corcuera was also charged with appointing his nephew, Don Juan Francisco, to command the ship to protect the governor's spoils. According to the prosecutors, this led directly to the loss of the ship. Excerpts from the charges state that Francisco was "at most 22 or 24 years of age," and "of little age or experience in military or naval matters. For this reason a few days . . . out . . . the officers of the *Concepción* lost respect and obedience for him, each one seeking to give orders and be obeyed, splitting into factions and attacking each other, in which mutiny men were killed and wounded. While they were obstructing each other, and not attending to navigation, the ship broached to and the wind seizing it thus broke the masts up to the bowsprit, which all went into the sea in an instant, leaving the ship without control at mercy of wind and currents which carried it to run aground on a reef. . . ."

THE SEAS along this reef off Saipan can be extremely rough, and it is frightening to imagine the ordeal of the *Concepción*. The galleon trying desperately to clear Saipan's southwest shores, being hurled into the reef by towering waves and pulverized against the coral, spilling ballast and cargo from gaping holes below the waterline, passengers and crew leaping into the churning seas and facing the spears and slingstones of waiting Chamorro islanders. I can almost hear, above the gale, the terrible

At this spot 350 years ago the Concepción *first ran aground. Only a few dozen of the 400 or so passengers and crew survived the wreck and ensuing attack by natives. Six Spaniards, escaping to Guam, reached the Philippines by open boat ten months later.*

Sherds of Ming dynasty porcelain, like these collected by the Tengar's *crew (left), still speckle Saipan's shoreline, concentrations of which helped pinpoint the wreck. Coral was left on the lip of one jar (right) as a reminder of the sea's ongoing architecture.*



screams of helpless men and women. Of some 400 aboard, only a few dozen survived.

SAIPAN is an island rich in legend and history. Already we had uncovered Spanish gold side by side with Budweiser beer cans and ancient Chamorro slingstones, as well as World War II shrapnel and unexploded ammunition. Only three miles away lies the island of Tinian, renowned as the World War II airfield that launched the B-29 *Enola Gay* toward Hiroshima. Ironically, a world-class golf course catering to Japanese tourists recently opened along the shore overlooking the *Concepción* site.

Our survey and recovery vessel arrived in Saipan on March 14, 1987, and anchored a hundred yards off a narrow strip of coral sand called Agingan Beach on Saipan's southwest coast. The first three weeks of diving yielded ceramic sherds and scattered concentrations of ballast stones, but little else. Nearly 350 years of typhoons have played havoc with the wreck remains, but with patience we developed almost a sixth sense of where the artifacts lay. Threat of typhoons prevented fieldwork between July and December, but during the first six months of both 1987 and 1988 we recovered nearly all that remained of the *Concepción*.

Our handpicked crew of 30 men and women included seven nationalities—Thai, Malaysian, Singaporean, Filipino, Australian, English, and American. It was as varied as the crew that had manned the *Concepción* herself, which shipped out with a colorful passenger list and sailors from the polyglot labor pools of Manila and Mexico. We had archaeologists, conservators, computer programmers, artifact illustrators, photographers, writers, engineers, cooks, riggers, welders, marine biologists, and a secretary. Virtually everyone was a qualified diver as well.

One of the seasoned veterans was the expedition's assistant director, Hank Parker, a professor of marine biology on a two-year leave of absence from Southeastern Massachusetts University. Hank was a fellow U. S. Navy salvage officer in the 1960s. During ten months' work on the *Concepción* site the crew conducted more than 10,000 individual dives without a single serious mishap.

OUR DISCOVERY of the golden lady occurred on March 10, 1988, during the third and final dive of a day early in our second season. At that time Vichai and I were moving from seaward toward shore, clearing successive swaths across the channel with a water eductor, a steel nozzle eight inches in diameter that draws sediments up from the seabed, exposing artifacts for recovery, then depositing the sediments at the end of a 40-foot flexible plastic pipe.

Moments after the discovery Vichai saw a stonefish, warned me, and chased it away. Its venomous spines can cause excruciating pain—even death. We had been lucky so far. Reef sharks hadn't been a problem, since we didn't spearfish or discard garbage. But moray eels, which have sharp, inward-curving teeth, had bitten several divers. However, we discovered that in our mutual fright, the eels were quick to let go. Fire-coral burns were also common and painful, and nearly every diver had had at least one sharp encounter with a sea urchin.

But most of the marine life around Saipan is benign and beautiful. With visibility at times greater than 200 feet we were often distracted by rainbow palettes of reef fish, by the bright red-and-yellow feathery fronds

Treasures edible and otherwise, the riches of the Far East came in many forms. Rare spices and jewelry, like most of the goods traded, were luxuries appealing to all elements of Spanish taste. A gold shoe pendant with 41 diamonds (opposite) may have been a container for exotic fragrances. Dress studs, like these with diamonds (above), served fashion more than function. An emerald stud (left) sits atop clove, an important spice of the galleon trade. Another delight to Spanish palates, cinnamon bark shows off rings of ruby, diamond, and sapphire (below).

of crinoids, and by the playful foraging of goatfish that swept into newly excavated areas like birds in a freshly plowed field, sometimes plucking tasty tidbits from our fingers.

After 75 minutes below, our dive time was up. Coiling our 250-foot air hoses to prevent tangling or snagging, we made our way across the reef to a weighted line tied to the diving ladder. Thirty feet overhead our vessel, the *Tengar*, rocked gently in the swells. Other teams of divers were surfacing or starting down.

THE GOLDEN LADY was worthy of a dramatic entrance. On deck I opened my artifacts bag with a flourish. But finds supervisor Corey Malcom looked wary. Earlier that week a diver had produced a glittering insect-shaped object and proclaimed it a golden scarab. The "treasure" was actually a brass beetle from a local gift shop, with a hinged carapace and ashtray abdomen, that I had mischievously buried on the bottom.

My lady was an important find, but others were even more impressive. Earlier in the week Entu Nawin, a welder and diver from Sarawak in Borneo, had found a small gold shoe with 41 inlaid diamonds (page 48). The shoe may once have carried perfume—certainly one of the world's most valuable perfume bottles. And the previous year Michael Flecker, an Australian civil engineer and our diving operations manager, brought up a mass of 32 gold chains, each about five feet long, all held together with a twisted gold wire. The 160 feet of delicate chain lay under seven feet of sediment below a narrow ledge as far back as the arm could reach.

"I felt something and began pulling gently," Michael explained. "It was stuck, but it eventually started coming. Then it just kept coming . . . and coming."

Altogether the excavation yielded more than 1,300 pieces of 22.5-karat gold jewelry—chains, crucifixes, beads, buckles, filigree buttons, rings and brooches set with precious stones. Jewelry historians have since declared that most of the collection is of great importance. When styles changed, outmoded pieces were often melted down and recast in new designs. In other cases jewelry was melted down for use as currency. Thus the *Concepción* wreck site has yielded a time capsule of early 17th-century jewelry and has proved that European-style jewelry was being made in the Philippines.

Some of the less valuable finds from the *Concepción* were just as fascinating. For example, we discovered 156 intact storage jars at depths between 140 and 250 feet. Full of waterlogged sediment, the jars weighed more than a hundred pounds each and had to be winched aboard. Later study revealed that they had come from kilns in South China,

Cochin China (present-day Vietnam), and Siam (Thailand), and one was of Spanish design.

Our conservators carefully sifted the sediment. Two of the containers held congealed Oriental aromatic resin used as incense, and others contained small animal bones still bearing scars from a butcher's knife. We found owners' initials and symbols in Spanish, Tagalog, and Chinese engraved on the jars. The symbols indicated that the jars had orginally held antimony, saltpeter, salt, vinegar, sulfur, and wine.

But most jars would have contained drinking water. The Manila galleons made no stops on their arduous five- to eight-month journey to Acapulco, so water had to be carried on board, secured on deck or below in more than a thousand earthen or stoneware vessels. Sturdily made, they were used over and over again, often for decades.

FOR EXPLORATION at depths far beyond safe scuba range, the *Tengar* carried a two-man diving bell. We also used an ROV (remotely operated vehicle), essentially a mobile video camera guided from the surface. In addition, a submersible that held two observers and a pilot was used for even deeper searches and confirmed that the wreckage did not extend beyond 250 feet.

Under Dr. Parker's direction we monitored the reef regularly for any possible effects of our work on the surrounding environment. The information we collected was summarized in monthly reports to the government of the Commonwealth of the Northern Mariana Islands, with whom we worked closely, and to the U. S. Army Corps of Engineers. Two field seasons of data showed that our activities had minimal negative impact on the reef.

Conservation work continued around the clock to stabilize and protect fragile objects immersed for centuries. After cleaning, all items were measured, photographed, and drawn on paper, and their images recorded on laser disks in the ship's computers. All details, including precise locations, were entered into our computerized data base for the final archaeological report.

Many artifacts showed damage from typhoons and wave action long after the *Concepción* went down. One morning conservator Myrna Mella Clamor and I examined a curved bronze object that lay soaking in a chemical solution. "It's a dolphin!" she exclaimed. Although badly corroded, the dolphin, a lifting handle from a cannon, was a significant find. It may well have been torn off and lost during the efforts of the early Spanish salvage crew.

What at first appeared to be an amorphous iron-stained chunk of coral was actually a concretion of 564 individual

Some of the 997 gold buttons found at the wreck site—each tagged for identification—form an array of fancy filigree (left). Such items were made in the thousands by Chinese and Filipino craftsmen for export to the West.

A gold comb (right) belonged to Doña Catalina de Guzmán of Manila, whose name is abbreviated in appliquéd gold dots. Whether or not she was on board the Concepción *is unknown. Combs made from other materials, especially tortoiseshell and ivory, were more common. In 1767 one galleon, the* San Carlos, *carried a cargo of 80,000 combs.*

Gold does not corrode in salt water, yet centuries of punishment by abrasive sand and pounding waves have taken their toll. In Singapore a goldsmith restores the bottom of a gold filigree box (below), whose top lies on his workbench.

FREDERICK MCDONALD

Part of a gold chain is retrieved by divers using a suction device that removes overlying sediments (above). Many of the artifacts were salvaged in bits and pieces. Fragments of another chain are welded together by a craftsman in Singapore (below).

Three restored chains, including the one found by divers above, drape a branch. The simplest, made of thin gold strands, weighs nearly three pounds. Excavation and restoration have finally brought the Concepción's *cargo safely to port.*

artifacts—glass beads probably of Chinese origin, ornate brass tacks that bore remnants of gold leaf, ceramic sherds, gold and brass buttons, two silver sword pommels, and a bronze Chinese weight, which may well have been used in weighing precious metals.

Some items were touchingly personal. Along the edges of a small gold comb I made out "AÑOS 1618" inscribed in appliquéd gold dots. An abbreviated name, "DOÑA CATAL D GUSMA" (short for Doña Catalina de Guzmán) was also visible. Later research revealed that she was a widow residing in Manila in 1634. Had she been aboard the stricken vessel? What was her ultimate fate? No one knows.

The artifacts constitute a fascinating collection that will be displayed in the Northern Marianas. The collection will be enhanced by models, paintings, and specialists' reports.

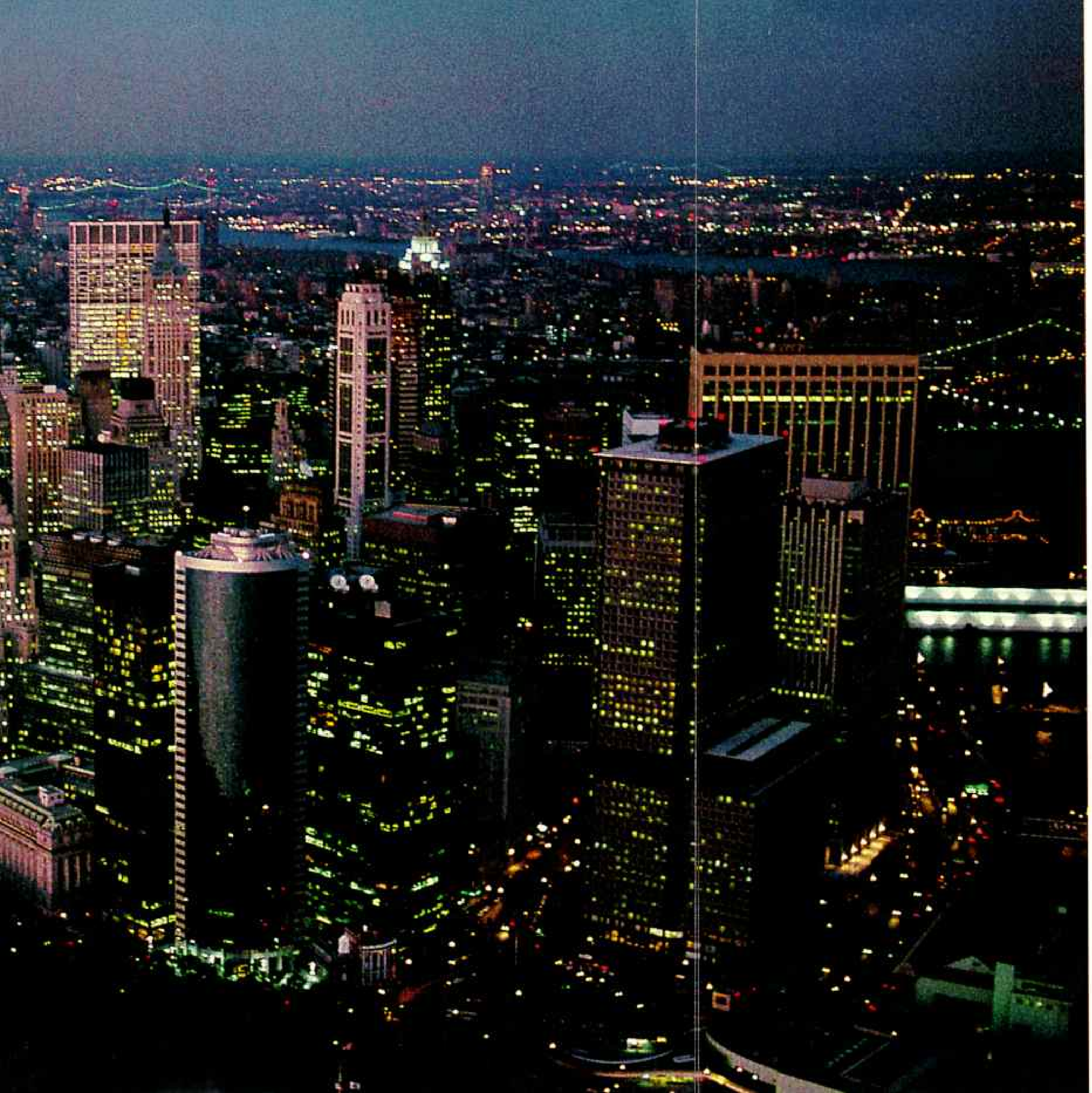
AT 5:45 each afternoon diving activity stopped for the day. The crew gathered on deck to clean and stow the gear, usually amid much laughter and enthusiasm. Our evening meal was always a special event: mostly an international cuisine expertly prepared by Vichai and his fellow Thai cook. We dined on deck and watched the sun slip into the Pacific.

Late one evening toward the end of the expedition, with most of the crew asleep, I took a stroll on deck, absorbing the night's peaceful, velvety beauty. With time to think, I tried to interpret the distribution of the *Concepción*'s remains and what they might tell us about her.

We had painstakingly searched half a square mile of seafloor, from depths of 2 feet to 400 feet, and had found bits of the *Concepción* scattered throughout the area. The findings, plotted on archaeological site maps, had been puzzling, but a plausible sequence had begun to emerge: The galleon struck the reef repeatedly, first tearing out her bottom and losing her ballast, then disgorging her remaining contents in stages as she was driven along the reef. The superstructure washed into shallow water, and a section containing storage jars broke away and drifted seaward, finally settling in deep water.

The loss of the *Concepción* was a random accident, its fate perhaps an allegory of man's greed. But it was an event that proved costly to the Spanish crown and left an indelible impact on the merchants of Manila, on the families of the lost sailors, and on the few survivors who eventually made it home. More than 350 years later, it has left its impact on us.

Was it worth the years of research and excavation? After all, we have done no more than uncover a few more fragments of the past. But what we have learned will contribute to a fuller understanding of a fascinating chapter in the history of the Pacific. As students of the world, we cannot ask for more. □



From Battery Park, in southernmost Manhattan, Broadway begins its run north through a gantlet of towers in New York's financial district. From here to Harlem the street passes some of the world's most expensive real estate.

Through the years Broadway has led the way as groundbreaker for northward growth. Veering on the bias across New York's orderly grid of streets, Broadway will not be typecast, reflecting the vital, contrary spirit that defines this great city.

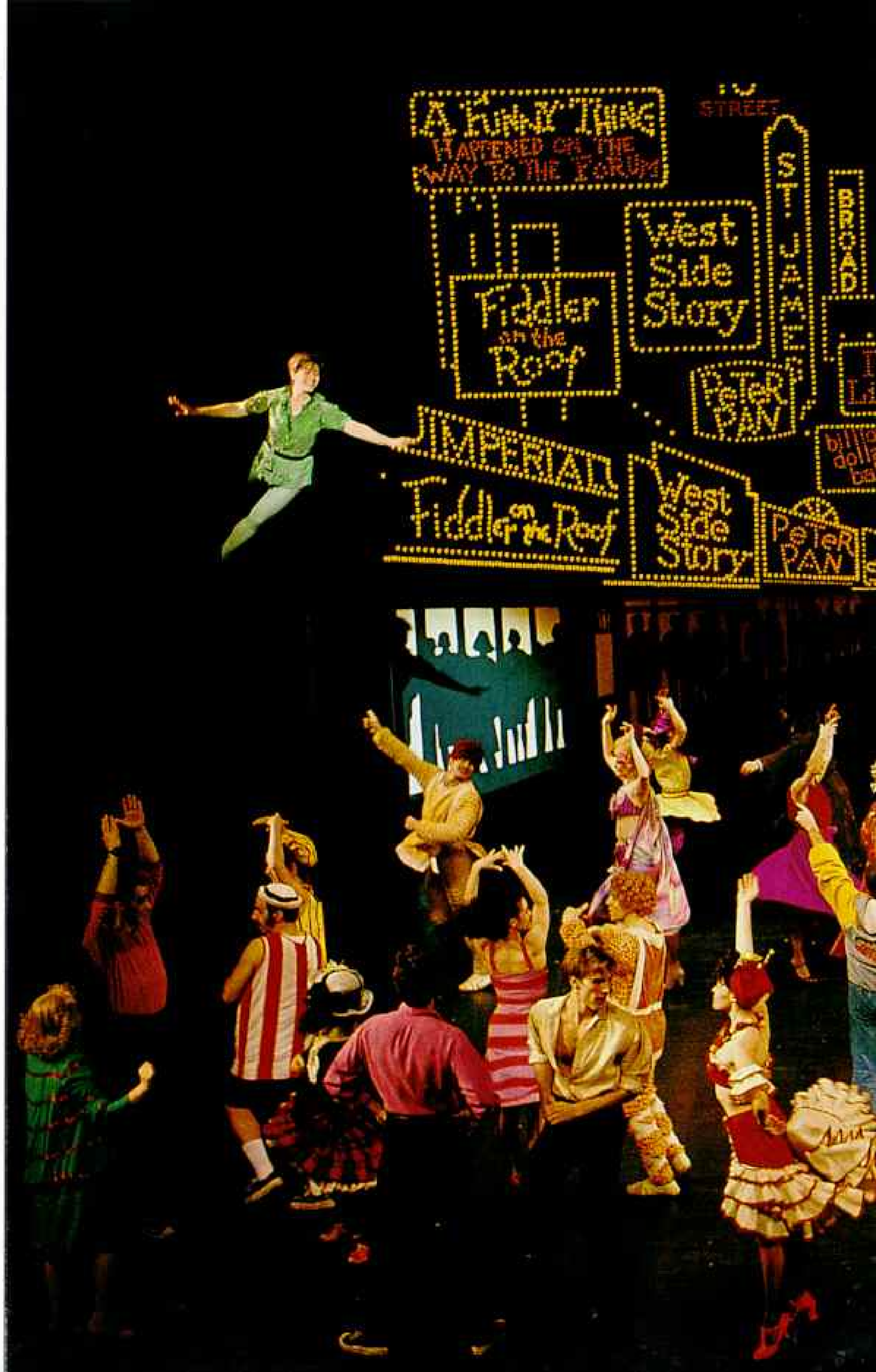
BROADWAY
Street of Dreams

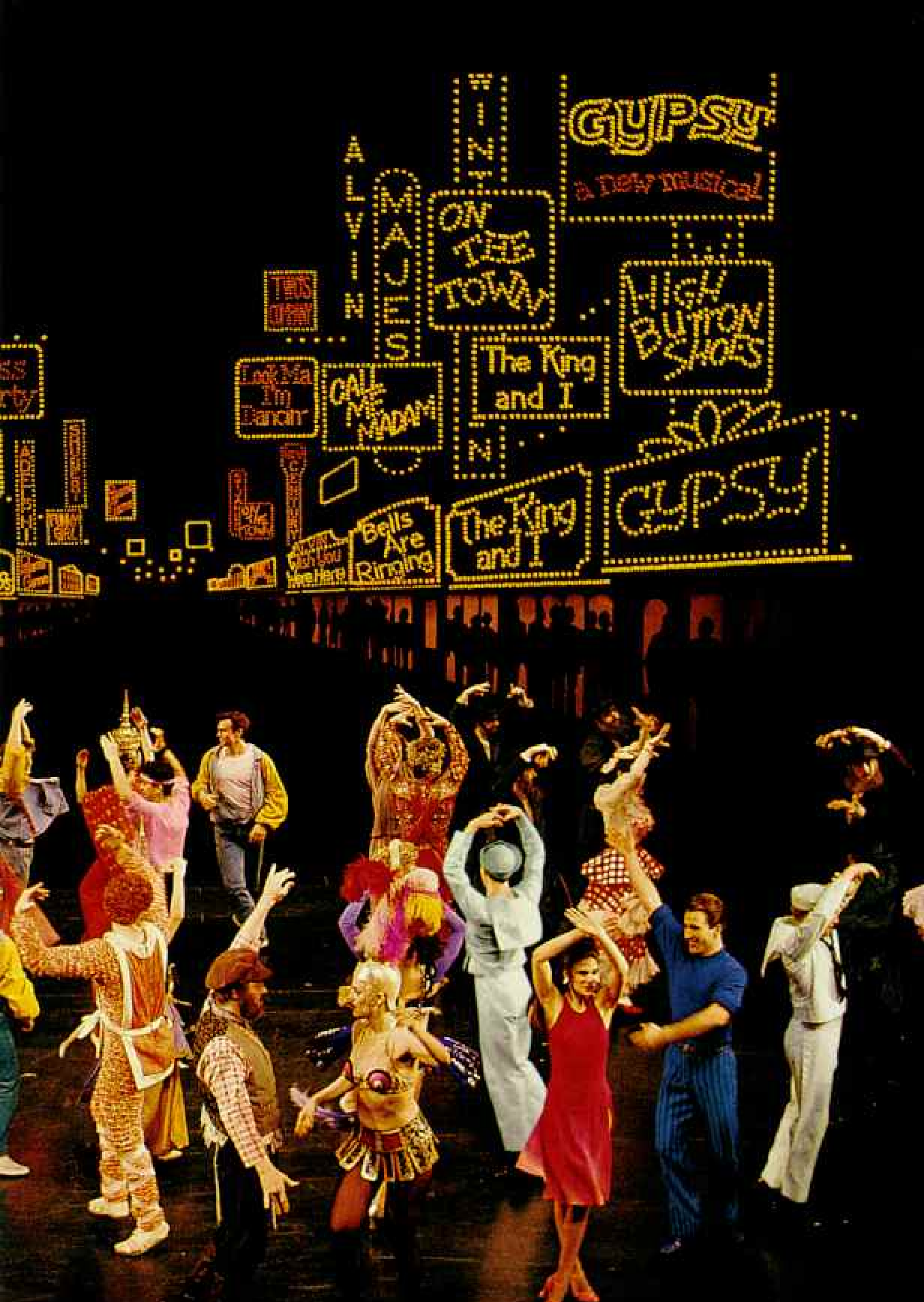
Cutting a swath of lights from the tip of Manhattan, New York's glitter street beckons to the star struck like a blazing theater marquee. Called Heere Straat—High Street—by Dutch settlers, today's Broadway puts on comic balloon faces for Macy's Thanksgiving Day Parade (above) but cannot mask the sometimes sleazy reality below.

Broadway. Intense, raucous, and gaudy. It's where people aim for top billing in business, fashion, and art. Or dance their way to glory in musicals like *Jerome Robbins' Broadway* (overleaf), a medley of the choreographer's greatest works.

By RICK GORE
ASSISTANT EDITOR

Photographs by JODI COBB
NATIONAL GEOGRAPHIC PHOTOGRAPHER




GYPSY
A New Musical
Anything Goes
Call Me Madam
The King and I
Bells Are Ringing
Gypsy
Call Me Madam
The King and I
Bells Are Ringing

The steamy diversions of Broadway's Times Square area provoke

bored yawns from native Manhattanites who have seen it all.

A Wall Street limousine adds the Midas touch to reflections of a venerable

landmark, Trinity Church, and the distant towers of the World Trade Center.

"There's a Broken Heart for Ev'ry Light on Broadway"

1916 SONG BY HOWARD JOHNSON AND FRED FISCHER

THE YEAR WAS 1959. The year I first stepped foot on Broadway. I was only 13 and had seldom been out of Florida. My older brother Christopher and I had tickets to the hit musical *Gypsy*, the saga of the famous stripper Gypsy Rose Lee. In 1959 such fare was considered risqué, not suitable for children. But we were on our own—and on the town.

Halfway through the show the indomitable voice known as Ethel Merman broke into one of the musical's most stirring moments. "I had a dream!" she brayed, fighting tooth and tonsil with the orchestra's brass section, and telling us that this woman was not giving up. She was hanging in and, come what may, she was gonna make that dream come true.

"I had a dream!" Since that electric moment Broadway has always been the Street of Dreams to me. And in my fantasies the big Broadway show was the biggest dream in a town built on them.

My brother went on to make a career on the Street of Dreams, writing musicals. I chose a different route—journalism. I wrote mostly on science. Fact not fantasy: geography, geology, astronomy. His stars were metaphoric. Mine were made of matter. My canyons were lined with fossils; his with neon.

My brother died recently. And through one of those unpredictable twists of fate, I find myself back on the Street of Dreams, rewriting, because of a promise, a musical he created more than a decade ago. I have returned to Manhattan, where I lived during the late 1960s and early '70s, to prepare a staged reading—the first level of production—of that revised musical for the off-off Broadway York Theater. But I am still a journalist. And I have an assignment. In the months ahead, as I pursue my theatrical dreams, I will also be exploring the who, what, when, where, and why of this legendary street.

Now it all comes back. Life in New York. Waking up each morning to horns blaring and garbage trucks groaning down below. Waking up each morning and worrying: Can the show—can *I*—make it in this toughest town in the world?

I've sublet an apartment on Broadway at 63rd Street, right across from Lincoln Center and three short blocks from the Number One IRT subway. I've chosen my coffee shop, my deli. I learn to walk again—it's often the fastest way to get around. The West Side, I discover, has changed: Often hazardous when I lived here before, it is now aglitter with upscale food markets, restaurants, affluent young couples.

Yet there are beggars everywhere below 96th Street. *Shake. Shake.* They rattle the coins in their paper coffee cups. Suddenly a man with a gray beard leaps in front of me and does a Mr. Bojangles dance before extending his hat with a leering grin. I know him; he works this corner. And I gave already. "Maybe tomorrow," I say.

A few things are quickly learned about Broadway. Originally an Indian path to the Adirondacks, it now runs 17 miles from the tip of Manhattan Island to the Bronx. It travels four more miles before crossing over into suburban Westchester County, where it is eventually renamed the Albany Post Road.

Broadway is the spine of Manhattan,

intersecting all major avenues from Park Avenue west. At each intersection it creates a square—Union, Madison, Herald, Times. As native-born SoHo waiter Ali Johnson explains: "Wherever Broadway goes, it makes things big. It makes things happen."

Every New Yorker I meet can define Broadway. "It's really just a series of villages," my brother's agent, Fifi Oscard, tells me. "Wall Street. SoHo. The fashion and theater districts. The Upper West Side. Columbia. Harlem. Washington Heights. To name a few."

"Broadway is energy," says Joseph Polisi, president of the Juilliard School, the famed academy for the performing arts. "Each morning it energizes me whether I like it or not."

"Yup, it sure is a hurry-up street," says shoeshiner Charles Culler, a 25-year veteran of cacophonous Times Square. "And these days it sure seems in a hurry to change."

"Broadway *is* change. That's its essence," says Batia Plotch, a tour organizer at the Young Men's Hebrew Association. "It's a microcosm of the city, never very chic but always exciting." Broadway is also full of classic New Yorkers—famed for not mincing words.

"This street is propelled by one thing," says agent Phyllis Black. "Money." Or as Gordon Gekko, the callous financier in the movie *Wall Street*, put it: "It's all about bucks, kid."

WALL STREET is where I begin my journey up this rambunctious river of life. I walk from the South Ferry subway stop to the corner of Broadway and Wall on a steamy day at lunch hour. I enter a forest—some would say jungle—of towers that look weighty enough to sink this end of the island. Bankers, brokers, clerks, secretaries dash to and from the New York Stock Exchange. At 160 Broadway I find probably the world's most successful trader of futures—contracts to buy a commodity at a specified price on a specified date. The profit comes, as always, from buying low, selling high.

"We manage about 500 million dollars," says 35-year-old Paul Tudor Jones II (page 75). "Since 1984 we've had only one losing quarter. Our returns to our customers have averaged more than 90 percent a year."

Jones, a native of Memphis, belongs to a new breed of whiz kids who began lighting bonfires on Wall Street in the late 1970s. They rode an exploding market in futures contracts, junk bonds, and mortgage-backed securities and pioneered the era of the leveraged buyout. They pulled New York City from the brink of bankruptcy and turned Manhattan into an island filled with young professionals earning outrageous amounts of money. The crash of 1987—and indictments for securities laws violations—dampened many of their fires, but more careful traders still thrive.

"I'm successful," Jones tells me, "because I hate losing money with a passion."

"Nobody knows you when you're down and out" could be the lyrics for many on Broadway, like this homeless man at the base of George M. Cohan's statue on Times Square. When the songwriter wrote his famous regards to Broadway, Tin Pan Alley and New York's theater district were centered around 34th Street. As happens along this ever evolving street, the district gathered its marquee lights and moved up Broadway to the 40s more than half a century ago.

Numbers and letters roll constantly across a video monitor above his desk. He has another monitor at home, and one at his retreat in the Hamptons. His arm shows an occasional tremor, the only sign of the high-pressure life he lives. I ask about the monitor.

"Those are prices."

"Of what?"

"Everything. I've got positions in deutsche marks, yen, Swiss francs, Eurodollars, Treasury bills, silver, crude oil, soybeans, cattle, you name it. They have one thing in common —a price. And it changes every second. A lot of things I buy and sell in 20 minutes."

Jones sees the world as a "flow chart for capital." He talks about waves of money shifting across international borders, seeking the best haven for the immediate future.

But Jones wants to talk about another kind of future—that of a class of 109 disadvantaged Brooklyn sixth graders he has adopted in a program called "I Have a Dream." He has agreed to pay for the college education of all that make it through high school. Moreover,

Safe behind the glass front of a theater lobby, Japanese tourists seem stunned by the spectacle of Times Square, a must-see for New York's 19 million yearly visitors. Unused to the street crime for which mid-Manhattan is notorious, tourists are easy prey for hustlers and purse snatchers.

he makes time each week to work individually with them, and he has bought a retreat in Virginia where they escape urban influences.

"Trading makes you very performance-driven," he says. "Every day you calculate to the penny how much you've got. It's instant gratification. With these kids it's frustrating. You don't know if you are making a dent at all.

"I wanted to go over there and kick all their butts. That doesn't work. All you can do is try a little harder and love a little more."

So is it all about bucks? Maybe not.

JUST ABOVE THE FINANCIAL DISTRICT sits the elegant old City Hall, where I meet architectural historian Barry Lewis. He takes me north through New York's historical record. "The growth of New York followed Broadway," Lewis explains. "Down here the streets wind around like those of a medieval city. Broadway was the only major street to cut through the jumble."

We pass cast-iron buildings that belonged to New York's original garment center.

"During the Civil War many people here were pro-South. We were the cotton capital. The South shipped to us, and we shipped to Europe. These buildings were the warehouses and factories for turning cotton into cloth."

New York's population grew phenomenally in those days. "It took Rome hundreds of years to reach a million population," Lewis tells me. "It took us less than one lifetime."

At White Street and Broadway we stop at a sign written in Chinese. "Ten years ago there were no Chinese here," says Lewis. "This was the shoe district. But Chinatown is expanding from new immigration."

Crossing Canal Street, we enter SoHo (SOuth of HOuston Street). In the years surrounding the Civil War this stretch of Broadway was the equivalent of today's Fifth Avenue. Now a parking lot occupies the former home of Lord & Taylor. A tacky storefront disguises what once was Tiffany & Co.

SoHo today is known primarily for one thing—art. About 20 years ago its huge abandoned lofts, mostly located a few blocks away off West Broadway, began attracting poor artists. Around 1980 art dealers also began flocking to SoHo. But SoHo's success began to devour what fed it. Rents grew outrageous.

"Today most artists couldn't afford a toilet in the heart of SoHo," says Lewis.

Increasingly the art world is moving east to Broadway itself. One 11-story building—578 Broadway at Prince Street—has become a center of the high-priced avant-garde.

"This building's been dubbed the shopping mall," says gallery owner Curt Marcus. "You

don't have to leave it to visit 18 galleries."

Marcus, like other proprietors in 578, thrives on contemporary art. New Yorkers pay dearly for the daring and the different.

"In this city, art is about change, about new perspectives," Marcus says over coffee in his gallery. "Good artists here cannot stick to formulas. They have to remain innovative. The competition in New York forces that."

A few blocks north on Broadway I visit a gallery dedicated to a different type of contemporary struggle—that of the American Indian.

Indians on Broadway? Why am I surprised? This whole island belonged to them.

"My dream is to break stereotypes about us," says Lloyd Oxendine, a Lumbee, curator of the American Indian Community House Gallery. The artwork here reflects not only the enduring symbolism of Indian culture. It also expresses, sometimes bitterly, the problems of coexisting with the world that the Europeans introduced here three centuries ago.

Today about 15,000 Indians live in the city.

"Fifty-seven tribes are represented here," says Community House spokesman Rudy Martin, a Tewa/Navajo. "If we were a reservation, we'd be the 11th largest. We come here like everybody else—to get a piece of the American dream.

"This city is a total culture shock for someone used to being in touch with the earth. Many can't cope. We just pass the hat and send them back home. But a lot we can help."

NORTH OF HOUSTON STREET Broadway starts intersecting numbered streets. At Grace Church on Tenth Street, where P. T. Barnum staged the marriage of the famous midgets Tom Thumb and Lavinia Warren, it takes a diagonal turn before creating Union Square at 14th Street. Any lover of musical theater knows that the "lights of 14th Street" before the turn of the century drew Dolly Levi back to be serenaded by her faithful waiters in *Hello Dolly*.

In her day 14th Street was the beginning of a

A national hemsetter, Broadway has become a center for some of the country's hottest mid-price fashion houses, which swank their wares during spring fashion week (left). At Astor Place Hairstylists young trendsetters get the cutting edge from a staff of a hundred barbers.

glorious stretch of Broadway known as Ladies Mile. Here were the great shops where refined women selected lacework and millinery. Although the neighborhood has for years been a warehouse and small-factory district, many of the elegant storefronts remain. Some are being restored. A preservation battle has just landmarked many more.

Ladies Mile ends at 23rd Street—Madison Square. After World War I, Broadway's shopping district moved north, and the streets near Madison Square became a bastion of blue-collar jobs. But this part of Broadway is once again attracting the young and the stylish—professionals like John Bond.

"THE LOOK is Ralph Lauren. The price is Ralph Kramden." John Bond, 32-year-old upstart advertising executive is reading me his recent award-winning ad for men's suits.

"You need to be witty," Bond says at his agency, Kirschenbaum and Bond, on Broadway at 26th Street. His speech is fast clipped, his eye movements rapid. "Americans see 1,500 ads a day. You've got to break through that clutter.

"We're one of the hottest agencies in the country. Two years ago we started with one $200,000 account; now we have 25 million dollars in billings. We went from half an office and a beach chair to this."

His offices are not swank Madison Avenue. Their aura is converted warehouse. But they bustle. And like many of the brasher agencies, they are on Broadway.

"Rent's a lot cheaper than on Madison Avenue," says Bond. "And the location says something about not being in the mainstream. Maybe when they all move over here, we'll move back over there."

A few blocks north of Bond's office, where Broadway intersects Sixth Avenue, sits Herald Square. This dinky little square has a big reputation—for giving George M. Cohan's regards to Broadway. Indeed around the turn of the century Tin Pan Alley and New York's theater district were anchored here at 34th Street. At least 85 theaters lined the streets in this era before movies and TV; their new electric lights gave Broadway its nickname, the Great White Way.

More enduring than the lights in Herald Square has been Macy's department store, built in 1901. Once there was Gimbel's as well.

Both stores catered to low- to middle-income shoppers. But as Manhattan rents forced those residents off the island, Gimbel's closed. Macy's has shifted focus to upscale buyers.

Also fast disappearing are New York's garment workers—mostly Russian Jewish and Italian immigrants who colonized the upper 30s between Broadway and Seventh Avenue in the 1920s. Now it is cheaper to have clothes made in Asia. Increasingly these streets are dominated by prestigious designers.

She greets me, this unparalleled icon of the American working woman, in her office overlooking Times Square. Her dark hair is closely

A sunny spotlight provides a warm place for a young dance student to limber up in a studio at the Juilliard School in the Lincoln Center complex. After hours on her toes, a dancer's foot bears testimony to the agony of practice—a price exacted of all who hope to make it on the boards of Broadway.

Completed in 1969, Lincoln Center, New York's citadel for the performing arts, is credited with revitalizing a part of Broadway once lined with tenements.

One of an army of conquering cats, Anna McNeely grabs a bite backstage in Andrew Lloyd Webber's feline follies, *Cats*. Out-of-town productions provide more opportunities for New York actors, many of whom have benefited from the tutelage of director Richard Jay-Alexander, here rehearsing a young actress for a roadshow of *Les Misérables*.

cropped. She wears a simple white T-shirt-style blouse under a white jacket. Navy slacks with a white pinstripe. A tasteful gold chain and red-rimmed glasses. The look is impeccably relaxed. Impeccably Liz Claiborne.

"We are on Broadway and not Seventh Avenue. That's an important distinction," she tells me. "Seventh Avenue means high fashion: Calvin Klein, Bill Blass, Geoffrey Beane. Broadway means higher volume, broader appeal. It's fashion as an industry, as a well-organized business."

And if Liz Claiborne is anything, it's a businesswoman. Her company was founded in 1976 with a $250,000 investment. In 1989 it grossed 1.4 billion dollars.

"I felt there was room for a design-oriented company to dress the new American woman. She was busy. Clothes were important but not *the* most important thing on her agenda. Nor could she afford designer clothes. That was the vision. Good design. Good price. Good taste."

Did she envision anything like a billion-dollar company? She laughs. "In my dreams I saw maybe 25 million dollars."

Claiborne is only in New York for a board meeting. Last year she surprised the industry by retiring early, at age 60, and moving to Montana, to dedicate herself to environmental concerns. "I wasn't as excited by fashion changes, colors, the shows in Paris," she says. "I got so I couldn't care less if hems were going up or down. It was time to turn the company over to younger people. I want to make a difference in Montana. That's my new dream."

AT TIMES SQUARE another formidable woman has been fighting to save an old dream—her father's vision of a neon-lit Broadway.

Tama Starr is the powerhouse behind the Artkraft Strauss Sign Corporation —the people who made the smoking Camel, the Coca-Cola, the Panasonic, and for more than 90 years nearly every other sign in Times Square. Her grandfather, Jacob Starr, is said to have built the first electric sign in Russia. In 1907 he invented the ball that drops over Times Square every New Year's Eve. During the fifties her late father, Mel, painted the square with its famous flashes of neon.

"My father saw these signs as pieces of music. They reflect the rhythms of Broadway," she says. "I say their twinkling stimulates our dream neurons."

Until recently, however, those lights were disappearing. Neon had fallen out of fashion. Forty-second Street had degenerated into a pit of pornography and crime. City and state officials wanted to purge the area by building four hulking, colorless office towers on the corners of Times Square.

Then in the early eighties Japanese manufacturers brought their unabashed love of neon back to Broadway with a spate of expensive new signs. A grass-roots movement also sprang up to keep Broadway aglow with neon. It was led not only by Starr but also by the Municipal Art Society. Recently the coalition won a radical redesign of the proposed new skyscrapers. Moreover, new zoning regulations require razzle-dazzle lighting on all the new hotels and office buildings sprouting between 42nd and 50th Streets. Already more than an acre of new neon or flashing signs is planned.

Change can't come fast enough for some along 42nd Street.

"This street is awful. It's filled with miscreants," says Rebecca Robertson, president of the 42nd Street Development Project, the city-state agency charged with revitalizing Times Square. "Last year there were 2,300 reported crimes—six a day—on this one block. And I don't think people here spend a lot of time reporting crime."

Forty-second Street, however, has the remnants of some of New York's most beautiful theaters. The New Amsterdam, for instance, which Florenz Ziegfeld built for his Follies, still has its stunning ornamentation and gilded art nouveau. It is boarded up.

Restoring such classic theaters is part of the agency's ambitious plans for a new Times Square. "We want to break up the idea that 42nd Street is the place to go to look for prostitutes, crack, and runaway kids," says Robertson. These days, as 15 new skyscrapers rise in the theater district, you are just as likely to find jackhammers and construction workers.

"IT'S BEGINNING TO LOOK a lot like downtown Houston outside," says Jim Woolley, stage manager for the musical *Jerome Robbins' Broadway*. He takes me backstage at the Imperial Theater. I am in heaven. Legendary director-choreographer Jerome Robbins has re-created some of Broadway's most memorable moments.

"You have part of *West Side Story* hanging above you," says Woolley. "That's the Buddha from *The King and I*. Behind you is the Statue of Liberty from *On the Town*. And that's Wendy's bed from *Peter Pan*.

"This show took seven months of rehearsal," says Woolley. "Most have six weeks. But Robbins is a perfectionist. That's one reason it cost more than eight million dollars."

In the wig room I confront a wall of polystyrene heads with Russian Jewish beards. "*Fiddler on the Roof*," explains hair supervisor David Brown. "And these are Roman wigs from *A Funny Thing Happened on the Way to the Forum*. Those belong to the strippers in *Gypsy*. I take care of 118 wigs, 36 beards, 66 mustaches, 10 pairs of sideburns."

"This show is dizzying," says Woolley, as we head for the dressing area. "Some people have to change costumes and wigs in 20 seconds. So we have 22 dressers to help them."

Wardrobe supervisors Joe Busheme and Richard Ruiz, responsible for the show's 450 costumes, are sitting by three washing machines. "We do 15 to 17 bags of laundry each performance," says Busheme. "The guys all wear something like four T-shirts. And doing all those dances from *West Side Story* they go through a set of sneakers a month."

"This show also inflicts injuries," adds Woolley. "It's so demanding and athletic. We go through four giant bottles of Advil a week."

"Good evening, everyone," says a voice over a loudspeaker. "Half hour, half hour." Tony award-winning dancer Scott Wise warms up onstage, while electricians test the lights on the set for the show's finale—a spectacular 28-foot-high montage of marquees for all the Robbins shows.

"It has 11,000 lights," says Woolley. "It cost $150,000, and it's on for all of 30 seconds. Spectacles like this are another reason musicals have become so expensive."

Costumed cast members assemble in the narrow wings. Peter Pan walks by. So does Wendy in her nightgown.

"Our lines got tangled last night, and Wendy couldn't fly," says Woolley. "She jumped out the window instead."

"Five minutes, please," says the voice on the loudspeaker.

The sailors and their girls from *On the Town* mingle with gang members from *West Side Story*. I turn around to see a treasured fantasy—Electra, a stripper from *Gypsy* whose gimmick is shimmying while tiny lights

BOB SACHA (LEFT)

One of Wall Street's hottest money managers, Paul Tudor Jones II, spends a day in Brooklyn with some of the 109 students he has agreed to send to college. "This city has been good to me," says the 35-year-old commodities trader. "This is my way to repay a debt." West of Wall Street traffic moves at a crawl through the heart of Broadway's financial district.

twinkle indiscreetly on her scanty costume.

I can't help myself. "How do you make them twinkle?" I ask actress Susann Fletcher. She shows me her battery pack.

Stagehands move out the Statue of Liberty. The overture begins. Curtain up.

A few minutes later three sailors dash offstage for a costume change, while flappers position themselves to do a number from *Billion Dollar Baby*.

"Come on, do the number with us," invites one of the flappers. I laugh nervously.

The clowns gather for *Funny Thing*. The flapper reappears as a Roman courtesan. "Come on," she jokes. "Do 'Comedy Tonight' with us. Anything goes."

Soon the T-shirted *West Side* boys and their girls line up, preparing to do the entire suite of dances from that show. One after the other.

"We rarely get through 'The Rumble' without an injury," says Woolley.

At Rumble's end, Scott Wise tears offstage, panting and dripping as if he'd just finished a marathon. He collapses against the fly rail in agony, takes a deep breath, crosses behind a drop to the other side of the stage. He changes his T-shirt and in moments dances back onstage, somehow managing to look fresh.

I ask Wise later how he does eight performances a week. "I sleep a lot. If I'm injured, no one wants to cover my role. They have to spread my various parts around."

As *West Side Story* brings down the first act curtain, I get bad news. I have to leave. The stagehands' union does not want me here. I was not approved by them ahead of time. So if the show must go on, so must I.

Unions with unrelenting pay scales and staffing demands are another reason Broadway costs have soared in recent years. *Jerome Robbins' Broadway* costs $340,000 a week to run. It will close September 1, having played to near capacity for almost two years without recouping its investment.

Over lunch, drama critic Frank Rich of the *New York Times* explains the new economics

of Broadway: "Theater owners have become the producers. They don't want to gamble. They want to fill seats. So they let the off-Broadway and regional theaters nurture the new plays while they simply import the London spectaculars or pick up the shows they think are commercially viable. In the end it's all about real estate."

ON THE MORNING after the staged reading of our musical, I am summoned to the office of my brother's agent. We had a strong audience response and raised the $60,000 we needed to mount a full-scale production in Florida. We start auditions soon. "You know," says agent Fifi Oscard, one of the grandes dames of the business, "it's going to be like pushing a peanut up a mountain. Do you really want to do this?"

"Yes."

"Well, it's possible. Maybe. Don't sign anything. Have any contracts sent to me. If you make any money, I'll take 10 percent."

Summer progresses, and I head farther north on Broadway, in search of other people with other dreams. They are not hard to find.

At the Juilliard School at Lincoln Center young musicians abound. I am surprised by the heavy percentage with Asian surnames. "Forty percent of our students now come from overseas," says Juilliard president Polisi. "We accept students solely on the basis of their auditions. Music, like sports, judges people on their ability. That means determination, talent, and family support."

But five years ago soprano Veronica Villarroel never dreamed she might leave her family. She scarcely knew she could sing.

"This really is a dream I didn't want," she says. "But so many people kept pushing me."

The day before, I had watched spellbound as this working girl from Santiago, Chile, who knew nothing of opera and who now, according to Polisi, has a world-class future, rehearsed arias from Mozart's *Così fan tutte*.

Her father had become ill. She auditioned for the chorus of a Santiago opera company to earn extra money for her family. Metropolitan Opera diva Renata Scotto heard her, and scarcely a year later she landed in New York.

Hating the city and speaking no English, she struggled with loneliness. Scotto helped her adapt to what she calls "my new planet."

"As I watched Renata at the Met," she recalls, "I began to love this music. I grew accustomed to the rhythm of life here. Now I need it. Now I'm completely sure this is what I want. But what a complicated job this is. You have to give all of yourself. All your heart. Otherwise, you will be a robot."

Such is the energy of Broadway. It echoes up and down the street. "I'm restless. I have to have change," says Murray Klein, president of one of the greatest institutions on the Upper West Side—Zabar's.

Klein, who immigrated to New York at 29 in 1950 from a displaced persons camp in Europe, began working as a delivery boy for what was a little Jewish delicatessen. Today Zabar's is five stores, occupying most of Broadway's west side between 80th and 81st Streets.

I meet Klein at 7 a.m. He is unpacking boxes. "There's no other city where you can make it like New York—if you apply yourself 100 percent," he tells me as we tour his enterprise.

Cheeses. Meats. Lox. Pots. Fresh-roasted coffees. Cuisinarts. Bagels. Klein packs me a shopping bag full of hot croissants.

"We aren't just a Jewish deli any more," he says. "You know, I don't do this for the money, although I am now a wealthy man. I do it to survive. I feel so insecure if I don't do something constructive every day. I'm still always afraid I'm not going to make it."

VASHTI MCMICHEAUX might say the same thing, only less articulately. She lives in an SRO—a single room occupancy apartment. I go to see her with Hank Perlin, a tenant organizer for the West Side SRO Law Project. He explains this West Side housing phenomenon.

In the late 1950s big urban-renewal projects, such as Lincoln Center, drove out thousands of poor people. Landlords took advantage of the situation by subdividing huge West Side apartments into single rooms —the SROs. They could make more money by renting the rooms individually to low-income refugee tenants than by keeping the apartments intact.

Then in the 1970s, as affluence hit the West Side again, the landlords began to reclaim those big apartments. Single tenants were evicted. Those who resisted were often deprived of services and even terrorized by goon squads hired by the landlords.

"Ironically, many SRO landlords happen to be concentration-camp survivors," says

Perlin. He walks me to a decrepit building off Broadway on 94th Street.

"More than 100,000 SRO units have been lost since the early seventies," he says. "We have fewer than 50,000 left. They are the last housing resource for low-income individuals. At least a third of the single people in homeless shelters came from SROs. They are usually people who don't know their rights, who don't have family or friends. They have had rough lives."

As we enter the building, the desk clerk is screaming curses at a resident. Reluctantly she lets us go upstairs. Perlin knows his rights. A policeman sits outside the five-room subdivided apartment where Vashti lives. One of the tenants just died; he had fallen and struck his head on a radiator. He is being put in a body bag. We knock on the door of the room where Vashti has lived for 30 years. She is lying on a sheetless bed with a roommate, James Downey, watching TV.

She pats the bed, smiles, and offers us juice from an old refrigerator. The room is about 8 feet by 12. Its condition is deplorable. The rent, says Vashti, who panhandles on Broadway, is $213.62 a month.

We inspect repairs the landlord recently made. The new vinyl flooring was sloppily installed. The walls were not painted behind the bed. Some of the other tenants had been withholding rents, and a court had ordered the landlord to make repairs before he could collect or evict.

"He told me today to pay up or get out," says Vashti.

"Don't you pay him anything," Perlin counsels her.

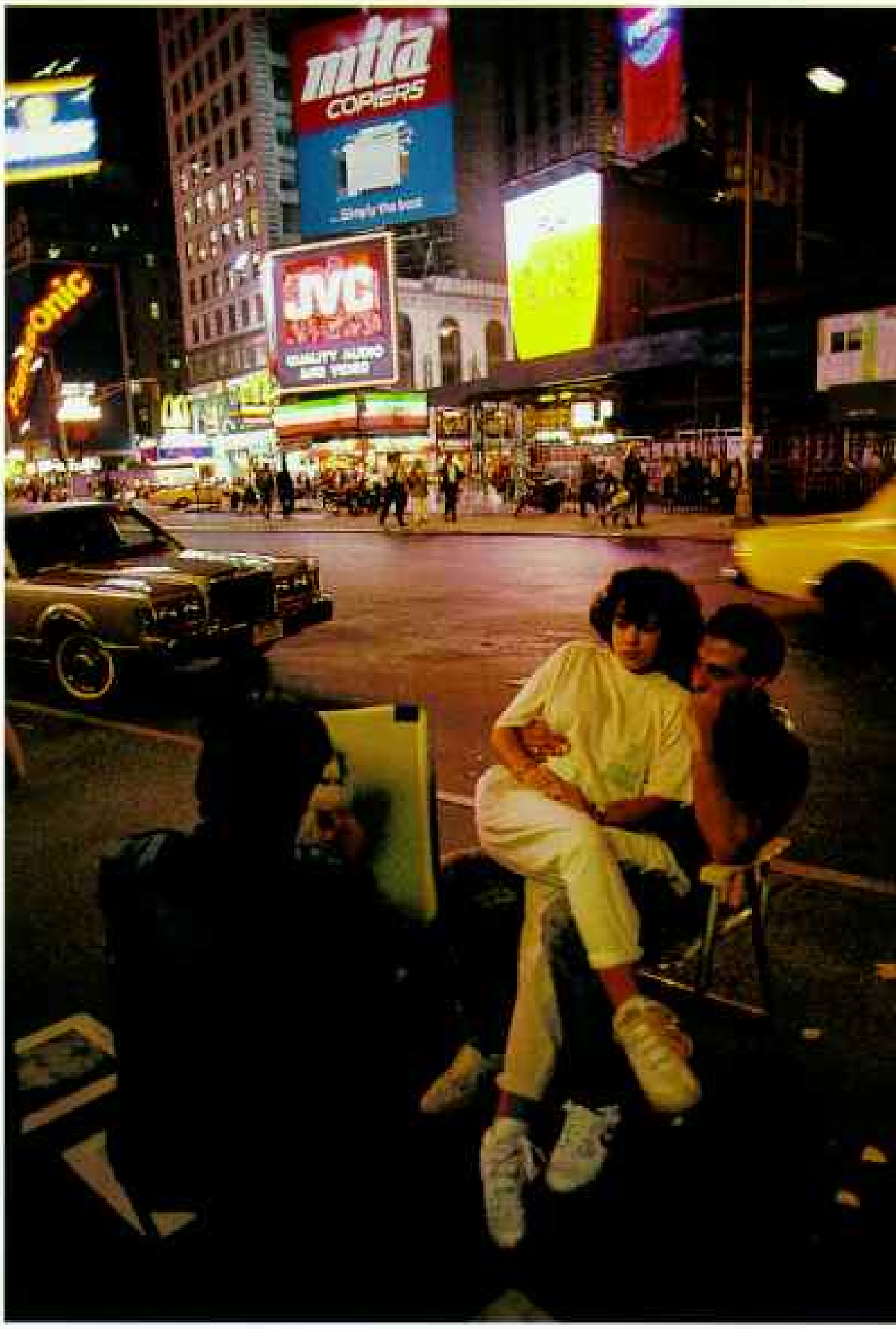
"I always pay my rent," she continues. "That way he's OK with you. I have nowhere to go. Sure you don't want some juice?"

The police walk by with the body bag.

"Mr. Foster hit his head and died," she explains.

"Is the bathroom fixed?" asks Perlin.

"It's still locked," says Downey. "Has been for nearly a week." He gets up, explaining that he limps due to a botched brain



"The finest free show on earth" or "an angry carbuncle" on the face of the city? Both descriptions of Broadway from the early 20th century fit today's reactions to Times Square, where a portrait artist works the street. Architectural renewal threatened to erase the area's bright lights until a public outcry mandated neon and flashing signs on new buildings.

Ho! Ho! Ho! **and $1.15 gets Santa on the subway. Opening in 1904 with a line**

along Broadway, the subway cost only a nickel during its first 44 years.

operation. "I have to use that bucket. Or one of those bags."

As we leave, Perlin tells them once more not to pay yet. Vashti smiles again kindly.

"You come back," she says. "Next time stay and have some juice."

"WE EXPOSE aspiring journalists relentlessly to the real world," says Stephen Isaacs, associate dean of Columbia University's Graduate School of Journalism at 116th Street. "Location. Location. Location. Walk out that door onto Broadway, and you can't help but find a story. You can't help but realize how lucky you are—and how unlucky some others are."

"It's like writing boot camp," says student Catherine Herridge, who aspires to be a TV reporter. She also reflects the changing times in journalism. Today, for instance, 55 percent of the school's 182 students are female.

"I don't want to be just a TV talking head with hair," she says. "I came here to be criticized to bits, to learn to ask the right questions, to develop better intuition, to go into situations that make me as vulnerable as possible, and to deal with the terrifying discovery that what I thought I knew was absolutely wrong."

I meet another Columbia student for lunch. Craig Rubano, who sang in the chorus for the reading of my musical, is doing graduate work in comparative literature. We wander the campus on a summer Sunday, passing the great steps of Low Memorial Library, where in 1968 the students of my generation shut down the university in a protest sparked by the school's plan to build a new gym in a nearby community park.

Columbia is just part of the huge academic, musical, and theological community centered along Broadway south of Harlem in Morningside Heights. Barnard College is across the street. Nearby are two influential churches, the Cathedral of St. John the Divine and Riverside Church. Then there are the Union and the Jewish Theological Seminaries, St. Luke's Hospital, and the Manhattan School of Music.

Craig and I walk up Broadway to 120th Street. I can see the subway come out of the hillside to cross the geologic fault that creates the valley in which Harlem lies.

"This is where the world ends as far as the campus's sphere of influence goes," says Craig. As we head back to the subway, he tells

me he is going to abandon his $22,000 fellowship to pursue a life on the stage. His fresh, hopeful face makes me believe him when he says, "I'm not planning for failure."

Minutes later as the train doors close at the 96th Street station, a ragged, emaciated, long-haired youth about Craig's age bursts into the car holding out a Burger King cup.

"My name is John," he says. "I'm 21 years old, and I'm dying of AIDS." He shows us open sores on his legs. "Help me. Spare some change. I'm dying." That's the way dreams

Spirits undampened, a graduate of Columbia University exults in his degree. Minorities account for 26 percent of the enrollment at Columbia, bordered by Harlem to the north and east.

The outlook for much of the city's youth remains bleak, especially for those who live in high-dropout neighborhoods such as that around Columbia-Presbyterian Medical Center. Here a young mother (left) leaves with her newborn.

Curbside auto repairs enliven a Sunday in the upper Broadway neighborhood of

Hamilton Heights, where shops cater to immigrants from the Dominican Republic.

Past the Bronx and into suburban Westchester County, Broadway passes Lyndhurst, whose Gothic Revival spires dominate a 67-acre estate overlooking the Hudson. Once owned by railroad magnate Jay Gould, the estate passed to the National Trust for Historic Preservation in 1961. Nearby is the home of Washington Irving, whose memory is kept alive at the Sleepy Hollow Country Club, where members Eve Newlands (right, at left), Eileen Weber, and Kathryn Spencer meet in the library.

are along Broadway. The good ones and the bad ones all take the same train.

THE NEXT DAY I walk north into Harlem. It is muggy, and the streets are washed by rivers from gushing fire hydrants. Caribbean music blares from ghetto blasters in the open-air fruit and vegetable stands. Here the street has a Spanish accent. The heart of black Harlem lies to the east of Broadway. By 150th Street I am approaching Washington Heights, once a solidly middle-class haven dominated by German Jews and Irish.

In the past few years a surge of Hispanic immigrants, most from the Dominican Republic, have claimed the Heights. One of the newcomers is 15-year-old Maria Pineda.

"I want to be a star," the pretty girl tells me. She says she is the oldest of six children. Her father was killed by random police fire in Honduras. Her mother brought the family to New York. She lives in a walk-up on 158th Street. But she spends as much time as possible at the Harlem School of the Arts. That's because 158th Street is one of New York's most crack-infested streets.

I meet Maria after touring the school. Executive director and retired opera singer Betty Allen describes the facility as "an oasis in a sea of despair." More than 1,300 students receive training in the arts and creative writing from some of New York's most talented teachers.

"We want to bring black and Hispanic children into the mainstream," says Allen. "You can't wait until high school. You've got to start nurturing them earlier."

"I'm trying to make my dreams come true," says Maria. "I take everything. Dance. Drama. Chorus. Clarinet. Piano. I want to be proud of myself."

I tell her about my story, the "Street of Dreams." She likes the title and says she's going to write a poem with that name. I ask her about her street.

"I don't like to go outside. Even inside my building there are sometimes blood-soaked bodies. My own friends work for the drug dealers. But here you forget about all that."

I ask her where she will be in ten years.

"In a nice house in Hollywood, California," she says. "I'll be an actress. I don't want it for the money. Although if I were rich, I'd help the people in the street and back home in Honduras. I just want to be happy. And to make people happy."

One way or another the problems of the Heights find their way to the world-renowned Columbia-Presbyterian Medical Center at 168th Street.

"We used to provide care largely for the wealthy or the insured," says spokeswoman Helen Morik. "Then all the other hospitals up here closed. Now we are it."

"When I came here in 1977, we reported 130 cases of child abuse or neglect," says pediatrician Nick Cunningham, who oversees hospital services to the community's children. "Last year we reported 700—maybe half were newborns with crack in them."

Moreover, pediatric AIDS is becoming an overwhelming burden. Increasingly women up here are being infected by their drug-using

male partners. Thus the hospital, long known for its high survival rate with premature babies, finds itself treating infants born with even greater odds against them.

"There are many together families in Washington Heights," says Cunningham. "But huge numbers can't cope. There's inadequate day care and almost no after-school care. When you don't keep the kids off the street, the whole society eventually pays the cost."

"AND THIS IS AMERICA," says Reid Cramer, as we stand on the second floor of the Fort Washington Armory, just across 168th Street from the hospital. Some 700 cots fill the vast drill floor below. Men, many desperate, some crazed, all homeless, mingle beneath the harsh lights. A foul, institutional odor wafts up.

This is New York's most notorious homeless shelter, and even its director has just told us that it's "intolerable and inhumane." He did not know I was a journalist. I would not have gotten past the abusive guards at the door. I came with Cramer, assistant director of the Coalition for the Homeless, which has won the legal right to inspect conditions here.

We go down on the floor. Our badges identify us as people who might help, and we are besieged. "You ever eat green liver?" asks one man. "That's what they're serving downstairs. But if you can fight, you might get yourself some chicken."

"The hot water here is 190 degrees. Do you know what taking a shower in that is like?"

"The rats play tag at night."

"Could you survive on an ounce of baloney and collard greens?"

A chubby man approaches me. He tells me he is a chef for a coffee shop. "About half the people here have jobs," he says. "We just can't afford a place to live. But this is New York. I came here to do better, and I feel if you don't have a job, your job is to get one."

"The staff needs to respect us," adds the chubby man's friend. "At five a.m. seven days a week they wake us by knocking on our beds with pipes."

A few minutes later several other men approach us. They seem starved for someone who will listen. One points across the room to the chubby man.

"That guy," he whispers, "is like the leader of the mob. Even the staff is afraid of him. We couldn't talk to you honestly in front of him and sleep here tonight. He and his friends charge us to go into the food line. They deal drugs in the bathrooms. If we complain, we get beat up. Not by one or two, but by ten. The security guards don't stop the fights until the ambulance comes. Can't you do something?"

I'm approached by a big, fire-eyed man.

"I was a POW in Hanoi for four years," he tells me. "I have this disease. They call it post-traumatic stress disorder. I've tried to take my life several times, and I've tried to take other people's lives. I'm frightened. I need help. And no one here will tell me how to get it."

I am shaking when I get back on the street. Who's responsible for this? I ask Cramer. The answer is, of course, complicated.

New York has hundreds of thousands fewer low-income housing units than in 1981, he says. There is no longer federal money to build more. Funding cutbacks also closed many psychiatric wards, putting huge numbers of mentally ill on the street. Inflation has devalued the minimum wage by 35 percent in the past decade, making housing even more expensive for unskilled workers.

THE HOUSING CRISIS extends well beyond the city's limits. "Our children can't afford to live here any more," complains Eileen Pilla, mayor of Tarrytown, a quiet Hudson River village in Westchester County near the northern terminus of Broadway. "And these are people who have deep roots here. They identify with our history and the sleepy atmosphere. And they can't find a new two-bedroom condominium for less than $200,000."

By the time I reach Tarrytown, Broadway has changed dramatically. Through the Bronx and Yonkers it persists as a bland, well-worn major road. In Westchester County it sprouts leaves. Deeply green and peaceful, it passes great historical homes—Washington Irving's Sunnyside, Jay Gould's Lyndhurst, and the Philipsburg and Van Cortlandt Manors. As it changes names, Broadway skirts the Rockefeller State Park Preserve. This network of carriage and horseback trails was until 1983 part of the immense holdings of the Rockefeller family at adjacent Pocantico Hills.

I tour the estate with Bob Snyder of the Greenrock Corporation, which manages the family properties for the Rockefellers. Old money and quiet good taste abound in this embodiment of the American dream. We pass

A Broadway bride leaves for the Old Dutch Church of Sleepy Hollow in North Tarrytown. Jennifer Foster was married by her father, Gerald Vander Hart, pastor of the 305-year-old church. North of here Broadway too changes names and heads toward Canada as the Albany Post Road.

mansions impeccably maintained for weekend use. Workers tend a golf course reserved for family and guests. Landscaping is breathtaking—a botanical garden. And last week I was hiking through Harlem. Street of Dreams. Street of contrasts.

IT IS WINTER. I have returned to New York. Our Florida production was a success. We have recruited a major star and raised several million dollars to begin an international tour. Maybe we'll reach Broadway. Certainly the stuff of dreams. And perhaps as ephemeral. I walk down West 44th Street, past the marquees for *A Chorus Line* and *The Phantom of the Opera*, to an alleyway between the St. James and Helen Hayes Theaters. A revival of *Gypsy* is playing the St. James.

An antique elevator leads to the office of New Musicals, an organization started by former sportswriter and magazine editor Marty Bell to nourish this threatened art form. His group is looking beyond Broadway, developing shows out of town and taking them on tour.

"Theater is thriving everywhere else," he says. "The road is now outgrossing Broadway. Broadway isn't the engine on the train any more. In many ways it's the caboose."

Bell also saw the original *Gypsy* as a boy. We reminisce. "I want to get back to the childhood memories. I want it to be like that again," he says. "And I think it can."

Can it? I buy an orchestra seat for the new *Gypsy*. Once again, from the first note of its classic overture, it mesmerizes. Can it really be 30 years? No one on stage looks older. Yet it no longer seems risqué. Certainly those two teenage boys sitting across the orchestra have seen more in a PG-13 movie. I watch them, wondering if they are brothers. I hope so. Maybe there are some things on the Street of Dreams that don't change. □

WILLIAM WILLIAMS COLLECTION, NEW YORK PUBLIC LIBRARY

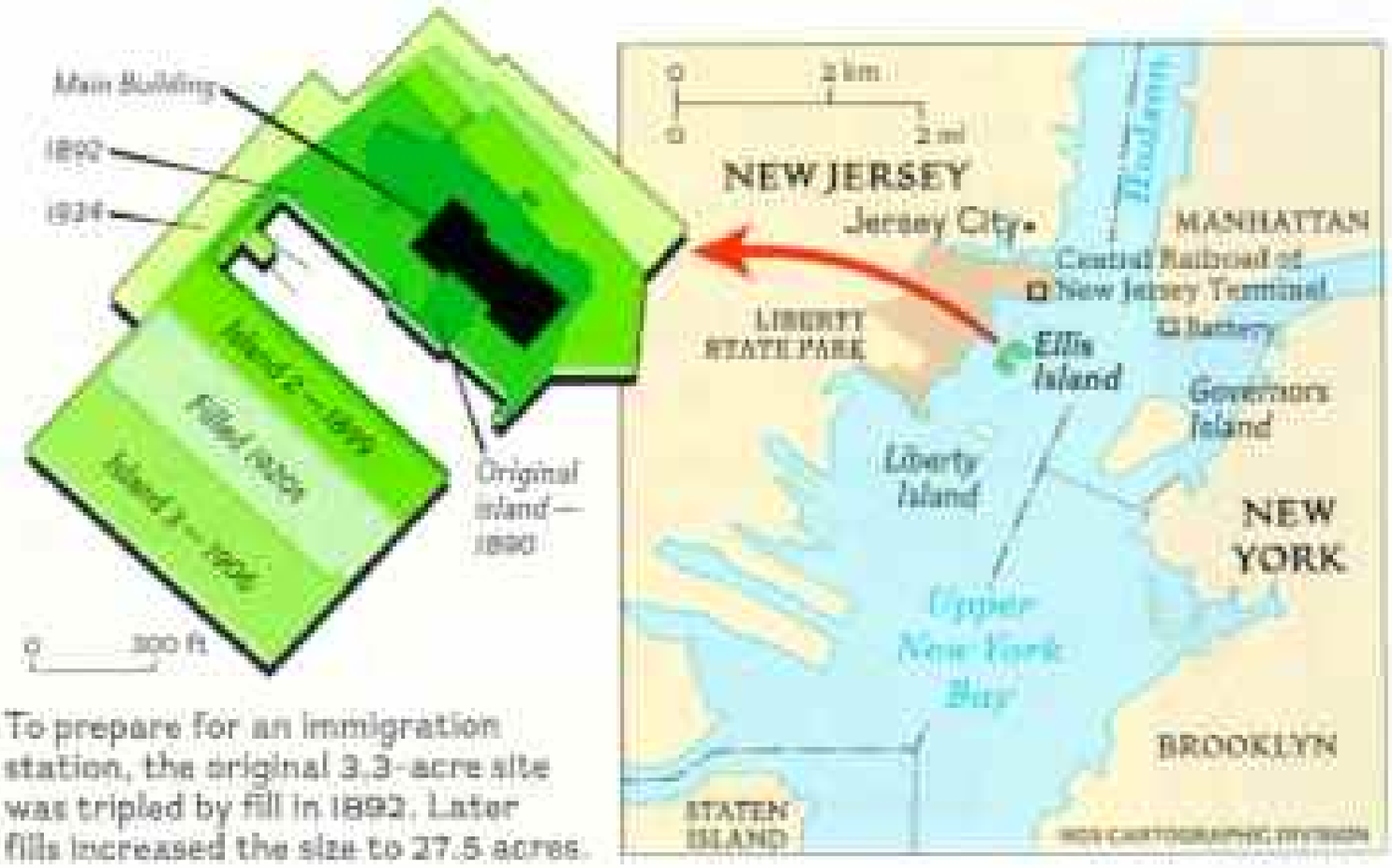
New Life for Ellis Island

WORKMEN HOIST MARBLE PARTITIONS FOR REINSTALLATION

Alive with would-be Americans from many lands, the Registry Room of Ellis Island was the nation's primary reception depot for immigrants between 1900 and 1924. Here in 1912 newcomers await questioning by inspectors seated under the flag. The spectacle of these foreigners—often 5,000 a day—drew American citizens for a view from the balcony. After an extensive seven-year restoration, the Main Building opens this month with a museum honoring all immigrants to the United States.

By ALICE J. HALL
ASSISTANT EDITOR

Photographs by JOE McNALLY SYGMA



To prepare for an immigration station, the original 3.3-acre site was tripled by fill in 1892. Later fills increased the size to 27.5 acres.

FABULOUS CASTLE, the Main Building of Ellis Island glistens like new in New York Harbor. Its turrets, freshly capped with copper, rise 134 feet. The rich architecture so impressed Sicilian farm boy Giuseppe Santi Italiano that he would later tell his grandchildren, "If they let the poor into such a gorgeous hall, I knew it was possible to be rich in America."

For three centuries immigrants have flocked to New

York City. By the 1880s processing, then regulated by the state, occurred at Castle Garden on the Battery (map). Then in 1891 Congress established federal control over immigration and the next year moved operations to Ellis Island. The first wooden buildings there burned in 1897.

This brick-and-limestone replacement, built in the French Renaissance style by a prominent New York firm at the cost of 1.5 million dollars, opened on December 17, 1900. It was planned to accommodate half a million arrivals a year, about twice the number entering in the 1890s. But poverty, anti-Semitism, and overpopulation in southern and eastern Europe were pressuring more people to emigrate, and numbers ballooned. Close to 900,000 came through Ellis in 1907, its peak year.

And that included only steerage passengers—the great majority. They were barged or ferried to Ellis from Manhattan piers, while first- and second-cabin passengers were cursorily processed on shipboard.

For 17-year-old Myron Surmach from Ukraine, Ellis Island marked the first day of a long life in America. He came in 1910 intending to work for a few years in the Pennsylvania coal mines, then return to his homeland. "At Ellis nobody changed my name; nobody bothered me. Right away I liked America. I made money and felt good."

BROWN BROTHERS (TOP); KEYSTONE/MAST COLLECTION, UNIVERSITY OF CALIFORNIA

First Steps in a New Land

As immigration increased, officials moved functions to different rooms, added wings, and removed walls. This cutaway shows the way the Main Building looked in 1907.

1. Immigrants entered under a metal-and-glass awning. This marquee has been re-created.

2. Newcomers checked luggage here. The Baggage Room will be used for exhibits and visitor orientation.

3. As they climbed the stairs, immigrants were visually inspected. Those marked with chalk were directed to an examination room (yellow). In 1911 the stairway was relocated to the room's east side. On a new stairway visitors will follow the immigrants' climb.

4. For legal inspection, newcomers lined up with fellow passengers in rows outlined by metal rails. Each wore a tag with two numbers referring to the page and line on the ship's manifest where his name appeared. The Registry Room has been restored to its appearance in about 1920.

5. If an immigrant failed to answer inspectors properly, he was sent to the special inquiry rooms (yellow). Exhibits here will detail immigrant inspection.

6. Detainees slept in dormitories that separated men from women and children. Today one of these dormitory rooms has been re-created to show how it looked in 1908.

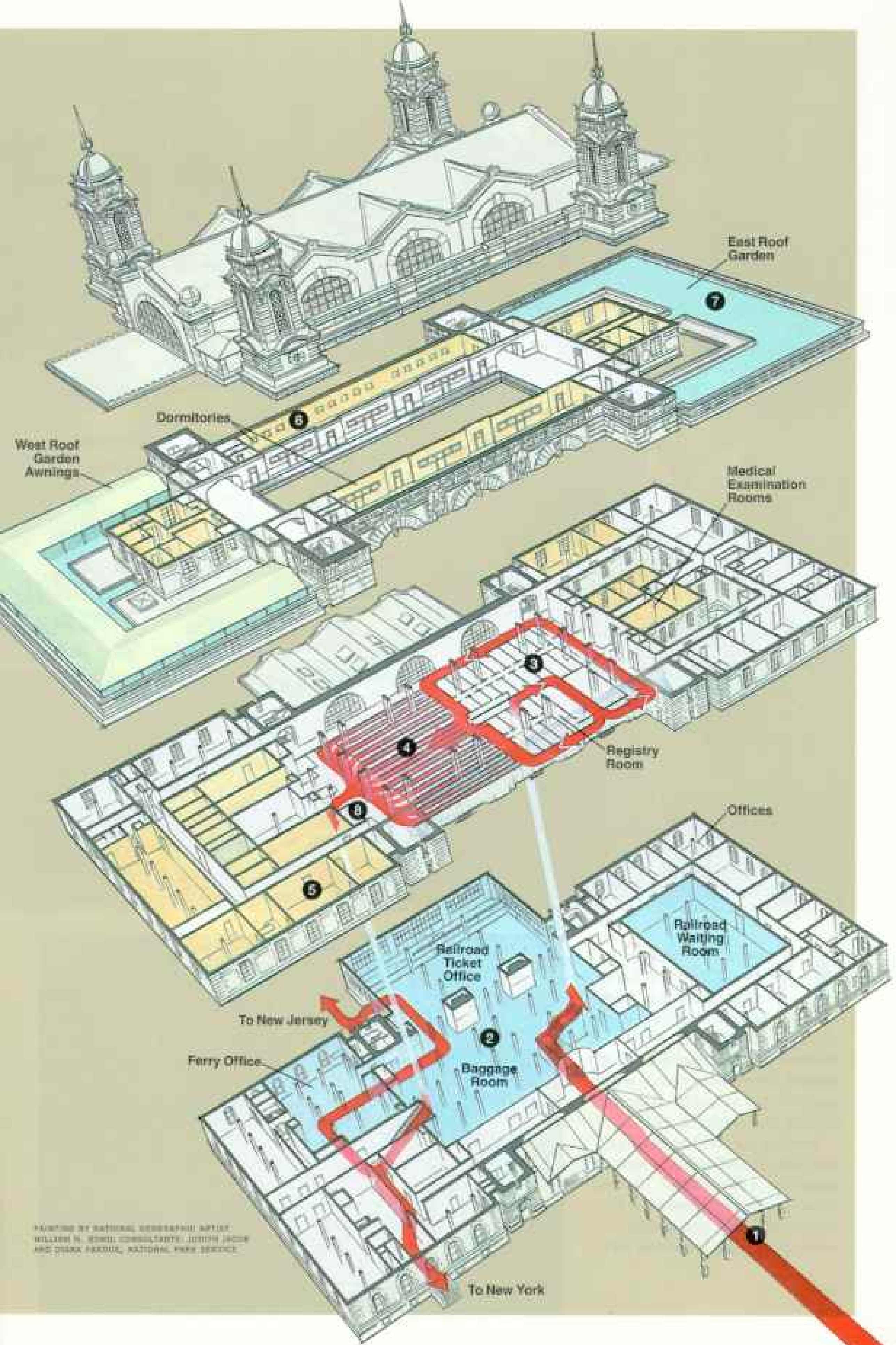
7. Roof gardens (blue) used for fresh-air exercise in 1907 were enclosed for dormitories and offices by 1914. Today the east wing will display "Treasures from Home."

8. Immigrants descended to purchase tickets to their final destination. The Railroad Ticket Office will house the "Peopling of America" exhibit.

WEIGHTED DOWN by their belongings, Slavic women trudge to the Main Building about 1910. Behind them rises a hospital, opened in 1902.

During the preliminary "six-second medical"—a once-over at the top of the stairs to the Registry Room—two women were marked with blue chalk, E for eyes, and diverted to an examination room (above). There Public Health Service inspectors, using fingers and button hooks, looked for signs of trachoma. Such a "dangerous contagious disease" was—and still is—grounds for exclusion. Another category to be weeded out: "persons likely to become a public charge."

Eighty percent of the immigrants passed health and legal inspection in a day. For those singled out for a closer look, delays lasting days or weeks seemed interminable. But only 2 percent of all Ellis Island immigrants were ever sent home.


East Roof Garden
7
Dormitories
8
West Roof Garden Awnings
Medical Examination Rooms
3
4
Registry Room
6
Offices
5
Railroad Ticket Office
Railroad Waiting Room
To New Jersey
2
Baggage Room
Ferry Office
1
To New York

DETAINED during the 1910 Christmas holidays, these men from Bohemia and Bulgaria shared a midday meal in the Kitchen and Laundry Building's second-floor dining room, which seated 1,200 at a shift. A kosher kitchen was added in 1911.

Feeding the multitudes was not easy. Scandinavians wanted dried fish, Chinese rice, Italians wine. Meals were provided by concessionaires, and menus reflected typical American fare.

BROWN BROTHERS

A 1906 noonday dinner featured beef stew, boiled potatoes, and rye bread, with herring for Hebrews, plus crackers and milk for women and children. By 1917 meat was served at supper too. Myron Surmach tasted apple pie for the first time; others ate their first banana.

World War I temporarily curbed the immigration flow. Restrictive laws in the 1920s cut the numbers and required inspection of immigrants by U. S. consular officials abroad.

During World War II Ellis Island was a detention center for illegal or criminal aliens already in the United States. The Coast Guard also trained recruits here. After the war fewer people were detained, and the facility was closed in 1954; its 42 structures fell to vandals, thieves, and decay.

Only artifacts of little value, such as these rusty pans, remained when restorers began their work in 1983. They found that as time and weather took their toll, multiple layers of paint peeled from interior walls, revealing traces of graffiti left by immigrants on the original plaster. In detention and waiting rooms the restorers noted initials, dates from 1900 to 1954, poems, portraits, cartoons, birds, flowers, and religious symbols. Some were written in pencil, others in the blue chalk inspectors used.

Among the comments scrawled in Italian: "Damned is the day I left my homeland" and "Giuseppe and Achille came to the Battery the day of the 18th of May, Saturday 1901." And in Greek: "Blast you America with your much money who took the Greeks away from their race."

A fine-arts restorer was called in to preserve this direct link to the past. More accustomed to working on frescoes in Italy, Christy Adams used scalpel and swab to remove overpaint and make visible such scenes as this incised ship, belching smoke and apparently flying the Greek flag (above). The section of wall with this image was moved to a second-floor-west exhibit called "Through America's Gate," about the medical inspection, mental tests, legal exams, and ship manifests, which were the only records of arriving immigrants.

Many later recorded their impressions. An Armenian boy, George Mardikian, loved the hot-water shower so much, he recalled, "I began to sing."

A 14-year-old Jewish girl, Sylvia Bernstein, fleeing the anti-Semitic atmosphere in 1914 Austria, pretended to be 16—an adult—to join a brother already in New York. Women traveling unaccompanied were detained until a male relative came to fetch them. Sylvia found her two-day wait very exciting. "They feed you and they watch you [because of] white slavery. Sunday my brother picked me up. Monday I got a job."

"LIKE A DESERTED village," Ellis was described in later years, and the stench of decay still fills unrestored, vine-covered outer buildings. Grime-encrusted metal eagles guard the Ferry Building built in the 1930s.

The glass-enclosed corridor on Island 3 connected the 11 wards of the Contagious Disease Hospital. Crutches are reminders that the wards were used for wounded servicemen of both World Wars.

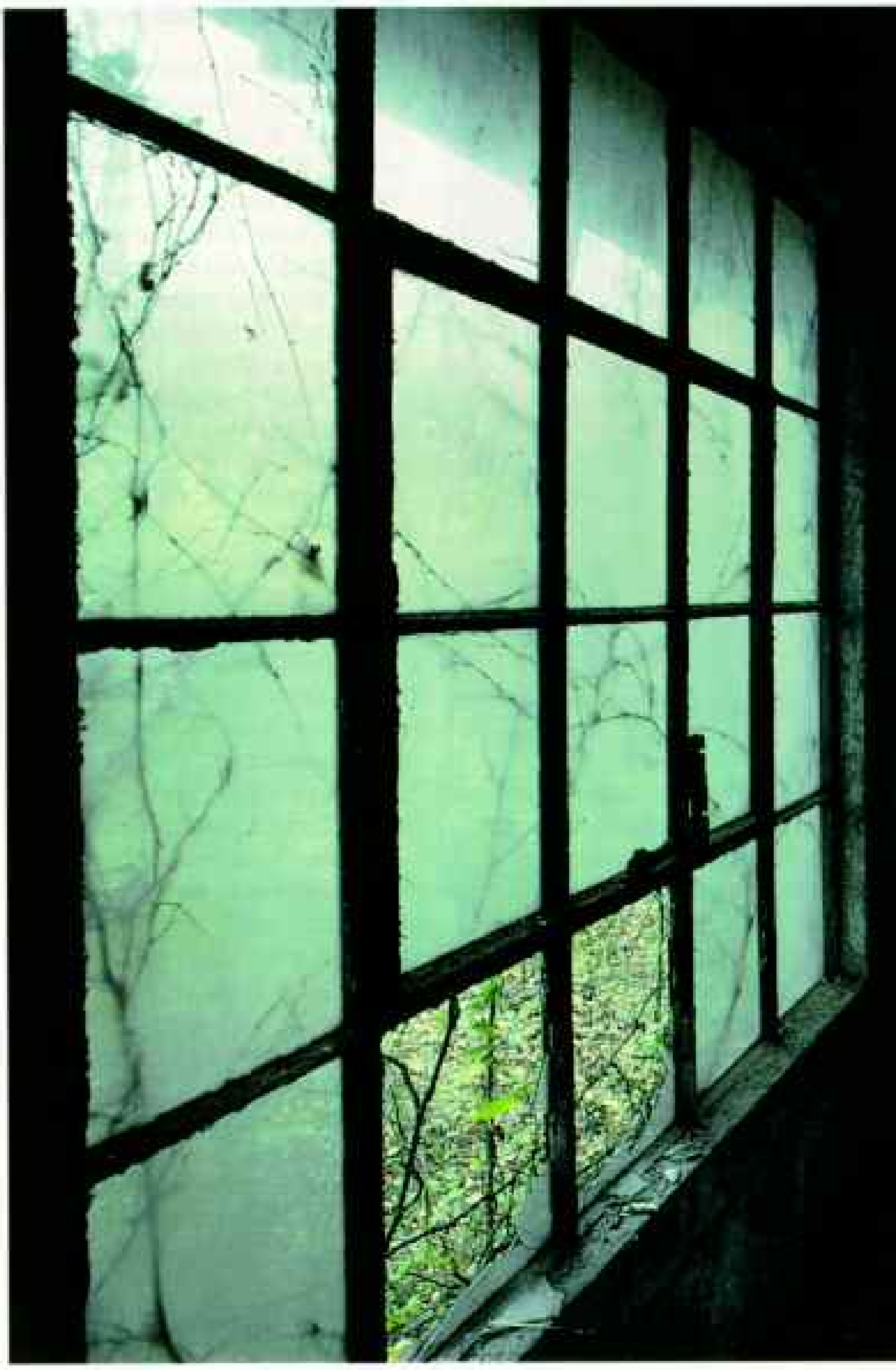
Originally Island 3 buildings were crowded with immigrants suffering from infections contracted aboard crowded ships or at the island itself. Many were children with measles, scarlet fever, diphtheria, or a combination of ailments.

Two-year-old Walter Strahm became ill during the month-long journey with his parents from Bern, Switzerland. When the family arrived at Ellis on December 20, 1920, he was admitted to the hospital for what became a six-week stay.

"Our days on Ellis Island were very long days," his mother later recalled. "Only one of us could go visit our sick boy for five minutes once a week." Viewing him through a glass, she said, "I could hear him cry, 'Mama, Mama.' "

The child developed measles, scarlet fever, and pneumonia, and finally died at 11:10 p.m. on February 9, 1921. But Mrs. Strahm had heard rumors of children being kidnapped, and "no one told me what would happen to our boy's body."

When researchers at Meta-Form, designers of the new Ellis Island Immigration Museum, became aware of the story, they helped locate Walter's death certificate in city records, which listed his burial place in a local cemetery. Now the tale has joined the collection of oral histories told in museum exhibits.



BUILT WITH CARE, restored with pride, the Main Building reflects an exacting attention to detail by original craftsmen and their present-day successors.

The plaster ceiling of the Registry Room was severely damaged in 1916 by an explosion set off by German saboteurs on the Black Tom Wharf a mile away in New Jersey. The contract for a new ceiling went to a firm founded by a Spanish immigrant, Rafael Guastavino, who arrived in 1881 with his small son. He brought from Catalonia the ancient technique of building vaulted ceilings lined with thin interlocking glazed terra-cotta tiles set in concrete.

Under the son's direction, craftsmen hanging from ropes installed these tiles so carefully in 1918 that only 17 had to be replaced when the ceiling was recently cleaned. Such contributions by immigrants belied the then common complaint that aliens offered little to America.

During restoration some 30,000 square feet of rotting wooden floors were torn up. New subflooring was covered with oak planks, duplicating the original surface, as here on the second floor of the east wing.

Wearing the calluses of 45 years' experience, floor installer Alf Melander cradles his coffee in a thermos cup. Like many of the hundreds of craftsmen and craftswomen who restored the Main Building, he can point to an ancestor who came through Ellis. His mother, arriving from Norway in 1923, went directly to the then Scandinavian neighborhood of Bay Ridge in Brooklyn. His father, a sailor from Sweden, skipped immigration altogether by jumping ship. "Like all good Americans then," Melander recalls, "my father made us speak English at home, so I never learned a Scandinavian language."

READY FOR A FLOOD of visitors, the Main Building opens in September 1990 to an anticipated two million day-trippers a year. In square feet its museum will be one of the four largest in New York City.

Restoration was carried out by the Statue of Liberty-Ellis Island Foundation in cooperation with the National Park Service. In an unprecedented fund-raising campaign, the foundation took in more than 160 million dollars in individual and corporate donations for the Ellis Island project alone. As one appealing money-raising plan, the foundation offers to put the name of any immigrant family, regardless of point of entry or year, on a Wall of Honor for a contribution of a hundred dollars or more. The names will be etched on copper panels along the arrowhead-shaped seawall by the flagpole. Other buildings may be renovated and reused, perhaps as a conference center.

Circle Line ferries will carry visitors to Ellis Island from the Battery, the Statue of Liberty, and Liberty State Park in New Jersey. The two-million-dollar bridge to New Jersey, built to transport construction equipment, will be removed.

These immigrants (right), having cleared inspection in 1912, wait on the north landing for a ferry to a train depot such as the Central Railroad of New Jersey Terminal (above, at upper left), which has also been restored. About two-thirds of Ellis Island immigrants moved to homes beyond New York City, the rest crowded into the great metropolis, then as now a haven for newcomers. □

Ellis Island

LIBRARY OF CONGRESS

For New York's newest, the dream still lives.

Immigration Today

SUNLIGHT STREAMING through high windows at Kennedy Airport's new immigration arrival hall reminds me—for an instant—of the light-filled Registry Room at Ellis Island, where for decades new immigrants to New York City were processed. Here also at Kennedy weary foreigners, documents in hand, line up for inspection by the United States Immigration and Naturalization Service (INS).

But for today's immigrant—prescreened and approved by a U. S. embassy or consulate in his or her homeland—entry is streamlined. In minutes an INS inspector confirms that papers are in order and directs the new immigrant to a glass-walled room. There the newcomer's face is photographed at an angle—right earlobe showing, please. (It's an identifying feature.) A print of the right index finger is taken, and the person's signature recorded.

These three identifiers will be printed on a computer-generated, pink-colored, blue-bordered, forgery-proof permanent alien registration card. Still popularly known as a green card, after the kind once used, it is a work permit and proof of legal entry, and it entitles the bearer to permanent residence and, should he so decide, to apply for citizenship after five years.

PAM SPAULDING (ABOVE AND OPPOSITE)

Soviet Jewish refugees are admitted to the United States at Kennedy Airport; bearers of altered and counterfeit documents (above) were rejected.

Each week as many as 2,500 immigrants arrive at Kennedy terminals. And close to 100,000 newcomers—whether coming by air, ship, or car—claim New York as their final destination each year. That's a sixth of all legal immigrants—some 600,000—that come annually to the United States. The flow is higher than in any decade since 1900-1910.

These new immigrants come for the same reasons that brought their Ellis Island predecessors—for opportunity, to escape oppression, to provide a better life for themselves and their children. But they come from other parts of the world, with different racial and cultural backgrounds. Whereas Ellis Island welcomed primarily Europeans, Kennedy receives its newcomers mainly from Asia, the Caribbean, and Latin America.

The Dominican Republic heads the list, with 18,000 entrants in 1988, followed by Jamaica, China, Haiti, and Guyana. Completing the top ten: India, South Korea, Colombia, the Philippines, Ecuador. Another 150 countries send from two to 2,000 immigrants each, making New York the globe in microcosm.

How did it happen, this change in the origin of immigrants? Europeans had been favored since 1924, when Congress in the Johnson-Reed Act set quotas based on the percentage of a nationality in the U. S. population. During the 1950s that system

was perceived as discriminatory, and in 1965 the Hart-Celler Act gave applicants from *all* countries a chance to apply for permanent residence. Now new regulations mean that no more than 20,000 such visas can be allotted to any country annually.

The 1965 act gave preference to family members of United States citizens or resident aliens already in the U. S. Some 270,000 enter the country each year under this system. An additional 330,000 entered in 1988 under other special rules: The spouses, parents, and young, unmarried children of U. S. citizens, for instance, can come without limit. At the same time as laws were changed, Europeans seemed less impelled to emigrate, while demand grew in other continents. The global waiting line to enter the U. S. lengthens; it stands at 2.3 million. Those who signed up for family preference visas in Mexico and the Philippines in 1977 may reach the head of their country's line this year, 13 years later.

Of course many would-be Americans enter without permission—at the same or double the rate of legal entrants. No one knows for sure. But I found undocumented immigrants in well-organized networks everywhere in New York City.

Leopoldo, for instance. I met him on a Washington Heights street. Clad in a sweatshirt on a freezing January afternoon, he was selling sugary Mexican doughnut sticks called *churros*, earning $35 a day. In Mexico City he had been a diesel mechanic, but in New York without a green card he could find work only as a vendor.

Leopoldo had arrived by way of a well-established pipeline across the United States-Mexican border, one used by some Asians and Africans as well as Latinos. He had borrowed $700 to pay a *coyote*—"travel agent" for the undocumented—to walk him across the border near Tijuana, drive him to Los Angeles, and put him on a plane to New York. Here jobs were said to be plentiful and immigration enforcers scarce.

Attempting to stop such illegal migration, Congress in 1986 passed a law penalizing employers who knowingly hire undocumented workers. It was, in the words of supporters, an attempt "to gain control of our borders."

INS spokesman for New York, Charlie Troy, feels little sympathy for those who get caught. "It's a matter of fairness. People wait years to get a visa and enter legally. It's not fair that those who can pay or sneak in can stay too."

And stay they do. New York City does not report undocumented aliens or discriminate against them when providing such

Destination: New York

When the flood of immigrants crested after the turn of the century, nearly 80 percent of all newcomers entered the U. S. through New York. In the first decade of the 1900s alone, more than six million men, women, and children from Europe landed at the Port of New York. Today most immigrants come from Asia and the Americas. Since the 1960s numbers have risen again; in the 1980s about six million legal immigrants arrived, a sixth of them in New York.

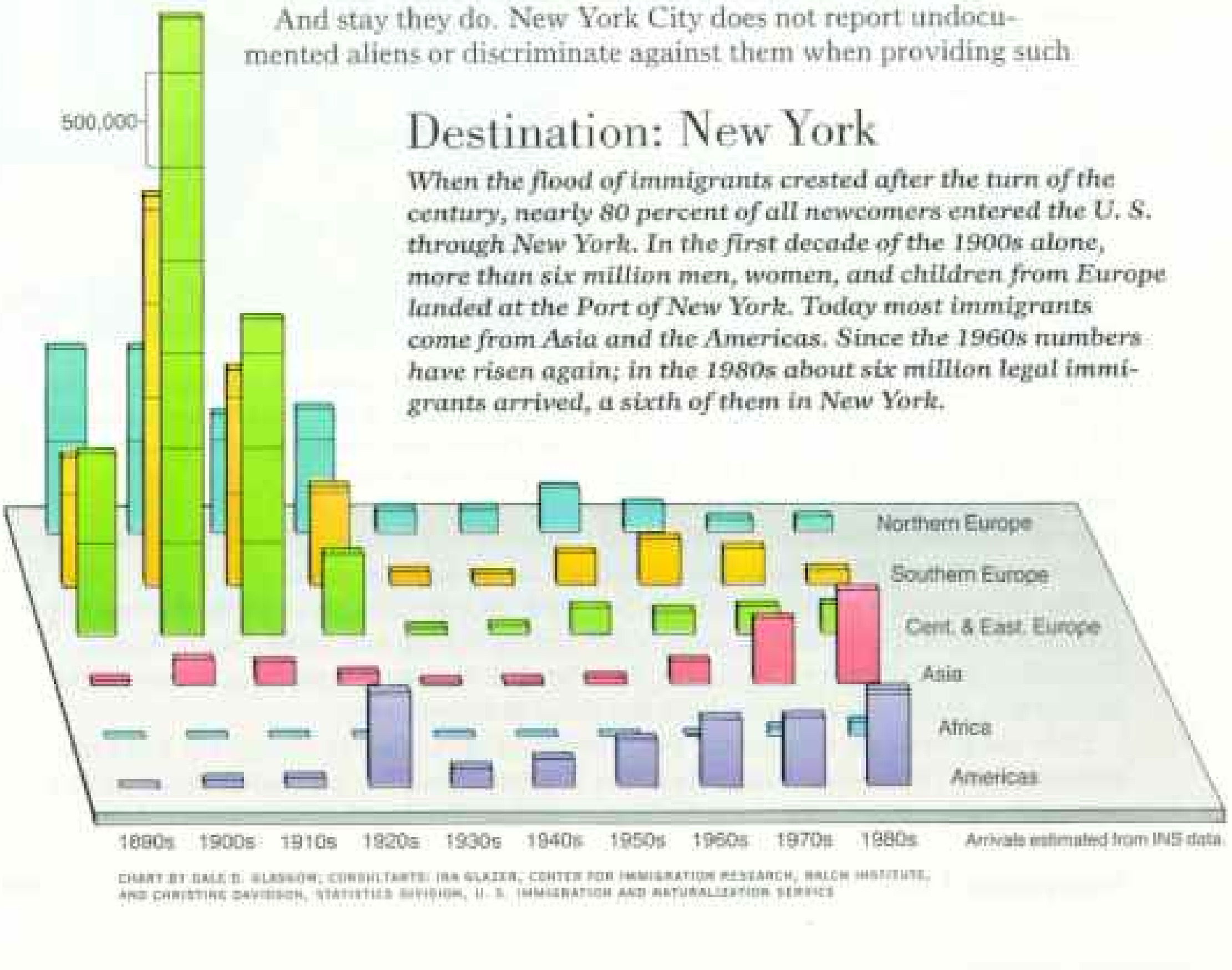


CHART BY DALE D. GLEGHORN; CONSULTANTS: IRA GLAZIER, CENTER FOR IMMIGRATION RESEARCH, RALCH INSTITUTE, AND CHRISTINE DAVIDSON, STATISTICS DIVISION, U. S. IMMIGRATION AND NATURALIZATION SERVICE

public services as police or hospitals. INS Washington spokesman Verne Jervis shrugs his shoulders. "Frankly, the administration of immigration law is a nightmare. We have 1,700 investigators working on employer sanctions nationwide. If we had 1,700 in New York alone, we still couldn't adequately enforce the law."

The 1986 immigration bill did have a more humane side; it offered amnesty to any illegals who could prove United States residency prior to 1982. One immigration adviser from the Borough of Queens told me: "I processed 3,000 cases; and I never saw so many bankbooks. Many applicants were also homeowners, with good jobs. Nothing is so unfounded as the charge that immigrants go on welfare."

Indeed recent demographic studies suggest that immigrants contribute more in income, sales, and social security taxes than they get back in social services. Illegals receive few if any welfare benefits.

Regardless of their legal status or their country of origin, the newest New Yorkers follow a familiar pattern. They take lowly jobs spurned by the native-born. (Without the new surge of immigrants, for example, New York's garment industry would have collapsed.) In time they buy small businesses as elderly owners retire. They rehabilitate old buildings, renovate deteriorating neighborhoods, and, after the required five years, most become naturalized citizens.

FAN SPAULDING

Immigrants from China, Jimmy Tsang and his family will soon leave this crowded Chinatown tenement for an apartment they are renovating.

THROUGH THE EYES of 15-year-old Wenny Cui, from Guangzhou (Canton), China, I have come to understand new immigrants. Five years earlier, Wenny, her sister, Jenny, and their parents were sponsored by grandparents who had brought, one by one, Wenny's 12 aunts and uncles with their spouses and children to the U. S.—a classic case of what is called chain migration.

"When we first came, I cried and cried. My father cry with me," Wenny recalls, "because we didn't know English. Not even A-B-C."

Adjustment was eased because they settled among their own in one of New York's oldest—and newest—immigrant neighborhoods. From a foreign-born population of 20,000 in 1960, Chinatown has ballooned to 100,000, expanding the informal boundaries of the lower Manhattan enclave. Neighboring Little Italy and the formerly Jewish Lower East Side are now increasingly Chinese. New Chinatowns are taking root in Brooklyn and Queens, as Chinese arrive from China, Hong Kong, Taiwan, Malaysia, Indonesia, Vietnam, even Cuba and South America.

The Cuis are on the immigrant opportunity track. Both parents work in Chinese restaurants, and the girls speak clear English and do well in school. But problems remain. "How," Wenny asks, "with so many possibilities, do you decide in America what you want to be?" The shock of freedom, the many choices, the burden of responsibility for self must be among the most difficult adjustments.

Meanwhile, Congress is again tinkering with immigration laws and quotas. Bills are now under debate that would provide tens of thousands of additional visas to those with advanced degrees, needed skills, or money to invest. Lawmakers argue that the preference given to families blocks worthy candidates without those ties. The search for the most equitable formula continues—but unchanged is the vision of millions abroad that America is the land of promise.

—ALICE J. HALL □

Loggers in Washington State work in the eye of a storm over the fate of the world's greatest temperate rain forest. As the old trees fall, North Americans ask,

Will We Save Our Own?

By ROWE FINDLEY
ASSISTANT EDITOR

Photographs by JAMES P. BLAIR
NATIONAL GEOGRAPHIC PHOTOGRAPHER

Beyond the chain saw's bite, a Roosevelt elk surveys Gothic depths of an old-growth forest in Olympic National Park. Elsewhere heavy logging and hunting have eliminated two of six elk subspecies; others have been stressed almost to extinction. Only a fraction of virgin forest on public lands in the United States and Canada is wholly protected.

A view that timber cutting favors such animals by increasing shrubs and foliage along forest edges has drawn increasing challenge from researchers. Recent studies indicate that some species, such as the Roosevelt elk and black-tailed deer, need the tempering microclimate of old growth to get through summer's heat and winter's cold.

Bearing antler racks three feet across and weighing as much as a thousand pounds, the Roosevelt ranges through a realm that provides luxuriant ferns and grasses in summer and browse shrubs in winter. Once hunted relentlessly for meat and sport, it has made a comeback through wildlife management programs and protective refuges.

TOM AND PAT LEESON

EDWARD VISHNIAC

Bird that has rattled the timber interests of the Pacific Northwest, the northern spotted owl polarizes environmentalists and loggers. The former have seized on research linking the bird's survival to old-growth forest, making it a surrogate for the forest's survival.

The U. S. Fish and Wildlife Service recently listed the owl as threatened, mandating protection of habitat that could withdraw several million old-growth acres in public forests from timbering. This appeared to be a victory for environmentalists until the Bush Administration announced a program to blunt the loss of logging jobs by easing environmental strictures, including the Endangered Species Act itself.

David Marshall, a 25-year Fish and Wildlife veteran who helped research the owl, regrets that the listing did not come a decade earlier: "Our options for wildlife and logging alike would have been much broader."

Swooping for a snack, the owl at left seizes a mouse provided by researchers. An immature offspring (above, at left) awaits parental sharing. Each of the estimated 3,000 to 5,000 pairs of owls needs as much as 3,000 acres of old forest for foraging, according to radio-tracking data. Snags and tree holes offer nest sites, and red-backed voles (below) and flying squirrels provide meals.

GARY BRAASCH

We can't see the forest for the trees. That old saw has new teeth as logging of old growth accelerates, while many call for a pace more in step with nature.

FOR MORE THAN A YEAR I have lived with troubling vistas of a realm that once made me serene: a realm of trees, among them the world's biggest and tallest and almost its oldest . . . valleys and slopes and mountaintops of trees, sheltering wildlife, nurturing lesser foliage, regulating watersheds . . . factories for solar energy, purgers and rechargers of our dynamic atmosphere . . . mature giants of trees that once gave our continent the monarch forests of the world, but lately those forests have become so shrunken that creatures formerly thriving there are nominated for the endangered list.

We live in an age of endangered lists. The specter of plants and creatures made extinct by our civilization haunts our collective conscience. Losses of unknown value to life's genetic pool trouble our minds.

Consider the furor over the northern spotted owl. In the Pacific Northwest 3,000 to 5,000 pairs survive in remnants of the monarch forests. Levered by years of research, environmental advocacy, and lawsuits, the U. S. Fish and Wildlife Service has added the shy bird to its list of more than 500 threatened or endangered species. This could mean withdrawal of several million public-forest acres from logging sales. Citing its own research, the timber industry has asserted that the owl is not threatened; rather it is the loggers, truckers, and mill hands who are the endangered species.

Owls or jobs? The Bush Administration dealt with the dilemma warily. It proposed to delay restrictions on logging—and to dilute the Endangered Species Act itself—to soften the effects on industry. The timber industry greeted the plan with guarded optimism; environmentalists saw a campaign "to gut the Endangered Species Act."

All too clearly, the monarch forest itself is on the endangered list. In the Pacific Northwest nine-tenths of the virgin woodland has been hauled to the mill; on the continent as a whole less than 5 percent survives. Called "old growth" to connote its many ancient trees, it has been labeled "overage" and "decadent" by foresters of tree-farm persuasion. Its vulnerability raises a question for North Americans already concerned for tropical rain forests: Will we save our own?

Increasing efforts to save viable remnants of our temperate rain forests spark confrontations, lawsuits, legislative offensives, logging-community rallies, sit-ins high in trees by environmental activists.

But 1990 finds more voices calling for new approaches to the problem. Favor rises for a new forestry in phase with nature's cycles of growth, with wood harvests pulled back toward the tempo of nature's pruning. The vision of sustained yield enlarges to embrace sustained ecological systems. But we work with an ever shrinking resource, with fading options. Are we already too late?

IT'S A WAR OUT THERE in the greatest temperate rain forest in the world, and it is no mere metaphor that clear-cuts look like battlefields. The heat is on the woodlands that offer the greatest timber value—the kingdoms of the giant sequoia in the Sierra Nevada and the coastal redwood in northern California, the Douglas fir's domain in Oregon and Washington, the Alaska Panhandle's wealth of great Sitka spruce, and finally British Columbia's empire of spruce and fir.

My initial dismay came from a Cessna's-eye view of Sequoia National Forest, which cloaks the slopes and folds of the southern Sierra Nevada in California. There, I had heard, John Muir's "noblest forests of the world" were the concern of an alliance of environmental groups. "Come out and get in my airplane, and I'll show you what we're concerned about," invited Martin Litton, veteran Colorado River runner and Sierra Club activist.

A few mornings later I was in his vintage Cessna 195 as he lifted it off Porterville's airstrip and headed eastward.

First I saw the sweeping undulations of ever higher ridges beneath low clouds, drifting,

Nurturing new life, intermittent canopies of old-growth forests admit dappled sunlight for seedlings like this young alder that rises against the girth of a centuries-old redwood.

broken, doing glorious things to the sunshine's play on Muir's "range of light." Then increasing altitude gave me a vantage that revealed many patches in the forest's cloak—the numerous clear-cuts that have become a fact of life in most of our national forests.

But now Martin dips a wing toward a particular clearing where a few lone giants stand forlorn in a field of stumps. These trees are sequoias, known the earth around as the largest in the tree world and, indeed, as the largest living things on our planet. (One record behemoth stands 274.9 feet tall and has a diameter of 25.1 feet at waist height and a volume of 52,500 cubic feet.)

These giants lately presided over a family of lesser trees, now commemorated by the stumps and by ash piles of burned slash. As we scout the western divide of the Sierra, I see other clearings guarded starkly by lonely great trees. Without consulting a map, Martin recites the names of the truncated groves like a litany—Peyrone, Starvation, Black Mountain, Long Meadow, Converse Basin. . . .

Our three-hour flight was followed by two days in a sturdy van, bumping over logging roads to set foot in some of those groves. At the cutting edge of a harvested tract I found giant trees wearing tiny yellow signs bearing the Forest Service Type I designation.

"We thought those signs meant protection for the groves," said Ardis Walker, Sierra Nevada poet and environmentalist. "Then one day we saw all the cutting. We couldn't believe it. We were outraged."

I had troubling questions for professional forester Bob Rogers at Sequoia National Forest headquarters in Porterville. He explained about the three classes of management—preservation, in which no trees are cut; intensive, in which all trees are cut; and nonintensive, in which not every tree is cut. The sequoia groves that concerned me were receiving nonintensive management. Why?

"Decades of fire suppression had let ground cover build up," Bob told me. "Even the sequoia's thick bark couldn't protect against the fires we were risking." Colleague Julie

Allen added that sequoia seeds need bare ground to take root in.

Environmentalists concede some fire danger but insist the Forest Service uses it as an excuse to cut and market lesser trees—mostly fir and pine—to the jeopardy of great sequoias representing the investment of centuries. An injunction secured by the Sierra Club banned further cutting in five earmarked groves. Law requires each national forest to issue a forest-management plan, and when Sequoia's was issued in 1988, the Sierra Club Legal Defense Fund appealed. "The forest planners were only talking about saving some sequoias, but we wanted guarantees for the integrity of the groves," said attorney Julie McDonald.

With his timber-sales program crippled, Sequoia National Forest Supervisor Jim Crates opted for mediation between his staff and all interested parties, a process now well advanced but one that ultimately entrusts the fate of the groves to the Forest Service.

THAT'S WHY two leading environmentalists are proposing alternative ideas. "Why not," wondered Sierra Club Chairman Mike McCloskey, "make the sequoia groves a world heritage site? That would give them protection under international treaty and remove them from any commercial timber category."

Under United Nations auspices a World Heritage Convention was adopted in 1972 and soon acquired membership by more than a hundred countries, including the U. S. Its purpose is to help preserve great landmarks around the earth, natural and man-made. Some 300 sites already designated include St. Peter's in Rome, the Taj Mahal, Yellowstone National Park, and the Grand Canyon.

"Sequoias hold a special place in the eyes of the world," said Mike. "They are a treasure that transcends national boundaries."

The initiative for his plan could come from Congress or from the President.

The White House is the hope of Executive Director John Dewitt of the Save-the-Redwoods League. Last November he appealed to President Bush to declare the sequoia groves a national monument. John's letter reminded the President that he would be following a precedent that created Muir Woods National Monument in 1908. That action came from Theodore Roosevelt, whom Mr. Bush quoted at a recent ceremony: "A grove of giant Redwoods and Sequoias should be kept just as we keep a great and beautiful cathedral."

I met John Dewitt as I explored the fate of the sequoias' sister trees. The coastal redwoods, not as massive but with a greater reach for the sky, easily qualify as the world's tallest living things. Given centuries to adolesce, they may top 350 feet, swaying masterpieces of richest color and flawless grain. And that is part of their trouble.

"As timber the redwood is too good to live," John Muir said almost a century ago, and he was uttering prophecy. By that time we already had Yosemite and Sequoia National Parks to protect stands of the sequoia, but not one acre of coastal redwoods then enjoyed such protection, state or federal. Mostly for a price of around $2.50 an acre, the redwood lands had all passed from public domain to private hands, from near Monterey, south of San Francisco, for some 400 miles northward into Oregon. Cathedral groves fell before the fierce energy of antlike men and straining mules. Growing naturally only in a coastal band limited by the inland reach of wet maritime mists, "the glory of the Coast Range," as Muir described the trees, began to suffer a diminution that continues today.

Our beachhead against an ultimate wipeout is a string of state parks, largely the 70-year achievement of the Save-the-Redwoods League, and Redwood National Park, midwifed by the National Geographic Society. The park, born in *(Continued on page 122)*

Stripped to the shoreline, gullied slopes of Mount Paxton shock visitors to Vancouver Island on Canada's Pacific coast. Slides, silting, and loss of ground cover penalize wildlife and fish on the 280-mile-long island, where only a fourth of the original forest survives and controversy flares over corrective logging policies. Slash fire (below) on private land in Washington removes logging debris but pollutes air and robs soil of enriching wood decay.

Deadwood metropolis

AFTER FIVE CENTURIES of life, a Douglas fir lives on by proxy for another half millennium as a downed log (shown in cutaway in the painting at left). It may once have housed in its branches a secretive marbled murrelet (right), a bird whose nest is so rarely seen in the trees of North America that this one is only the fourth ever recorded. Researchers Nancy Naslund and Robert Burton made the discovery in California's Big Basin Redwoods State Park.

Now, however, the dead log supports an immense colony of small life—from a crack in the bark, used by a folding-door spider **1** for its nest, to the log's center, where black heartrot fungi **2** consume the heartwood. Boreholes of Douglas fir bark beetle larvae **3** remain long after the insects have damaged the tree. Large larvae of the ponderous borer **4** and golden buprestid **5** tunnel their way through bark and sapwood to the heartwood.

Fungi such as white pocket-rot **6** spread through the wood, cracking apart the annual growth rings and opening the tree to invasion by the elements. Eventually termites follow, with thousands of soldiers and workers building citylike chambers **7**.

Below ground, living Douglas fir roots **8** benefit from yellow and black mycorrhizal fungi **9**, which pass along nutrients. Some of the fungi fruit as truffles **10** to be dug and eaten by the red-backed vole **11**.

Hunters, such as the pseudoscorpion **12** and the centipede **13**, and scavengers, like the oribatid **14** and the earwig **15**, prowl loose bark for a meal.

When a flying squirrel **16** alights to dig for truffles, it can come to a quick end in the jaws of a marten **17**; the limbs of a tree provide relative security but no guarantee against the talons of a spotted owl **18**.

Logs that rot in streams create pools, retard erosion, and enrich fisheries. When a log falls partly into a stream, it creates a mini-rapid, where the water is aerated and cooled by turbulence. Aquatic insect larvae **19** thrive in the clean water and use bits of wood for food and habitat building.

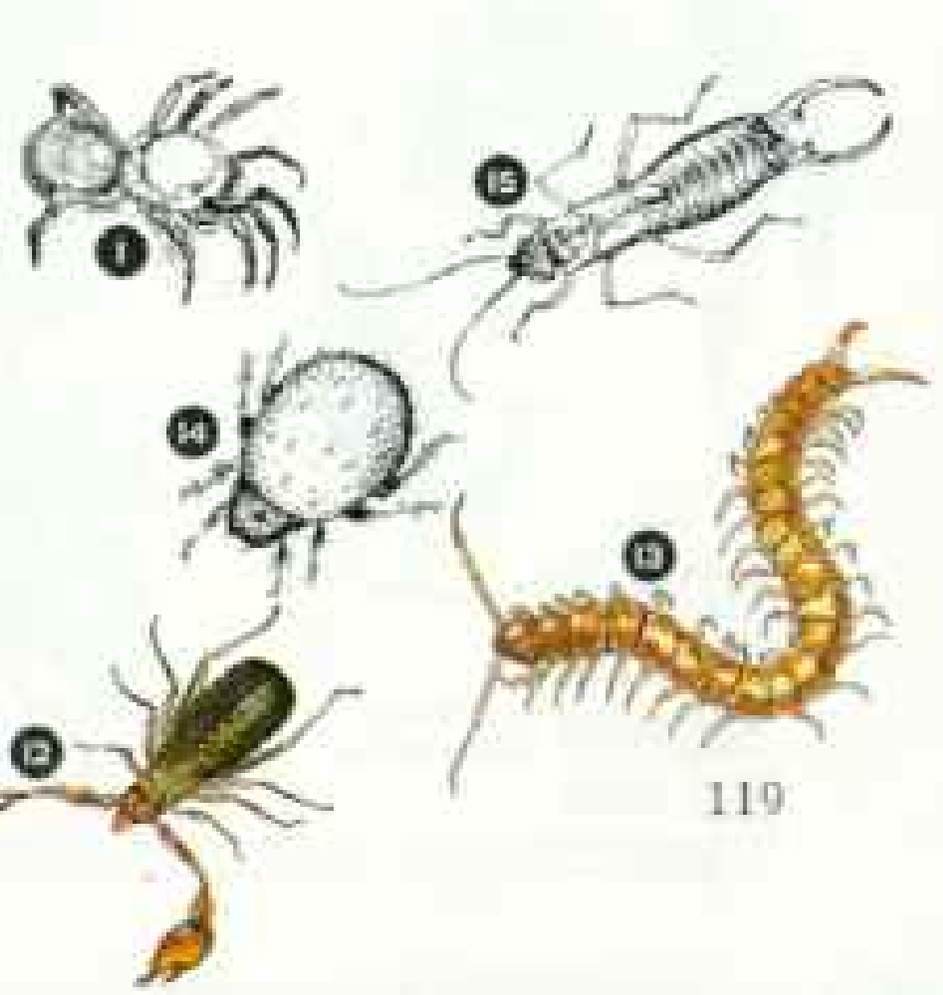
This cool, oxygen-rich water is vital for coho salmon **20** and steelhead **21**, and they in turn feed on the aquatic insects.

Saps and resins help living trees keep insects in check, but the dead log provides shelter and food to insect armies, which turn it into a sponge that stores moisture and renews forest soil.

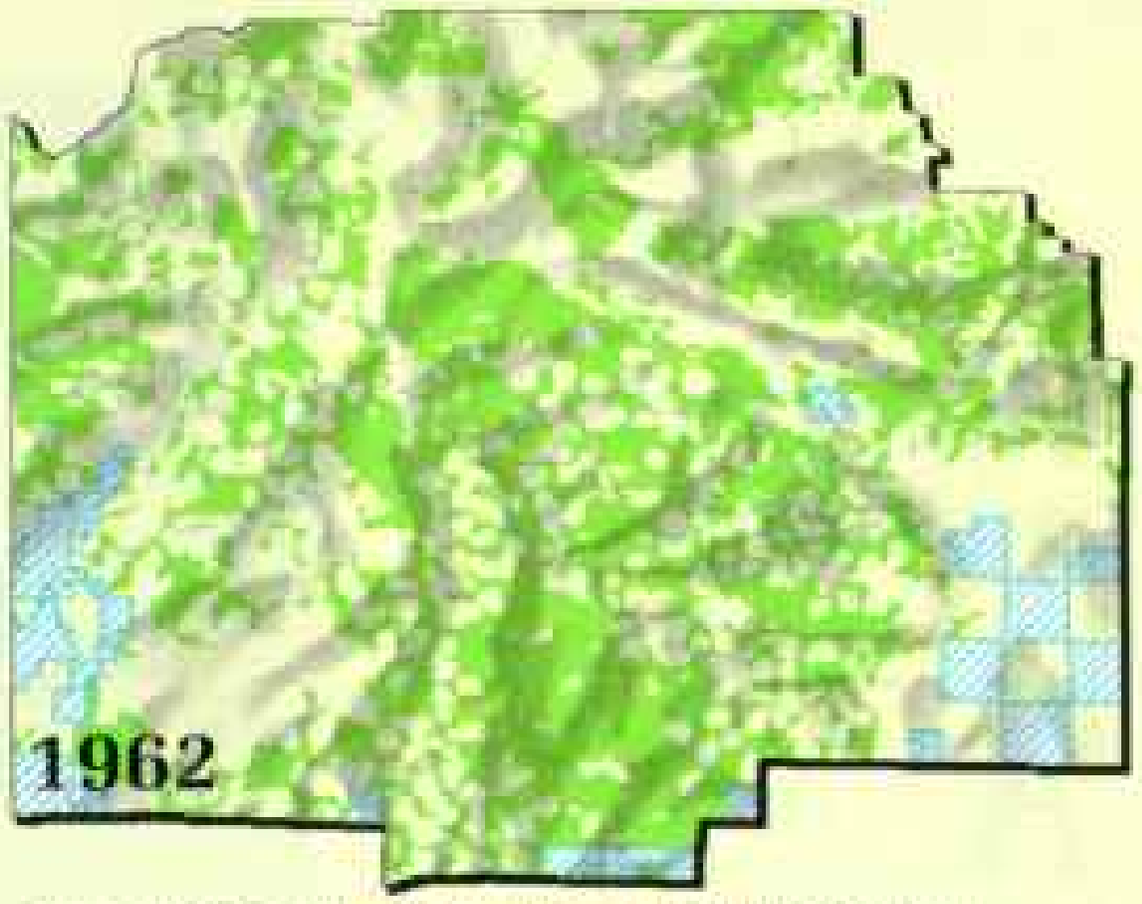
Biologists find at least 116 vertebrates at home in an old-growth stand, and more than 40 species may need such a habitat to survive.

Though not as diverse as a tropical rain forest, this temperate rain forest surpasses it in sheer mass of life by seven to one.

PAINTING BY JACK UNRUH
CONSULTANTS: JERRY F. FRANKLIN, UNIVERSITY OF WASHINGTON; LOGAN NORRIS, OREGON STATE UNIVERSITY; CHRIS MASER



Wearing the dark green of never-cut forest, a southeastern portion of Olympic National Forest in Washington—prime old-growth habitat—shows almost no loss to logging across its 217 square miles.



Most of the area's mature private timber having been cut, logging advances into state and Indian reserves. In Olympic's southeast section about one-fourth of the old growth has been cut under Forest Service license.

Virgin woodlands

The eastern forests of colonial times knew 200-foot giants felled for the Royal Navy's masts. Reseeding of public lands and abandonment of farm acreage have fostered a return of trees, especially in the East and South. But tree growing is not at issue in the old-growth dispute. That battle is over saving whole communities of plants, fish, and wildlife in the West.

Only 14 percent of the old growth remains in scattered pockets. Federal and state agencies replant for wood-crop sales in 60 to 100 years. An ecological web centuries in the growing has been made a woodlot.

SERIES MAP DATA AND IMAGERY BY PETER MORRISON, THE WILDERNESS SOCIETY, BASED ON SATELLITE DATA AND U. S. FOREST SERVICE AERIAL PHOTOGRAPHY

Shrinking realm of the primeval forest

NATURAL WEALTH astonished and wilderness terrified the first Europeans who entered the seemingly boundless North American continent.

Great forests swept from the Atlantic Ocean to the Mississippi Valley. They offered what appeared to be an inexhaustible wood supply. Yet for a time they slowed the way westward, concealed bear and cougar and Indian—and intimidated many a settler. "He must wage a hand-to-hand war upon it," wrote historian of the frontier Frederick Jackson Turner, "cutting and burning a little space to let in the light upon a dozen acres of hard-won soil."

So began a process that accelerated over the next 400 years as rising population, rocketing timber demand, and technological breakthroughs overmatched the mighty trees of the United States and Canada.

By mid-20th century almost all virgin forest had been cut from private lands in the conterminous U. S. By the late 1980s public lands under Forest Service and Bureau of Land Management stewardship seemed all too finite, incapable of sustaining the current pace of logging beyond a decade here, two decades there.

Citizen debate increasingly centers on when and where to slow or stop logging on public lands and how to shape a new forest policy.

The cockpit of the old-growth battle: Douglas fir thrive on the coast and on the western slopes of the Cascades. Cedars, hemlocks, pines, and hardwoods add diversity; one yew species has promise in cancer research.

World's tallest and most massive trees, California redwoods and sequoias have limited ranges. Parks hold only remnant redwood tracts. In a November 1990 referendum California voters may choose to ban clear-cutting of old growth on private and state-owned lands and sell bonds to buy and preserve private holdings.

Major forest types:
- Giant sequoia
- Coastal redwood
- Douglas fir
- Ponderosa pine
- Hemlock-Sitka spruce
- True fir-spruce
- National park or forest, provincial park

0 200 km
0 200 mi

NGS CARTOGRAPHIC DIVISION
DESIGN: RANDY SCHMECKPEPER; RESEARCH: LINDA R. KRIETE
COMPILATION: JOHN L. BESSER; ART: SHARDAR BADAY
PRODUCTION: DAVID B. MILLER, RAFAEL I. EDWARDS, RAMSEY MURRAY; MAP EDITOR: THOMAS L. GRAY

(Continued from page 115) 1968 after decades of frustration, encloses a few great groves linked by mosaics of second growth.

The state parks bead the Redwood Highway (U. S. 101), a sample of the great trees that once mantled the region. Partners in the Save-the-Redwoods League campaign have been a responsive public and landholders willing to sell, notably the Pacific Lumber Company—owner of a 195,000-acre realm of redwoods in northern California. For most of its 120 years, Pacific has been a rarity among lumber firms, enjoying public esteem, but lately it has become a company with an image problem.

UNTIL FIVE YEARS AGO Pacific had been perceived as a benevolent family-owned firm that practiced sustainable-yield forestry—cutting no more timber than was being replaced by new growth. Its practice included selective logging, cutting only a portion of trees in one area. Then it was acquired by Charles Hurwitz and his Maxxam financial empire in what has been described as a leveraged buyout involving junk bonds. Last year indictments against junk-bond king Michael Milken included charges of unlawful deals accompanying Hurwitz's takeover of Pacific with the help of junk-bond trading colossus Drexel Burnham Lambert, now mired in bankruptcy. Soon after the Hurwitz takeover environmentalists perceived what they called a "cut and git" policy by Pacific Lumber—accelerated logging for quick profits from the firm's privately owned stands of virgin redwoods. Clearly, declared environmentalists, Wall Street economics had come to the forests.

Not so, rebutted Pacific President John A. Campbell, a 21-year veteran of the company: "These stories get started in the media and you can't catch up with them."

What about selective logging? That practice, Mr. Campbell said, was economical under an old California tax law—but the law was changed, and it became uneconomical.

What about "cut and git"? "We've increased our cut in recent years only because a new inventory showed 30 percent more timber base than we thought we had. We cut only on about 3 percent of our land a year, we're buying more land, and we're making capital improvements. We're here to stay."

His rebuttals failed to slow reports that Pacific's cut had more than doubled, that

Making a critical undercut, Chet Hunt sets the angle of fall for a 120-foot, 800-year-old red cedar. Partner Loren "Butch" Pearson (right) watches its crackling fall to earth on Bull Ridge near Forks, Washington. Down, it is a commodity, wood for homes and furniture, worth $10,000 at the mill. Chet and Butch can earn $175 a day each, felling 10 to 15 trees.

Hurwitz had used two years' accelerated profits to pay off his junk bonds, that employees who tried to buy out Pacific Lumber were being penalized and had appealed to the National Labor Relations Board.

Such episodes, incredibly complex in their details, demonstrate the intensity of the war over the trees. It is an index to the heat in the issue that Californians this November will vote on far-ranging "green" proposals to stop clear-cutting of old growth and purchase

pristine redwood tracts now in private hands.

A growing sense of what we have lost rode with me as I drove northward to Oregon. The splendid coastline, set with a gemstone series of state parks, buoyed me until I reached Coos Bay and a dockside mountain of giant logs awaiting loading into a Panamanian freighter for Japan. By paying prices a third higher than market, the Japanese get top quality and offend both American environmentalists, who mourn the loss of forests, and American mill workers, who mourn the loss of jobs.

I turned from the log mountain to talk with Gene Fuller, who is in the chipping business next door, working with mountains of splinters. The leavings at lumber mills that once were casually wasted now are resourcefully rendered into usable composites or pulp by an increasingly efficient industry. He eyed the Japan-bound timber: "You won't find logs like that going to the mills here."

Log exports and environmental constraints

Tree farm, national forest, and national wilderness share hills north of Mount Rainier. At right logging roads link clear-cuts, new stands, and a few older groves on Weyerhaeuser Company land. At left clear-cuts on steep slopes pock the Mount Baker-Snoqualmie National Forest below the Clearwater Wilderness. Butch Pearson (below) takes a smoke after felling another tree.

are both perceived as the enemy by those whose paychecks depend on making sawdust. At a flea market in Mapleton, Oregon, I bought two "spotted owl rocks" from Chuck Epperson, who gathers stream-ovaled pebbles and paints them with owl features to sell to pilgrims like me. It's a recourse when jobs in the woods slow down. "I think this spotted owl business is just a plot to jack up the price of lumber," he said. "If you want the loggers' views, go to Crazy Al's bar in Veneta."

For an exchange of ideas, early Saturday afternoon is the ideal time to visit Crazy Al's. There's down-home music, upbeat service, and people willing to talk about a subject dear to their hearts—the future of logging. Over frosty cans of Rainier and under a bar-mirror slogan suggesting spotted owls as toilet paper, I met three men whose lives have been in the timber industry—Rolland Temple, now retired, and brothers Fred and Gary Hawke.

"We don't believe that stuff about the owl

SANDY FELSENTHAL

Wood exports raise the hackles of environmentalists and mill workers. In Alaska's Tongass National Forest, where below-market pricing has been an issue, a tug nuzzles logs (left) toward a Ketchikan pulp mill; most of the pulp will be sold abroad. In Hoquiam, Washington, raw logs load an Orient-bound freighter. Bills in Congress would greatly reduce exports.

being dependent on old growth," Fred began.

"We see them all the time in the second growth, and they look healthy enough," said Gary. "They don't seem to be all that rare."

They agreed with Rolland that the dire talk about the Northwest's running out of trees to cut seemed exaggerated, views that pretty much dovetailed with the speechmaking heard at an all-day rally in the logging community of Forks, Washington, and at a special meeting of the Board of Commissioners of Skamania County, Washington, convened to help me understand their plight.

Commissioner Kaye Masco of District 1 stressed the critical nature of the timbering industry in Skamania: "Only 13 percent of our county is privately owned. Eighty-seven percent is in public forest."

Three-fourths of the 1,900 jobs in Skamania depend on the timber resources of the public forest. More directly a concern to local government and education, federal law directs the return of 25 percent of timber revenues to the jurisdiction of origin; last year the Skamania government received five million dollars—46 percent of county revenues—and the local school system got another five million.

"We don't have the land base or resources to diversify into other lines of industry," Tom Jermann, executive director of the county's Economic Development Council, told me.

"This spotted owl situation could put us out of business," said District 3 Commissioner Ed Callahan. "If that thing goes through, it will mean the end for the towns of Carson and Stevenson. People will just have to move out and go somewhere else. The last one out, please close the door and turn out the lights."

THE NORTHERN SPOTTED OWL, a scant two pounds packaged in white-barred brown feathers, seems a lightweight for the heavy role ascribed to it. How did it become the alleged destroyer of the logging life and the pursuit of happiness in the public woodlands?

"Because recent research has greatly increased the amount of forest thought to be critical to the bird's survival," said Eric Forsman of the U. S. Forest Service Research Laboratory in Olympia, Washington.

Much of Eric's life has centered around this little owl. "There'd been only about 25 sightings in Oregon by 1968, when I first found I

could call them out of the woods," Eric said. During a field trip I had witnessed Eric's calling style—a dovelike *who-whoo-whoo-whoo* that floated into the vespertine forest and soon fetched an interested echo.

Over the years Eric continued to call and locate pairs, taking note of the owls' preference for the deep mature woods. He gradually learned why: They nest in tree holes or snags and deftly navigate the intermittent foliage to prey on flying squirrels and red-backed voles. The squirrels and voles feed on various root fungi, including truffles, that tap the great trees for sap sugars and help the trees get more nitrogen from the soil. The trees in turn shelter the flying squirrels, voles, and owls, completing one of multitudinous interlocking life cycles that give old forests their special richness and diversity.

"And it seemed that every new pair of owls we located was living in the middle of a proposed timber sale," noted Eric. He and his research teammates would dutifully advise the Forest Service. The reaction?

"At first they might say 'What's a spotted owl?' But gradually there came an awareness that they had a problem."

Researchers used tiny radio transmitters on selected birds to plot their subsistence range. Earlier acreage estimates around 300 hadn't caused much concern; it was a different story when the transmitter numbers passed 2,000. "That's when people began to get spooked."

"If the preservationists didn't have the owl, they would find something else," said Arnold Ewing of Eugene, who has spent his life helping run Oregon lumber mills. Arnold wanted me to see reforestation practices in the Willamette National Forest, and from a helicopter we looked at helicopter-logged clear-cuts, where choppers lifted out great trunks to spare steep slopes, at streams he said ran clear because of logging restraint in riparian zones, and at experimental tracts where a few old trees per acre had been spared to serve brown creepers and spotted owls.

Timber people speak religiously for growing trees while environmentalists crusade for saving forest systems, and arguments of the two camps air on different wavelengths—each side has trouble tuning the other side in.

While the fighting goes on, the old trees keep falling at a rate of 170 acres a day, so how much do we have left?

Like other figures in this fight, acreages keep changing. Five years ago the Forest Service was talking about 6.5 million acres of old growth in Oregon and Washington. When a more precise definition emerged—of at least eight 200-year-old trees an acre, with appropriate numbers of snags and downed logs and undercanopies of shade-tolerant growth—the total shrank to 2.3 million acres, with about a third already protected in national and state parks and wildernesses. On the remaining 1.5 million acres, the pressure to cut is intense, and the old trees won't last long—up to thirty years in extreme cases, but in some areas no more than five or ten.

AN ELEGY for the old forests is playing out in the labors of Peter Morrison and his small Wilderness Society research team in Seattle. In cramped rooms above the roar and sirens of downtown traffic, they perform a dedicated drudgery of comparing 1988 satellite images from space with earlier Forest Service aerials and maps to pinpoint the chain saw's advance.

By mid-century an idea was taking root in the minds of foresters that Western forests held overage, rotting trees that were "decadent" and nonproductive, a "biological desert" shading out other life. It was the duty of foresters to cut old trees and make way for soldier-like files of fiber-producing seedlings, often a single species to replace nature's varying mix.

The campaign has been disturbingly swift.

"Only a fourth of the old growth remains on the Olympic," says Peter, reporting on his team's first completed survey of a national forest. "At present rates of cutting, the old growth will be virtually gone in 14 years. Our preliminary findings on other national forests in the Northwest point to similar figures."

For those of us consoled by the awareness of old growth safe in national parks and wildernesses, Peter delivered a further blow. I had visualized the quarter-million acres of virgin forest inside the Olympic Peninsula's national park and wilderness areas as a more or less contiguous, unfragmented block. Not so!

"The old growth in the park and wildernesses fills narrow valleys, separated by high ridges," Peter explained. "These fingers originally were contiguous with old growth that extended in a sweep across the lower country outside the park. But now in many places that forest ends in clear-cuts at the boundary, fragmenting the woodlands in the park—and

hence fragmenting the ecological systems."

So plants and animals that formerly could migrate through continuous forest now must play an uncertain game of ecological leapfrog.

"It's one of the worst environmental disasters ever to beset the Northwest," Peter concluded. "The costs to be paid will stretch over hundreds if not thousands of years."

Some mill owners are already experiencing a crunch in log supplies not entirely blamable on the spotted owl. Bill Wilkins, WKO Mill superintendent in Carson, Washington, goes as far as 230 miles into northeastern Oregon to truck timber back to keep his 190 workers employed. Stressing efficiency and utilization of every chip of wood, Bill is determined that his mill will not be a casualty of shrinking supply. But with the spotted owl on the endangered list, he's not sure he could make it.

"The number of mills in Washington and Oregon would drop by 80 percent," he said.

AS WITH OTHER STATISTICS in this dispute, forecasts on industry cutbacks vary by precinct, but survival is a common denominator—of jobs on the timber side, of life systems on the environmental. Thus I heard those same themes restated in Alaska.

Alaska . . . the last frontier . . . surely the chain saw had made few inroads on its wildernesses. That's what most of us non-Alaskans thought until newspapers and television began to report a toll to trees, land, and fisheries in the Tongass National Forest. Bigger than West Virginia, it spans the entire panhandle and holds more virgin woodlands than Washington, Oregon, and California combined.

And now here I am, flying over 130-mile-long Prince of Wales Island, seeing the same pattern of clear-cuts and logging roads that crosshatch forests in the lower forty-eight.

Riding with me is Roy Clark, a soft-spoken Tongass National Forest timber-sale administrator with a name for hard-line enforcement of Forest Service standards. He points out a slide, some stripped streamsides, a vast clear-cut as examples of bad practices that are now history; he points to smaller cuts, care in road placement and log removal on slopes, and streamside bands of trees as examples of increasing environmental sensitivity. "We used to make clear-cuts of 200 acres and more; now it's seldom over 80. We leave the riparian zones along streams to protect fisheries."

It is the familiar theme—tightening the rules on forest management. The Forest Service points with pride; environmentalists credit pressure tactics. The logging industry thinks it could live with new USFS standards, but not with the greater restrictions advanced by an environmental alliance.

Congress took center stage in the conflict with passage of House and Senate versions of a Tongass Timber Reform Act. Approved by a six-to-one margin last year, the House bill would terminate two 50-year contracts that guaranteed a flow of wood to two Tongass mills at bargain-basement prices, chiefly for Far East markets. One mill, Japanese owned, sends most of its output to Japan. The Senate bill, passed 99-0 in June, would renegotiate pricing and logging restrictions in the contracts but let them run their course. Both bills would kill an automatic 40-million-dollar annual appropriation that has subsidized the below-cost contracts. In addition, the House measure would give protective wilderness status to 1.8 million acres. The Senate's would protect only 673,000 acres. As the two measures were shunted into conference committee, environmentalists cheered the House bill and criticized the Senate's, while loggers could applaud neither version.

"We have about 4,500 jobs in the woods here, and probably half of them will go if the House version stands," said Don Finney of Ketchikan, manager of the Alaska Loggers Association. "The Forest Service has excluded a third of marketable timber in the Tongass as wilderness and another third for ecological reasons, leaving a third for timbering. That seems fair, but the tree lovers want more."

"Much of the land that has been set aside as wilderness is rock and ice," Bart Koehler of the Southeast Alaska Conservation Council told me, adding that the ecological reserves likewise are not first-rate tree-growing lands. "The part earmarked for timbering lies along the coasts and lower valleys. That's where the biggest and best trees grow, and here in Alaska, where the timberline is as low as 2,000 or 3,000 feet, it's also the best habitat for deer,

FOLLOWING PAGES >

Once and future forest, the Lady Bird Johnson Grove is sprayed by sunlight in Redwood National Park. The light passes through a nearby clear-cut, done before the park was established in 1968. Park status fosters old growth's return.

JAMES P. BLAIR, JOSEPH S. STANCAMPIANO, AND JOHN A. ECHAVE, ALL NGS STAFF

bear, bald eagles, and salmon. It's also the most desirable land for recreation—at least until it is clear-cut."

"Alaska is not like the lower forty-eight," said K. J. Metcalf, former Forest Service manager of Admiralty Island National Monument. "Growing conditions are less generous. The use pressure is on the lowlands, and they are already suffering a toll."

K. J. resigned and joined the conservation alliance after years of trying to work inside the Forest Service. He explained sadly, "I finally became convinced that they were just interested in getting the cut out."

"CROWN LANDS" is the designation in neighboring British Columbia for the province's public holdings, and the number-one business there has long been timbering. For three and four generations it has been a way of life on 280-mile-long Vancouver Island, and the sound of logging in the woods made happy music. But lately the tune has gone sad, with angry notes sounded fortissimo by environmentalists. Caught in the discord is old-growth forest.

Actually, any jet traveler to Alaska can see what it is about from 40,000 feet—a patchwork of tree cutting that rivals anything stateside. That realization replaced my mental image of Vancouver as one of the world's great wild places. I paid a visit to the island for some on-site looking, first with Peter McAllister of the Sierra Club of Western Canada and then with regional forester Stan Coleman of MacMillan Bloedel, one of Canada's timber titans. My timing coincided with an inspection Peter had laid on for 26 people representing a cross section of environmental concerns. He said he would show me the worst eyesore in the Pacific Northwest, and my Missouri-mule skepticism triggered doubt; I had seen an array of bad practices from California to Alaska.

But one long look at the St. Pauls Dome-Mount Paxton area northwest of the village of Kyuquot killed my skepticism. Guarded by a parklike cluster of islands, framed by rugged headlands stretching away to infinity north and south, percussioned by the ocean's cadenced breathing into shoreline sea caves, a slope of stumps climbed steeply to the skyline, braided laterally by roads and vertically by erosion, continuing into a curling valley beyond, fringed at its distant edges by some blowdowns, branded in places by fire. Here, in a two-square-mile area, were showcased some of the worst instances of bad forestry practices I had witnessed anywhere (pages 114-16).

From the folks in Kyuquot, on a cove beneath St. Pauls' shorn pate, I got an earful of unhappy effects of the forest's retreat.

"Since logging started here ten years ago," said Ralph John, "wildlife has decreased. We have fewer deer, fewer fish. None will be left for our children."

Last November a torrential rain blew in on vicious winds, and the plummeting runoff created new gullies and slides on logged slopes and put an unprecedented clot of mud and debris into the sound as far as three miles offshore. Stan Kujala sailed out to look at the prawn traps he had set in 30 fathoms. "When we picked them up, they had been dragged to 70 fathoms with both buoys sinking. They were covered with silt and had no prawns." He also had traps in the mouth of the Tahsish River, where logging has been minimal; they were clean and silt free.

At a town meeting in the community hall, Kyuquot villagers took stock of their plight and saw a need for concerted action.

"We've been too generous, too gentle," said Alex Short, speaking hesitatingly but with deep feeling. "We've been sleeping. Now all must help."

Don Sluggett, district manager of provincial forests at Campbell River, voiced regret for mistakes in the Kyuquot area clear-cuts and told me of improved logging practices that would avoid such problems: "Those roads were built with bulldozers, which simply pushed the dirt over the edges; today we use backhoes, which lift it out and replace it. We're going back into some areas to get rid of the roads, restoring the original contours."

He said a storm blew down a seaside buffer originally left on the cut: "We had to harvest the blowdown; then a slash fire got out of control, and we had to do more harvesting."

President John C. Southcott of Interfor, the company that logged the St. Pauls Dome-Mount Paxton area over the past ten years, stressed his firm's improving standards of cutting and planting. Sincerity and zeal marked his words, but it was the old refrain: Mistakes have been made, but now we're doing better. From California to Alaska lessons are learned at a cost to forest and land.

I got the tree grower's perspective from

SHAN GORDON

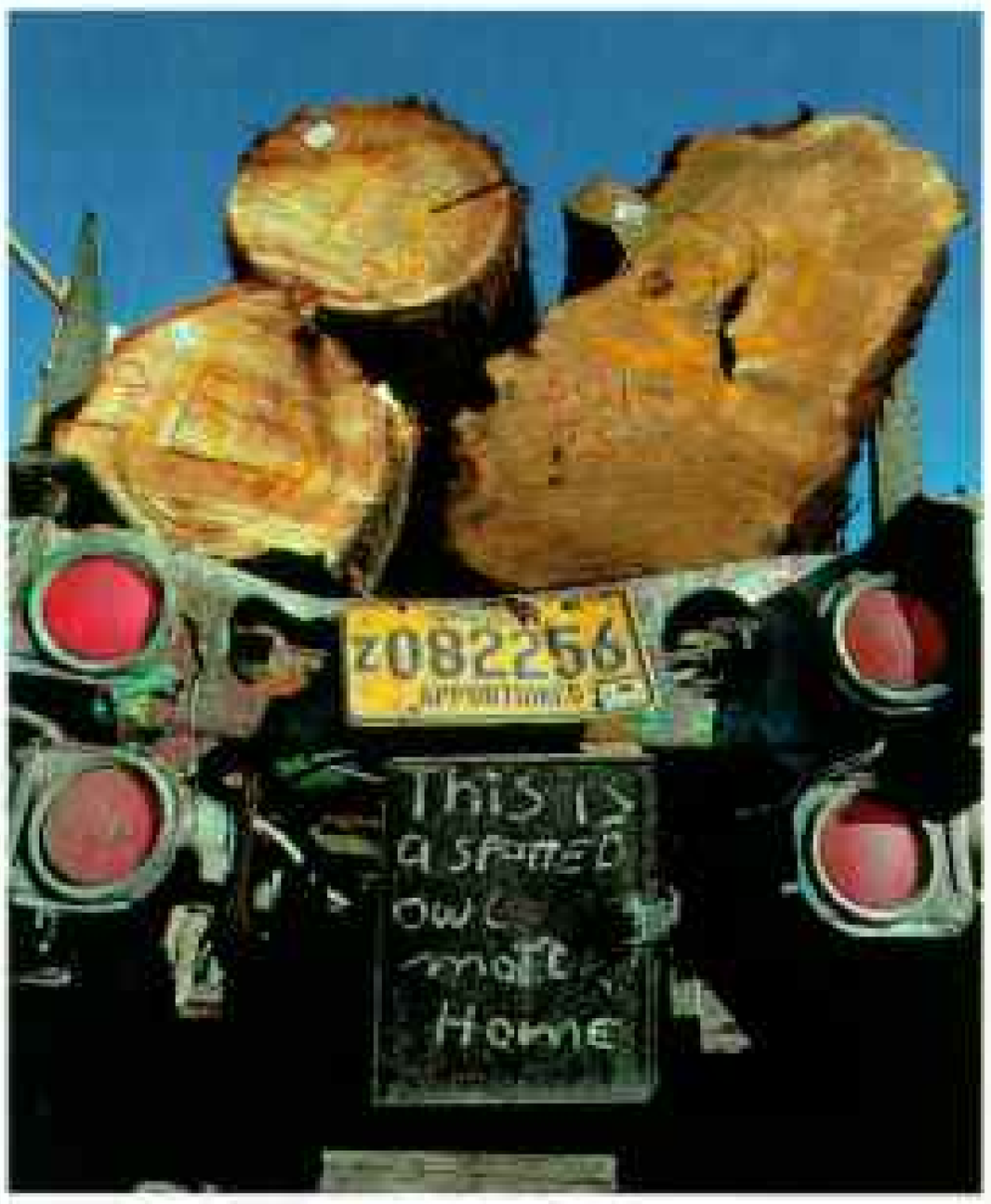
Stan Coleman, MacMillan Bloedel's regional forester in the firm's huge Alberni Region. We helicoptered to the Franklin River Division office to pick up engineer Dennis Bendickson. They explained how they cut and replant trees under their long-term tree-farm license from the province. I saw company mills, aircraft, and motor pools—an economic empire connoting jobs for 4,000.

On a sunlit afternoon we choppered gently onto a gravel bar of Carmanah Creek and plunged into stained-glass lights of pristine forest for a moss-carpet stroll under ancient giants whose crowns were beyond our seeing. Aloft once more, we skimmed those crowns until Stan pointed out one that modestly topped the rest.

"That is the Carmanah giant," he said simply. In its centuries of living it had reached 312 feet and been proclaimed the tallest tree in Canada. "One of our people found it in a routine flyover," said Stan.

As its fame spread, the big tree became a symbol of the struggle over forests. MacMillan Bloedel offered to protect a 1,300-acre enclave, but environmentalists wanted the whole 13-mile sweep of the Carmanah Valley. A recent government compromise saved about half the valley, disappointing both sides.

To protest cutting in the Willamette National Forest, Oregonians bind themselves to a Douglas fir with bicycle locks under the eye of the sheriff's deputy who arrested them. They belong to Earth First!, a group that stages sit-ins and promotes such tactics as disabling logging machinery. Cedar logs ride to a Coos Bay mill on a "spotted owl motor home," a logger's joke.



SO HOW MUCH is enough? This question looms over all the old forests of the U. S. and Canada. "The truth is that there isn't that much left to protect," said Brock Evans. He leads the National Audubon Society, a member of the Pacific Northwest's Ancient Forest Alliance of 80 environmental groups. They have fostered a bill in Congress that would stop all cutting of old-growth forests on federal lands.

The fire under the legislative pot received new fuel in an April 4 announcement from a panel of scientists known as the Interagency Scientific Committee. A chief recommendation concerns how much timberland should be embargoed for the spotted owl; this formula favors owls over tree cutting. The Forest Service says the committee's plan would cut timber production on public lands by 30 percent.

Meanwhile, Congress was at work on a new accommodation between cutters and savers; September 30 is the expiration date for the current compromise, which has been known for its chief architects, Senators Mark Hatfield of Oregon and Brock Adams of Washington. This being an election year, action was expected early to let lawmakers go home to campaign. Add to the pot the anticipated action on some version of a Tongass National Forest reform bill, and you begin to expect fire, smoke, and boilovers on the legislative front.

It's not all cease and desist by environmentalists, as was stressed in the Wilderness Society's recommendation last January to Congress. While reducing national forest cutting from 4 billion to 2.3 billion board feet a year, it would make additional timber available to domestic mills by slashing almost in half the present 4.3 billion board feet a year in raw log exports and let states tax remaining exports to finance schools and economic development in mill-dependent areas.

The log-export brake drew fire from export spokesman Nick Kirkmire, who heads Washington Citizens for World Trade.

"We're not Johnny-come-latelies to the industry," he said. "Exporters, shippers, and stevedores might lose more than milling and processing would gain, and the anticipated diversion to domestic mills is questionable." A graduate forester, he saw hope in closer adherence to sustained-yield forestry.

Sustained yield used to carry the clout of holy writ in the United States Forest Service, but now there are doubts. A litany of alarm has begun to find expression within the Forest Service—in the form of staff members who can no longer in conscience subscribe to "getting out the cut" from such ragged remnants.

The most visible spokesman has been Jeff DeBonis, a timber-sale planner with 12 years of wearing Forest Service green. He was truly a voice crying in the wilderness when he began last year to speak out against continued heavy-cutting practices in the already heavily cut Willamette National Forest in Oregon, where he was assigned to the Blue River Ranger District. There were two fast results, as he tells it:

"First, industry wanted my head, and, second, I found there were a lot of my Forest Service colleagues who felt as I did."

So he began to publish a newsletter called "Inner Voice" for those who wanted to promote change from within the agency, and he organized the Association of Forest Service Employees for Environmental Ethics.

To the credit of the USFS, industry did not get his head, despite a vehement letter to his immediate boss. Instead, and not without hierarchical agonizing, Jeff was counseled as to the house rules for exercising his right of free speech, which mainly amounted to doing it on his own time with private resources. Soon he had a mailing list of 2,000 and so much demand on free time that last February he resigned to devote his full talents to his growing group.

"I can no longer justify my direct participation in the liquidation of the remaining 10 percent of the temperate rain forests," he said. "I believe this will be remembered as one of the most significant ecological disasters of the 20th century."

THAT FEELING found expression at a higher level last November, when regional and forest supervisors expressed deep concern in letters and memos to their chief, F. Dale Robertson. Region One forest supervisors summed it up, reporting: "Many people, internally as

"Nonintensive management" by the Forest Service in Sierra Nevada sequoia groves left "three sisters" to look down on a dusty slash of lesser trees, where a planter unholsters a ponderosa pine seedling. The trees were cut with the stated aim of reducing fire danger and aiding sequoia propagation; environmentalists saw an excuse for logging.

well as externally, believe the current emphasis of National Forest programs does not reflect the land stewardship values embodied in our forest plans. Congressional emphasis and our traditional methods and practices continue to focus on commodity resources. We are worried that if we don't make some major changes . . . we will never move from rhetoric to reality."

A dozen years ago going public as a whistle blower was the only way to promote such sentiments, at the risk of professional suicide—blind-alley reassignment, early retirement, or resignation. But Robertson's reaction was the establishment of a New Perspectives panel, headed by Hal Salwasser, a deputy director of the agency who was deeply concerned about the spotted owl.

My previous conversations with Hal, a dedicated forester and an adjunct professor in wildlife management at Virginia Tech, had found him voicing strong environmental concerns. After his new appointment I asked him if he believed he could really shift the emphasis away from trees to the forests as entities.

"I believe the new direction in the Forest Service will make the difference," Hal said.

My mentors on a different approach to forestry have divided their time between laboratory and lectern. Jerry Franklin of the Forest Service, whose 33 years of field studies include monitoring the comeback of woods that were clear-cut by Mount St. Helens' 1980 eruption, also teaches at the University of Washington in Seattle. He sees forests as living systems, would trade hopeless fragments of old growth for combinable remnants. "And there should almost never be a total clear-cut," he adds. "Some old trees, snags, and logs should remain for continuity of dependent communities. If you want life to survive, you have to build a bridge."

After years of work in the woods for the Bureau of Land Management and the Forest Service, Chris Maser lectures through books, tours, and interviews on reverence for nature's methods. "We're in trouble as soon as we focus on our own limited goals and lose the broader view. When we destroy all our ancient forests, we will have thrown away nature's blueprint. We must have that blueprint if we are to save forests for the future."

Both Jerry and Chris see a smaller but endlessly sustainable forest industry. "There must be less cutting and more consolidating of remnants into viable entities," says Jerry. "What the balance will be is a subject for study and negotiation. But the need to seek that balance is not negotiable."

"Nature itself is constantly cutting and pruning the forests, through fires, blowdowns, blights, and volcanic eruptions," Chris told me. "Any large expanse of old-growth forest contains stands of various ages. By studying nature's model, we can fit our uses into a cadence of transition and renewal."

WHILE WE PURSUE hopeful visions, our options shrink daily, and somewhere in what remains there stands a tree of no return. It is not a specific spruce or fir but a specific number in the sequence of cutting, beyond which the remaining old growth will have shrunk below what natural processes can repair. Then creatures and plants dependent on the ancient woodland's moist multilayered canopies and rich ground covers, on the shelter and nurture bequeathed by its fallen patriarchs, will limp toward extinction amid the once great forest's crazy-quilt vestiges.

In Boston's Arnold Arboretum I went looking for a celebrated tree. Autumn's colors were coming on for sugar maples and golden larches and Oriental cork trees, but the tree I sought was evergreen. It had a place in history, but a precarious toehold in today's world. At last on a conifered slope I stood under the blue-green needles and spreading arms of a cedar of Lebanon, one of seven on the hill.

King Hiram of Tyre gave King Solomon the wood from the cedars that once clothed the Lebanon Mountains for building the Temple in Jerusalem. Other trees built the prospering ports and great trading fleets that made the Mediterranean a Phoenician lake.

In about four centuries Phoenicia ran out of fleets and forests, setting a pattern that would overtake Greece and Rome and nations into our own time. Though Canada and the United States are politically two nations, they are one community of interest on forestry questions. As I hope for good and prompt answers that will prevent our joining the sad recessional, I recall lines from the 104th Psalm:

The trees of the Lord are watered
abundantly,
the cedars of Lebanon which he planted.
In them the birds build their nests;
the stork has her home in the fir trees. □

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Students in Zambia Look for Acid Rain

How acid is the rain in Zambia? How does it compare with that in Japan, Missouri, and California? And how do the geography, economy, and climate of a place affect the acidity of its rain?

These are some of the questions students at the American Embassy School of Lusaka in Zambia tackled this spring as they joined students around the world in the National Geographic Kids Network.

The first step, of course, was to collect the rainwater—no simple matter in this sub-Saharan African nation, where the end of the rainy season coincided with the start of the acid rain project in April. Determination, and a few serendipitous showers, provided just enough samples.

The air around Lusaka, like that in many urban areas, is polluted by cars, buses, taxis, and minibuses, as well as by industries that emit sulfur dioxide. Prevailing winds carry pollutants from the city into surrounding open areas that are unpopulated.

The students tested their rainwater samples and discovered pH levels of 4.0 to 5.0 (5.0 or lower suggests acid precipitation). They sent their results via NGS Kids Network to the scientist for the acid rain experiment, John Miller of the National Oceanic and Atmospheric Administration in Silver Spring, Maryland. The students hypothesized that the acid rain came from industrial sources in neighboring Zimbabwe, Zaire, and Angola.

Dr. Miller sent the students a letter analyzing reports from classes in the United States, Canada, Zambia, Singapore, Indonesia, and the U.S.S.R. He added that data collected elsewhere in Africa by German scientists also showed low pH values. The scientists cited the burning of vegetation, which produces nitric acid, as a major factor.

Designed to introduce students in fourth through sixth grades to scientific methods of exploring real-world issues—such as water quality and the ecology of trash—NGS Kids Network was developed in collaboration with Technical Education Research Centers. It is funded in part by a grant from the National Science Foundation.

MARIA STENZEL, NGS STAFF

Distant Peak Challenges Geography Bee Winner

Tension was high on May 24 when *Jeopardy!* host Alex Trebek asked the final "sudden death" question of the 1990 National Geography Bee: "Mount Erebus is a volcano on which continent?"

Susannah Batko-Yovino of Altoona, Pennsylvania, and Timothy Forest of Goshen, New York, both had won their state competitions in late March and survived the preliminary rounds of the national competition. Now it was down to the second tie-breaking round of the finals.

"Antarctica," replied Susannah (above), clinching the championship and a $25,000 college scholarship. Timothy was awarded $15,000 for second place, and Martin Hohner of Chicago, Illinois, received $10,000 for third place. The Geography Bee was made possible by sponsorships from National Geographic WORLD, Amtrak, and KUDOS Snacks.

Some three million students took part in this year's competition, and contestants proved to be well-rounded individuals. Eighth grader Brian Jenkins of Malvern, Arkansas, won that state's spelling bee championship in 1989 as well as the national MATHCOUNTS competition this year. Aaron Wenger of Goshen, Kentucky, was the 1989 U. S. Junior Open Chess Champion in the under-17 division.

Of the 57 finalists, Susannah was one of only seven girls. "I think that more girls should get involved in this kind of stuff rather than in majorettes and cheerleading," she said. Her advice: "Read, read, read."

CYNTHIA HANSEN OLSEN

Specially treated paper changes color after being dipped into acidic rainwater by (from left) Aska Yamaguchi, Diane Ehlers, Teddy Tareke, and Stephen Proud, students at the American Embassy School of Lusaka in Zambia.

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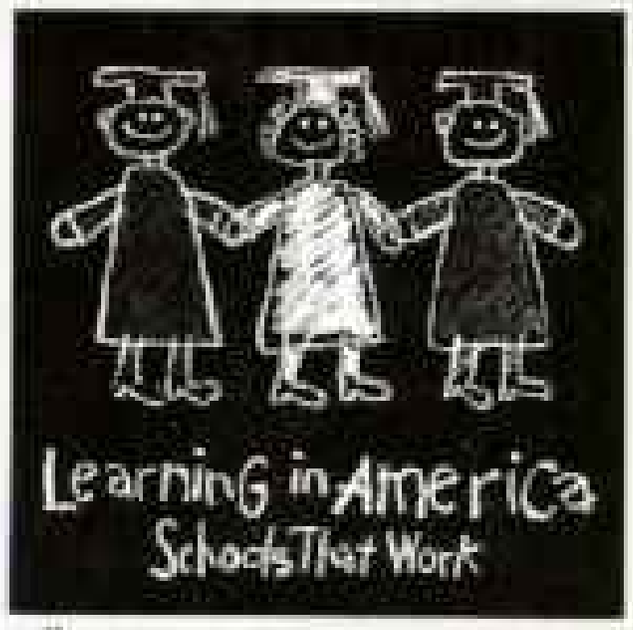

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GEOGRAPHICA

NATIONAL GEOGRAPHIC MAGAZINE

ROB WINIKER AND MIKE MADDEN

Underground Glories of the Yucatán

Not all the wonders of Mexico's Yucatán Peninsula are visible on the surface. The peninsula holds treasures that are literally underground. Mike Madden, Ron Winiker, and a team of divers have been exploring a vast network of water-filled caverns. Among them is a cave known as Nohoch Nah Chich, Giant Birdhouse (above); informally it is called the "Big One." Since mapping began in 1987, more than 43,000 feet of drowned passages have been surveyed, making this underwater cave system one of the largest in the world. Yet it is only 26 to 32 feet deep, and its entrance has an air passage with room for even beginning snorkelers.

Madden, a diving instructor, and Winiker, a retired airline pilot, photographed Nohoch Nah Chich together. And Madden has explored more than 20 underwater Yucatán cave systems, most in the vicinity of the Maya ruins at Tulum. He finds the cave entrances by diving into freshwater sinkholes formed when cave ceilings collapse.

During the last ice age, ocean levels along the Yucatán coast were lower, and the area was riddled with caverns of porous limestone. Rainwater trickled down, creating dripstone formations. When the ice age ended, the ice melted, causing groundwater levels to rise and flood the caves, preserving the formations but hiding them until now.

Fans of the Geographic in an Estonian School

When Reet Kirsis and Reet Noorlaid brought a class of 15 high school students to Washington, D. C., from the city of Tartu, Estonia, in April, one place they wanted to visit was the National Geographic Society. For the two teachers at Tartu Secondary School No. 2, NATIONAL GEOGRAPHIC has been a window to the outside world for years.

The group came to the United States in an exchange program with Georgetown Day School in Washington. Two Georgetown Day teachers took 16 of their students to Tartu in March.

"My uncle, who lives in New Zealand, gave me a gift membership in 1961, when I was a student," said Mrs. Kirsis, as she prepared to present flowers and an Estonian book of photographs to National Geographic Society officials. "He asked me what my favorite subjects were, and when I told him English and geography, he started sending me the magazine." Though sometimes interrupted—by Soviet customs seizures or by thefts from the mail—NATIONAL GEOGRAPHICS kept coming. "They are the most important books in my library," she says. "For years, they were my only source of information about the world. I use them in class and give them to my colleagues."

The Tartu school now will have new educational materials. Assistant Vice President Thomas E. Kutikosky gave Mrs. Kirsis and Mrs. Noorlaid a NATIONAL GEOGRAPHIC ATLAS OF THE WORLD and a Society wall map of the world for use in their classrooms.

Pursuit of Human Past Resumes in Ethiopia

After a lengthy hiatus, fieldwork in the study of human origins has resumed in Ethiopia, widely regarded as an area of great potential for providing clues to the puzzle of hominid evolution. An Ethiopian-led team is combining satellite imagery and work on the ground to provide a detailed guide to sites where in-depth study may pay off.

Ethiopia has been the scene of major finds of human ancestors, such as Lucy (GEOGRAPHIC, November 1985), the earliest known hominid to walk upright on two feet. But because paleoanthropology is a contentious science, with rival camps vying for access to field sites, Ethiopian authorities halted all fieldwork nearly a decade ago, saying they needed to formulate new regulations.

Meanwhile, several young Ethiopian scientists earned advanced degrees by working with leaders in the study of human origins. One of them, Berhane Asfaw, now with the Ethiopian Ministry of Culture and Sports, is head of the new team funded in part by the National Geographic Society.

TIM WHITE

The team began identifying sites for future fieldwork in 1989—"focusing on areas that might have potential," says Tim White of the University of California at Berkeley, a member of the group. And it has already found a site at Fejej, north of the Kenyan border, with what White calls a "fantastic assemblage" of stone tools 1.8 million years old (above) and similar to the tools found in Tanzania's Olduvai Gorge. "We know hominids were present at Fejej in a pretty big way because of the abundance of tools we discovered there," explains White. "It's only a matter of time before somebody finds hominid remains."

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ERNEST WEE (BELOW); RUTH ROBERTSON

A Photographic Gift of a Venezuelan Trek

By her own admission, Ruth Robertson, who is 85 years old, is "a tough old broad." And, she says, she was like that more than 40 years ago when she led the first successful overland expedition through the Venezuelan jungle to remote Angel Falls, the world's highest waterfall. She described that expedition, made on foot and via canoe, in the November 1949 GEOGRAPHIC and illustrated it with color as well as black-and-white photographs (above).

Robertson, who lives in Brazoria, Texas, is now donating those photographs and thousands of others she took in Venezuela between 1946 and 1958 to the National Library of Venezuela. During those years she did promotional work for the nation's new airline and for oil companies and also helped launch a daily newspaper.

Robertson (shown here in a 1949 photograph) first went to Venezuela after meeting some Venezuelan pilots while working as a home economics reporter for the now-defunct New York *Herald Tribune*.

"It was cold in New York; nobody was picking up the garbage. Besides, I've always been curious about what's on the other side of the mountain," she says. "I gave two weeks notice, packed my things, and left."

She decided to trek to Angel Falls after seeing it from the air, at a time when its height was unknown. "Someday someone was going to go in and measure it, and I decided it might as well be me," she says. The expedition determined its height: 3,212 feet.

When the Maya Met Spanish Colonists

The Maya are best known for the great monument-building period of their civilization. But some scholars are studying later Maya life and finding that there are many other stories to tell.

Elizabeth Graham, David Pendergast, and Grant Jones are learning how the Maya dealt with Spanish colonization. Funded in part by the National Geographic Society and combining a study of Spanish documents with archaeological excavation, they are looking at two Maya towns in Belize. In the 16th century both came under Spanish rule, which lasted until a rebellion occurred almost a century later.

The two towns, Lamanai and Tipu, were about 60 miles apart. Each added Spanish goods to the products they traded, and both were at least nominally converted to Christianity. At the same time, both towns clung to some Maya traditions, making tools, weapons, and even church-related ceramics in pre-Spanish ways, and each openly practiced pre-Columbian religious rituals after the rebellion.

But Tipu and Lamanai differed in some ways. For example, skeletal remains show that Tipu's residents suffered less from diseases such as anemia than did those of Lamanai.

Archaeology and Spanish documents provide different perspectives on the same people. "The documents tell us what the Spanish thought about the Maya," says Graham. "The artifacts tell us what the Maya themselves thought was important."

Finding a Tiny Lemur Is No Easy Task

Bernhard Meier, searching in Madagascar for a lemur some scientists feared was extinct, sat down in the jungle one night in despair. As he rested there, the very creature he was looking for leaped within a few feet of his headlamp, lingered for a moment, then disappeared into the darkness.

Meier regrouped and, with the help of guides and a dog, found a group of three hairy-eared dwarf lemurs in the dense rain forest 25 miles southwest of Mananara.

Lemurs, unique to Madagascar and a few nearby islands, are in trouble because the expansion of agriculture is destroying their forest habitat (GEOGRAPHIC, August 1988). Meier's rediscovery of *Allocebus trichotis* represented an important opportunity to study a live specimen. He captured

BERNHARD MEIER

one, photographed it, recorded its measurements, and let it go. Since then other scientists have taken two live pairs to learn even more about these unusual animals.

The hairy-eared dwarf lemur, a mouselike creature weighing about three ounces, is one of the smallest known lemurs. It was first described in 1875 by Albert Günther, who discovered a skin in a British Museum consignment. Only four other specimens—one preserved in Malagasy rum—are known to exist.

Meier, a zoologist at Germany's Ruhr University who found *Allocebus trichotis* while working on a TV documentary, hopes the attention his work has received will help save the Madagascar rain forest and the remarkable fauna that live there.

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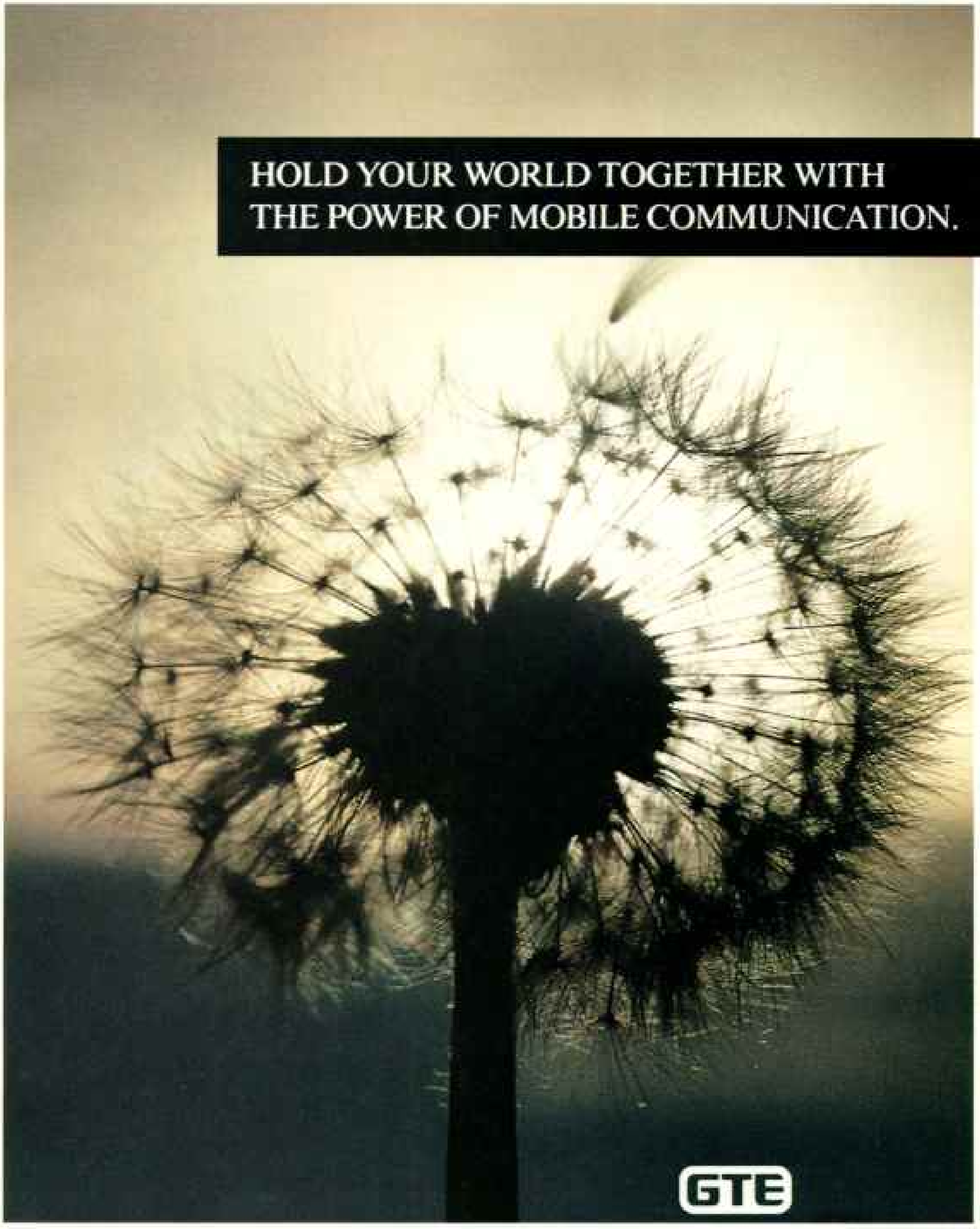

THE POWER IS ON

HARRY BURKARDT, MARROW

Heyerdahl Still Busy, on Land This Time

At 75, Thor Heyerdahl is, he says, "as active as ever, maybe a little more." The Norwegian scientist and explorer, who has sailed the world's waterways on such unlikely craft as *Kon-Tiki*, *Ra*, *Ra II*, and *Tigris*, now is coordinating excavation of a large group of pyramids near the coast of Peru. He was alerted to the site by Peruvian archaeologist Walter Alva, when the two met at a Moche tomb at Sipán (GEOGRAPHIC, October 1988).

"It was completely overlooked in the past," says Heyerdahl of the pyramid site of Tucume. "Alva asked me to organize excavations. I got the Kon-Tiki Museum in Oslo to fund the project, with the approval of Peruvian authorities."

With Alfredo Narvaez, chief resident Peruvian archaeologist at Tucume, Heyerdahl and his crew have uncovered buried walls in a residential area. They also found that the inhabitants were active traders, with an emphasis on fishing and sea-related products. Artifacts found so far date from the 12th century, but Heyerdahl expects to unearth much older material eventually.

Meanwhile Heyerdahl has written a book about his work on Easter Island. He claims that the first settlers on the Pacific island—with its mysterious stone statues (left)—came from South America, not from Polynesia as most experts say. But their opinions don't faze him. "The real experts are those who worked there with me," he says.

A National Park on Great Blasket

A tiny community of fishermen and their families once lived the most basic of lives on windswept Great Blasket Island, two miles off the tip of Ireland's Dingle Peninsula (GEOGRAPHIC, April 1976). Because islanders spoke the ancient Irish language and kept the old ways, many intellectuals went there to study their folklore in the early 20th century. Those visitors inspired islanders to set down their life stories, and the result was several vivid portraits of island ways, the best known being Maurice O'Sullivan's *Twenty Years A-Growing*. All have been translated into English.

Great Blasket's population dwindled, and the government moved the last residents off the island in 1953. Now, under the prodding of a group from the Dingle Peninsula called the Blasket Island Foundation, the Irish Parliament plans to preserve the outpost as a national historic park. The government hopes to purchase most of the island, restore a dozen homes to look as they did in the 1930s, erect a visitors center on the mainland, and license regular ferry service.

"We would prefer not to have more than 300 people at a time on the island, and only basic facilities—a café and maybe a hostel for overnight stays," says Micheál Kennedy, the foundation's secretary. "We want to keep the character of the place."

JAIME ABASOLO, THE SLIDE FILE

Franklin Saga Deaths: A Mystery Solved?

It has always been thought that the 129 members of Sir John Franklin's fateful 1845 voyage in search of the Northwest Passage died because of a combination of starvation, scurvy, and bad luck.

But the primary cause may have been much more prosaic: lead in the solder used to seal their food tins.

NGS CARTOGRAPHIC DIVISION

A study of the bones of Franklin's sailors found on Canada's King William Island and of the bodies of three others from Beechey Island shows that their remains contained higher than normal levels of lead. The chemical composition of lead varies according to its source. The study showed that the lead found in the skeletons came from a single source and that it matched lead in the solder used to seal food tins found in a Beechey Island cache.

Owen Beattie, an anthropologist at the University of Alberta, participated in the study. If the lead didn't kill the men, Beattie says, it probably affected their judgment, leading to poor decisions that contributed to the death of the entire crew.

Franklin's voyage, its tragic end, and the long search for clues to its fate formed one of the great sagas of Arctic discovery (GEOGRAPHIC, August 1990). Ironically, Beattie notes, the invention of tinned food in 1810 made such long voyages of exploration possible. But the toxicity of lead was not recognized until the 1880s, when new methods of sealing food tins were devised.

Suggestions for GEOGRAPHICA may be submitted to Boris Weintraub, National Geographic Magazine, Box 37357, Washington, D. C. 20036, and should include the sender's address and telephone number.

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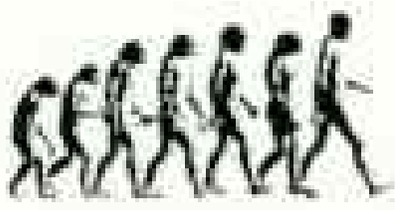

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FORUM

California Earthquake

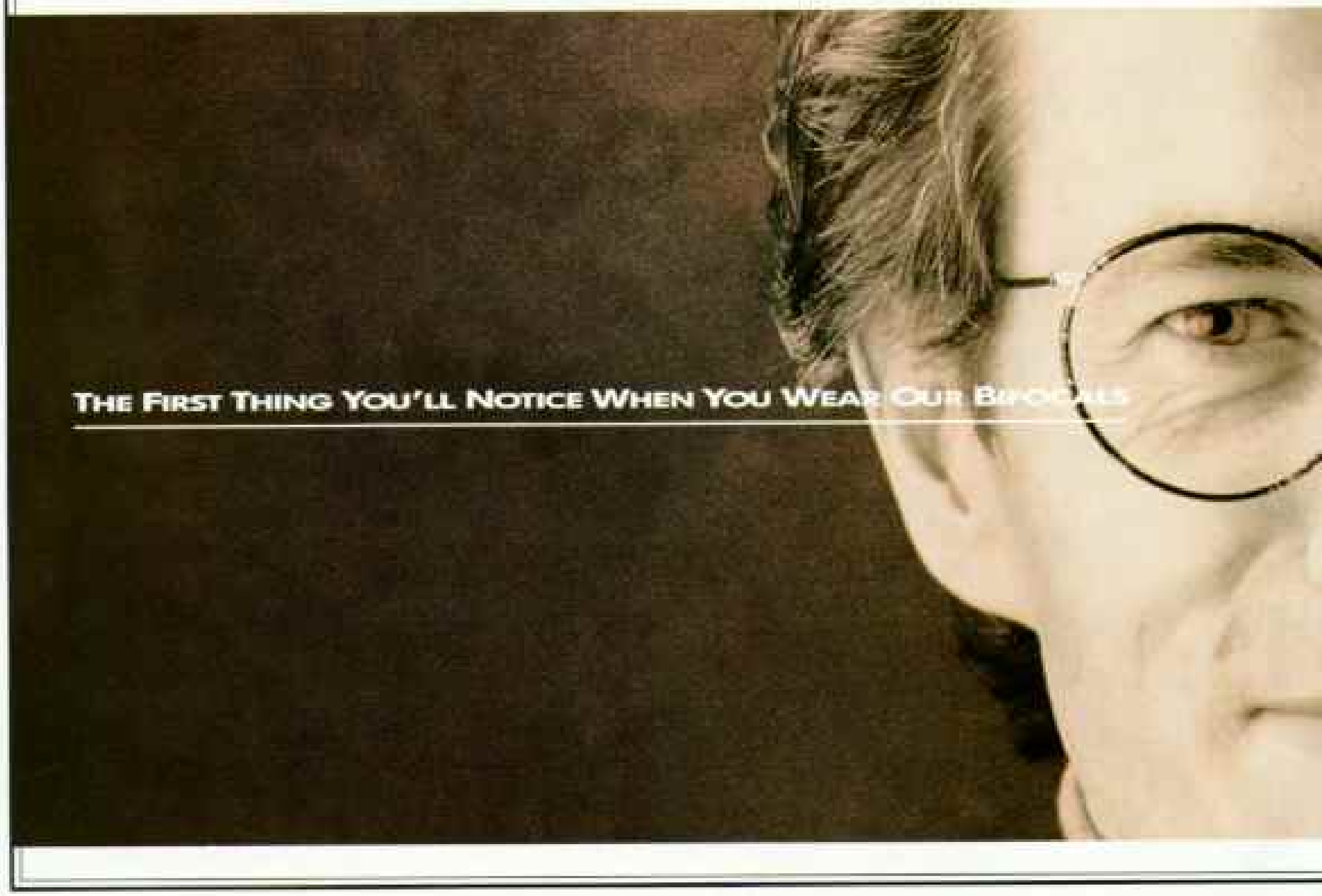
Your excellent, magnificently illustrated article on "Prelude to the Big One" (May 1990) was sadly prophetic. A major swarm of moderate shocks again disrupted life for Watsonville area residents. TV showed a frustrated Mayor Art Agnos of San Francisco lashing out at the geotechnical community as if they were the culprits. Okay, shoot the messenger.

You touched upon but did not emphasize the fact that San Francisco and nearby cities have had all the technical information needed to select safe sites and build safe structures for over 50 years. While major buildings have been made earthquake resistant and the California Legislature has required inspection and reinforcement of public buildings, that is not where people live. As available land has been consumed, submarginal sites have been approved and developed; witness the tight clusters of housing on the actual trace of the San Andreas Fault. Tens of thousands of people are living in unsafe buildings on unsafe ground.

WILLIAM A. BREWER
Olympia, Washington

Yes, errors in design or construction lead to catastrophic failure, as dramatized in this stress test at Failure Analysis Associates in Menlo Park, California. Unreinforced concrete, subjected to high stress, explodes. Such dramatic disintegration occurs during a major earthquake in many unreinforced or poorly designed concrete structures. Properly designed structures, subjected to the same extreme loading conditions, deform and crack extensively before failure. JAMES A. SUGAR, BLACK STAR

The University of California, Santa Cruz, although near the epicenter of the October 17 earthquake, sustained minimal damage. The campus was constructed during the 1960s with careful adherence to building codes, so damage was mainly broken windows. Students and faculty followed instructions in vacating buildings and gathered in a nearby meadow. Our daughter was able to telephone us from her dorm within hours, at a time when the TV newscaster said communications with Santa Cruz were entirely out. UC should be



commended as a good example of the importance of being prepared.

INGELISE L. LANMAN
Kadena Air Base, Okinawa

In Monterey damage was light, thanks to the granite beneath our small peninsula. While I had the foresight to have a geologic inspection for the house I purchased, I did not have the insight to purchase earthquake insurance. Even though I only lost an old water heater, it was enough for me to order that insurance for the coming big one.

ROGER DENK
Monterey, California

East Harlem

Kudos to Jere Van Dyk for an insightful, poignant report about a reality of which many of us are unaware (May 1990). The picture painted is a careful balance of negative and positive. The article depicts the hope and pride of barrio life.

BARBARA W. BAILEY
Fairfax, Virginia

As a former teacher at the Manhattan Center for Science and Mathematics (page 70), I would point out the extraordinary efforts of former principal Coleman Genn, who converted failing Benjamin Franklin High into the magnet school through tireless work. I acknowledge the assistance of IBM and GE, but the applause must go to Genn and a staff of caring, dedicated teachers.

STORI MACPHEE
New York, New York

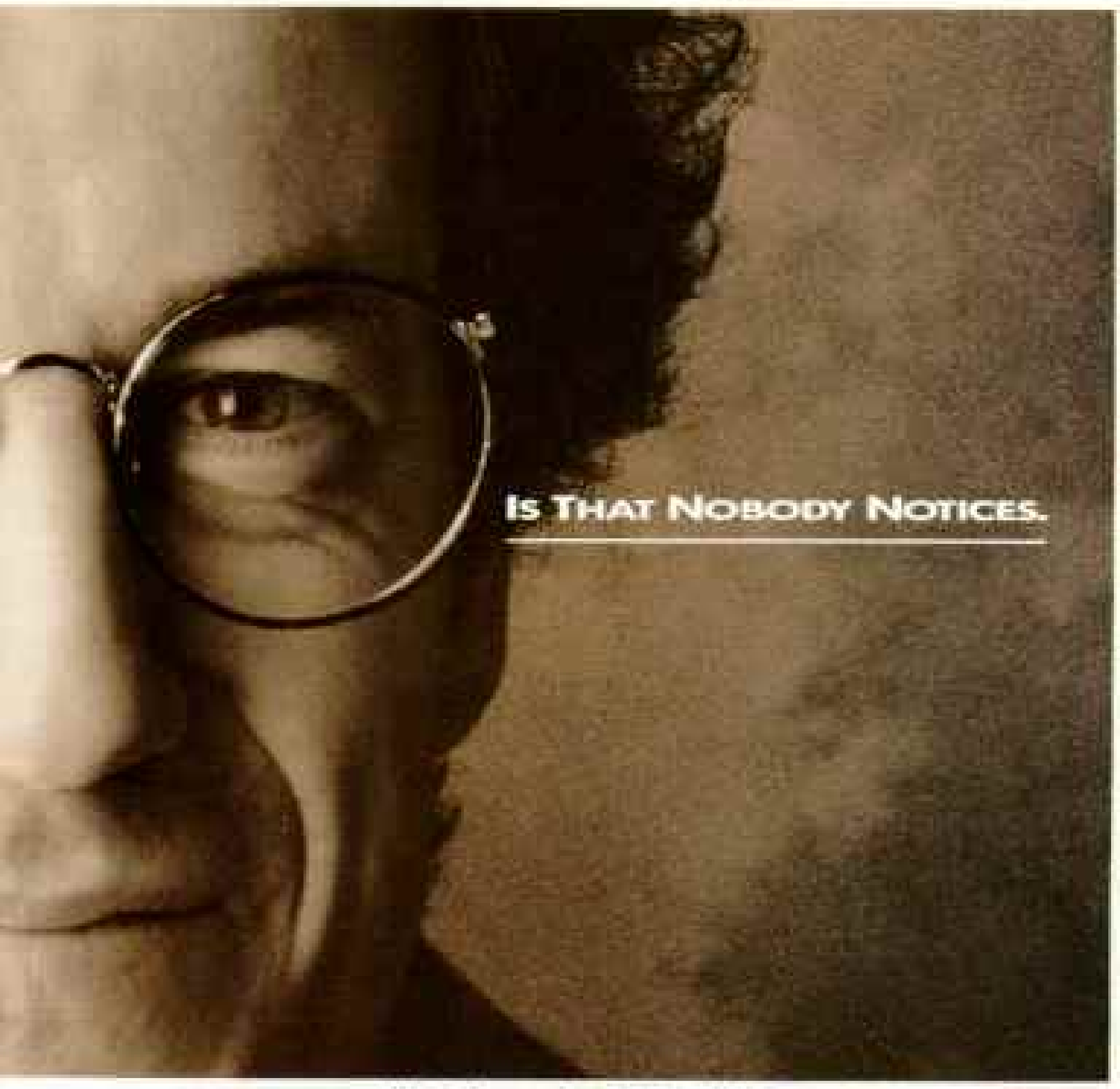
The article reads like growing up in the worst days of Dodge City. The overall tone is one of near-total despair. The large buildings (pages 52-3 and page 68) are, by the way, the 1,600-family, low-to-moderate-income cooperative, Franklin Plaza, where hardworking people are making it in very normal occupations.

WILLIAM ARTIS, JR.
New York, New York

Maria Penton on page 68 ignored the fact that most of the adults in East Harlem are either working part- or full-time, and that a large percentage of East Harlem welfare recipients are in fact part-time workers.

JAMES VERNON JENNINGS
Baltimore, Maryland

To think that the rooftop from which pigeon fancier Tany Davila surveys el barrio is where I flew kites as a boy more than 50 years ago. There were no high-rise projects, but drugs were already on the scene, as was the mob. Vincent "Mad Dog" Coll once drove down 107th Street spraying unsuspecting pedestrians with his tommy gun. The real horror, though, was the Depression. The most



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pitiful sight was a family's belongings piled on the sidewalk after eviction for nonpayment of rent.

James L. Giorgi
Bronx, New York

As a member since 1947, I have seldom read a better or more realistic article. It faces the evils of the environment head-on. But it also gives the pluses.

George A. Johnson
Chapel Hill, North Carolina

I applaud your attempt in this article and others to make us aware of the socioeconomic conditions of all Americans.

Kate Land
Hercules, California

Grand Trunk Road

I followed Harvey Arden on the map on his trip through India (May 1990). What a wonderfully human, humane, and humorous article. I learned more about the people of India, their religions, and their history in a few pages than I could in a book.

Woodrow H. Wilson
Muskogee, Oklahoma

Arden wrote that he could not find the memorial to British victims of the 1857 war of independence. Cannot the writer of any subject on India stray away from the pet subject of the British raj, which for most Indians was a period of great repression,

pain, and humiliation? He could concentrate on some more important issue or subject.

SURAJ ANAND
Derby, Derbyshire

Not only did the article give an absorbing account of an exotic journey, but it also helped show that the Hare Krishna devotees are a bona fide part of one of the largest and oldest religions in the world, Hinduism.

DWIGHT BRANNON
Kemp, Texas

Senior Writer Harvey Arden captured the humor and contrasts so prevalent in India; Raghubir Singh—and Tony Heiderer in the companion article—took superb photographs. India is a rich mine for skilled wordsmiths, but your staff proved to be the best of the best.

BRUCE B. BROWN
Dhahran, Saudi Arabia

Lake Malawi Fish

The same plasticity that has allowed many cichlid species to exploit diverse niches in their natural habitat (May 1990) also allows them to replace native fish if they are introduced into aquatic ecosystems elsewhere. Numerous examples of such feral populations exist worldwide. Indeed some African lake cichlids are themselves under threat of extinction due to introduced fish species. This

or pull it with this, forget it.

Ah, the family trip. What a moving experience. Things can get emotional just packing up. Before you know it, you're sobbing uncontrollably into that sleeping bag that won't fit.

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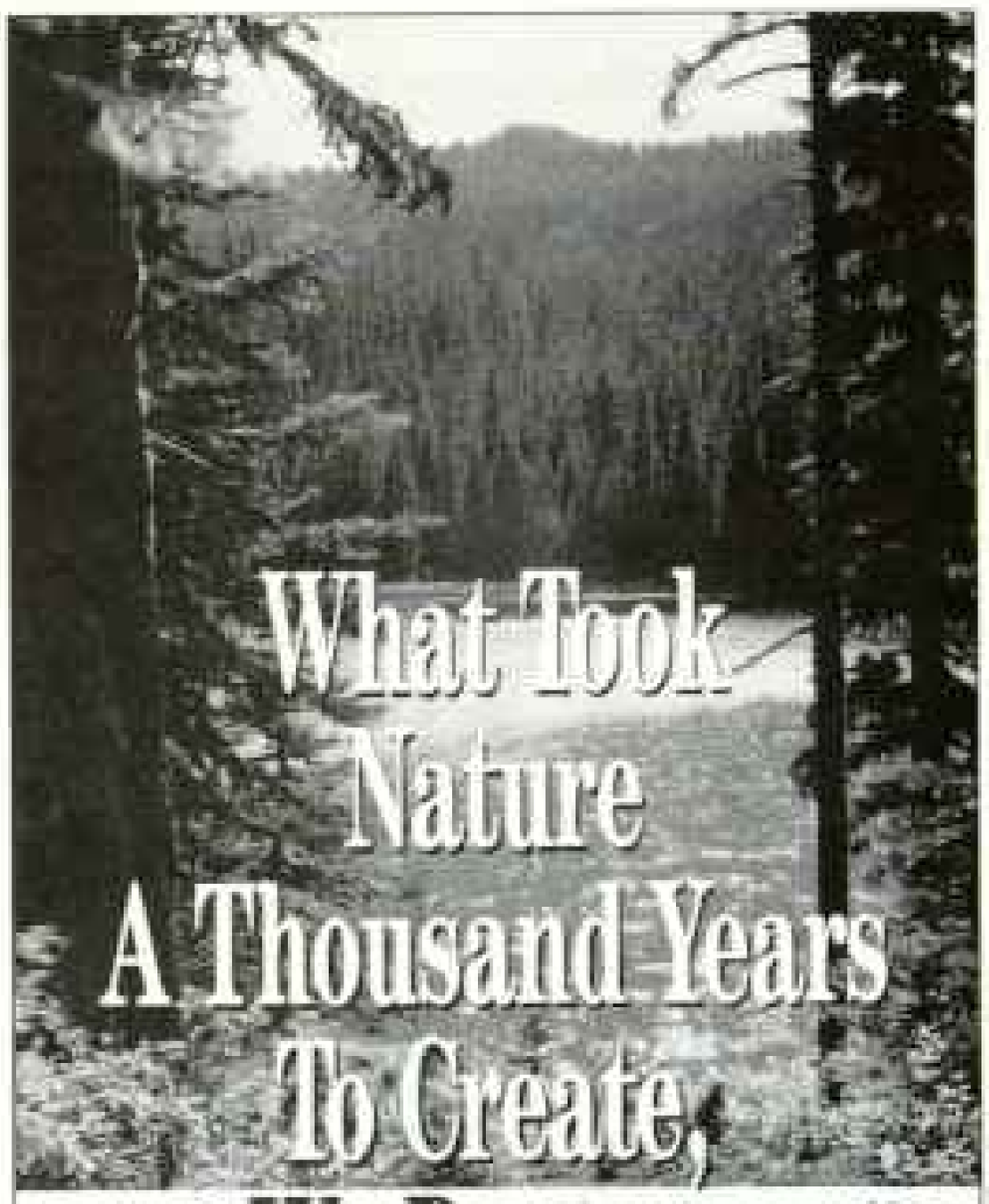
It's really the only civilized way to take everyone and everything, everywhere. By the way, if you're out on a quick run without all the gear, it's fun to sing those awful camp songs and listen to the echo.

Dodge

Advantage: Dodge.

*Ram Wagons are covered by 3/70 as well as dirt, dust, and bugs if you really get into the boonies. See this limited powertrain warranty and its restrictions at your dealer. *Of course, when we talk about the towing we mean when properly equipped. And all of this is reduced by the number of happy campers, options, and cargo weight. Buckle up for safety. Leave a clean campsite.*

Ram Wagon



This ancient forest was standing tall long before the voyage of Columbus. Majestic trees like these could be found across the continent. Now they are reduced almost exclusively to small scattered pockets on public lands in a few states in the Pacific Northwest. Once cut, they can never be replaced. Never.

During the next few months, the White House and the Congress will be deciding on the fate of most of the remaining old-growth forests in the U.S. Now is the time for Americans to speak out against the senseless destruction of one of our most priceless natural resources. If the cutting does not stop, in a few years, most of the remaining ancient forests will have vanished forever.

Our ancient forests provide clean air, fresh water, and natural habitat for many rare wildlife species. Can human-kind afford to ignore these vital interests?

The Wilderness Society believes that the short-term gains of the timber industry should not supersede the long-term interests of the American people. Please join our dedicated team of ecologists, economists, and foresters in waging this crucial battle. For more information, or to send a tax-deductible contribution to our Ancient Forest Protection Campaign, write to The Wilderness Society today.

The Wilderness Society, 900 17th Street, N.W., Washington, D.C. 20006.
A non-profit membership organization.

article could encourage the public to introduce these fish outside their native range. They disrupt the existing biological system and, unlike other forms of pollution, can reproduce and remain forever. The ill-informed action of one person can result in the establishment of an unwanted species, such as carp in Australia's Murray River system.

R. K. Lewis, *Director*
South Australian Department of Fisheries, Adelaide

Great Rift Valley

I enjoyed the article on the African Rift (May 1990), but having spent time in Zaire, I wonder why you used the colonial names for Lakes Idi Amin (Edward) and Mobuto (Albert). The new names are those given the lakes by local nationals.

Fred E. Hahn
York, Pennsylvania

The GEOGRAPHIC usually uses the conventional names recognized by the U. S. Board on Geographic Names.

The spread on pages 6-7 has to be one of the most clever photographs I have seen in a long time. It reflects artistic merit and the elusive goal of photographing something common in an unusual way.

Todd Siders
Berkeley, California

President's Page

As Australians we were interested in the report on Bob Brown, who campaigned against damming the Franklin River in Tasmania and is still raising issues of environmental protection. However, it was not the Australian government that planned to build the dam but the Hydro Electric Commission of Tasmania, a powerful force in state politics. The federal government strongly opposed the scheme and used its powers to prevent construction by nominating the area for the World Heritage List.

G. W. Collett
Sydney, New South Wales

Geographica

The article about the Côte d'Ivoire church would have been more relevant if it had expounded on the circumstances surrounding its creation on the whim of Félix Houphouët-Boigny, whose title of president would more correctly be dictator. It seems the nation's resources were squandered on self-gratification, especially since only 12 percent of the citizens, as stated, are Roman Catholic.

Colin Stedman
Perth, West Australia

Letters should be addressed to 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.

If you were leaving home to start a new life, what would you take with you?

Photo courtesy of National Park Service.

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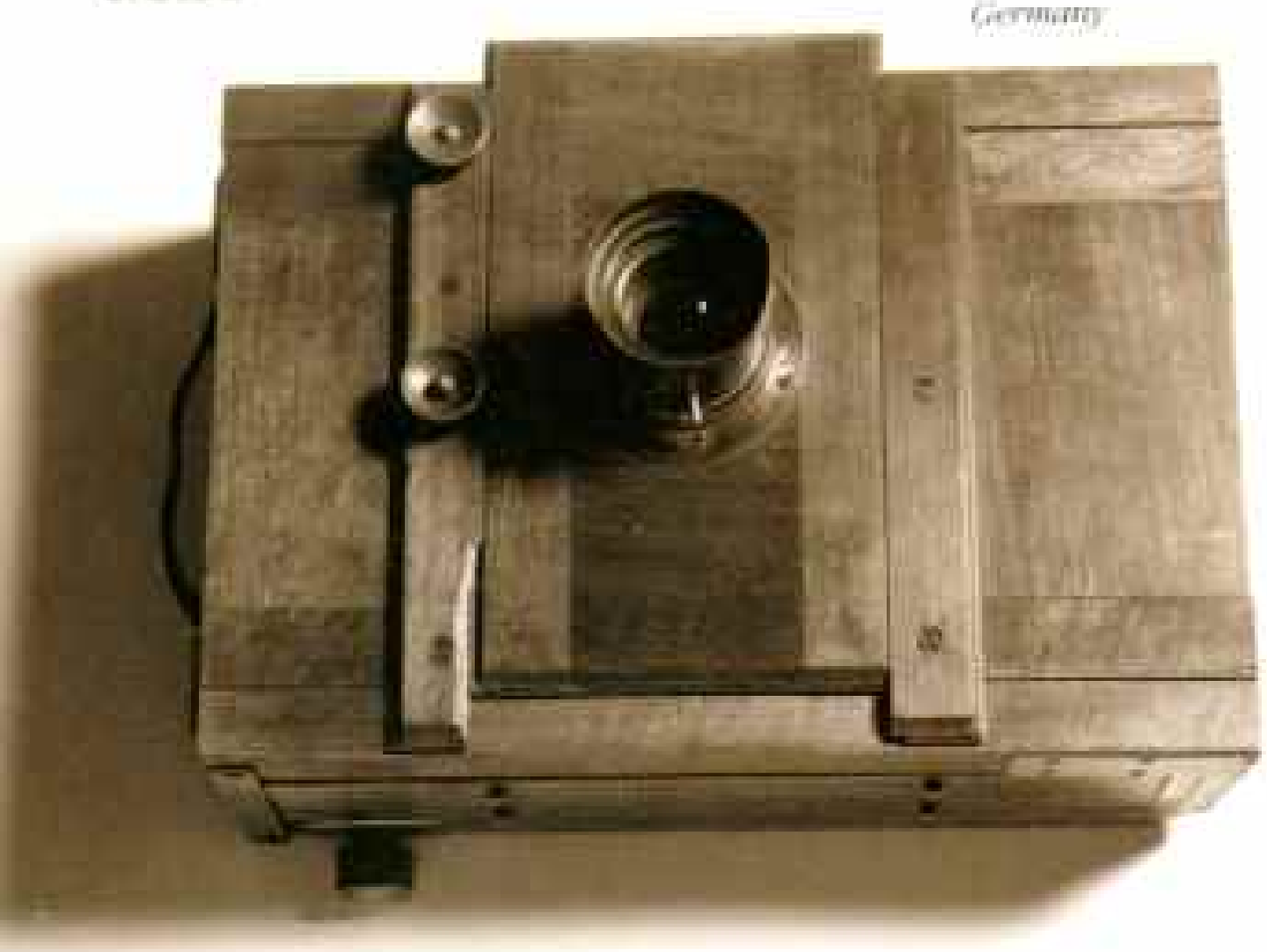
1892 - 1992



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THE KISS OF DEATH?

We now import more than 40 percent of all the oil we use, and that percentage continues to grow. This excessive dependence on foreign oil could poison America's economy and our national security if our supply were ever disrupted.

But the more we use nuclear energy, instead of imported oil, to generate our electricity, the less we have to depend on uncertain foreign oil supplies. America's 112 nuclear electric plants already have cut foreign oil dependence by 4 billion barrels since the oil embargo of 1973, saving us $115 billion in foreign oil payments.

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Importing so much oil is a danger America must avoid. We need to rely more on energy sources we can count on, like nuclear energy.

For a free booklet on nuclear energy, write to the U.S. Council for Energy Awareness, P.O. Box 66080, Dept. SK04, Washington, D.C. 20035.

U.S. COUNCIL FOR ENERGY AWARENESS

Nuclear energy means more energy independence.

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WILDLIFE AS CANON SEES IT

Baird's Tapir
Genus: *Tapirus*
Species: *bairdi*
Adult size: Length, 200cm; height, 120cm
Adult weight: Up to 300kg
Habitat: Varies from woodlands to rain forests in Mexico and Central and South America
Surviving number: Unknown
Photographed by Patricio Robles Gil

Barely visible among the leafy shadows, a Baird's tapir basks in a cool, tropical river. The tapir is solitary and primarily nocturnal, foraging for leaves and fruits in the safety of darkness. The Baird's tapir has disappeared from much of its former range. As trees are cut, the tapir retreats to undisturbed areas, but it remains seriously threatened by continuing habitat destruction and hunting. To save endangered species, it is essential to protect their habitats and understand the vital role of each species within the earth's ecosystems. Color images, with their unique ability to reach people, can help promote a greater awareness and understanding of the Baird's tapir and our entire wildlife heritage.

Canon

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Can a bat really help save the world?

Believe it or not, yes.

Because in addition to controlling vast numbers of insect pests and pollinating many of the world's most valuable plants, bats are responsible for up to 95% of the seed dispersal essential to regeneration of tropical rain forests.

And without rain forests, the world's entire ecological balance would be destroyed.

However, due to people's fears and misconceptions, bats are being randomly and brutally exterminated. Many valuable species are endangered or already extinct.

Bat Conservation International (BCI) was founded to educate people worldwide about these intelligent, useful mammals. As a result, many important bat populations have been protected. But much more needs to be done. And BCI needs additional funding to implement many of its conservation projects.

Please help BCI by becoming a member and making a donation. (As a BCI member you'll receive our quarterly publication, *Bats*.)

Please send your check or money order as soon as possible.

The bats' survival—and possibly your grandchildren's—depends on it.

Bat Conservation International
P.O. Box 162603, Austin, TX 78716
Telephone: 512-327-9721

FROM THE EDITOR

Old-Growth Forests: The Good News and the Bad

THIS YEAR Yosemite and Sequoia National Parks both celebrate their 100th birthdays, events intimately connected with the Society's own history. As early as May 1899, nine years after the parks were born, we ran our first story on the redwoods, citing wholesale logging of irreplaceable groves. Seventeen years later the National Geographic Society contributed $20,000 toward their protection, then a substantial sum, when a congressional appropriation for the redwoods had fallen short of the goal. In the 1960s the Society participated in a successful campaign to establish Redwood National Park in California, preserving additional stands of the great trees for all time.

Yet today the redwoods and other old trees continue to fall to the chain saw, a disturbing fact reported by Assistant Editor Rowe Findley and staff photographer James P. Blair in the article starting on page 106, "Will We Save Our Own?"

Now and then someone asks, "How can you preach conservation when the NATIONAL GEOGRAPHIC magazine consumes hundreds of tons of paper a month?" The answer is it doesn't: it consumes *thousands* of tons a month—4,500 tons per issue, or 54,000 tons of paper a year. That adds up to 783,000 medium-size trees—about 1,800 acres of forest.

The good news is that none of that forest is virgin timber. NATIONAL GEOGRAPHIC paper comes either from tree farms or from second- and third-growth stands that are commercially owned and managed.

In fact, our country's overall timber supplies are in good shape. We have more wooded acres in the eastern United States, for example, than existed a century ago. With new and enlightened forestry techniques we can continue to have ample supplies of wood as well as sustained work in the woods.

What we can't have is the destruction of priceless old-growth forests that support unique plant and animal life and that, once cut, can never be replaced.

The stakes are literally as high as the redwoods.

Wilbur Garrett

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Today America has over 20% *more* trees than it had just twenty years ago. And the numbers are growing daily, with trees being replenished faster than they are harvested in every region of the country.

Thanks, in part, to private landowners and America's forest products companies, who plant over 6,000,000 trees a day, reseed entire forests, and use other forest management techniques to promote natural regrowth.

We're determined to keep up with the growing demand for wood and paper products. And to make sure our forests are a continuing source of joy for every American.

To learn more about the future of America's forests, write: American Forest Council, 1250 Connecticut Avenue, N.W., Washington, DC 20036. Or call **1-800-648-6699.**

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Earth Almanac

NATIONAL GEOGRAPHIC MAGAZINE SEPTEMBER 1990

India's Giant Water Project Continues

The end of the monsoons in October will bring renewed activity in central India on what could be the largest water project in history.

Construction of 30 major dams and scores of lesser ones along the 800-mile-long Narmada River and 41 of its tributaries will submerge perhaps a million acres and displace a million people. By comparison, the Tennessee Valley Authority flooded 650,000 acres and displaced some 70,000 residents.

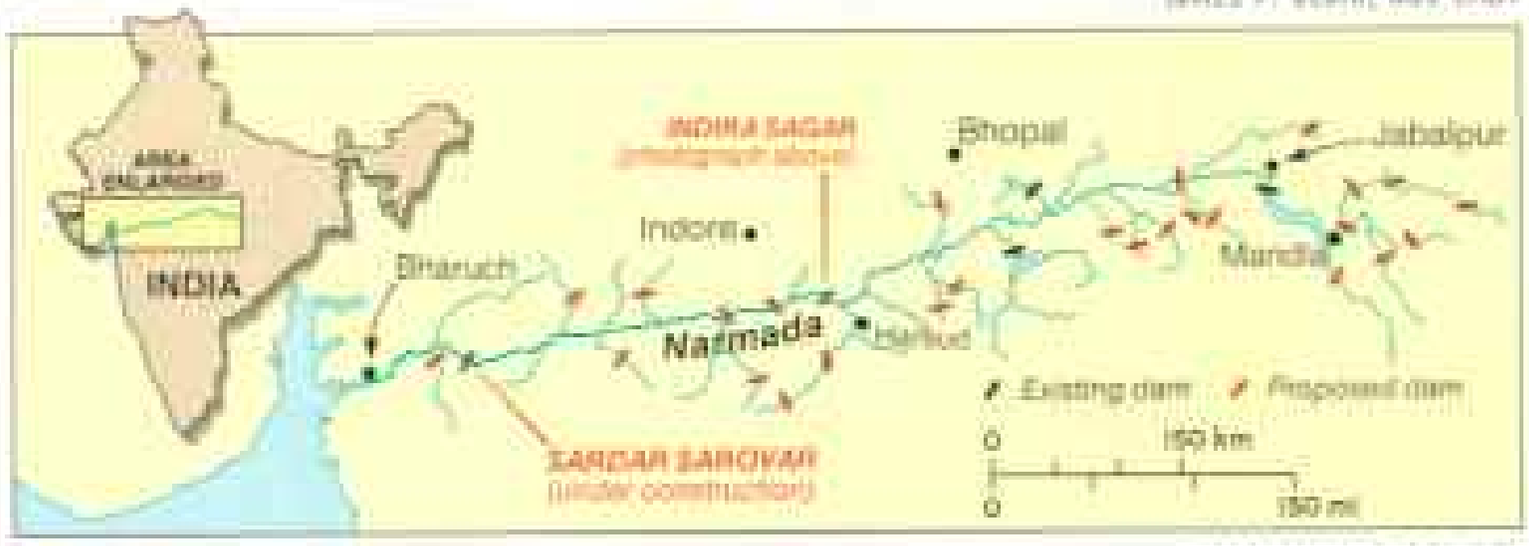
Impoundment will provide drinking water, irrigation for parched lands, and electricity for industrial development.

Critics object to the displacement of villagers by dams such as the Indira Sagar, whose site is studied here by engineers. One of the larger structures, it will create a huge man-made lake, engulfing 225,000 acres.

"Dams can diminish rather than enhance agricultural production by causing salinization and waterlogging of soils," according to the Environmental Defense Fund of Washington, D.C., which joined Indian groups in opposing the Narmada River project. "We also oppose moving villagers without a proper resettlement plan."

The World Bank already has committed 450 million dollars toward another large dam, two-billion-dollar Sardar Sarovar, and says funding will continue, despite demonstrations that at one point blocked a highway for two days. "We're sensitive to the protests," said a bank officer, "but we see no alternative to this plan, which could help feed millions of people in India."

JAMES P. BLAIR, NGS STAFF



NGS CARTOGRAPHIC DIVISION

Can El Lobo Make a Comeback?

The call of the wild may echo again through Texas and New Mexico if plans to reintroduce the Mexican wolf, *Canis lupus baileyi*, find approval. *El lobo* in Spanish, this smaller cousin of the timber wolf of northern North America ranged over Mexico and the American Southwest a century ago. Like wolves elsewhere, it was shot and trapped as a threat to livestock. Only a few may still roam the Sierra Madre in northern Mexico, and fewer than 50 live in captivity.

In a pilot project the United States Fish and Wildlife Service plans to release several pairs of Mexican wolves on the White Sands Missile Range in New Mexico, if an agreement can be worked out with military officials. The Mexican Wolf Coalition of Texas, in Richardson, has suggested additional releases in Big Bend National Park along the Rio Grande, an idea opposed by livestock and hunting interests outside the park. Wolf supporters say objections from both groups can be minimized by controlling the wolf population and by compensating stockmen for losses. Such reintroduction efforts have increased since the successful release of captive red wolves in North Carolina.

STEPHEN J. KRASEMANN, PETER ARNOLD, INC.

Nonburnable Boom Corrals Marine Oil Spills

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Cleaning up oil with skimmer boats is preferable to burning it off, say engineers of 3M, the company that developed the boom. But in large spills and in the absence of skimmers, damage to wildlife and the environment may be prevented by quickly concentrating petroleum so that it can be ignited.

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"Blue Planet": A Distant View of Earth's Problems

"We wanted to share the special feelings astronauts have when they look at earth from outer space," said Marine Col. James Buchli, who was one of the space shuttle crew members to handle a large IMAX camera recording images for the film "Blue Planet."

Scheduled for release in late October, the motion picture will play on super-size screens at close to 70 IMAX theaters around the world. "It comes as close as you can get to pressing your nose against the window in the spacecraft," says Buchli.

Views may include this topside look at a circular storm system as a satellite is being deployed from *Discovery*'s cargo bay. Shuttle crews also saw troubling panoramas of man-made impact, such as plumes of agricultural runoff stretching hundreds of miles out to sea, vast blankets of fossil fuel emissions, and fires eating away tropical forests.

"Blue Planet," produced by the Smithsonian Institution in cooperation with NASA, focuses on environmental problems seen from space and on ground-based views of human activities that cause them. "I grew up in North Dakota, and I always cared about the environment," said Colonel Buchli. "Seeing the earth from space makes you want to save what we have."

IMAX SPACE TECHNOLOGY INC. (ABOVE); JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY, ILLUSTRATION BY P. GALAIS (BELOW)

CHRIS CALDWELL, NATURAL RESOURCES DEFENSE COUNCIL

California Voters Weigh Big Environmental Plan

The most extensive environmental restrictions ever considered by American voters will appear on the California ballot in November. Supporters claim that victory for the Environmental Protection Initiative of 1990, known as the Big Green, could spur the entire nation into significant action against pollution and depletion of natural resources. Opponents say it will mean higher prices, loss of jobs, and unnecessary hardship on the poor.

The 15,000-word initiative calls for a 20 percent reduction in carbon dioxide emissions by the year 2000 and a 40 percent reduction by 2010, restrictions that may affect this electrical power plant in Morro Bay. It also decrees a phaseout by 1996 of hazardous pesticides believed to cause cancer and a phaseout of ozone-depleting chemicals by 1997. The proposal includes the preservation of old-growth redwoods, prohibits off-shore oil drilling within three miles of the coast, and requires sewage treatment plants to meet federal Clean Water Act standards. Enforcement would be handled by an elected Environmental Advocate, who could impose fines on violators.

In the voting booth Californians will confront a ballot crowded with business-sponsored counterproposals. The agricultural industry seeks further studies of pesticides rather than a total ban, an initiative that would nullify the pesticide portion of Big Green. "It's going to be incredibly confusing for voters," said an observer.

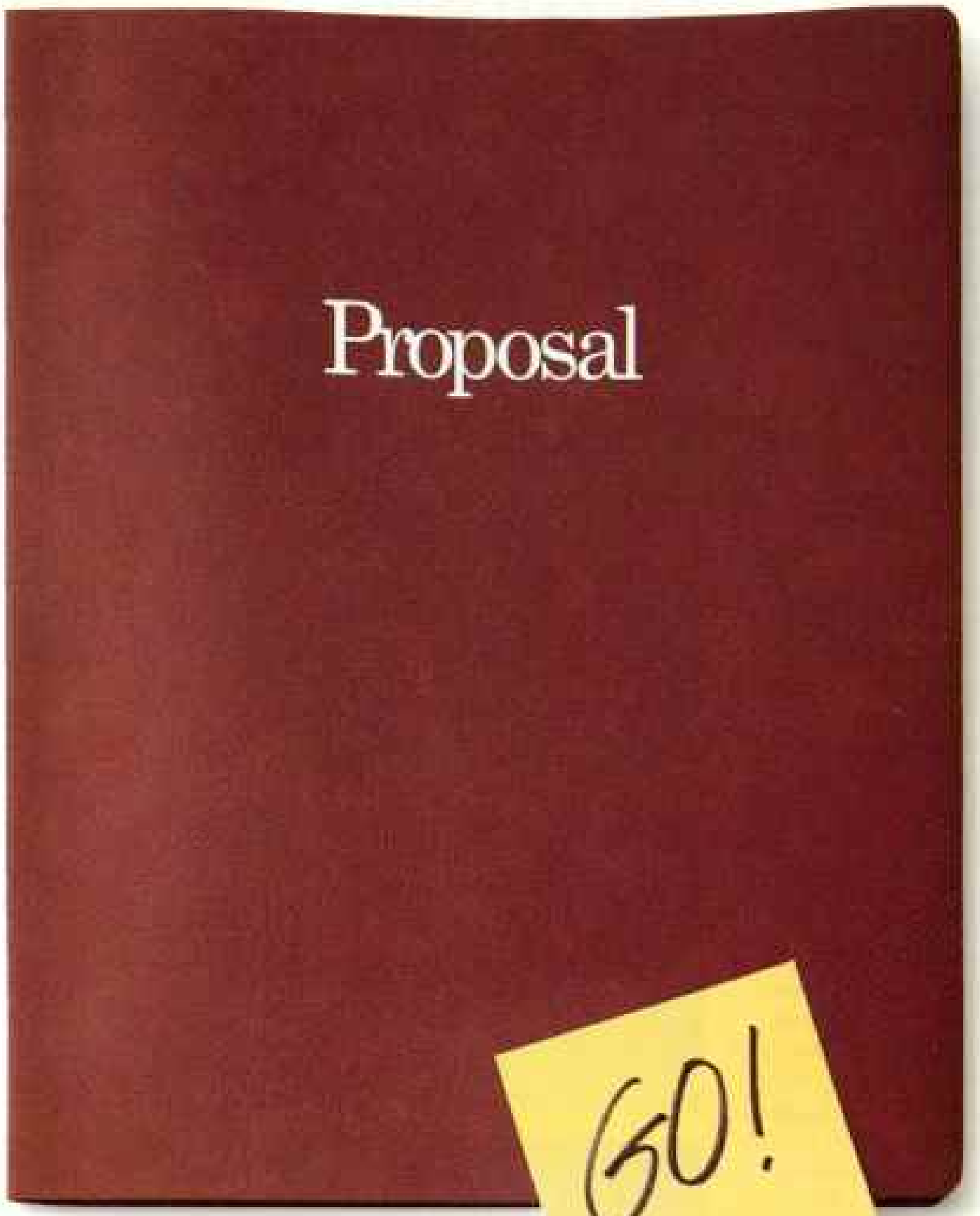
Even if the environmental initiative becomes California law, court tests of its constitutionality and lawsuits could tie it up for years. Proposition 65, approved in 1986, requires warnings on products containing toxic substances, but implementation is only now beginning to take place.

Solar Sails Will Power Ships to a New World

Much as the wind pushed caravels to the Americas, the sun will push a fleet of spaceships to Mars in an international race to be launched for the 1992 quincentennial of Columbus's historic voyage.

Scientists say the project promotes solar energy. Such a clean and economical propulsion system could ferry supplies to future planetary stations.

After rockets put the racers into orbit, synthetic sails larger than football fields and thinner than plastic wrap will unfurl, as in this Johns Hopkins University design. Photons, or light particles, from the sun will propel the sails and their payloads, including TV cameras. Weighing as much as half a ton, the craft will attain speeds of 70,000 miles an hour to reach Mars in perhaps 500 days. By sending radio signals to solar-powered mechanisms, ground controllers can steer the ships by adjusting the sails, even tacking laterally to the sun. The U.S., Canada, Great Britain, Italy, China, Japan, and the U.S.S.R. have sent entries to the race's sponsors, the Christopher Columbus Quincentenary Jubilee Commission in Washington, D. C.



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On Assignment

THE CATACLYSMIC ERUPTION of Mount St. Helens ten years ago sheared 200 square miles of forests, and Assistant Editor ROWE FINDLEY was there, assessing the destructive swath across the Pacific Northwest (see January and December 1981 NATIONAL GEOGRAPHICS). For this issue he traveled the West Coast from California to Alaska to assess remaining old-growth forests. He returned with a startling realization: "The destruction by clear-cutting exceeds Mount St. Helens by many magnitudes."

Rowe found the conservation question clouded by miscommunication—for example, this yellow sign by a clearing in Sequoia National Forest: "People supposed it meant the grove was protected. When all but the biggest trees were cut on tracts like this one, there was a public outcry."

Feeling like an old tree himself after 31 years with the GEOGRAPHIC, Rowe has reported on communications satellites, balloon research, and the American Southwest, his first love. He has traveled most of the Colorado River by raft, jet boat, aircraft, or horseback.

Covering Scotland in 1983, Rowe interviewed a man professing to be the Loch Ness monster—in human form. "My big question," said Rowe, "was why, in view of the centuries of speculation about the monster's existence, he'd been so reluctant to make a definitive appearance—in his monster form? He countered with a question: 'In view of mankind's habit of going for the spear or rifle or grenade upon sighting a strange life-form, would you be eager to make a definitive appearance?' "

GEOGRAPHIC photographer JAMES P. BLAIR, veteran of 43 articles during the past three decades, brought a special perspective to this month's assignment. He had already photographed dwindling tropical rain forests (January 1983), and now he focused on the last of the old-growth woodlands along the Pacific coast. "In both cases I had a sense of loss," he said.

MARTIN LITTON (TOP); JOHN A. ZUBKOFF, BOB STARR

"There's a feeling of death in seeing the great trees fall, of losing something forever." Here he and photographic technician Joseph S. Stancampiano photograph logger Chet Hunt in Washington State.

Jim finished the assignment convinced that the best hope for the remaining old growth would be a moratorium on cutting to permit a long-term perspective on the problem. "John Muir wrote that 'the clearest way into the Universe is through a forest wilderness.' " Jim said. "Let's not make it read 'through a clear-cut.' "

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