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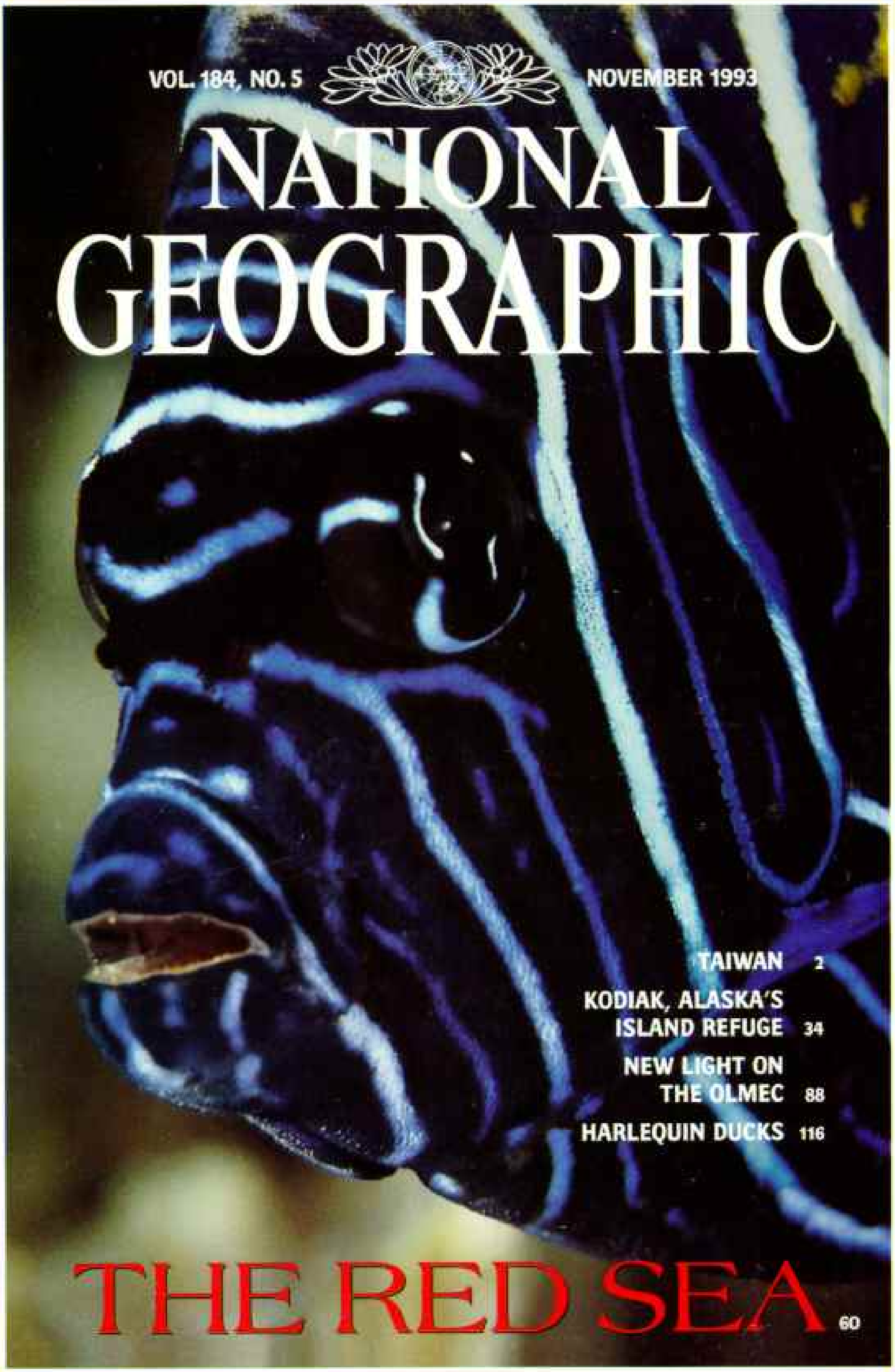

SEE "THE POWER OF WATER" WEDNESDAY, NOVEMBER 10, ON PBS TV

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COVER: Bold white stripes of a juvenile emperor angelfish will turn to gold when this Red Sea reef dweller reaches adulthood. Photograph by David Doubilet.

The Other China Changes Course

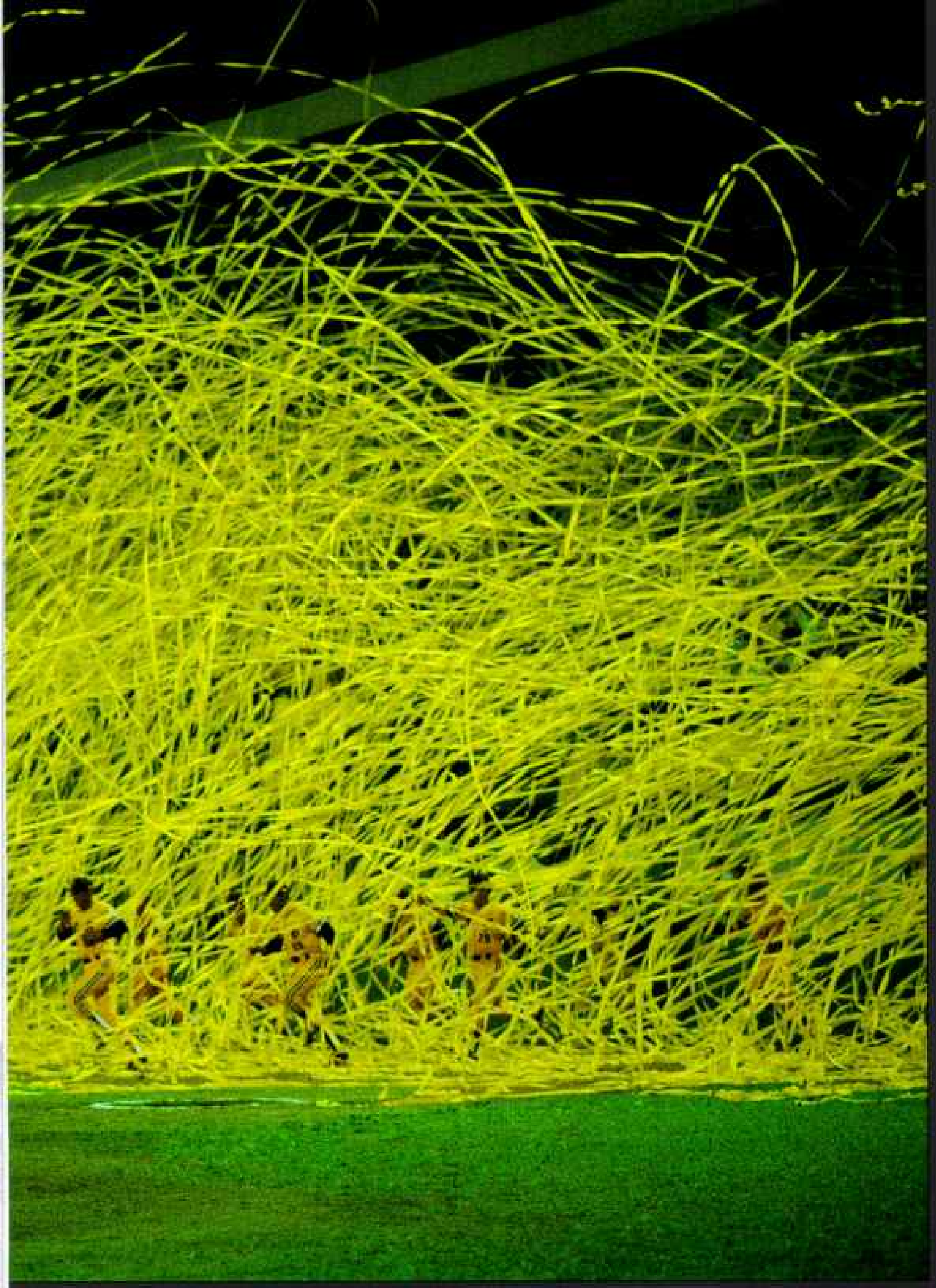
TAIWAN

Candles and confetti mark a Taiwan TV station's 30 years of success. Lasting autonomy and new prosperity give the whole island reason to celebrate, even in the shadow of mainland China.

By ARTHUR ZICH

Photographs by JODI COBB
NATIONAL GEOGRAPHIC PHOTOGRAPHER

Hero to the rank and file, Sun Yat-sen personifies freedom on National Day, October 10, which celebrates the 1911 revolution inspired by Sun that overthrew China's last dynasty.



A blizzard of streamers engulfs Taiwan's 1992 baseball champs, the Brother Elephants. Growing in number, fans enthusiastically support the island's only professional sport.

Choking the streets of Kaohsiung at rush hour, motorcycles are a commuter's best friend; islandwide, some ten million—one for every two people—vastly outnumber cars and trucks.

"YOU'RE A GARBAGE HEAP!" cried the legislator.

"You're the fattest cockroach feeding on the garbage!" his political opponent shouted.

It was but one moment in a session of the Li-fa Yuan, the highest lawmaking body of Taiwan, characterized by shouting and bloody brawls that have sent at least three parliamentarians to the hospital.

"Nothing to get excited about," my friend Sen Hong Yang said later over Chinese tea in a Taipei teahouse. "Just another day at the Li-fa Yuan."

Only a few years ago such an exchange in the staid halls of the Taiwan congress would have been unthinkable. Now it symbolizes a sea change in the government and politics of Taiwan—the first prosperous, stable democracy in the history of the Chinese people.

This new Taiwan is nothing like the bleak island garrison I knew when I first went there as an interpreter for the United States Air Force in 1958. Then, the Cold War raged, and Taiwan was among the poorest and most precarious outposts in "Free Asia." The shadow of communist China loomed, just a hundred miles away across the Taiwan Strait. Only U. S. economic and military aid kept that colossal dragon at bay.

By the time I arrived, the U. S. Seventh Fleet commanded the strait, and U. S. B-52s cruised the skies overhead. On Quemoy and Matsu, Taiwan's islets near the mainland coast, artillery batteries buried deep in concrete bunkers exchanged bombardments with communist gunners in Fujian Province. When I flew into Quemoy back then, the strain was ragged and constant. I have never forgotten the granite-cracking thunder of those shells—or that first realization that out across the water people were actually trying to kill me.

Times change. Today U. S. assistance is long gone, and Taiwan, officially the Republic of China, is one of the largest economic powers in the region.

But Taiwan could hardly have traveled a more tortuous road to reach its success. In 1949 China fell to the communists. The battered army of Nationalist Generalissimo Chiang Kai-shek fled to China's offshore possessions with two million refugees. All that was left of the Nationalists' dominion was the mountainous, 230-mile-long island of Taiwan; the Pescadores, a cluster of rocky windswept islands in the center of the strait; and the garrison islets of Quemoy and Matsu lying in sight of the China coast.

Chiang's followers maintained that they would once again rule one China under the Nationalist flag. They made Taipei, Taiwan's largest city, their capital-in-exile until they could regroup and recapture the mainland. Their chances for achieving reunification seemed to wane with each passing year, but their policy toward the communists remained resolutely based on no contact, no negotiation, and no compromise—the "three noes."

Nationalist legislators, who had been

"Speak the truth, do the right thing, perform real service," urges independent candidate Hong Tsung Lin, campaigning—unsuccessfully—in Kaohsiung last year. In that election voters chose the entire parliament from a multiparty slate for the first time, a milestone in the move from authoritarian rule to democracy.

Outside parliament in the capital of Taipei, Po-yu Wu protests for freedom of speech. Her husband, Hua Huang, was in jail for promoting Taiwan's independence from China—his fourth incarceration for rebellious acts.

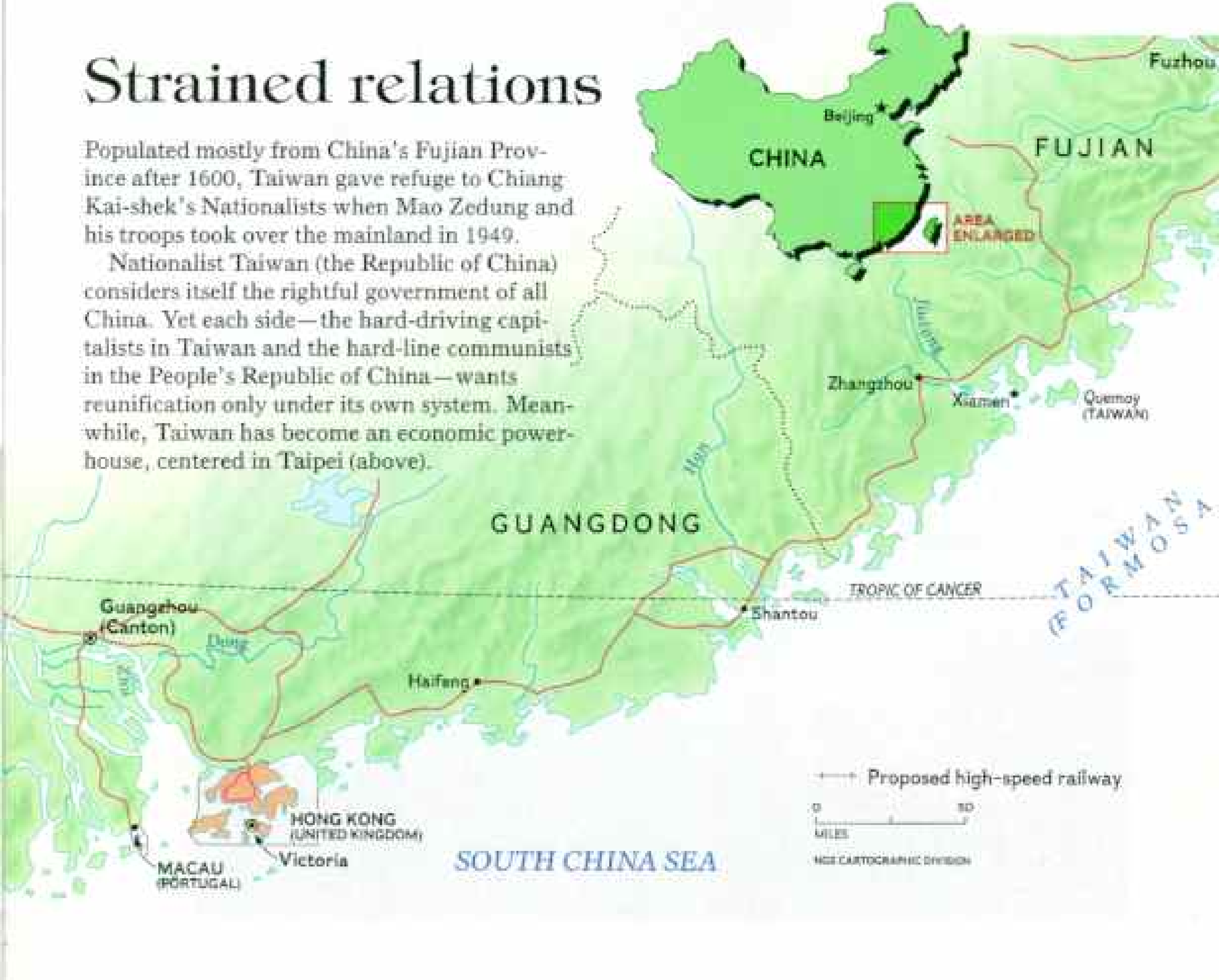
ARTHUR ZICH is a frequent contributor who specializes in Asian subjects. His most recent article, "Japan's Sun Rises Over the Pacific," appeared in November 1991.


總選總部成立大會
做真話 做事實 做負責的政治

Strained relations

Populated mostly from China's Fujian Province after 1600, Taiwan gave refuge to Chiang Kai-shek's Nationalists when Mao Zedung and his troops took over the mainland in 1949.

Nationalist Taiwan (the Republic of China) considers itself the rightful government of all China. Yet each side—the hard-driving capitalists in Taiwan and the hard-line communists in the People's Republic of China—wants reunification only under its own system. Meanwhile, Taiwan has become an economic powerhouse, centered in Taipei (above).



elected on the mainland as representatives of all China in 1947, kept those positions in Taiwan for more than 40 years. In effect the Nationalist Party and the Taiwan government were one and the same, and their legitimacy rested on the principle of one China. On that point they would brook no argument. And so, in practice, they added a fourth "no": no political dissent by native Taiwanese. Wielding the authority of martial law, the Nationalists restricted free speech, press, and assembly; prohibited opposition parties; and punished dissenters with jail, torture, even death. They sought to cultivate a sense of "Chineseness" and suppress the islanders' separate identity as Taiwanese, even banning Taiwanese history in the schools and the Taiwanese dialect from public life.

On February 28, 1947—a date Taiwanese bitterly remember as *er-er-pa*, "two-two-eight"—an incident occurred that further explains the resentment native Taiwanese still feel for the mainlanders. On that day Nationalist police beat an old woman selling black-market cigarettes, then fired into the crowd that formed in protest. All over the island Taiwanese rebelled and rioted. No one will ever know the exact number of Taiwanese killed, but a recent study sanctioned by the government reports that it may have been as many as 28,000.

POLITICS ASIDE, it is almost impossible today to tell the difference between Taiwanese and mainlanders. Among the native Taiwanese, reverence for things Chinese runs deep, and I saw it surface in countless ways in their daily lives. In the predawn stillness of the hills behind Taipei's stately old Grand Hotel, I joined scores of early risers in *tai-chi chuan*, the ancient Chinese exercise ritual. At the 18th-century Lung Shan Temple, I watched worshipers stream in, each to light a joss stick, say a prayer, and leave a fragrant jade orchid blossom to Kuan Yin, the Buddhist goddess of mercy and the most beloved of China's deities. One night in Taipei's "Snake Alley," with the blaze of neon Chinese characters flashing in the puddles underfoot, I watched hawkers snatch live cobras from their cages, slit them open, and mix the blood with herbs and wine into a Chinese potion believed to restore potency. Wizened old men guzzled it down on the spot.

I found Chineseness in little touches too. One afternoon over a bowl of noodles at a tiny sidewalk shop, I was reading the poet Li Pai, who wrote in the eighth century during China's Tang dynasty, when a young Taiwanese waitress looked over my shoulder and began reading with me. "Li Pai's my favorite poet too!" she exclaimed. In Lukang, an old fishing port on the Taiwan Strait, I met Li Sung-lin, an elderly but spry wood-carver. His tiny house was jammed with his carvings of the gods and demons of Taoist myth. He greeted me with a viselike handshake and a welcome in classical Chinese: "Is it not indeed a pleasure when friends visit from afar!" It was the opening of *The Analects of Confucius*.

But Taiwan's Chineseness is best reflected in a kind of joie de vivre at simply being Chinese among other Chinese, the more the better. I got a taste of this with my friend Sen Hong Yang at the annual Dragon Boat Festival at the lovely country town of Ilan. We were standing on a bridge over the Ilan River watching the long, slender dragon boats racing by below. The cheering crowd around us

was so thick we couldn't move. The din of firecrackers was earsplitting, and we could barely see the water through the smoke.

Suddenly the squeal and clank of Chinese horns and gongs joined the cacophony as a mummers' parade of Taoist deities pranced onto the bridge. Just then the sky opened and it began to pour. Sen Hong and I looked at each other. There was no need for words. Soaked to the skin, water running off our noses in cascades, we simply stood there, arms around each other, laughing. It was *jen-ching-wei*—that intangible joy of being Chinese.

DESPITE their common culture, a great gulf still separates the two Chinas. No formal peace has been declared, and direct travel is still prohibited. But martial law is gone from Taiwan. And now the islanders look toward the mainland less in fear than with an eye toward business investment where labor is cheap, workers are plentiful, and construction costs are low. Indeed many Taiwanese firms have already moved—an underwear factory to coastal Shanghai, a baby-food manufacturer to Beijing, and a tomato-packing plant to the far northwest.

By 1993 Taiwanese investments in mainland China, pouring in mostly through Hong Kong, reached 8.9 billion dollars. Trade between the two sides was worth more than seven billion dollars. And the two were continuing negotiations to improve relations.

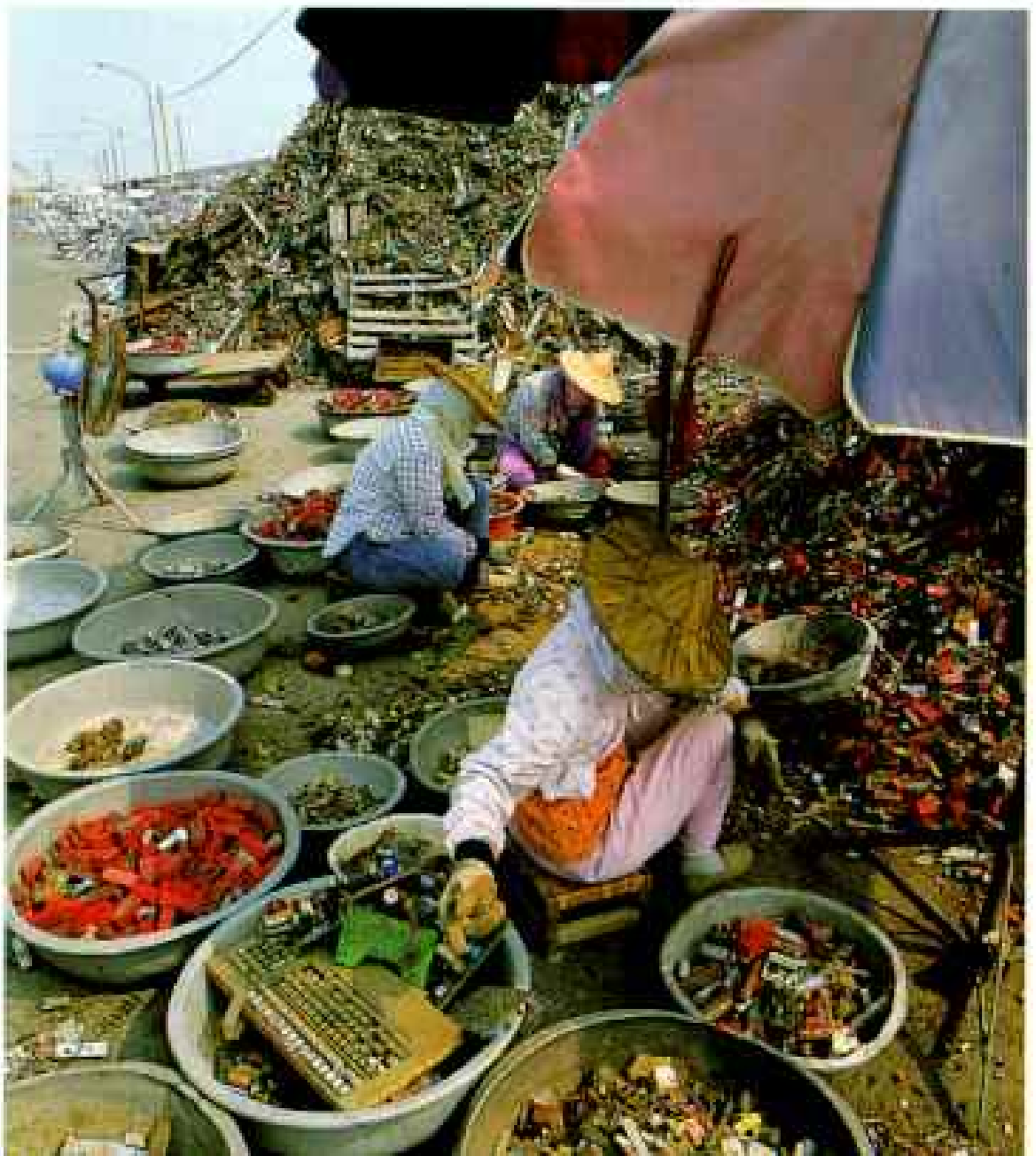
I saw the effects of this thaw everywhere. On Quemoy the military's guard was still up, but the atmosphere resembled a college campus more than an embattled outpost. Not long after my visit the military returned both Quemoy and Matsu to civilian control.

But the biggest change was on Taiwan proper. Close to 300 newspapers, many of them sharply critical of government policies, were thriving.

The native Taiwanese were asserting their identity in ways I had never seen before. Of the nearly 21 million people on Taiwan, 85 percent are descendants of Chinese who emigrated from Fujian Province and elsewhere along the coast between the 1600s and 1949. Like the mainlanders, they speak Mandarin, but they also speak Min-nan hua, the old Fujian dialect that the Nationalists had banned.

"In grade school we were fined a dollar for every Taiwanese word they caught us using," recalls Fan Yun, a 24-year-old Taiwanese graduate student at Taiwan University. "We had to wear a sign around our necks that said, 'I was bad. I spoke Min-nan hua.' "

Three years ago Fan led the island's first major student demonstration—a week-long sit-in of 3,000 students at Taipei's Chiang



Veiled against the sun, women sort electronics trash—much of it originally imported from the United States—at a government-run yard near Kaohsiung. Recovered metals earn big profits on this mineral-poor island, but the expense of controlling pollution during the extraction process has put the industry in jeopardy.

Taiwan's future lies in its own electronics industry, especially now that the manufacture of labor-intensive goods—the foundation of recent wealth—is being driven by high wages to cheaper locations elsewhere in Asia. This microchip factory (right) operates in a high-tech industrial park built by the government in Hsinchu, the island's Silicon Valley.

Kai-shek Memorial. She does not mince words. "We don't want to live under a mainland regime," Fan said. "The old leaders here were outsiders. To them, Taiwan was a hotel. They reckoned they were going back to the mainland, so they spent huge sums on the armed forces and next to nothing on roads, rails, and harbors. We Taiwanese have never been our own boss. We want independence."

BY THE TIME I LEFT TAIWAN, all but one of the Nationalists' political prisoners, who were jailed for advocating independence from China, had been released. The exception was George Chang, 56, a native Taiwanese and a leader of the independence movement for 30 years.

I visited Chang inside Taipei's Tu Cheng prison. We sat at a simple table in a bare room. Chang's skin was pale, his eyes rimmed with red. He told me he had recently been diagnosed with heart trouble and hypertension.

Chang told me in a soft, quaking voice how the government revoked his passport when he was a student at Rice University in Texas 30 years ago. He and his wife, Tina, became U. S. citizens. But when they returned to Taiwan in 1991, the Nationalists detained them at the airport. "They wanted to deport me," Chang said. "I said, 'Taiwan is my home.' "

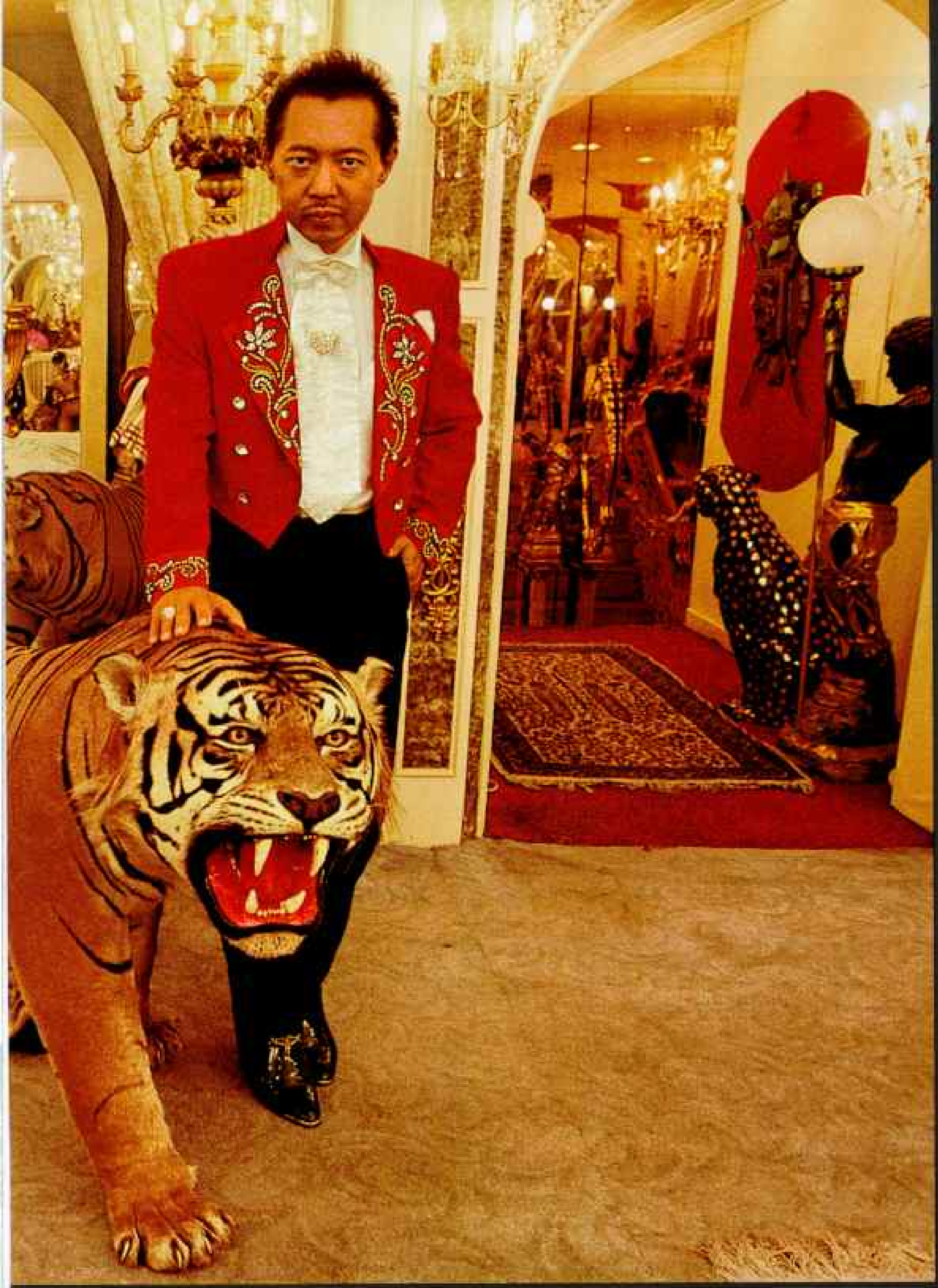
They sentenced Chang to five years in jail on charges of conspiracy and sedition, accusing him of "stealing the national territory" — the Nationalist phrase for advocating independence. "How can I steal it?" Chang asked me. "I was born here. It's mine!"

One day I came across Mr. Yin, an old Nationalist soldier whose claim to Taiwan was no less valid than Chang's. Yin had lived in Taiwan for nearly 50 years.

It was a typical Taipei afternoon. The day was overcast, the air muggy and thick with smog. I was strolling a residential section of the city known as Number 7 Park. Old men sitting on low stools kibitzed over a match of *weichi*, a popular board game. In the shade of a wine red bougainvillea, an old woman snipped turnip greens. Tawny hens pecked and strutted in the lane.

Mr. Yin, a bald, apple-cheeked man wearing a sleeveless undershirt, denim shorts, and flip-flops, lived at Number 17, Alley 21. He had just passed his 80th birthday, he told me proudly, but still rose before dawn and pedaled his daily paper route to 300 homes. Leaning his bicycle against a whitewashed wall, Yin told me of a life that had come full circle.

In the early days of exile the Nationalist government wanted to make this 25-acre tract into a park. But they were forced by the flood of refugees from the mainland descending on the



"I worked so hard to make money. Now I spend it," says David Tang, showing off purchases in his Taipei bedroom. A refugee from communist China, Tang built a fortune on shoe exports.

city to turn the land into a squatters community. Over the years Yin and the other squatters turned their shanties into modest houses, paved the muddy lanes, planted trees, and opened tiny groceries. The place took on the charm of a quiet Chinese village. Then, a few years ago, authorities announced that they were reclaiming the land for the park it was meant to be—and bulldozing everything on it. Yin would lose his house.

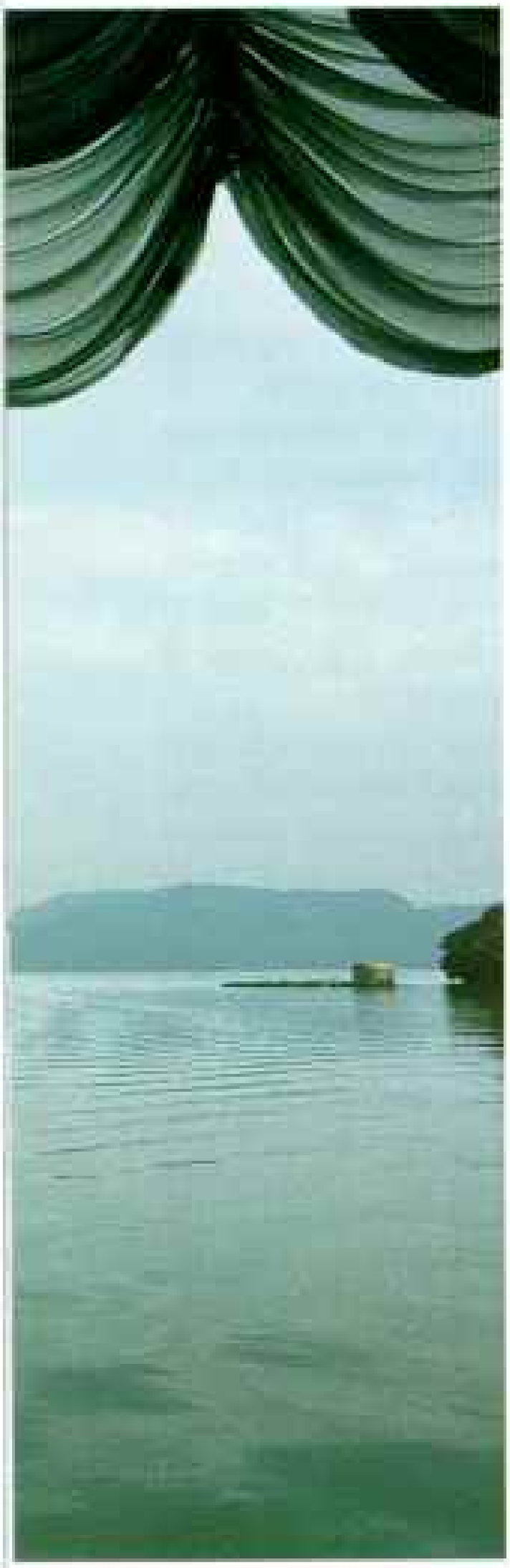
"Nothing can be done," Yin said. "I'll get compensation for my house and my army pension twice a year. But that doesn't amount to much. I'm a Nationalist, but the government doesn't care about me. There is nothing for me here except to walk the streets."

What will you do? I asked.

Yin's face brightened. "I'm going home!" he said. "I've got a son in Fengdu, my hometown in Sichuan Province, and he says my money will go a whole lot further there. Why, I'll be well-to-do in Fengdu! My son's the head of the Fengdu Communist Party!"

IN 1978, Chiang Ching-kuo, the eldest son of Chiang Kai-shek and longtime head of the secret police, succeeded to the presidency. I attended the ceremonies, and as Chiang began his inaugural address in Taipei's great red-draped Sun Yat-sen Memorial Hall, I wondered where this man, known to many by the initials CCK, might lead Taiwan. I was as surprised as anyone when, in July 1987, he ended martial law. "The party," he had declared earlier, "must accommodate itself to changing times."

H. H. Michael Hsiao, a sociologist at



The silken tranquillity of Sun Moon Lake, ringed by the peaks of Taiwan's central mountain range, complements the sybaritic atmosphere of a new hotel. As wealth has increased in the past decade, the demand for luxury accommodations—and for recreational facilities such as beach resorts, golf courses, and private clubs—has outstripped construction.

A favorite getaway of Chiang Kai-shek, the lake offers refuge to more than the rich and famous. Day-trippers escaping crowded cities, particularly on the west coast, clog access roads on holidays and weekends.

Taipei's Academia Sinica, explained. "It took a strong man to terminate strong rule," Hsiao said. "CCK had few friends. He trusted no one. He was old, almost blind, and he knew he was dying. And there's an old Chinese saying: 'Before one dies, one tells the truth.' "

In January 1988 CCK died. But his handpicked successor, President Lee Teng-hui, the first chief of state born in Taiwan, kept the movement alive. Last December the citizens of Taiwan elected a whole new legislature, finally replacing the old members who had been elected in 1947. Democracy had arrived.

But while the Nationalists retained control of the island, winning 53 percent of the vote, the opposition Democratic Progressive Party (DPP) won 51 of the 161 seats—an unexpectedly strong showing. What keeps the Nationalists' commitment to reunification alive? Ironically, the strongest influence is communist China, which has threatened war if Taiwan declares independence.

"Beijing has warned, 'Don't play with fire,' " Ying-jeou Ma, then special assistant to President Lee, told me. "They use the phrase *'Fen-shen-suei-ku*—We'll break your bones into pieces.' "

What is perhaps most remarkable about the change that has so swiftly swept over Taiwan is that so few bones have been broken. "Consider the Philippines, Korea, Thailand, Eastern Europe," Ma observed. "In each case, political liberalization has brought costly social upheaval. Taiwan is achieving democracy within a stable social order."

What made this peaceful transition possible? Prosperity. Since 1951 the island's annual economic growth has averaged almost 9 percent. This year per capita income will approach $10,000, bringing Taiwan into line with the other members of Asia's industrial elite. And nowhere is this affluence more visible than in Taipei.

When I first saw Taipei, it was poorer than poor, a grim, impoverished city of fewer than a million people herded between the Tanshui River on the west and malarial marshes and rice fields to the east. It was a city of black-roofed hovels, open sewers, and lightless nights. Chung Shan North Road, the principal thoroughfare, was a two-lane blacktop plied by three-wheeled pedicabs. Taiwan's per capita income was $162 a year.

Today greater Taipei's population has swollen to almost six million—nearly 30 percent of the island's total. Chung Shan North Road is one of many eight-lane boulevards. The city chokes on the fumes of 460,000 cars, 7,300 buses, 38,000 taxis, and 869,000 motorcycles, whose drivers park all over the sidewalks and often drive down them too.

The once squalid east side flaunts palatial hotels, glitzy discos, and pricey restaurants. A well-placed parking space in a garage can sell for $100,000, a small apartment in an upscale district for more than a million dollars.

This wealth has also bought the Taiwanese time to enjoy their leisure. But like everything else in Taiwan, it's expensive. Karaoke, the Japanese fad of singing along to music videos, has swept Taiwan with such force that singing schools demand tuitions as high as $75 an hour. More than 30 golf courses cater to some 400,000 golfers. And at least 80 more courses

are planned, with memberships running as high as $150,000.

Economic success and political liberalization have quickened the pace of social change. More than a thousand special-interest groups have sprung up over the past few years, and their members are making demands they never would have dared to a decade ago.

ONE OF THE MOST far-reaching movements may be a challenge by Taiwan feminists to the traditional, submissive role of the Chinese wife. Among the first of many women's self-help groups was the Warm Life Association for Women. Founded in 1984, the group's name derives from a Tang dynasty poem that celebrates life's middle years—the time, Warm Life's founder, Shih Chi-ching, explained, "when women are most likely to seek a divorce."

Ms. Shih, a high school teacher turned housewife, did just that. At age 36 she discovered that her husband had become involved with another woman. "I left him, but I couldn't divorce," Shih told me. "Under Taiwan law, the husband took everything: children, property, money, even money a wife may have brought to the marriage. There were no jobs, no openings in the schools."

Shih eventually found work translating American best-sellers into Chinese. "Five years after my separation, I translated Betty Friedan's *The Feminine Mystique*," she said. That did it. Shih filed for divorce, even though she knew she would lose her son and her belongings, according to the law. Then she founded Warm Life so she could "help women who were afraid of divorce, just as I was. It wasn't easy. At first I was facing 2,500 years of Chinese tradition all by myself."

But the response was overwhelming. Today, Warm Life counseling offices are scattered throughout the island, and the government is helping cover the costs. And Shih regained custody of her 16-year-old son. "Women now have access to higher education and job opportunities," Shih said. "And they don't intend to suffer any more."

It took the Cold War and strong government

Noxious air brings tears to Chen Wang-to in her home near Linyuan, in the industrial heart of Taiwan. Chen's doctor believes factory emissions caused her liver cancer. She died in June. In Taipei, where cars and motorcycles create much of the smog that smothers the capital (right), the government directs a top-priority campaign—initiated by citizens—to protect the environment.

policy to bring about Taiwan's economic miracle. In 1950 the communist Chinese were mounting an assault on Taiwan when North Korea's armies swept over the 38th parallel to attack South Korea. President Harry S. Truman recognized Taiwan's strategic position as "an unsinkable aircraft carrier" keeping China at bay and ordered the Seventh Fleet into the Formosa Strait. That ended communist invasion plans. A total of 1.5 billion dollars in U. S. economic aid began flowing in.

"We used U. S. aid very effectively," K. T. Li, 82, former Taiwan economic affairs and finance minister and the architect of the economic miracle, told me. Li began by buying land from landlords and selling it to the peasants who tilled it. "That gave our farmers incentive to boost production," Li explained, "and it gave the landlords the capital to become industrialists."

At the same time, Li pressed for development of highways, telephones, and electric power. By 1965 the economy had improved to such an extent that Taiwan became the first recipient of U. S. aid to no longer request it.

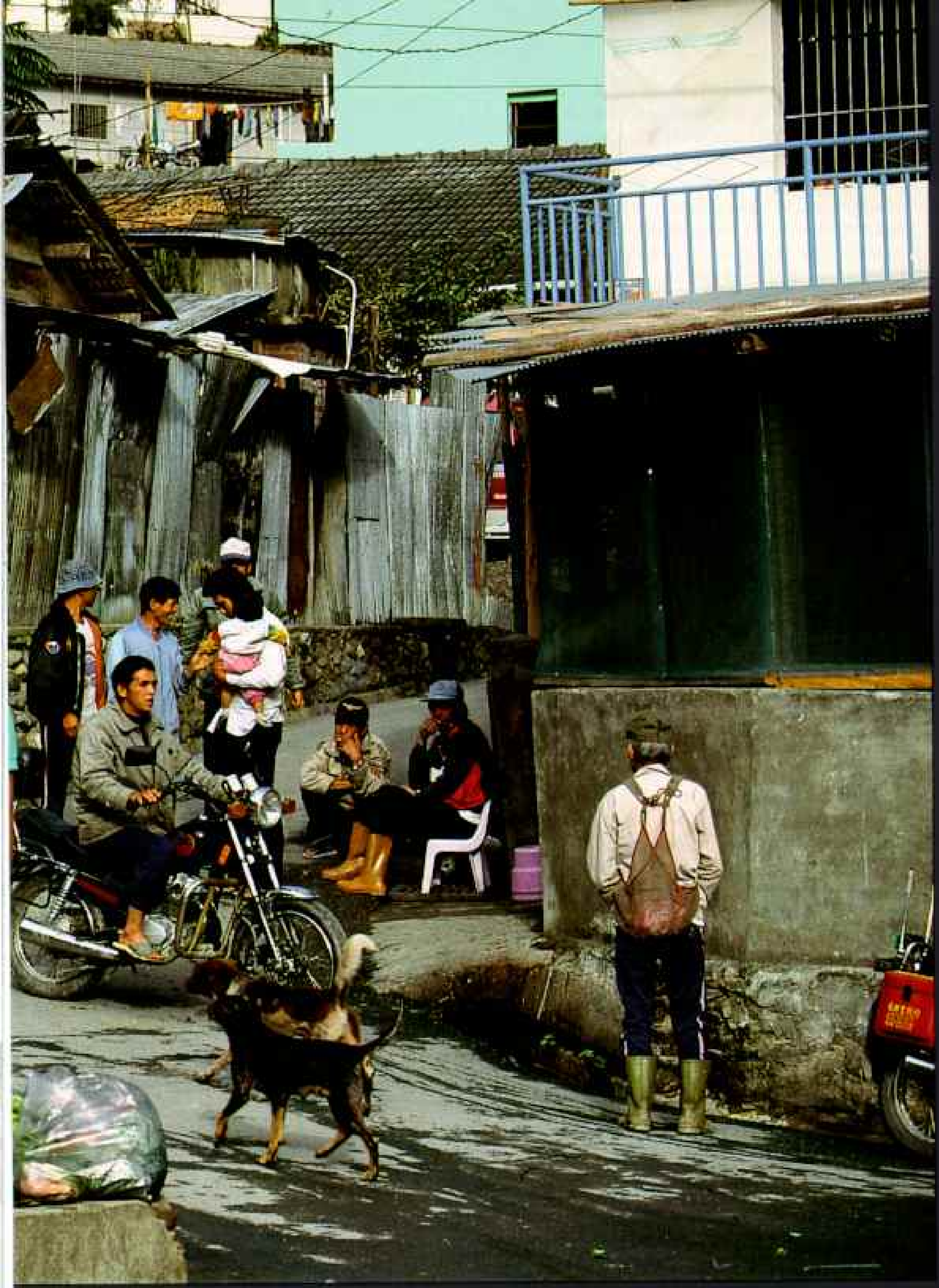
In 1966 Taiwan launched the world's first export-processing zone in the southern city of Kaohsiung. Tiny "living room factories" sprang up all over the island. By the end of the decade it was said that smoke coming out of a chimney was the sign of a patriotic household.

Everything from Christmas tree lights and shoes to refrigerators and television sets poured off small-scale assembly lines. All of it was cheap, much of it was shoddy, but it helped generate the capital to build heavy industries like petrochemicals and steel that today are among Taiwan's biggest.

In 1980 Taiwan made its own "great leap forward" with the opening of Hsinchu Science-Based Industrial Park, 45 miles from Taipei, in the hope of luring home the enormous pool of technical talent working abroad.

Here, 25,000 employees of more than 125 electronics firms live and work in azalea-landscaped surroundings reminiscent of California's Silicon Valley. One person Hsinchu Park lured home was Patrick Wang, the genial founder of Microelectronics Technology Inc. Wang told me how his company began.

"It was 1983," Wang said. "There were eight of us who'd gone to the U. S. for advanced degrees. The U. S. had broken diplomatic relations with Taiwan and had recognized communist China. Our families were here, and we were worried. Mr. Li had declared a policy to lift Taiwan into the world of high technology. We felt that we could, and



Sunday morning is far from sleepy in a remote mountain village near Wushe: The weekly market truck has come and gone, and harvesters wait for a ride to nearby tea fields.

should, contribute. We got together at a Chinese restaurant in San Carlos, California, and decided to go back and start our company."

From that simple beginning MTI has grown into an electronics giant with worldwide sales of a hundred million dollars a year. But Wang has not forgotten the impulse that brought him home. "For the past 200 years the Chinese people have suffered nothing but turmoil and hardship," he said. "Their confidence is poor. We're a model for Chinese everywhere. If we can do it, so can they!"

But while Wang and Hsinchu Park are symbols of Taiwan's high-tech tomorrow, the backbone of the island's prosperity remains those small-scale entrepreneurs who built Taiwan from nothing—men like Ho Kwang-liang, 44, founder and president of Ho Hung Ming Enterprises (HHM), whom I met at his factory outside the city of Taichung.

Ho's father had been a peasant. His mother traded vegetables for scraps of meat in the market. At age 13 Ho went to work in an ice-cream-machine factory for 50 cents a day. At 17 he got a $400 bank loan and invested it in his own small factory for bicycle tire pumps. Ho worked 15 hours a day, seven days a week, and ate and slept on the factory floor.

The venture failed. At age 20, Ho was $7,500 in debt and cut off by the bank. But one quality Ho and entrepreneurs like him have in abundance is intrepidity. Taichung was now a shoemaking hub, and Ho had relatives willing to entrust their savings to his industriousness. "I started making machines that punched holes for shoelaces," Ho said with a smile.

Today Ho's 25-million-dollar-a-year company has a hundred workers in eight plants producing everything from buttons, buckles, and snaps to automated equipment for making shoes. Profits are sufficient to allow Ho and his wife to own a comfortable home and send four daughters and a son to college.

Last year Ho opened a new shoemaking-machine factory—in Shanghai. Having made Taiwan what it is, enterprises like HHM now face rising land and labor costs and have begun looking abroad for relief. Taiwan allows virtually no direct investment on the mainland, but since 1988 the government has permitted businessmen to channel funds there through Hong Kong or other third parties.

Still, much economic contact with the mainland remains illegal. In Taipei's old Tihua market I saw fresh Fujian clams, Shandong peanuts, Sichuan garlic, and Gansu watermelon seeds—all marked, all smuggled in.

To learn how these delicacies came across the strait, I visited a smuggler in his handsome two-story house on Taiwan's rugged northeast coast. Out front, goldfish glided in a tiled pond. Inside, a new National refrigerator, still in its plastic wrapper, stood in the sitting room. A fancy rowing machine sat on the floor. The wiry bootlegger sat on a chair and dandled his baby daughter on his knee.

"We use rafts made of plastic pipe lashed together, powered by outboard motors," he said. "One raft carries ten tons of cargo. We meet the mainland vessel at mid-strait around 3 or 4 a.m., pay in cash, and run for home. Our people on shore warn us by cellular phone which inlets the police are watching. In 40 minutes a truck is loaded and speeding toward

Handing out high fives, groom William Tsung (center) salutes a friend's joke at a post-wedding party in Taipei. With a degree in business from a U. S. university, Tsung is confident about his next move: expanding his car dealership onto the mainland. "Almost everybody's going there because that's where the market is right now."

Attracted also by cheap land and labor, Taiwan entrepreneurs have invested some nine billion dollars on the mainland. Because Taiwan and China have no official contact, such investments are mostly made through an intermediary, usually Hong Kong.

Taipei—and by 6 the markets are open, and the housewives are buying our products.

"It's getting tougher," he added. Then he grinned wildly. "But the sea is so vast, there's still room for us all to conduct our business!"

CHINA'S FUJIAN COAST, with its proximity to Taiwan, its common language and culture—not to mention its low-cost labor—has received a major share of investments from Taiwan. So along with several hundred Taiwan tourists, photographer Jodi Cobb and I took a creaky packet boat from Hong Kong to Xiamen to see how Fujian has changed. I had hoped to see the city as those early Europeans had when they sailed along the coast in the 17th century. No such luck. The harbor was a Great Wall of billboards advertising 555, Lucky Strike, and Marlboro cigarettes; 10,000 Precious refrigerators, Flying Person athletic shoes, and Coca-Cola (or as they call it in China, *Ke-kou-ke-le*).

The Xiamen dock was jammed with lackadaisical communist officials, frantic hawkers, and clamoring pedicab drivers. Jodi and I loaded our gear into two pedicabs and jostled off like characters out of some old Hollywood movie set in China.

It seemed as if capitalism had displaced communism. Chinese from all over the mainland had descended on the city to grab a share of its economic success. Construction was everywhere. The air was thick with red-clay dust. The whole city seemed sheathed in bamboo scaffolding; entire hills had been bulldozed away to provide clay for bricks.

Everything had a price. One Taiwan

manufacturer told me it took 12 payoffs to move his product, which I promised not to name, from the mainland factory to markets overseas. A tiny two-bedroom condo in a hillside development called Mountain Phoenix Village listed for $73,440; a four-bedroom house with a yard for $455,000. A telephone hookup? Five hundred dollars under the table.

In a small storefront gallery selling mail-order art, I met the proprietor, an affable 39-year-old Taiwan businessman I'll call Yang. Three years ago rising labor costs had forced him to move his sunglasses factory out of Taiwan to Xiamen. Yang showed us through the three-story plant, where 300 young women hunched over tiny machines producing glasses that cost a dollar a pair to make but sold for about $35 in the U. S.

I was impressed. The plant was clean and filled with light. The workers seemed earnest and quick to smile. We had seen other factories in Xiamen that weren't so nice—dingy places with filthy toilets and polluted air. I asked Yang why he seemed to care about his workers more than other Taiwan entrepreneurs in the city. "I want to help," he replied. "We're all Chinese people."

Yang also owned part of a bottled-water company that sold 3,000 bottles a day throughout China and was an agent for a bottled-tea company. To bring his various enterprises under one roof, Yang had recently purchased the gallery building, but it wasn't easy.

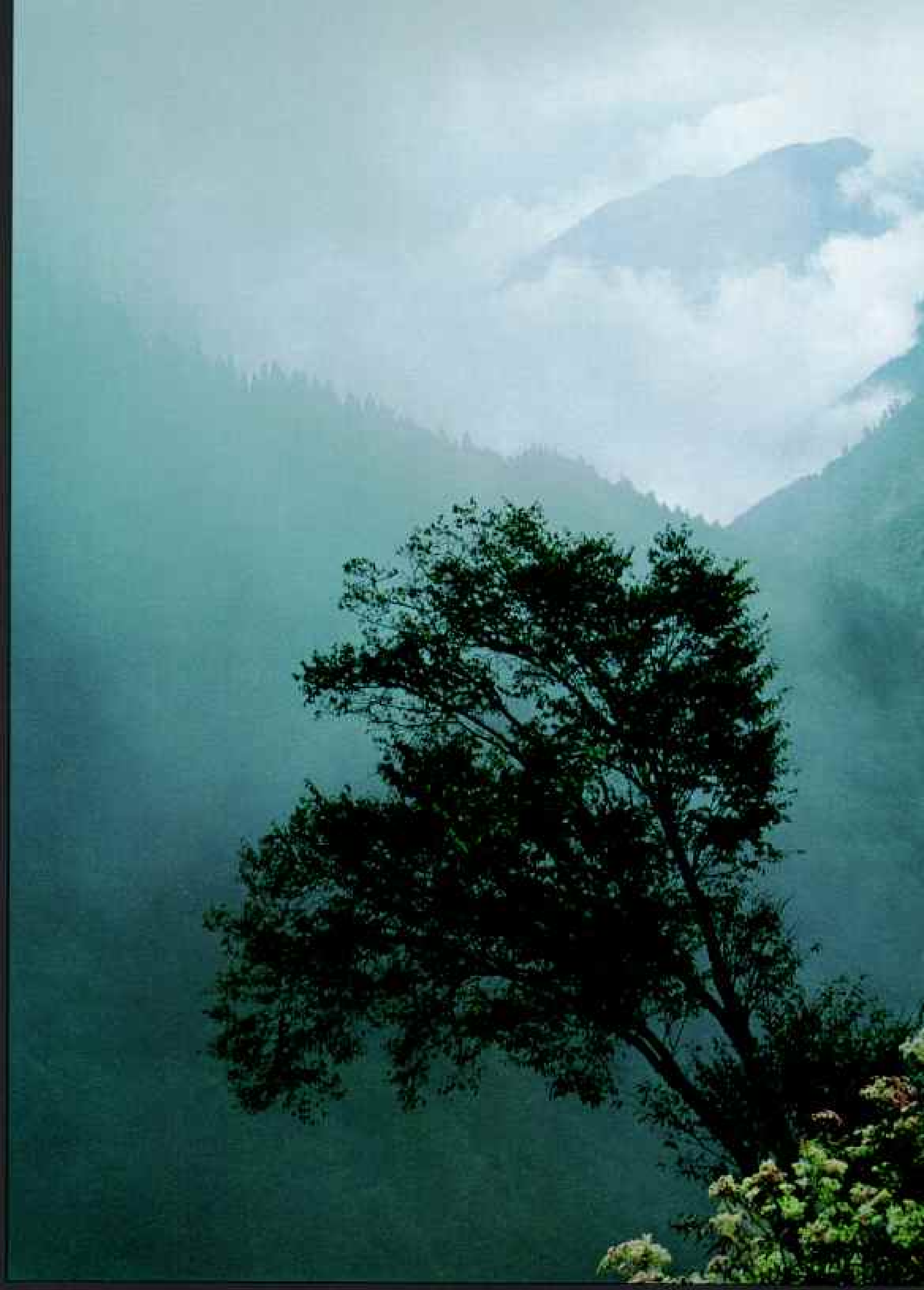
"I paid a $100,000 bribe to government officials over and above the cost of the property," he said. "It's the cost of doing business. Here in China, everything is crazy. The only thing the government doesn't control is the air."

RETURNING TO TAIWAN was a pleasure—to stroll its narrow lanes, to visit its temples, to discover once again that in spite of the pollution much of it still lives up to its old Portuguese name, Ilha Formosa—"beautiful island."

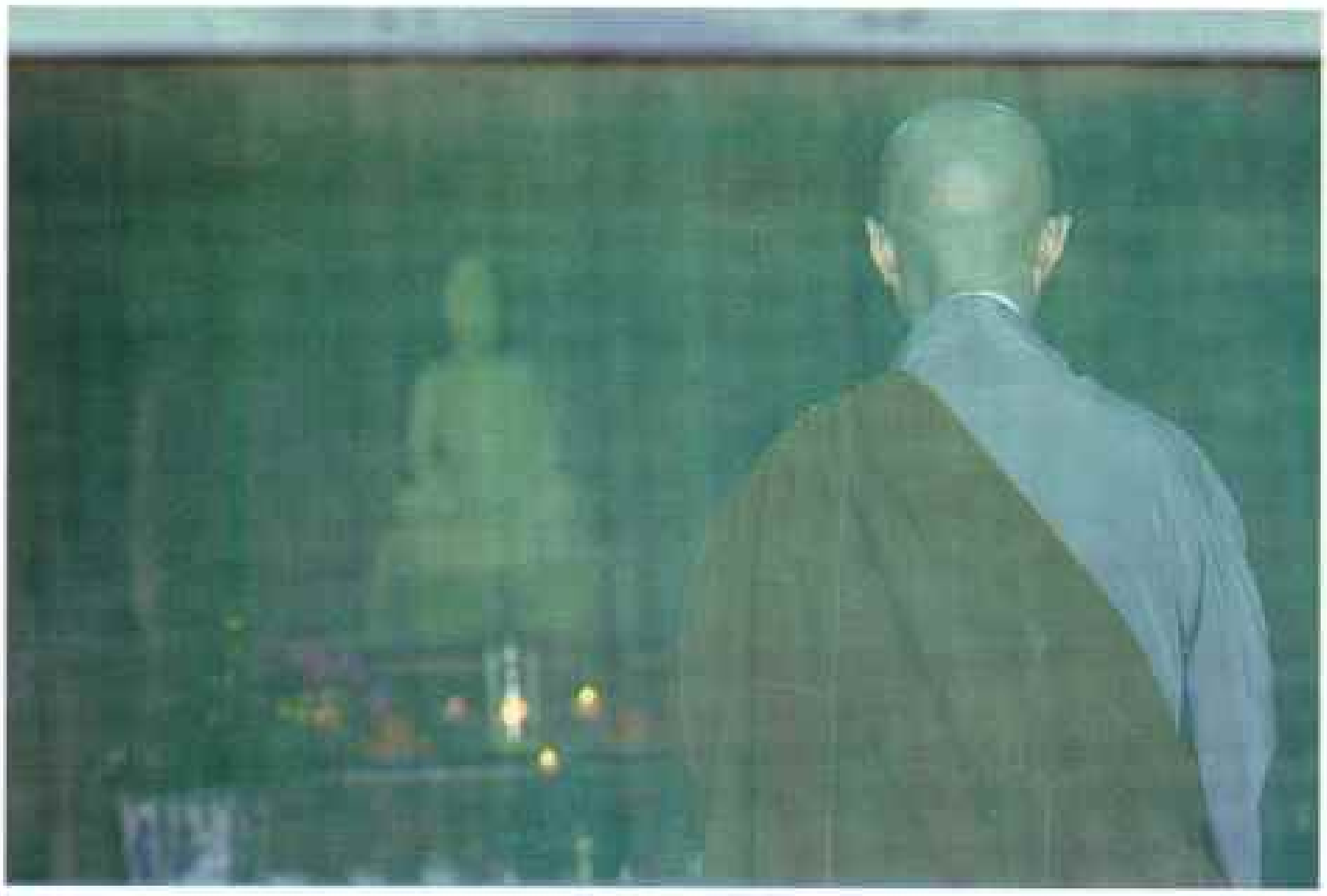
I drove the 120-mile East-West Cross-Island Highway that belts Taiwan's mountain spine from the rugged east to the western coastal plain, snaking through Taroko Gorge, where waterfalls tumble like angel hair and dark green jungles are spangled with wild orchids, black-and-yellow butterflies, and darting, swooping birds.

Thrill seekers ride high on a rooftop amusement park in Kaohsiung, where the price of ground-level lots is prohibitive. Preoccupied for decades with building business districts, the Taiwanese have now begun to preserve their past. In the town of Lukang, where a perfect smile advertises a dentist's office, a restored historic district embraces centuries-old shops, homes, and temples.


MICHELIN



Morning clouds settle over mountains near Yushan National Park. Esteemed as a prime source of chi, or life energy, the mist is believed to bring longevity and virtue.



"Whatever I do is meant to create a society full of love," says the revered Buddhist nun Cheng Yen (bottom), performing a ritual at her Hualien temple. She guides the charitable foundation she created in 1966, which today has some three million members and raises 12 million dollars a year for domestic and international relief.

Pilgrims come to her temple from all over Taiwan and abroad, setting out along a nearby road before dawn. Led by volunteers who direct traffic around them, they kowtow every three steps to cultivate humility. At their destination they join Cheng Yen in prayer.

I toured the magnificent National Palace Museum, tucked in the mountains outside Taipei, home to the world's greatest collection of Chinese art: 600,000 masterworks dating as far back as ten centuries before Christ—such a trove that museum officials say they can change the entire display every six months and not repeat themselves for 30 years.

So it was an added pleasure to discover that prosperity and freedom are now among Taiwan's treasures too.

But I know better than to think these new treasures came to Taiwan without a cost. One of the biggest costs is the loss of agriculture. In 1953 farmers made up 56 percent of the labor force. Today the figure is around 13 percent and falling. Industrial growth and urbanization have gobbled up farmland at an estimated 6,000 acres a year. And liberal government trade policies have allowed domestic markets to be flooded with almost six billion dollars' worth of agricultural imports a year, nearly half Taiwan's total food supply.

To learn what this meant in human terms, I visited the family farm of my friend, journalist Antonio Chiang, in the mountains above the central city of Fengyuan. For 40 years Tony's family struggled to clear 132 hardscrabble acres and plant them with peaches, plums, oranges, and litchis. Tony led me up a trail through his orchards. The air was clean, cool with the tang of wild plum. To the east, a mountain ridge rolled like a dragon's back into the interior wilderness. Far to the west, beyond the urban coastal plain, the Taiwan Strait was covered with a mauve and yellow smog. Tony gestured to the plain below us.

"Once upon a time much of that was farmland," he said with regret. "When I was a child, we kept up to ten workers on the job day and night just picking litchis here. I was up at 4 a.m., pushing huge cartloads of them to market. When I was seven, I worked our lowland rice fields with my father." Tony plucked an unripe plum, bit into it, and made a sour face. "We live a different life today," he said, hurling the plum into a ravine.

Over tea in the family's tidy red-brick house, Chiang Chin-huo, Tony's 73-year-old father, reflected on the changing years. "No one wants to work a mountain farm today," he said sadly. "They want to work in the factories, earn money, live in cities."

That night, on the bus back to Taipei, Tony seemed resigned. "Our economy needs high-tech industry," he said thoughtfully. "We just don't have much land. The farmer must be sacrificed." He gazed out the window at the lights of industry flashing by in the darkness. "There is no other way."

THE MOST TANGIBLE COST of modernization is environmental. From Taiwan's highest point, the summit of 13,113-foot Yu Shan, to the coastal crags of Lungtung, the landscape looks like one big fouled nest. "Taiwan is filthy rich," as a Taiwanese friend put it.

More than 90,000 factories spew cadmium, chromium, zinc, and other toxics into Taiwan's water. Less than 4 percent of its sewage is treated. There are 44 contaminated rivers, and, according to a Taiwan Environmental

Protection Agency survey, half its drinking water comes from polluted sources.

"In a sense, we've become too prosperous," said Jaw Shau-Kong, then Taiwan's energetic minister of the environment, as he looked down through the pall of smog from his office windows high above Taipei. "After you make the money, you've got to spend some on environment. Because your life, your health, your kids are precious." He sighed. "We've made a start. But can we turn things around fast enough?"

The southern town of Linyuan will have a hard time turning things around. There Taiwan's largest chemical company, Chinese Petroleum Corporation, attempts to put a good face on pollution by painting its air-monitoring stations with fluttering birds and gamboling sheep. When I visited the plant, the chief engineer showed me a film explaining the company's environmental cleanup efforts. Images of gurgling mountain streams and wild mountain flowers flickered on the screen. But none of them bore any relevance to the reality of the blighted coast just outside. "Air, water, noise, and solid-waste pollution control standards are all higher here now than national standards," the engineer assured me.

A mile away from Chinese Petroleum I met a married couple who told a different story. Chen Feng-fu and his wife, Wang-to, both 59, were mushroom sellers who lived in the bamboo and concrete farmhouse where Chen was born. Ten years ago, they said, monsoon rains created an atmospheric condition that caused noxious plant emissions to collect along their house's earthen floor. When Mrs. Chen squatted to light a mosquito coil, the air exploded, flash-burning her legs and feet. She spent four months in a hospital and had hideous pink scars. She suffered from liver cancer, respiratory problems, and other ailments, which her doctor blamed on the plant.

"The air was clean here before Chinese Petroleum came," Chen told me. "It's gotten worse every year since."

Why didn't you move? I asked.

Chen shrugged. "No one will buy the house because of the pollution," he replied.

Did the company offer compensation?

"They covered some medical expenses but paid no damages," Chen replied. By then I'd been there perhaps an hour and a half, and my eyes and throat burned from the fumes. Mrs. Chen's eyes filled with tears.

I asked if she was crying.

"No!" she snapped. "My eyes just won't stop watering. I'm not sad. I'm angry!"

Mrs. Chen died last June.

SOME 200 MILES NORTH of Linyuan, the government is trying to clean up the human wastes polluting the water supply of the more than six million people crowded in greater Taipei and along the banks of the Tanshui River. To serve them, a massive 154-million-dollar sewer project is under way, but it is at least seven years away from completion. Allen Tsai, adviser to the Taiwan EPA's Water Quality Control Bureau, gave me a glimpse of the enormity of the project.

We visited the power plant, where a dozen 3,000-horsepower pumps would one day drive the system. We sloshed through a dripping wet tunnel and clambered down into giant concrete sedimentation tanks that would treat 31,000 tons of sewage a day.

I left Tsai at Tanshui village and took the ferry back to Taipei to see the river for myself. Its banks were thick with refuse; its waters greasy with excrement and stinking of sulfur and methane. A bloated dog carcass drifted by. On the far shore putrid smoke wafted from a smoldering mountain of garbage. Behind it, the lowering sun burned like a rebuke.

And then, as we approached the Taipei dock, a flock of snow white egrets swooped out of nowhere, glided over the ferry, and flashed on down the river—a gleaming splash of beauty, and a promise, it seemed to me, of what could be. And as I climbed the old stone steps back into the city, I pondered the miracle Taiwan's determined people had achieved since I first visited the island so many years ago, and what it had become: China, yes, and yet Taiwan; Taiwanese, but Chinese too. And out of both something new still becoming. □

Masked against air pollution, a young family takes a spin in a Kaohsiung park, choosing the maneuverability and economy of a motor scooter over the comfort and safety of a car. Facing similar trade-offs on a larger scale, Taiwan charges full speed ahead into the industrialized world.

Kodiak

Snug outpost, Old Harbor—population 298—nestles beneath sheltering peaks. On Kodiak nearly everyone fishes, including the island's huge brown bears, which roam a renowned wildlife refuge.

By JOHN L. ELIOT
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by
GEORGE F. MOBLEY
NATIONAL GEOGRAPHIC PHOTOGRAPHER

Alaska's

Island Refuge

BURNISHED by a low-slung Alaska sun, the fish leaped from the sea like red-gold arrows. They could sense the waters of their birthplace, the Ayakulik River, spilling into the Pacific. Searching for the mouth of the river in order to spawn upstream, the sockeye salmon jumped, surrounded by fishing vessels. Ninety skippers jockeyed for positions and reined in their engines, like bull-riding cowboys waiting for the chute to bang open.

At the tick of 9 p.m. an official's red flare shot across the sky, opening the sockeye season. Pandemonium roiled the water. The salmon must have been thunderstruck. Throttles roared and clouds of black diesel smoke belched as the big boats maneuvered and their attendant skiffs raced to circle seine nets around those precious fish, worth about seven dollars apiece.

This was no-holds-barred fishing, Kodiak style. Waves smashed into one boat intentionally beached by its skipper, angling to net fish running close to shore. In the wheelhouse of Jack Christiansen's *Desiree C.*, I hung on as the stern of the *Sea Star*—it was easy to read—cut close across Jack's bow. He never blinked. I watched dumbfounded as one boat, pursing its seine, was encircled by another boat's net.

"No problem," said Jack. "When the guy in the middle is finished, he'll just leave, slipping his engine into neutral as he passes over the net, so that his prop won't tear it up."

The frenzied harvest continued for four days, until Alaska Fish and Game authorities called a halt to assess the strength of the salmon run. Jack and his crew—which included his

Engines roar as a flare is fired and a hundred or so vessels race to net sockeye salmon at the mouth of the Ayakulik River. Officials limit such season-opening free-for-alls to a few days, then assess the catch. At a cannery, crewman Allen Christiansen unloads his vessel's sockeye, worth $1.40 a pound.

Scattered through wilderness, Kodiak's population is just 16,000, with about half in Kodiak city. Many of the island's 2,200 Alutiiq natives live in six villages. They own 330,000 acres of refuge land but have been prohibited from developing it to earn income, though they log and sell timber from their lands on neighboring Afognak Island.

Two-thirds of 3,620-square-mile Kodiak Island is a federal wildlife refuge, home to many of the Kodiak archipelago's 3,000 brown bears.

Kodiak National Wildlife Refuge
Native land conveyed within the refuge
Archaeological site
Road
Forest
Logging area
Polluted shoreline from Exxon Valdez oil spill

two teenage children—had worked furiously, sleeping in cramped quarters aboard the boat. They headed for Wards Cove cannery on the south end of the island. Jack's sockeye catch weighed in at about 5,000 pounds and, with the price hovering around $1.25 a pound, paid off more than $6,000.

Kodiak Island, which sits in the Kodiak archipelago some 250 miles southwest of Anchorage, is one of nature's great treasure houses. In a good year more than a million Pacific salmon come plowing up the Ayakulik: chinook, coho, pink, chum, and steelhead, as well as sockeye. The river teems also with thousands of rainbow and Dolly Varden trout. And the Ayakulik is only one of some 400 rivers and streams on Kodiak. Offshore swim herring and halibut, and, farther out, pollock and cod.

It's a land of stark and spellbinding contrasts, ranging from coastal wetlands and meadows to glacial valleys, alpine lakes, and ice-sculpted 4,000-foot mountains. Fingers of the sea reach in, so that nowhere on Kodiak can you stand and be more than 15 miles from salt water. Sixty-eight inches of rain a year

Passionate enough to melt the coldest heart, an ice sculpture proclaims a Valentine's Day message in Kodiak city. With close to 3,000 vessels registered, the city is home port (left) to most of Kodiak's commercial fishing fleet, one of the nation's largest. It lands some hundred million dollars of salmon, cod, halibut, pollock, herring, and shellfish annually. The king crab fishery ended in 1982, when the crab population suddenly collapsed.

drenches the island, turning it green as green can be. Here North Pacific low-pressure systems collide; days are overcast more than half the year, often with pea-soup visibility or howling 60-knot gales.

Roaming the islands, and ruling them, are some of the largest carnivores on earth—Kodiak brown bears, perhaps 3,000 of them. Many are protected in a U. S. wildlife refuge that takes up two-thirds of Kodiak Island's 3,620 square miles. Males tower ten feet (when rearing up for a better sniff of you) and approach 1,500 pounds. In the refuge they average one bear per 1.5 square miles, among the highest densities in the world.

Sharing this wilderness with bears and salmon are 16,000 humans. More than half live in the city of Kodiak and on the U. S. Coast Guard base on the island's northeastern tip. Many of the island's 2,200 Alutiiq, also known as Aleuts, live in six villages.

But even in a wilderness paradise conflicts simmer, and it wasn't hard to find them during a recent visit. The U. S. Fish and Wildlife Service is nervous that native landholdings within the refuge threaten the bears. And on

Ugak Bay sleeps beneath a winter sun. Many of these long inlets deeply cleave the coast: No site on land is more than 15 miles from the sea.

Kodiak's sister island, Afognak, chain saws were ripping down great Sitka spruce forests. There was also talk of solutions and the money to implement them—so that the islands might remain whole. I would investigate all these issues, but first I started haunting the docks to see just how fish-rich an island can be.

Alaska cowboys ride a fading trail on the Kodiak Cattle Company ranch. For decades a few dogged ranchers have tried to raise cattle on an island full of hungry bears. When ranchers blamed heavy losses—mostly calves—on bears, and hired hunters to kill them, the refuge was created to protect the predators. Branding a calf, owner Bill Burton says, "We can't afford to keep feeding our cattle to the bears." He is switching to more bear-resistant stock—buffalo.

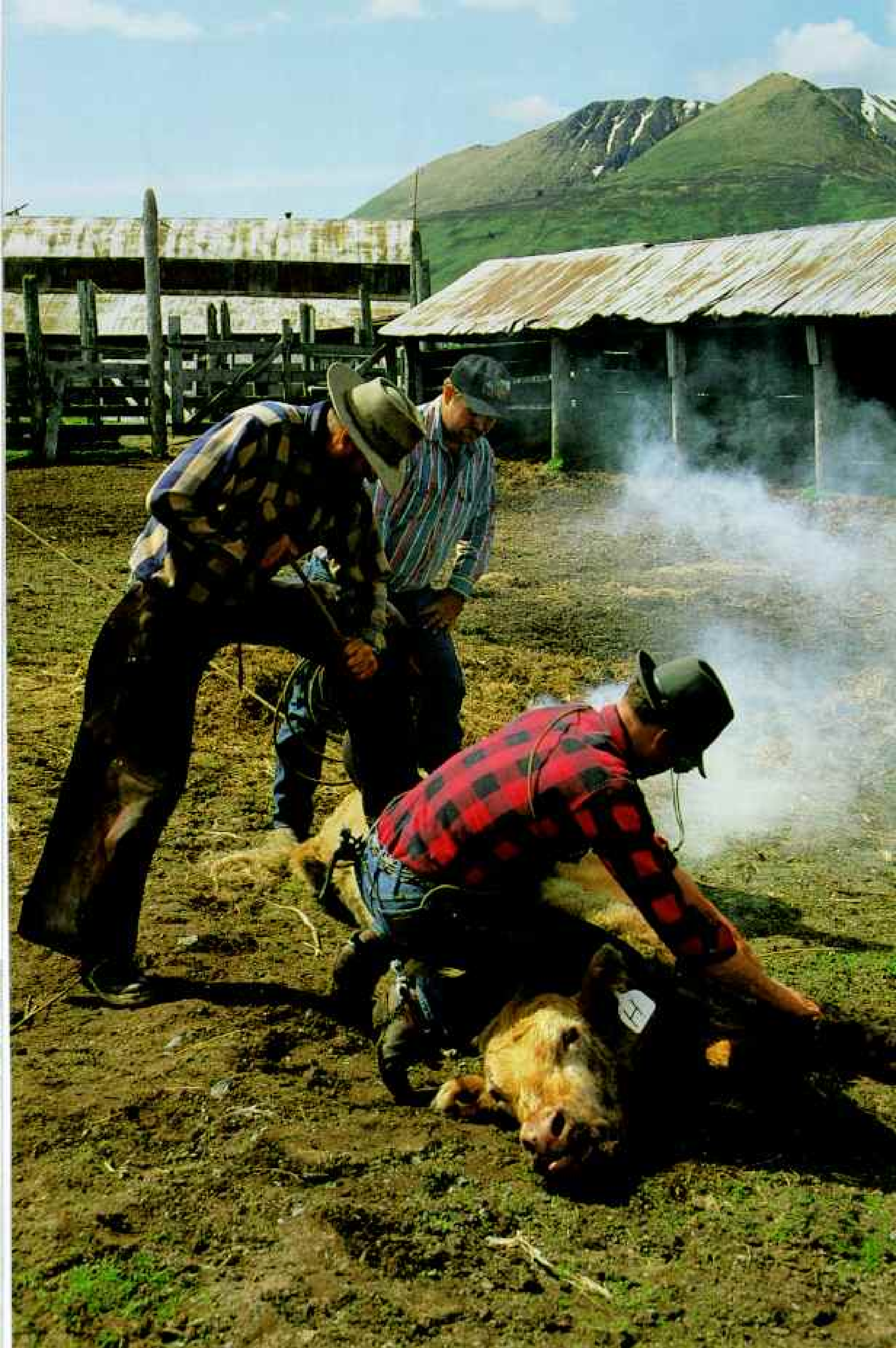
JACK CHRISTIANSEN, the *Desiree C.*'s skipper, is an Alutiiq and lives in the village of Old Harbor, population 298, on Kodiak's southeastern shore. He is in his 40s, short and wiry. Jack and his four brothers are part of the formidable Christiansen clan, which began when Jack's father, a Norwegian fisherman, married a Kodiak native about 1930. Any boat with a name that ends with "C." for Christiansen is among the flagships of Old Harbor's small fishing fleet.

Old Harbor itself is a fairly tidy town that rambles a bit because it was all but wiped out in 1964 by tsunamis spawned by an undersea earthquake. That Good Friday disaster killed 22 people and caused 45 million dollars in damage throughout the archipelago. Jack, his wife, Benny, son Jack, Jr., and daughters Desiree and Tara live in one of the two subdivisions of the rebuilt village. After he agreed to take me along as ballast on the *Desiree C.*, he invited me home for dinner.

Jack was feeling a little sheepish, because he had recently gained a reputation as a highliner. That's what folks call a top-dog fisherman who always makes the big haul. Jack is a blue-collar kind of guy, never a pretender to any throne. But he was taking a lot of ribbing from his buddies because of what he had tied into in May 1992.

In a routine ordeal for Kodiak fishermen, Jack had chugged 32 hours from Old Harbor around the Alaska Peninsula, weathered a big storm, then cut across Bristol Bay to Togiak Bay in search of herring. By law he was allowed time enough for only a single set of his seine. Instantly his net was bursting with fish.

"I've never seen anything like it," he recalled. "It took hours—days—before we knew how much we had." The numbers kept rising like a blue-chip stock and finally



reached 890 tons, blowing away the existing state record of 680 tons for a single herring set. At 1.5 pounds each, that's more than a million fish. With the cannery paying about $325 a ton, that's $290,000—minus $125,000 for the hired pilot who spotted the fish—to be split among 12 boats in two teams, or combines.

Everyone in Old Harbor dips a hook or sets a net, including Father Sergios Gerken, the community's Russian Orthodox priest. Father Sergios was born in Latin America of Russian immigrant parents and arrived in Old Harbor in 1978. He later spent eight years in a monastery in Greece before returning to the island in 1989. Like Kodiak's five other Russian Orthodox priests, he answers to the bishop in Sitka.

"I went fishing last month just to get away and relax," Father Sergios said, his brown eyes intense above a tumbling black beard. Clad in a cassock, he was planting sweet peas, columbines, and monkshood in front of his squeaky-clean, blue-domed Three Saints Orthodox Church. "My partner was Rick Berns, the mayor. Our combine did OK, caught 300 tons of herring worth $240,000."

His is the oldest Russian Orthodox community in the Western Hemisphere, dating from 1784. Russian traders, seeking the fur of sea otters, had reached Kodiak in 1763. The Alutiiq drove them away, but the Russians returned 21 years later and established the first European settlement in Alaska at Three Saints Bay, just a few miles from Old Harbor.

The traders worked for the Northeastern American Company, later called the Russian-American Company. In 1792 it moved its headquarters to the site of today's Kodiak city and soon dominated all of Alaska.

The years of Russian control, which ended in 1867 with the purchase of the territory by the United States, left their mark. Many Alutiiq today roll their names with Slavic suffixes: Melovedoff, Naumoff, Pestrikoff.

"But other people downplay their Russian names and emphasize their native names to get government benefits," said Father Sergios.

A prayer for calm seas, the Blessing of the Fleet is held in Old Harbor on the Fourth of July (left). The Right Reverend Archimandrite Innocent and the Reverend Sergios Gerken, at left, sprinkle holy water. Their Russian Orthodox faith arrived in 1784, when traders started Russia's first colony in North America.

Loss of a loved one unites relatives at a memorial service for fishermen who died at sea (below). Each year about 20 of the island's 1,400 commercial fishermen perish. Many more are saved by the U. S. Coast Guard (right), here conducting a search-and-rescue training exercise. The base on Kodiak houses 2,000 personnel.

Welfare programs, he said, "are killing this place, because they make it more convenient not to work."

On Pentecost, the day before the fleet departed for the Ayakulik, I sat in church on a plain white pew next to another Christiansen, Jack's brother Freddie, and his spruced-and-scrubbed children. Father Sergios wove specially tailored threads through the tapestry of the service. He prayed "for our fishermen who are about to go upon the sea. Blessed art thou, O Christ our God, who hast revealed the fisherman as most wise. . . . Through them thou didst draw the world into thy net."

THE CITY OF KODIAK is home to the nation's second largest commercial fishing port, as measured by quantity of fish caught. Three thousand vessels are registered there. Beyond the forest of masts in the twin harbors of St. Paul and St. Herman, the city sprawls into a dusty, hardscrabble Alaska town flung helter-skelter

at the foot of Pillar Mountain. Houses perch precariously on its slope; during torrential rains, some slide downhill.

Fishing drives the economy: The salmon harvest brings fishermen more than 40 million dollars a year, the deepwater trawlers' catch of pollock and cod nearly an equal amount in recent years. The city does not forget the merciless nature of that workplace of the sea.

In May a memorial service draws a quiet crowd to the harbormaster's office to honor those who have died at sea since the last ceremony. A Coast Guard color guard presides. Wreaths are laid, taps is played. Two bells, one at the memorial, another at the nearby Russian Orthodox church, toll after each name is read. In 1992 they tolled 19 times. An average year.

The bells once very nearly tolled for Lindy Kimball. Short, tough, and outspoken, Lindy, 37, grew up in California, joined the Coast Guard, and arrived on the Kodiak base almost 20 years ago. Eventually she shifted to commercial fishing boats, working aboard them out of Kodiak for seven years.

Sometimes when her hands are cold, she still thinks it's because of what happened in January 1987 aboard a 125-foot crabber. She knew neither the vessel, from Seattle, nor its skipper before she signed on. The boat left Kodiak for the Bering Sea to catch small crabs called *opilio*, which are crammed into steel tanks on the boat's deck until they weigh tons.

"I would have made $3,000 for one week's

Fighting for their share, about 80 Alutiiq in the village of Akhiok own 138,000 acres within the refuge. Hard-pressed for cash, they seek to sell the land to the federal government. Otherwise, they plan to build lodges, airstrips, and other tourist facilities in defiance of the law that prohibits development. A few cabins already have sprouted in the refuge.

Below the restaurant in which we talked, a billowing veil of fog and drizzle nearly erased the vessels bobbing in the twin harbors. The seasons were changing, and fishermen were switching gear to convert their boats from herring seiners to halibut long-liners. Halibut fishing offers a special incentive to tempt fate: The season is usually limited to two days, one in May, one in September. Everyone feels the pressure to join the fray—even in a small boat, even in dangerous weather.

Kodiak's the kind of town where you think the municipal emblem ought to be a red pickup hauling a golden retriever, with the truck shaking to a country tune like "Achy Breaky Heart." But you can't drive those pickups very far. A single road leads south for 50 miles, ten of them paved, and the only adventure it offers is the explosion of a tire when the viciously sharp bed of shale takes its toll.

Fortunately, the city offers half a dozen air-charter services. On Kodiak the real transportation is the floatplane. A roaring de Havilland Beaver winged me southwest into bear country.

work," Lindy said, "but we hit a snowstorm with hundred-knot winds. The spray broke over the vessel and immediately froze. We tried to get the ice off with baseball bats and sledgehammers, but it was hopeless. We started listing and our stern started sinking. Then the boat just went out from under us. It happened at night, and it happened so fast that no one could get to a survival suit.

"I broke my leg. I was sure I was going to die. I was in the water for maybe half an hour before another vessel picked me up. Somehow, all seven of us survived. But I will never go out again." One of the speakers at the memorial service had observed, "He who has no fear is the most dangerous person on the boat." No one would ever worry about Lindy.

THE REFUGE was created a half century ago in response to growing human activity on Kodiak. Canneries had been built, cattle and sheep introduced. When bears killed livestock, federal hunters were brought in. Conservation groups protested. On August 19, 1941, President Franklin D. Roosevelt signed Executive Order No. 8857 establishing the Kodiak National Wildlife Refuge. Nearly two million acres of publicly held lands were set aside—an area larger than the state of Delaware. Since then the bears have flourished.

In summer their density peaks at ten per square mile—probably the world's highest, a real bear jam—around the O'Malley River. A floatplane set me down nearby one August afternoon. The O'Malley is only 800 yards long, linking Karluk Lake to O'Malley Lake, but those few yards are all magic.

Feuding over fish, Kodiak brown bears spar on the O'Malley River. This subspecies—among the world's largest bears—is unique to the Kodiak archipelago. Males may tower ten feet and weigh 1,500 pounds. To limit access to these popular animals and to offer a lifetime thrill, the U. S. Fish and Wildlife Service runs a viewing program; 250 people from around the world applied for 90 slots in 1992, including these winners, chosen by lottery (above). Vic Barnes (below, at left), who started the program, radio collars a bear with his 11-year partner, state biologist Roger Smith.

EDWIN C. HIELSCH

At a Fish and Wildlife Service camp on the shore of Karluk Lake, I joined five other people in a bear-viewing program sponsored by the service, inspired by the popularity of other Alaska bear-watching sites at McNeil River, Brooks River, and Pack Creek.

Participants are chosen by lottery. Our winners included a retired San Jose lawyer, an Anchorage government worker and his daughter, and two young Californians from a computer firm. Everyone had come loaded for bear—with cameras and bazooka-like lenses, tripods, binoculars, spotting scopes.

One of our two guides from Fish and Wildlife was biologist Vic Barnes. He has legs of steel from following Kodiak bears for 11 years. More than 70 bears wear radio collars attached by him and his tagging partner, Roger Smith of the Alaska Department of Fish and Game.

Vic knows the O'Malley bears by age, sex (all but one we would see were females, called sows), cub-to-mother relationship, and name. "Well, we're really not supposed to name 'em, but we do anyway because it's just easier to keep track of 'em," he explained with a grin.

Although the O'Malley doesn't look like much of a river, every year it funnels a torrent of spawning salmon. The runs begin in June and continue into November—a feast for about 130 bears. All those fish help explain the prodigious size of *Ursus arctos middendorffi*,

On a weekend getaway with family and friends, Tom Hendel sweeps snow from an ice rink he created by draining his vacation cabin's hot tub. Hendel moved from Minnesota 21 years ago, angling to tap Kodiak's commercial fishery.

considered a subspecies, although the only obvious difference between Kodiak bears and most other brown bears is the tale of the tape and the scale. They grow so big simply because Kodiak offers them so much to eat.

The bears are asleep in their winter dens by December and emerge between March and May. As their appetite returns, they begin devouring about 20 fish a day, along with elderberries, salmonberries, cranberries, and bearberries; nutrient-rich grasses and other plants; and seal and whale carcasses on the beach. Occasionally they dine on beef—on the hoof from a few Kodiak cattle ranches still run by optimists. As if those pastures of plenty weren't enough, in 1934 nine Sitka black-tailed deer were introduced to Kodiak and have now multiplied into 100,000 potential morsels of bear chow.

AT KARLUK LAKE blooming fireweed raged in a pink flame around our camp. Each morning we hiked about a mile to the river, where an inconspicuous six-by-sixteen-foot wooden platform had been built on one bank. Then we settled down and waited for the show to begin 40 feet in front of us.

Ambling up the river, scanning the surface for sockeye salmon, the 600-pound sows came in a daily parade. The matriarch was Samantha, claws whitened by 15 to 20 years of age, her newly grown fur coat neat and brown. Ruth, blond and skinny, came with two cubs born seven months earlier; they tussled and played on the riverbank and melted our hearts. Lacey, with a red scruffy mane, was often challenged by Samantha as the two reared up in jaw-to-jaw disputes over fishing

Dancing dolls, Cassandra Janz-Burns, left, and Savannah Tallino play children of Russian colonists in "Cry of the Wild Ram," an outdoor pageant. The story tells the travails of Alexander Baranov, Alaska's first Russian governor. His Russian-American Company controlled Alaska from 1799 until 1867.

rights. "Poor old Lacey often gets the heck kicked out of her," said Vic.

One of Lacey's nightmare bears was Gloria, who had her paws full keeping track of her two yearlings. We watched as Lacey made the mistake of confronting the three. When she and Gloria were 30 feet apart, Lacey tried to defend her dignity, woofing and half standing. Gloria curled her lip in disdain. She charged like she'd been shot out of a gun, chasing panic-stricken Lacey out of the river and a hundred feet up a hillside, where she caught and pummeled her without mercy.

We laughed, but later had our own run-in with Gloria. Hiking back to camp one evening, our group followed the lakeshore, moving cautiously—because Gloria and the yearlings were only about a hundred yards ahead of us. Gloria swam in the lake, diving after fish and delivering them to the cubs, who watched from the beach. Finally she came ashore, collected her young, and reversed direction . . . toward . . . us.

We made a quick left turn and huddled in the fireweed above the beach. But after a look-see, Vic said, "No, she's leading them up here." Down we went and backed into the water right up to the tops of our hip waders. The fireweed rustled as the first yearling passed. Then a great huge head that looked like an ursine Mount Rushmore popped up 40 feet in front of us.

Gloria woofed softly, looking for the other wayward yearling. Then she looked at us. "Easy, girl," Vic crooned softly. Like a dawdling teenager, the second yearling caught up to her, and they disappeared into the brush.

"She's a good bear," said Vic, totally at ease. I was willing to take his word for it.

These bears' fame does not make them immune to threats. Since about 1900 the bears have been legally stalked by trophy hunters from around the world. Despite criticism from conservationists, the hunting continues, with about 150 animals killed each year. Refuge personnel argue that Kodiak's economy benefits—a guide can earn as much as $10,000 a kill—and that the bear population can sustain the loss.

But U. S. Fish and Wildlife is more concerned about a long-term danger: Nearly one-fifth of the refuge is now owned by Kodiak natives who may soon develop the land in ways that could hurt the bears. How did the Alutiiq come to have a stake in this famous federal wildlife refuge? History provides the beginning of the answer, and the Ayakulik River provides a lot of history.

ONE DAY THE DE HAVILLAND set me down on the Ayakulik: Over the quiet stream floated the song of golden-crowned sparrows, three descending notes, *"oh, dear, me."* Perhaps they were bemoaning the fate of the giant chinook salmon, 25- to 35-pounders, that were slamming like trucks into lures offered by a party of anglers.

I walked the riverbank with Rick Knecht and his assistant, Sven Haakanson, Jr. Rick

is an archaeologist and director of Kodiak's Alutiiq Cultural Center.

They were looking for holes in the ground, and they were finding them everywhere in the soft hummocky muskeg. Seven centuries ago this river nourished a thriving Alutiiq culture.

"These depressions were barabaras, built partly underground like old plains sod houses," said Rick. "Several families of Alutiiq lived together, about 20 people in each house. They built up layers of earth and used driftwood for support posts. There was a central room, about eight by ten feet, where all the food fixing, dancing, and romancing took place. This one had three side rooms."

Sven added, "They would bring heated rocks inside, pour water on them, close up the entrance, and have a sauna." That became a Kodiak tradition, still practiced, called *banya*—the Russian word for "bath." Those early Russian traders had liked it too.

Salmon and plentiful berries nurtured the ancient Alutiiq, who also hunted whales and seals from skin boats. Rick estimates that a village of a thousand people had flourished here by the river, a few feet from where now stood the gaudy tents and aluminum lawn chairs of the fly-in fishing party. Rick thinks there were some 20,000 Alutiiq on Kodiak when the Russians settled at Three Saints Bay in 1784.

TO SHOW THE TERRIBLE RESULT of that cultural collision, Rick led a group of us a few days later to the site of the massacre at Refuge Rock. The story has been long known, but it was not until 1990 that Rick discovered the site, using historical descriptions and finding skeletons showing possible foul play. The rock lies not far from Old Harbor.

A few months after landing at Three Saints Bay the Russians determined to subdue the Alutiiq and force them to hunt sea otters for the company. The commander, Grigory Shelekhov, led 70 armed men in skin boats to a "single large rock which was inaccessible from the seaward side because of steep cliffs." Several thousand Alutiiq were temporarily living atop the rock.

We followed the Russians' route, boating through a lagoon that cleaves Sitkalidak Island, then walked over a thin spit of land to the sea at Partition Cove. There stood Refuge Rock, surrounded by water.

From there the Russians opened fire with

***Happiness money can't buy:** Filipino immigrants Ephraim Amodo, Jr., and his wife, Leila, celebrate their wedding adorned with bills pinned on by well-wishers. Filipinos began arriving on Kodiak 60 years ago to labor in canneries. Today they number about 2,000; many drive taxis and work in retail shops.*

cannon or perhaps mortars that hurled stones, and with small arms. On the rock people panicked, falling or jumping off the cliff. Then low tide revealed a natural bridge of boulders to the site; the Russians charged onto the rock and massacred hundreds of Alutiiq —"a terrible bloodbath," according to a native account.

Rick led us across the same low-tide bridge the Russians had used and onto the rock. "There were probably 2,000 Alutiiq here," he said, pointing to the ubiquitous holes of sod houses. "Just offshore were seals, sea lions, and whales for them to hunt."

About 500 of the survivors were taken hostage or enslaved. "This broke the back of Alutiiq resistance," Rick said. "By the early 19th century the population on Kodiak had been reduced from 20,000 to 1,500 and was racked by diseases like smallpox."

Listening with me was someone for whom the massacre had special meaning—Ralph Eluska, who is an Alutiiq.

"I'm speechless," he said, shaking his head. "You read about massacres of American Indians, but . . . we might as well not have any history, as little as we know about it. If we can piece this together and pass it on to our children, this may give them a little feeling in their hearts. This brings it to life."

Fabulous fishing creates tent towns on the Ayakulik. Six salmon species—chinook, sockeye, pink, coho, steelhead, and chum—spawn in it. An Alutiiq from Old Harbor and Harvard archaeology student, Sven Haakanson, Jr., hefts a 25-pound chinook.

RALPH was born and raised in the isolated village of Akhiok on Kodiak's south end. The modest homes of about 80 people nestle on the tundra, and the green-roofed Orthodox church perches by itself on a little rise. Like most native communities, Akhiok has wrestled with economic and alcohol problems. Although some residents work seasonally in a nearby cannery, many rely on welfare, and virtually everyone depends on subsistence hunting and fishing.

Ralph, former chairman of the statewide Alaska Federation of Natives, Inc., is president of one of Kodiak's native corporations, Akhiok-Kaguyak, Inc. For a long time, he figures, his people have gotten a raw deal.

When the United States purchased Alaska from Russia, it vaguely agreed to settle land claims pressed by the natives. But not until 1971 did the U. S. Congress act. That year it passed the Alaska Native Claims Settlement Act. The law established native corporations, some 200 based on villages and 13 on regions. The corporations received 962.5 million dollars and title to 44 million acres of Alaska. These were to be managed as assets for the natives, and the corporations were mandated by the act to become self-sufficient.

The native corporations were required to select lands in the immediate vicinity of their villages. Some groups ended up with land holding valuable oil and gas rights. But on Kodiak three native corporations were forced to choose their 330,000 acres from within the wildlife refuge—for here lay their villages and traditional hunting and fishing grounds.

They soon discovered that the act had a catch-22—a clause called Section 22 (g) that stipulated that the land remains "subject to the laws and regulations governing use and development" of such wildlife refuges.

"It was a real injustice," Ralph said. "We have this land, and what can we do with it? Nothing. And now we're almost broke."

For years Ralph and other Kodiak natives have been willing to sell their 330,000 acres back to the government for perhaps 200 million dollars. They would use the money to restore solvency to their corporations and to ensure that shareholders receive dividends. They would use it also to establish collateral for bank loans, which are difficult or impossible for most natives to obtain now.

A few miles from Akhiok, in a luxurious sea pasture of salmon called Moser Bay, Ralph illustrated the hurdles natives face in order to fish. Shoreline setnetters had staked out their turf with gill nets extending from shore and anchored to the bottom. "For some of these sites the state permits cost a quarter of a million dollars," Ralph said. "Too costly for us, and the idea of buying a fishing boat is just as impossible. We can't get into the fishing game because we don't have the asset base, the collateral."

Now Ralph and other natives are threatening to develop their lands—Section 22 (g) or not. The three native corporations own nearly a fifth of the refuge, and this includes premier bear country, salmon streams, and recreation

areas. Perhaps 10,000 fishermen, hunters, and nature lovers visit the refuge each year.

"We're going to bring them in," Ralph announced. So far he has built a cabin—illegal in the eyes of Fish and Wildlife—for tourists in the refuge, and he speaks of lodges and airstrips. Also, he says, "We may lease land out to foreign firms"—meaning Japanese fish-processing concerns.

The prospect of such development sends shudders through conservationists and refuge officials. "What this would mean, if it happens, is fewer bears," said refuge manager Jay Bellinger. "Human presence and development are not consistent with these animals. The bear always loses." On Jay's map—a crazy quilt of mixed federal and native lands—he pointed out the high alpine country. "The bears den there, and it's still part of the refuge, but many salmon streams that the bears depend on are controlled by the natives.

"Right now we've got the bears' bedrooms," Jay said, "but the natives have the kitchens." Not only would the bears be crowded off their habitat, but increasing clashes with people would mean more dead bears. In Kodiak, as elsewhere in Alaska, the prudent hiker in bear country carries a firearm, preferably a big one.

Already the official rate of bear deaths resulting from unintended confrontations—often when a bear moves in on a deer hunter's kill—is about ten a year. But an equal number probably go unreported.

Old-growth monarch falls on 700-square-mile Afognak north of Kodiak. Loggers have clear-cut tens of thousands of acres of Sitka spruce (below), most bound for the Asian market. Fines resulting from the 1989 Exxon Valdez oil spill, which spread to Kodiak, will help preserve thousands of unlogged acres on Afognak.

ALTHOUGH REFUGE PERSONNEL and natives often seem at loggerheads, there is a sense that everyone would profit if the government buys back the land. Both sides have looked for money to do so, from private foundations and government agencies.

Last spring a huge new source of money appeared, which offers hope that finally the transaction can be made. When nearly one billion dollars in penalties was levied against the Exxon Corporation after the *Exxon Valdez* oil spill in March 1989, a six-member board was established to decide on uses for the money. Three trustees represent the state of Alaska and three the federal government.

This group, the Exxon Valdez Oil Spill Trustee Council, meeting in Anchorage, has started to earmark distribution of the money—and a large chunk may be used to preserve lands in the Kodiak archipelago as compensation for damage from the spill.

Enough oil drifted 300 miles from the stricken tanker to kill an estimated 200,000 birds in Kodiak waters, perhaps half of all those lost in the spill. The oil also temporarily crippled the island's economy.

Bob Brodie, Kodiak's mayor at the time, remembers: "The salmon fishermen were shut down for the whole summer. Things snowballed. We had cannery workers and others out of work. Pressure was tremendous. People couldn't make payments on their boats, their houses, their cars. Our mental health center was swamped."

The borough of Kodiak is seeking 280 million dollars from the Exxon Valdez trustees for its own projects, including an archaeological museum. Last March the trustees agreed to fund the museum with 1.5 million dollars. "I

think this calls for a beer," archaeologist Rick Knecht reported from Anchorage.

Land acquisitions will take longer. The trustees have targeted 19 land parcels totaling about 380,000 acres. One by one the pieces will require hard bargaining. One of the early negotiations concerns a parcel on Kodiak's sibling island, Afognak, just to the north.

IF YOU FLY into the city of Kodiak on a commercial airliner, you'll pass just east of Afognak and get a low-level eyeful of what has happened to this once lovely island. It's enough to bring on airsickness. The most visible of many wounds is a series of nearly continuous clear-cuts. These have left many square miles of ugly stubble where an old-growth forest of Sitka spruce had grown, some of it for 250 years.

What remains of Afognak's woodlands is breathtakingly wild. Through them range an estimated 270 Kodiak bears, 15,000 Sitka black-tailed deer, 1,000 Roosevelt elk. Lakes burst with salmon. And the human population is practically nil.

The devastation is due to those splendid trees covering half the island. Oddly, although Kodiak is only five miles to the south, it has few Sitka spruce. Holding almost no timber of commercial value, Kodiak has essentially escaped the chain saw.

Efforts to protect Afognak go back to 1892, when it was declared a forest and fish culture reserve. It later became part of Chugach National Forest, and extensive logging began in the late 1970s.

By the 1980s more than half the island had been ceded by the federal government to Kodiak's native corporations. The timber resource could yield money, unlike their holdings in the Kodiak refuge. They formed joint ventures and brought in loggers. Since then, more and more of Afognak's forest has fallen to the saw. Most of the logs are sold to Japan and China.

The scent of *Exxon Valdez* money is in the air here too. Kodiak native corporations are eager to sell 125,000 of their 400,000 Afognak acres for more than a hundred million dollars, to become state or federal parkland.

The Exxon Valdez trustees have surveyed parcels on Afognak and last spring began negotiating for land near Seal Bay owned by two native corporations on Kodiak. The adjacent area has been relentlessly logged.

Two of the handful of people who live on

Beneath frosted peaks, under a quilt of winter snow, bears sleep in alpine dens. In March they will begin to venture out, searching for grasses and other plants. Soon the salmon will bring a feast, then berries will offer dessert. What better place to be a bear than Kodiak?

Afognak are Roy and Shannon Randall. Roy came up from Texas 30 years ago to hunt seals and eventually married Shannon, a Toronto legal secretary. They run Afognak Wilderness Lodge at Seal Bay, where visitors pay $350 a day and stay in deluxe cabins crafted from two-foot-wide Sitka spruce logs. Roy started the operation in 1964. The Randalls often take clients deer and bear hunting half a mile across a cove. Toward that cove, the chain saws were steadily advancing.

"We're sick, just sick," Shannon said, shaking her head as the logging was proceeding. "We've been hearing the chain saws for a long time. Our chain saw is the only one I thought I'd ever hear—and ours is a lot more discriminating." Last May the trustees finally voted to spend 38.7 million dollars to buy 42,000 acres, and at Seal Bay the logging at last ceased. Continued bargaining may well lead to other purchases on both Afognak and Kodiak Islands.

Just west of Seal Bay lies another item on the Exxon Valdez trustees' potential protection list, a jewel called Pauls Lake. One evening, in the Alaska summer twilight that tries to last forever, a group of fishermen stood around the shore casting Blue Fox Pixies and other implements of deception into waters that exploded as if hit by incoming artillery. Erupting from the surface, scores of salmon—ten-pound cohos and smaller pinks—leaped and performed aquatic acrobatics. Tail standers, lurchers, and triple jumpers crashed their way toward the mouth of Pauls Creek. En route, several were waylaid by our hooks.

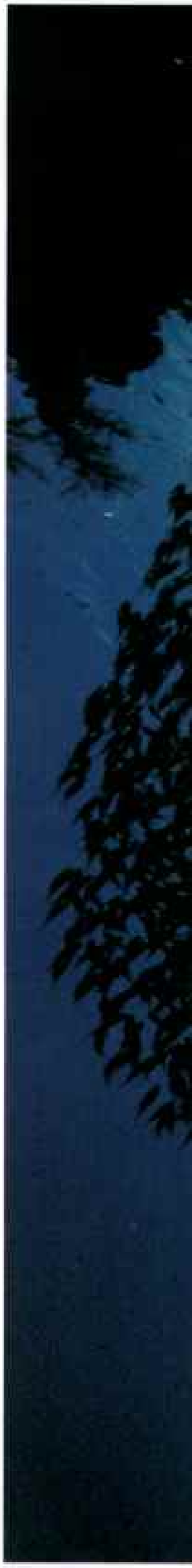
The chain saws may be heading toward Pauls Lake too—unless money from Exxon Valdez or other sources stops them in time. Most people call that infamous spill an environmental disaster. But it could end up paying significant dividends, if those funds can make Kodiak's refuge whole again and preserve what's left of Afognak. This country looks a lot better with its skin on. □

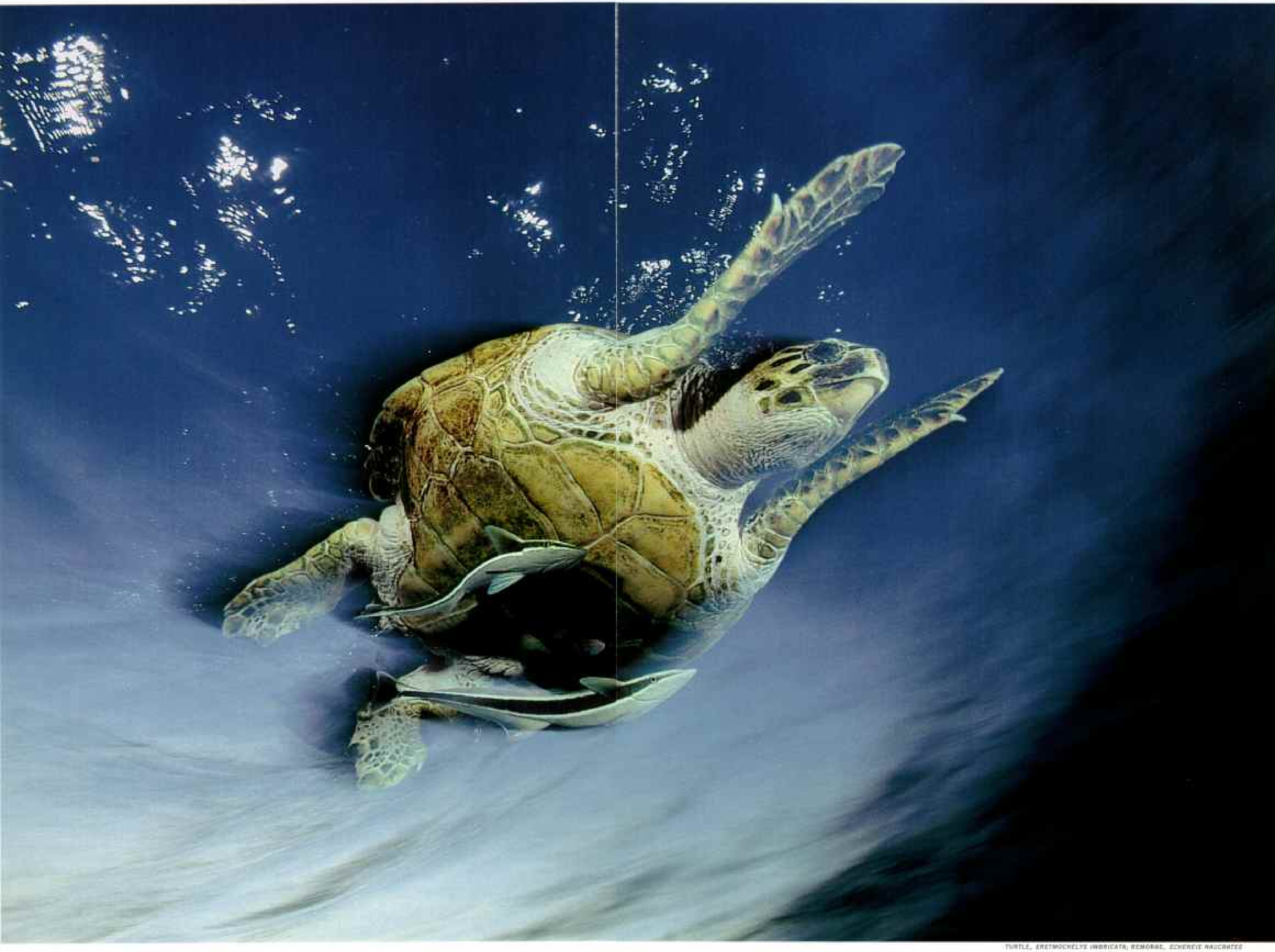
"Island of the Giant Bears," a National Geographic Special, will air on PBS January 12 at 8 p.m. ET.

THE DESERT SEA

Sundown light tinted by desert dust washes the Red Sea, divider of continents. After decades of diving in the northern reaches of this watery realm—so barren along its shores yet so brimming with life—I find new wonders in its southern depths. Two of my companions explore a glittering, shifting chandelier made of fish called glassy sweepers.

Text and photographs by DAVID DOUBILET





TURTLE, ERETMOCHELYS IMBRICATA; REMORAS, ECHENEIS NAUCRATES

PARROTFISHES, *CETOSCARUS BICOLOR* (ABOVE) AND *SCARUS FERRUGINEUS*

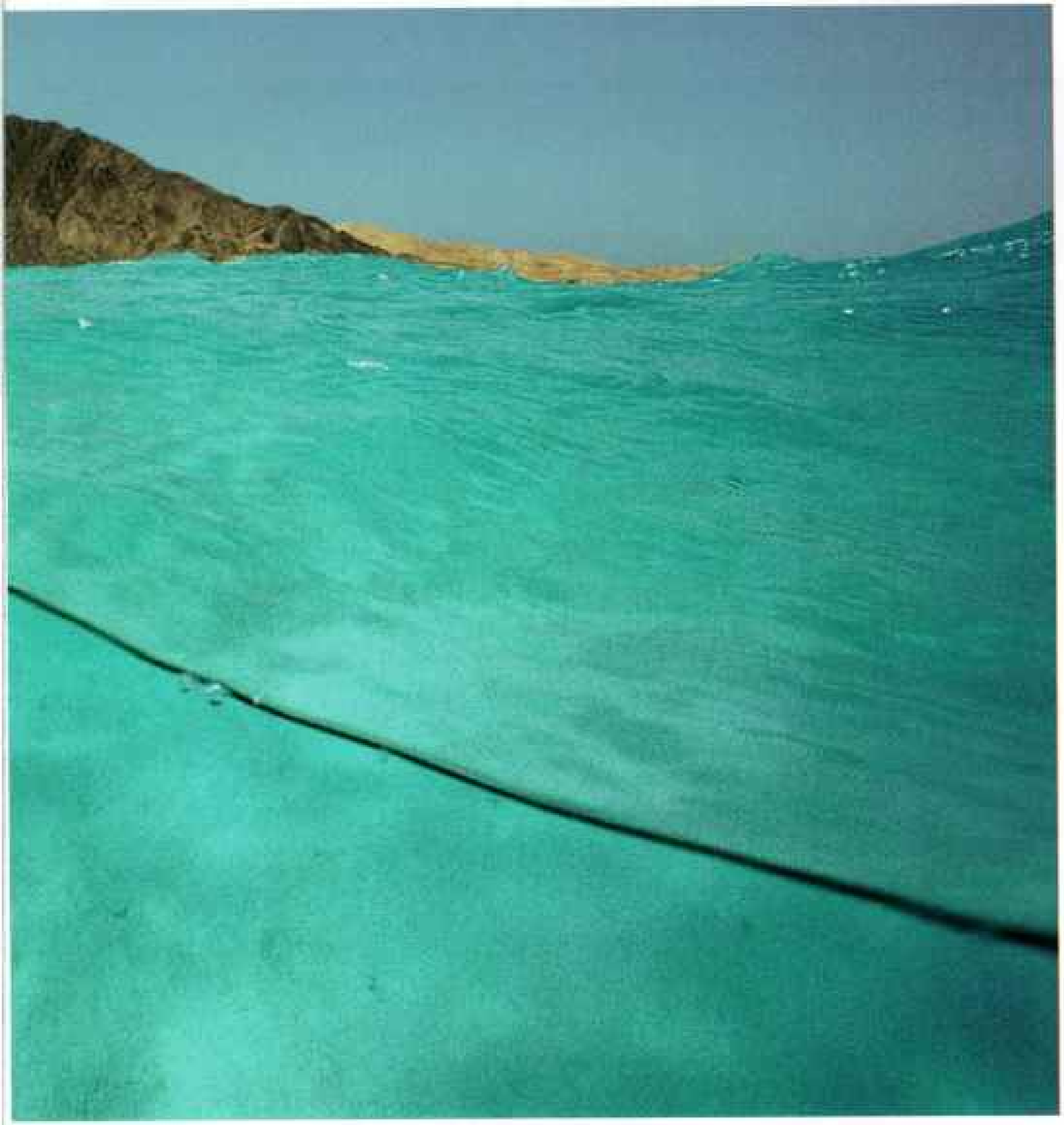
As dusk settles over the Gulf of Aqaba, I look up to find a hawksbill turtle. My strobe and a slow shutter speed lend it the eerie look of some alien reptile bounding back into outer space. A pair of remoras use suckers to hang on, catching a free ride to a distant dinner.

As with "hawksbill," the avian world inspired the name parrotfish, which I find fitting in light of their eye color and beaklike mouths. With dental plates edged like a concrete-cutter's saw, these fish bite off pieces of coral to get at algae. Their throats house grinding plates that pulverize the coral into sand that passes from the body and drifts to the seafloor.

Zabargad: It looks like a floating mountain, as if some ancient flood washed it out of Sinai. Encircling the island like an egg white, sand fans down from the surf line to the seafloor. My camera lens—half above and half below the surface—is divided by a wave line that mimics Zabargad's arched spine (above). To the east lies the arid Arabian Peninsula. To the west, the Sahara. I am back in the desert sea once more.

Over the past two decades I have come here many times to photograph the corals and marine life—sharks, scorpionfish, flashlight fish, and countless other species. Those visits centered on a northern finger of the Red Sea, the Gulf of Aqaba, which became a living laboratory and studio not only for me but also for my wife, Anne, our scientific colleagues Eugenie Clark and David Fridman, and my diving partner Howard Rosenstein.* But I hungered for more of the Red Sea's visual feasts—especially for those waiting among the coral reefs of the unknown south.

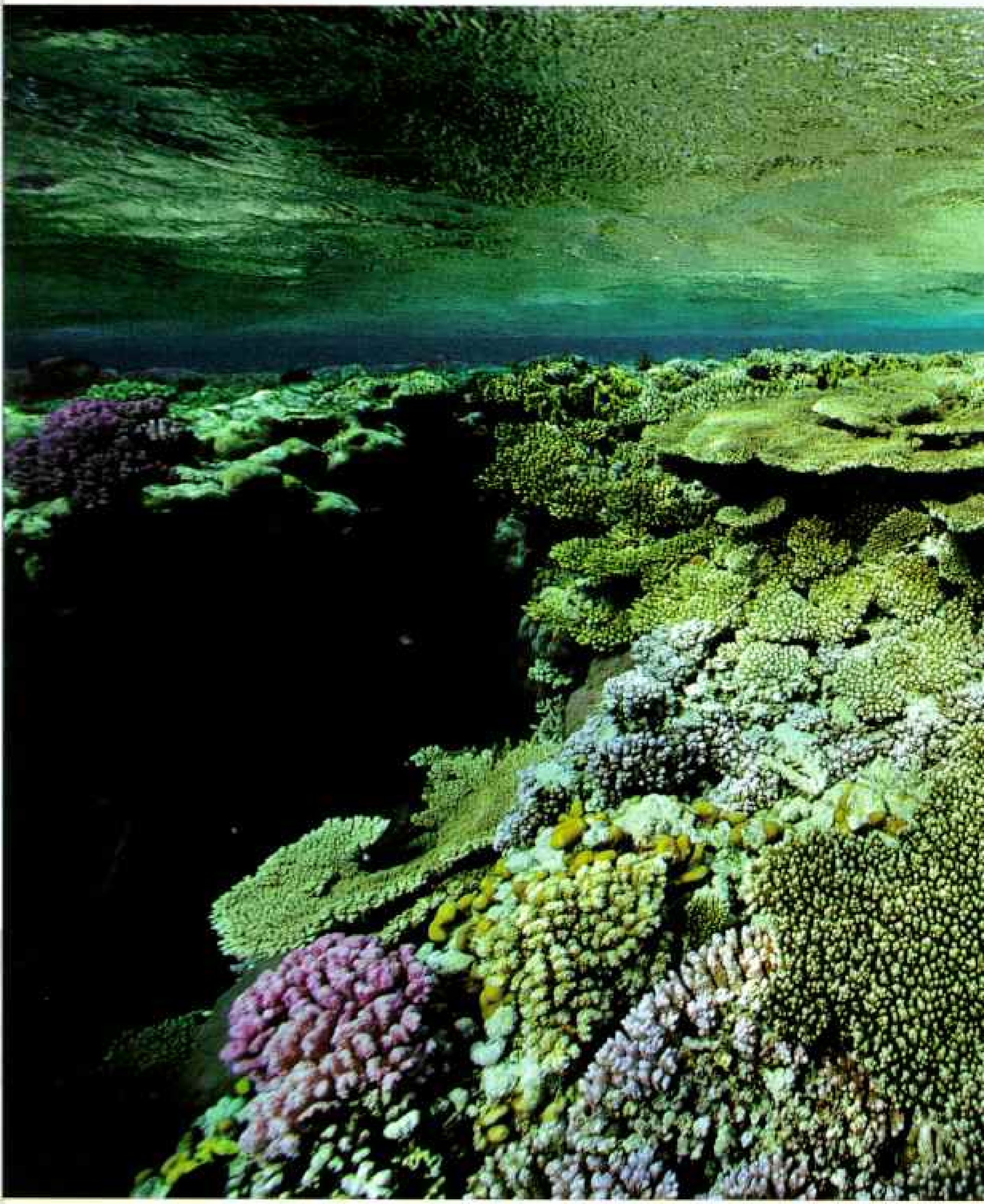
* Since 1972 DAVID DOUBILET has contributed 35 articles to the GEOGRAPHIC, ten of them in collaboration with Dr. Clark.



Working out of Howard's 125-foot motor yacht *Fantasea II*, I would finally be able to explore the length of the sea, ending where the narrow, tight-lipped body permits itself a slight yawn and gets a mouthful of cloudy Indian Ocean water.

Early on, off the tip of the Sinai peninsula at Ras Muhammad, I floated in an area I call the Swimming Pool. There a 40-foot-high reef wall makes a rare straight line where it meets the seafloor. I watched fish dive into the sand when disturbed. Unearthly creatures called garden eels anchored their tails in the sand as they fed on plankton suspended in the water. When I got too close, they too disappeared, like a mirage in a blue-and-white sea.

Nearby, in a bay called Marsa Buraykah, the seabed is furnished with patch reefs the size of living room couches. They were crowned with halos of glassy sweepers. Groups of jacks fed on them from above as scorpionfish, red spotted groupers, and lionfish lurked below. I have explored reefs the world over, but seldom have I seen such striking displays of diversity. This was a world of endless variety—colors, shapes, shadows, and light that made the sere landscape all the more drab every time I came out of the water. *(Continued on page 71)*



With its multitude of shapes, textures, and colors, a reef table off Zabargad Island looks as if it has been landscaped. I have never before seen a reef with such intricate

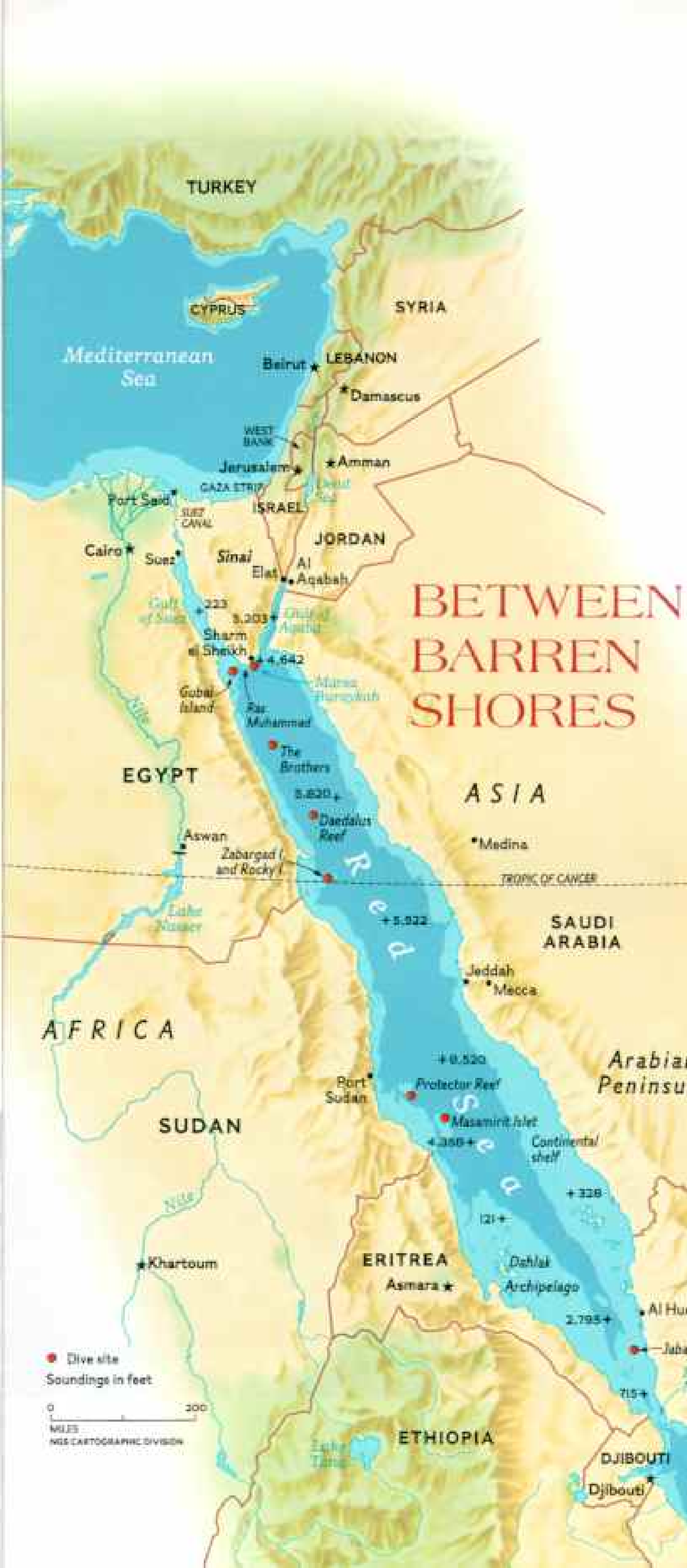
delicacy. Because it is so isolated from the open ocean, the Red Sea harbors a wealth of endemic marine creatures: One-fifth of the species are found nowhere else.

BETWEEN BARREN SHORES

A meeting place for Africa and Asia, this steep-sided sea became a crucial highway in 1869 when the Suez Canal connected European powers with their Asian colonies.

Relatively young as seas go, it was born as a crack in the desert floor 25 million years ago. The seafloor continues to widen by about an inch a year.

No rivers flow into this desert sea, which is barely connected with other waters by the canal and the strait of Bab al Mandab. The Red Sea sits isolated amid these desolate lands like a mammoth aquarium.



RED SEA

The reefs of the Red Sea are as deadly as they are rich. Shab Abu Nuhas arches off the northern end of Gubal Island like a hidden claw. At its base, 110 feet down, lies the 300-foot-long hulk of the Royal Mail Steamer *Carnatic*, her iron hull encrusted with hard corals (below). In September 1869, shortly before the Suez Canal opened, the *Carnatic* sailed from the port of Suez carrying 230 passengers. After she ran aground, the passengers voted to stay aboard until help arrived. On the morning of the second day, the ship broke in two, and 27 passengers and crew members drowned.

Farther south, two islands called The Brothers loomed like tan mushrooms on the horizon. We dived beside a reef built in wedding-cake tiers. It seemed an eclectic modern painting: Shallows veiled with orange anthias, Picasso trigger-fish with wedge-shaped heads and mouths like jet-engine intakes, and cornet fish, silver pipes with opal eyes looking like exiles from a Mondrian masterpiece. In an especially animated corner of the canvas two unicorn fish performed a courtship ballet, the male raising his pectoral fins as he circled the female.

As we pressed southward in the Red Sea, the water warmed and lost that blue perfection I'd seen in the north. Off Masamirit Islet I spotted my first orange butterfly fish, a visitor from the still distant Indian Ocean. After a rough passage that precluded any diving, I marveled at a forest of algae that grew like poplar trees from a reef off Jabal Zuqar Island. Soon we sailed through the strait of Bab al Mandab, the Red Sea's southern gate. It was the realization of a dream: to sail the length of this unique desert sea, a place that seems to protect—even to enshrine—the life of the reefs.

RED SEA

SEA ANEMONE, *STICHODACTYLA MERTENSII*; STONY CORAL, *DIPLOASTREA HELIOPORA*; CLOWNFISH, *AMPHIPRION BICINCTUS*

It looks as harmless as a shaggy bath mat. But the giant carpet sea anemone (left), resting on a plate of stony coral, uses nematocysts in its tentacles to stun its prey. Bright clownfish coat their bodies

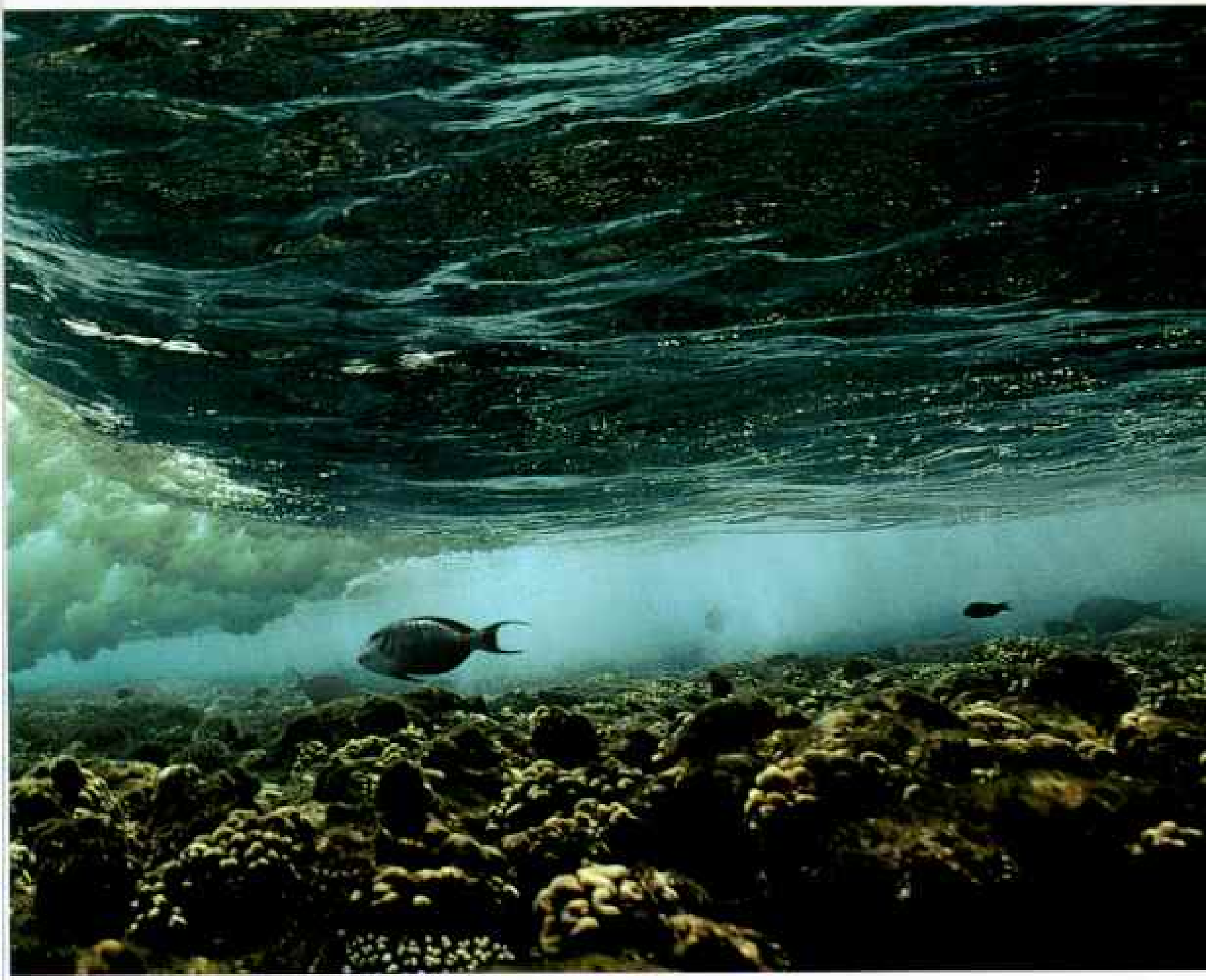
SOFT, GORGON STRINGY CORAL, *ACROPORA*

with mucus that the anemone secretes for protection against its own venom—and thus become immune themselves.

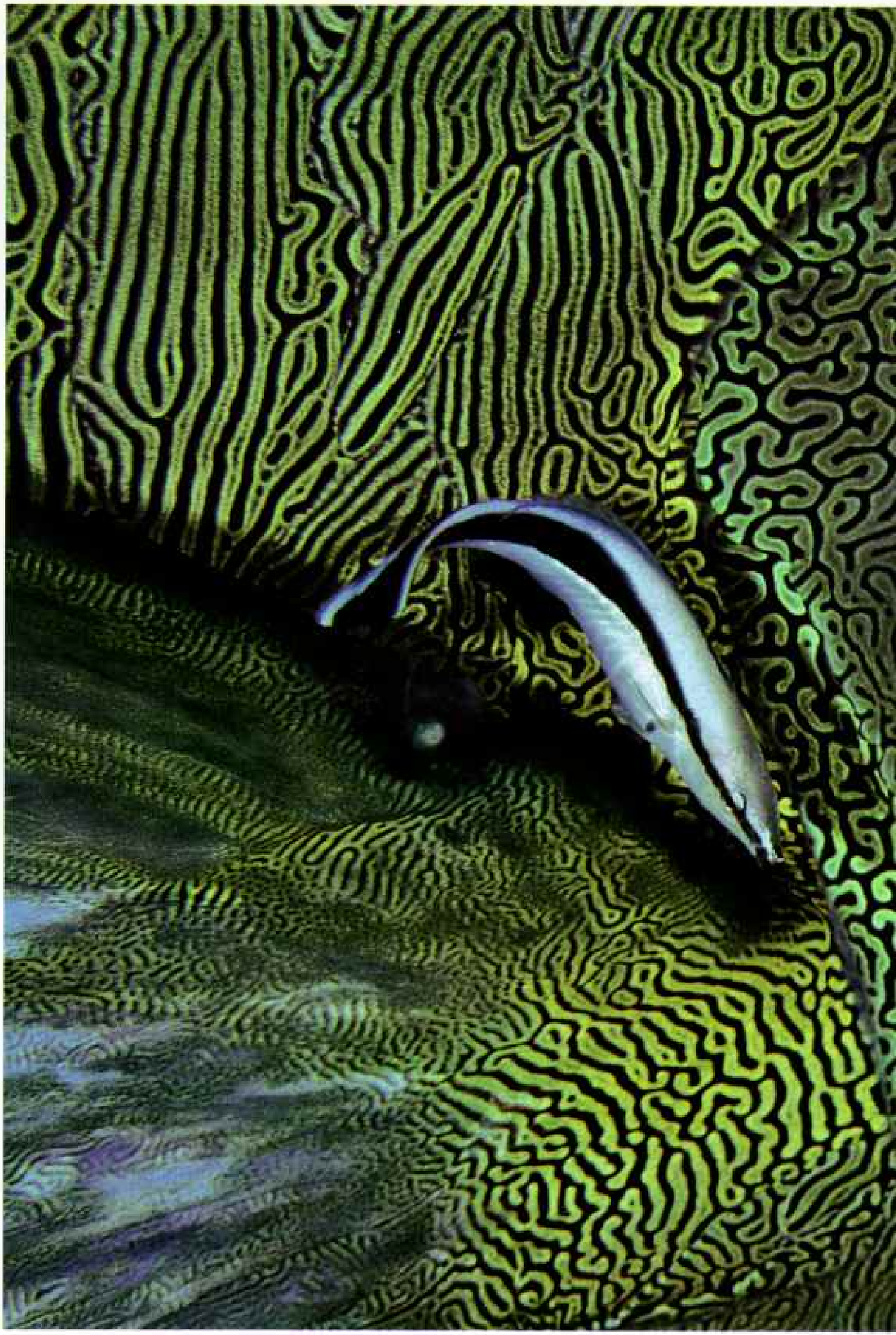
A lemon goby (above) finds its own protection within the branches of a stony table coral, where it hunts for worms, plankton, and small crustaceans.

RED SEA

A vigilant surgeonfish remains on patrol at Protector Reef despite surf breaking in the foot-deep water. It guards a section of a reef table covered with the algae on which this species—endemic to the Red Sea—feeds. Coloring the depths with brilliant purple, the Fridman fish was named for naturalist David Fridman, who discovered it. A blue-spotted stingray feeds by snuffling over the seafloor to excavate worms and mollusks.



SURGEONFISH, *ACANTHURUS SOHAL*; FRIEDMAN FISH, *PSEUDOCHROMIS FRIDMANI*; STINGRAY, *TAENIURA LYMMA*



HUMPHEADS, CHEILINUS UNDULATUS; REMORA, ECHENEIS NAUCRATES; CLEANER WRASSE, LABROIDES DIMIDIATUS

Living gargoyle, a humphead wrasse propels its ponderous bulk through the waters off Ras Muhammad (above). These shy giants can exceed 400 pounds. Omnivorous feeders, they are equipped with well-developed teeth and a pair of hard bony plates in their throats that crush cowries, spiny sea urchins, and other shellfish. This humphead kept close company: A remora rode piggyback.

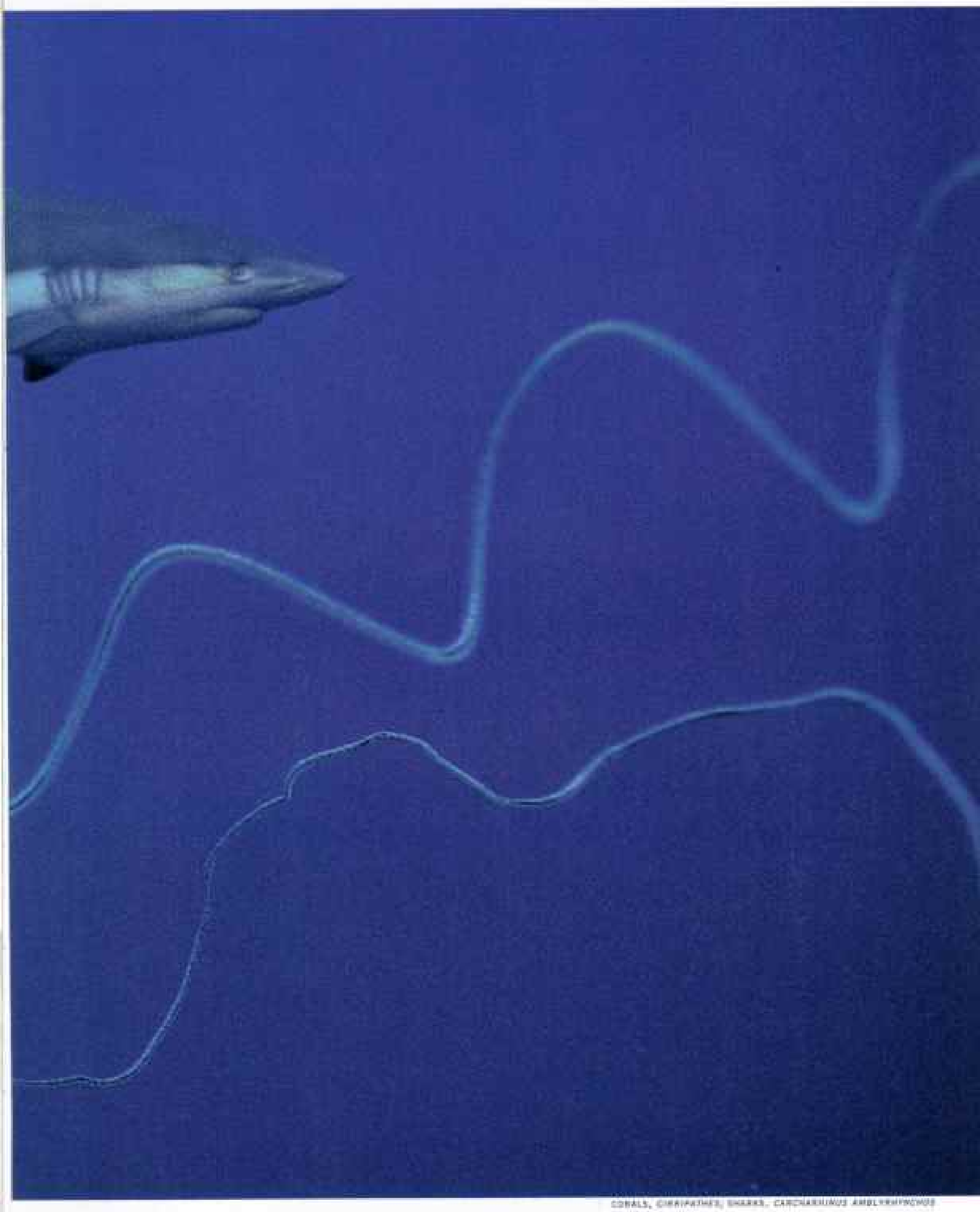
A two-inch-long cleaner wrasse (left) forages along the artfully reticulated gill plate of another humphead, making a meal of tiny parasites and skin growths.

With designs beyond imagination, reef fishes present an ever shifting kaleidoscope of shapes, colors, and behavior.

When mature, a juvenile emperor angelfish (right) will jealously guard its feeding ground. The coral grouper (below) opens its cavernous maw as it attacks, creating suction to draw in its victim. Flat-bodied yellow butterfly fish, which usually travel in pairs, join a rare crowd crossing the face of the reef, where they slip easily through narrow passages to forage. The Picasso trigger-fish can raise its spines at will, enabling it to thwart predators by locking itself in a crevice.

ANGELFISH, POMACANTHUS IMPERATOR; GROUPER, PLECTROPOMUS MACULATUS; BUTTERFLY FISH, CHAETODON SEMILARVATUS; TRIGGERFISH, RHINECANTHUS ASSASI

In placid water 170 feet deep, whip corals corkscrew from the sheer wall of Rocky Island near Zabargad. Gray reef sharks glide ghost-like above them, circling the island



CORALS, GORGONIANS, SHARKS, CARCHARHINUS AMBLYRHYNCHOS

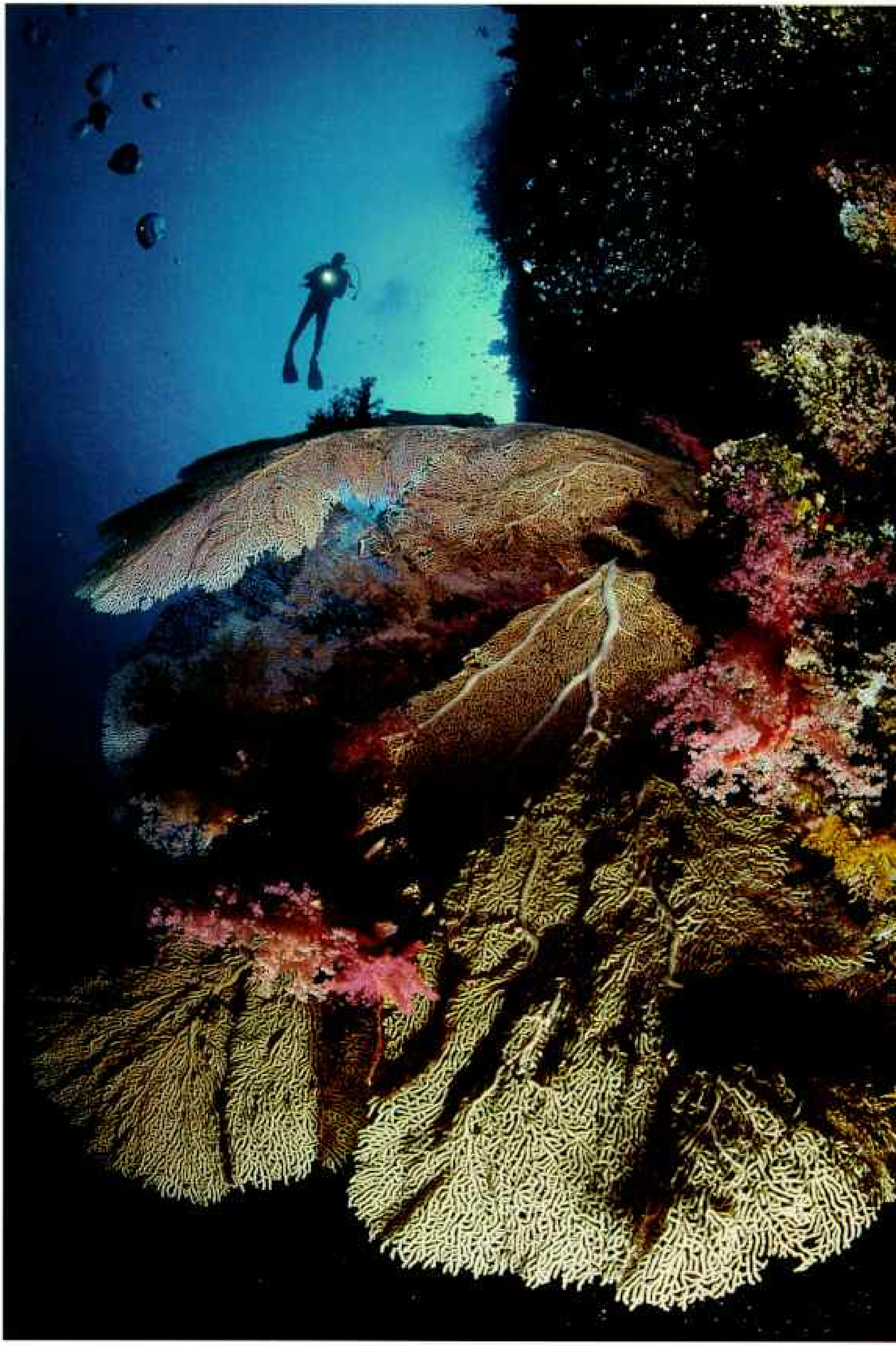
on a layer of cooler, denser water. As I watch the silent carousel, my imagination runs free with the narcotic fantasies that can overwhelm a diver at these depths.

SOFT CORAL, DENDRONEPHTHYA; GOBY, FLEURIEUICHA

WHIP CORAL, *CIRRHIPATHES*, WITH SHRIMPS, *PONTONIDES* (ABOVE), AND GOBY, *BRYAINOPS YONGEI*

In an endless variety of configurations, corals serve as castles and condominiums. The pink-and-orange profusion of a soft coral's waving, water-filled spicules provides an ideal habitat for a small goby (facing page).

Another goby (left) and a pair of armored shrimps, their eyes glowing from the camera's flash, live virtually their entire lives feeding, mating, and laying eggs on sections of whip coral at 120 feet.



GORGONIAN CORAL, *DENDRONEPHTHYA*; BLACK CORAL, *ANTIPATHES*; HAWKFISH, *GEYCIRRHITES TYPUS*; ANTHIAS FISH, *ANTHIAS*

Filigreed branches of gorgonian coral at Daedalus Reef grow free of disruptive surface currents a hundred feet above. Jutting out from the reef wall, the sea fans are well situated to feed, catching plankton as it descends during daylight and rises during the night.

Such gorgonian forests provide nurseries for many other species of plankton feeders.

Also thriving in calm water with dim light, black corals form shrublike colonies with well-separated branches (above, foreground). As I trained my camera, a red-and-white-checked longnose hawkfish darted up with incredible speed to nab a baby anthias fish, still visible in its jaws. With its forceps-like snout, the hawkfish stalks the coral for prey. Yet in two decades of diving, this was the first time I had observed such attack behavior.

RED SEA

Fish and water become one as I enter a school of glassy sweepers in the evening light. They all turn at once, making the sound of a bed sheet flapping on a

clothesline. It is a subtle, rarely heard sound in a spectacular reef system.

As night falls, I am joyously adrift in this perfect sea. □

NEW LIGHT ON THE OLMEC

Larger than life, this nine-foot-high basalt head from San Lorenzo, Mexico, portrays an Olmec ruler whose people created Mesoamerica's first civilization 3,000 years ago—and left a rich cultural heritage to later groups, from the Maya to the Aztec.

By GEORGE E. STUART
SENIOR ASSISTANT EDITOR
Photographs by KENNETH GARRETT

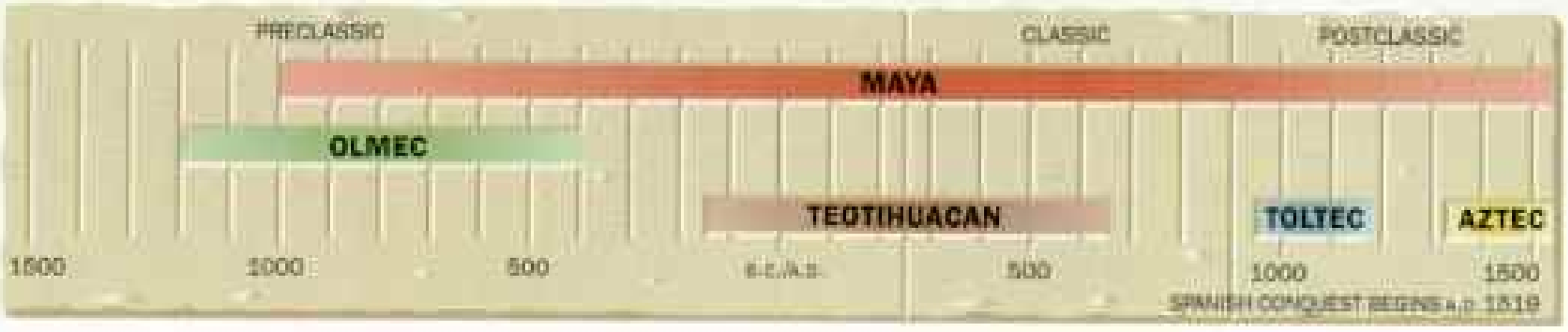
MUSEUM OF ANTHROPOLOGY, XALAPA

OLMEC CENTER AWAITS EXCAVATION

Even covered by pasture, Laguna de los Cerros near Mexico's Tuxtla Mountains illustrates the building plan of the Olmec, among the first Americans to design ritual centers and raise

pyramids. Here two earthen pyramids 260 feet apart align on a north-south axis. Walls enclose the intervening plaza. Platforms, tombs, and a ball court may also be concealed at this site.

Altogether nearly a hundred earthen mounds have been located. Four miles away recent excavation has uncovered a workshop where basalt statues and stelae were carved.



Olmec civilization flourished for nearly a thousand years, then disappeared. During the following centuries, Olmec descendants and neighboring peoples kept their achievements alive, relaying them to succeeding cultures. PAINTING BY DAVID S. MERRELL

IT BEGAN INNOCENTLY ENOUGH. In 1987 some villagers in southern Mexico started to dig a fishpond at El Manatí, beside the ancient springs at the foot of a small hill. But the villagers didn't dig for long, for strange things emerged from the sticky, gray muck: clusters of brilliantly polished stone axheads, human bones, rubber balls, and, strangest of all, large busts with long, impassive faces, made from wood and painted red and black.

These surprisingly well-preserved artifacts belonged to the Olmec, a culture that flourished along Mexico's Gulf Coast between 1200 and 400 B.C., roughly the period between the Trojan War and the Golden Age of Athens.

The Olmec world holds a special place in the sweep of cultures that rose and fell in the New World before the arrival of Europeans. Because of their early achievements in art, politics, religion, and economics, the Olmec stand for many as a kind of "mother culture" to all the civilizations that came after, including the Maya and the Aztec.

The diggers at El Manatí had stumbled upon an aspect of Olmec art that was previously unknown. Archaeologists Ponciano Ortíz with Mexico's University of Veracruz and Carmen Rodríguez of the National Institute of Anthropology and History believe the site was a place of pilgrimage—a natural shrine devoted to the hill and to water, features often considered sacred by early American cultures.

When Ponciano sent word of the new discoveries, I was tantalized. I knew well that the Olmec had carved huge monuments of stone, but no wooden objects had ever been uncovered in situ. And the busts were said to be 3,000 years old, among the oldest wooden artifacts yet found in Mesoamerica.

I arrived at the camp in the sodden heat of the Veracruz lowlands. Ponciano showed me one of the busts preserved in a tub of clear water. As I gazed down at the face, I recognized the slanted eyes, thick lips, and pear-shaped head characteristic of the Olmec style.

"Perhaps the busts represent sacrificial offerings," Ponciano told me. "Or they may portray the Olmec elite or their deified ancestors."

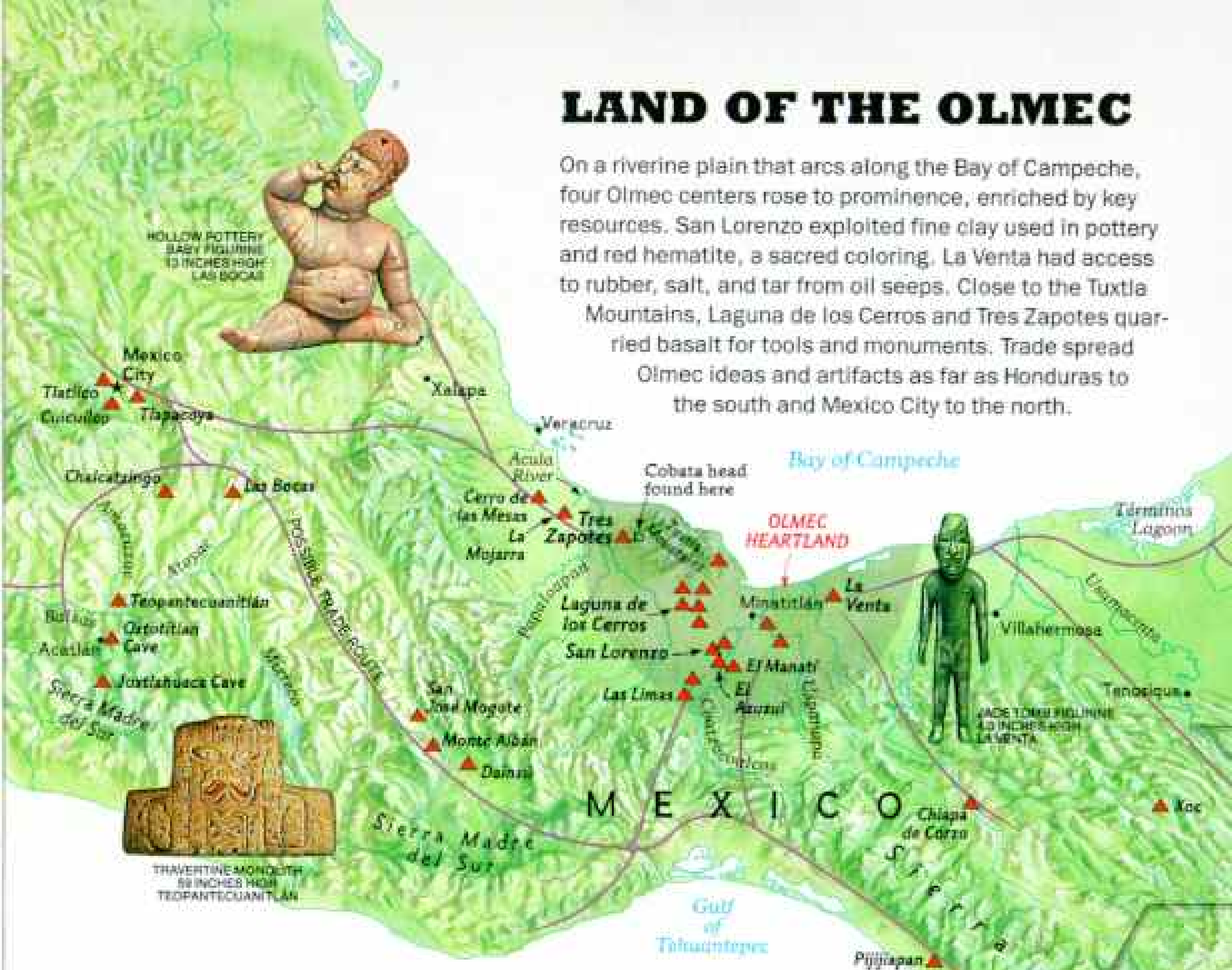
Whatever they represent, we know that Olmec worshipers came to this spot and placed wooden sculptures and other treasures. For 3,000 years their gifts lay undisturbed, buried in layers of mud.

From such clues gathered over the past half century, archaeologists and art historians had drawn the broad outline of the Olmec, a people who seemed as inscrutable as the wooden faces found in the mud. But within the past decade scientists have begun to sketch in more of the details of a complex society that invented its own cosmology, engaged in ritual sacrifice, and played a ceremonial ball game—all characteristics of the great civilizations that came much later.

A LEFT FOOTPRINT carved on an Olmec greenstone ax was identified by Mexican villagers who found it as a sign of *chaneques*, legendary dwarf tricksters who live in waterfalls. Its meaning to the Olmec is not known, but it came from El Manatí, where muddy springs yielded stone offerings and some of the oldest wooden artifacts in Mesoamerica. This 3,000-year-old armless wooden bust, 20 inches high (facing page), may have been placed as a sacrifice.

LAND OF THE OLMEC

On a riverine plain that arcs along the Bay of Campeche, four Olmec centers rose to prominence, enriched by key resources. San Lorenzo exploited fine clay used in pottery and red hematite, a sacred coloring. La Venta had access to rubber, salt, and tar from oil seeps. Close to the Tuxtla Mountains, Laguna de los Cerros and Tres Zapotes quarried basalt for tools and monuments. Trade spread Olmec ideas and artifacts as far as Honduras to the south and Mexico City to the north.



A LINEUP OF OLMEC RULERS

Hallmark of the Olmec, colossal heads were unknown until 1862, when a Mexican scholar saw a head found at Tres Zapotes. Since then 15 more have been uncovered in the heartland—and numbered in order of discovery at each site (below). The largest, the Cobata head, stands 11 feet high and was carved, like the others, between 1200 and 900 B.C.

Some scholars interpret the unique monuments as idealized warriors or ballplayers, but most agree with archaeologist Matthew Stirling, who noted that each "has an individual quality and was probably the portrait of a prominent leader." He believed the "broad-nosed, short-faced" physiognomy reflected a physical type "found over a considerable area in Middle America."

The San Lorenzo heads are carved from basalt taken from Cerro Cintepec in the volcanic Tuxtlas. Particles of reddish color found on one of the La Venta heads indicate that it was once painted. The flat backs and other features of many of the heads suggest they were recarved from tabletop thrones like that in the painting on pages 102-103.

THE OLMEC STORY played out in what has become known as their heartland—the sweeping coastal plain where the states of Veracruz and Tabasco meet in Mexico's tropical south. The Tuxtla Mountains, a chain of volcanic cones blanketed by forest, rise from this plain.

"It's clear from the distribution of sites in the heartland that each of these places had control over a different set of valuable natural resources," says David Grove, an archaeologist from the University of Illinois at Urbana-Champaign. He believes that Olmec society developed gradually as some villages became more powerful than those in less fortunate circumstances. "It seems they were sharing resources. It was a symbiotic relationship. La Venta was near a coastal estuary with rich food resources and salt. San Lorenzo is farther inland on a major river with fertile levee soils and various clay resources. Laguna de los Cerros and Tres Zapotes are at the foot of the Tuxtla Mountains, and they controlled the stone sources for the sacred monuments."

Nobody knows how the Olmec transported these stones back to their settlements, but many experts speculate that from the basalt quarries Olmec workers somehow loaded huge boulders—some weighing more than 20 tons—onto sledges. They dragged the sledges overland until they came to rivers, where they floated the stone home on enormous rafts. In local workshops, Olmec artists sculpted the basalt into great thrones, monuments, and colossal human heads, to glorify their rulers. These same artists also carved exquisite figurines of supernatural creatures that were part human, part beast, to honor their gods.

It was the discovery of one of these basalt sculptures at Tres Zapotes that brought the Olmec to world attention. Around 1860, according to the sketchy account that survives, a workman clearing a field happened upon what he later described as "the bottom of a huge inverted iron kettle" protruding from the ground. Curious villagers soon unearthed a bizarre object: a stone head almost five feet high,

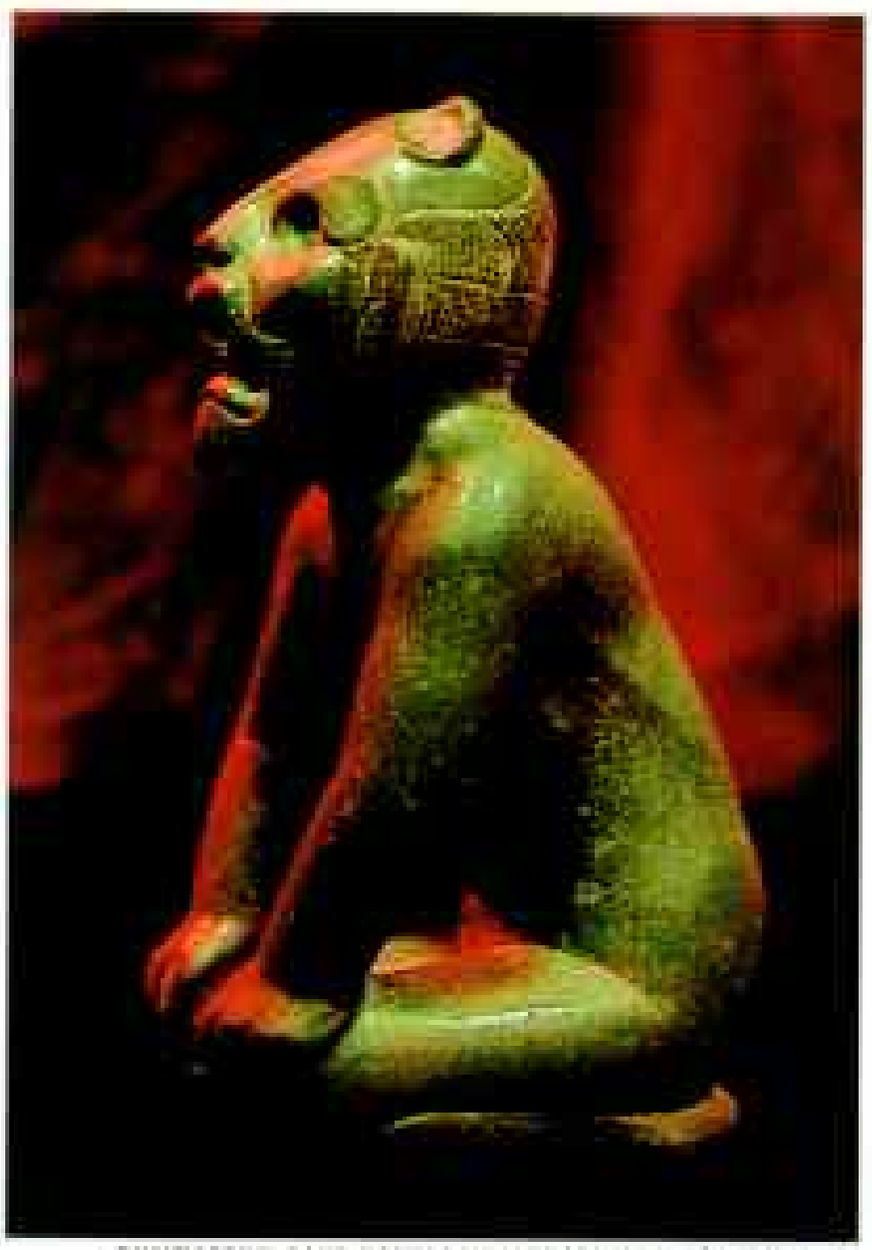
DRAWING BY DAVID S. MERRILL

estimated to weigh eight tons. The face was expressionless, with thick lips, a flat nose, and staring eyes. The top was carved with a headdress resembling a modern football helmet, which some experts believe may have been worn for protection during ritual ball games.

INTRIGUED by the fantastic head and other unusual sculptures from the same area, archaeologist Matthew W. Stirling of the Smithsonian Institution visited Tres Zapotes in 1938 and counted 50 earthen mounds, revealing the immensity of the site. Soon after, under the joint auspices of the Smithsonian and the National Geographic Society, Stirling led a series of expeditions into the Gulf Coast hinterland.

Over the next 16 years Stirling and his colleagues excavated at Tres Zapotes, La Venta, San Lorenzo, and other Olmec sites. By the mid-1950s they had wrested evidence of a remarkable culture from the swamps and uplands. They suggested that the Olmec represented the earliest civilization in the region that archaeologists call Mesoamerica, which stretches from central Mexico to the Pacific shores of El Salvador. Stirling, now revered as the "father of Olmec archaeology," argued that his finds dated back to earlier times than most other experts believed. By the late 1950s radiocarbon dates from La Venta proved him right. The site had flourished between about 800 and 400 B.C.—centuries before the flowering of Teotihuacan and other great urban civilizations of Mesoamerica.

Today the land of the Olmec has largely given way to cattle ranches, sugarcane fields, and oil refineries. Early this century prospectors found that vast pools of oil underlie many Olmec sites. La Venta, for instance, selected in ancient times for its high, dry ground, is situated atop a salt dome, and to the geologist salt domes mean oil. Deposits of sulfur also lie beneath the swamps and pastures, and more often than not the morning mists that rise off the wetlands swirl and mingle with the petrochemical haze that shrouds the land.



DUMBARTON OAKS RESEARCH LIBRARY AND COLLECTIONS, WASHINGTON, D. C.

WITH A JAGUAR VISAGE, a kneeling man may be transforming himself into that powerful lord of the Olmec spirit world. Some villages still venerate the feline deity. Smeared with clay and stamped with ashes, a boy of Tenosique becomes a jaguar dancer to bring rain to his people.

The day I drove from El Manatí to San Lorenzo was unusually free of haze. I could actually see the enormous plateau I had heard about for so many years. It appeared as a dark band on the horizon, visible long before the dirt road began to climb.

From the heights I beheld some 3,000 years in a single sweeping gaze—the stacks of the great oil refinery at Minatitlán and the hill where the sacred wooden offerings were found at El Manatí, a tiny green bump poking out of the green to the southeast.

Matt Stirling had put San Lorenzo on the archaeological map in the 1940s, when he excavated five colossal heads and other monumental sculptures on the plateau summit and in the deep ravines along its edges. Twenty years later, archaeologists Michael Coe and Richard Diehl spent the better part of three dry seasons excavating at the huge site.

From analysis of ceramics and other material discovered in layer after layer of excavations, Coe and Diehl traced the settlement's gradual progression from a hamlet of corn farmers to an important political and religious center. They also proved that San Lorenzo flourished between about 1200 and 900 B.C., making it the earliest of the large Olmec centers found so far.

"Something happened at San Lorenzo around 950 B.C.," says Diehl. "The pottery

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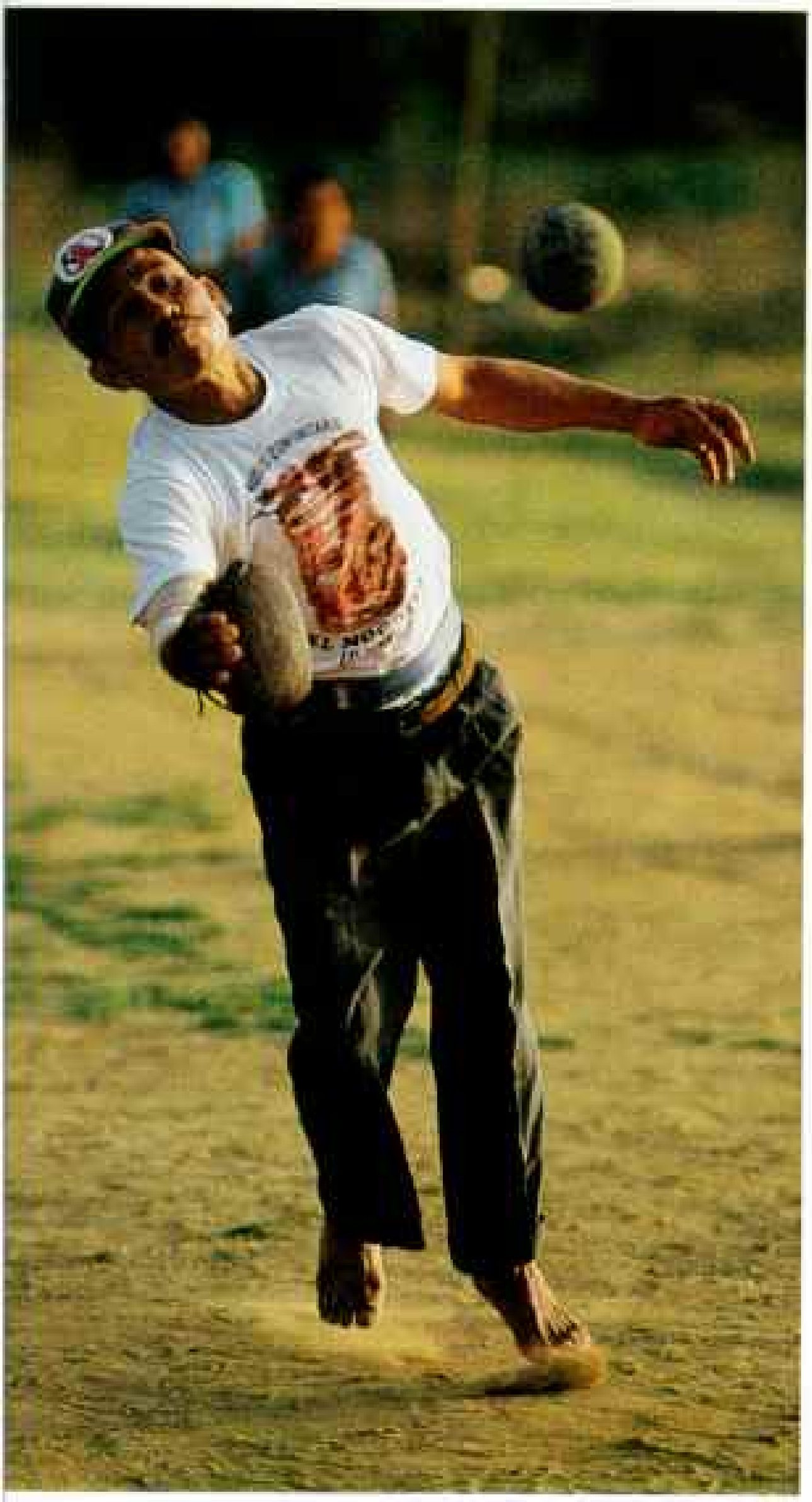
KENNETH GARRETT's photographs have illustrated several NATIONAL GEOGRAPHIC articles on the Maya. His most recent assignment was "The Iceman" (June 1993).

SPILLING BLOOD FOR THE JAGUAR SPIRIT

Growling men in leather *tigre* masks trade punches to draw blood, an offering to the jaguar. The deity reciprocates, giving his blood in the form of rain to nourish the cornfields. Other

masked men in gunnysacks and sombreros crack whips in imitation of the clap of thunder that signals rain. Several weeks after this early May ceremony, the rains come to the village of Acatlán. The Guerrero community of Aztec heritage holds beliefs that go back to Olmec times and before; a painting in a nearby cave portrays an Olmec ruler wearing jaguar skins.



changed after that, and monuments were deliberately mutilated and buried. They were placed in a line and covered with soil." Coe, for one, believes the monuments were destroyed by outside invaders. But David Grove and other scholars offer a different hypothesis: Many of the monuments were ritually destroyed at the death of the ruler they celebrated.

Ann Cyphers Guillén, an archaeologist at the National Autonomous University of Mexico, has been excavating at San Lorenzo since 1990. She thinks the Olmec simply recarved some of the statues into other monuments. I found her sitting on a pile of dirt by the edge of a deep rectangular pit. I could see where workers and students below had exposed part of a great column of basalt. It rested on a floor made of hard-packed red sand.

"We're opening some of Coe's and Diehl's old pits as well as others," Ann explained. "By using new recovery techniques, we'll be able to understand more fully how the monuments were used by the people of San Lorenzo. Eventually we may refine, perhaps even revise, the dating of the site."

Ann's main reason for working at San Lorenzo, however, is to identify a more mundane world of the Olmec—the living areas of the inhabitants and the workshops where sculptors and other specialists produced their remarkable art and monuments.

"The local people think that I'm a terrible archaeologist," Ann joked as we rode together over the dusty dirt road that traverses the broad summit of the plateau, "because I haven't found a big sculpture yet, much less a colossal head. I can't seem to convince anyone that I'm simply seeking a better understanding of the ordinary people who made the monuments."

With seven major excavations scattered at key points on the plateau summit, excavators are exposing floors of bright red ocher or pavements of bentonite, a white volcanic clay that occurs in profusion at the site. The surfaces of these floors are littered with potsherds and fragments of animal and human bones. Rarely, a fragment of sculpture is found. In one instance the excavations revealed what surely must be the remains of a craft shop that dealt in special beads made of ilmenite, an iron-bearing ore prized for its weight and luster.

"That workshop caused us to lose some time," recalled Ann ruefully. "Can you imagine excavating two tons of beads?"

As Ann and I drove between barbed-wire fences that line the road by the pastures, I tried to visualize the plateau as it might have appeared when the Olmec were thriving in this area.

Pole-and-thatch houses, virtual duplicates of those still used in the region, probably would have filled "downtown" San Lorenzo. Here and there, for maximum effect in conveying the power of the chieftain, the colossal heads would have been strategically placed—one doubtless representing the leader, others probably memorializing his ancestors. Elaborately carved thrones and statuary representing human and animal gods would have

completed the picture, all serving as reminders to the awestruck observer of the power of the ruler. But only when Ann and others complete their investigations will details of the vista emerge from the shadows of millennia.

The drive that Ann and I took across San Lorenzo ended at a small hillock isolated from the plateau proper, a separate site known as El Azuzul. Here was an emphatic reminder that in this area there's no getting away from the monuments.

In 1987 Atanacio Vasconcelos was cutting grass in these hills when his machete clanged on a buried stone, and, this being Olmec country, he and his friends checked it out. When they finished digging, three more basalt carvings had joined the inventory of Olmec sculpture—two exquisitely carved identical human figures found facing a four-foot-tall jaguar (page 105).

These splendid sculptures were the first Olmec pieces I had ever seen in the actual spot where they were discovered. Each of the human statues sat cross-legged, leaning forward slightly, gazing straight ahead. I sat in front of them and stared back. Their features seemed almost alive, even after the passage of 3,000 years. Clad in large, flat headdresses with flowing trainlike affairs sweeping down their backs, both wore rectangular chest ornaments, perhaps representing mirrors and, most remarkable of all, each had apparently been damaged in precisely the same way—by chipping off identical parts of the headdresses. It looked intentional, perhaps part of an inscrutable ritual.

OLDEST AMERICAN BALL GAME, once played throughout Mesoamerica, draws enthusiasts in San José Mogote and other towns of central Mexico. Hefting a leather "knuckle-duster" (facing page), a barefoot man hits a heavy rubber ball to his opponents. A similar rubber ball (above) was pulled from El Manatí springs last year. Though more than 3,000 years old, it still has the smell of latex. A masked ball player (top), raising his left arm and grasping the ball in his right hand, is poised for action on a stone slab at Dainzú. No one knows who invented the ball game, but the Olmec lived in a rubber-producing region; their name in the Aztec language means "rubber people."

WHEN I FIRST SAW LA VENTA some 25 years ago, it lay in the grip of a newly constructed oil refinery complete with a town that grew on the spot to house the workers. Despite the encroachment, I vividly recall the impressive symmetry of the layout, for I looked down on the settlement as privileged Olmec nobles must have—from the summit of the principal mound, a stupendous heap of earth more than a hundred feet tall.

During La Venta's florescence, between about 800 and 500 B.C., this mound may have stood as the largest pyramid in all Mesoamerica. The mounds below, probably platforms for long-vanished buildings, lie in near-perfect symmetry along an axis eight degrees west of true north, an orientation that marks other

RIVERS OF MONUMENTS

Waterways eased trade and transport for the Olmec. Great rivers, such as the Coatzacoalcos (right), helped solve the problem of how to move twenty-ton blocks of stone—whether raw or partly sculpted, as shown here—from the Tuxtla Mountains to the swampy plains where they are found today.

In the artist's re-creation, farmers, idled during the dry winter season, are commandeered to transport a ruler's monuments to La Venta. Such hefty blocks were likely moved overland on rolling logs or sledges to riverbanks, then rafted downstream, along the seacoast, and upriver to La Venta.

The stone portrait head bears a distinctive headdress, possibly naming the ruler himself—Eagle Claw. At San Lorenzo, 50 miles away, a bas-relief shows a figure wearing the same headdress, suggesting a connection, either friendship or rivalry, between the two communities.

On the unfinished throne, on the raft in the foreground, the figure of a king or shaman sits in a niche representing the gateway to the underworld. This common Olmec image symbolizes the power of the elite to pass between the spirit and real worlds. Many thrones and statues were purposely defaced and buried, perhaps during a revolt or in a ritual to negate a ruler's power after his death or dethronement.

PAINTING BY FELIPE DAVALOS

Olmec sites. Among these mounds the citizens of La Venta built an awesome assortment of sculptures, thrones, and row upon row of monumental basalt columns. Then, as if to guard the town, they placed three colossal heads in front of the main mound.

In the 1950s excavators discovered burials and dozens of spectacular offerings deep beneath La Venta's surface. Some were jade figures and ornaments, arranged much like the offerings at El Manatí.

By dating layers of earth at La Venta, archaeologists deduced that the Olmec here had a penchant for burying their monumental works of art almost immediately after completing them. In one offertory pit they put together great mosaics of supernatural faces from slabs of serpentine; another pit held an estimated thousand tons of special stone, brought in from the Pacific coast and laid 28 layers thick, then buried with layers of exotic orange, red, and purple clays brought to the site just for the occasion.

RESEARCH SUPPORTED IN PART BY YOUR SOCIETY

Since 1984 a new era of excavation has been under way at La Venta under the direction of Rebecca González of the National Institute of Anthropology and History. The results are changing our whole concept of the character of Olmec sites and how they were used. Rebecca and her colleagues have gone beyond the limited world of pomp and politics.

"La Venta," Rebecca explained to me, "was not just an empty ceremonial spot visited by Olmec priests and nobles but a prosperous community of fishers, farmers, traders, and specialists, such as the artisans and the sculptors."

By analyzing charred corn fragments and pollen, a member of Rebecca's team, William F. Rust, a graduate student at the University of Pennsylvania, found that people were planting corn in the La Venta region as early as 2250 B.C. A study of household garbage indicated that the Olmec who lived here also ate from a rich supply of shellfish, fish, and turtles. By about 1150 B.C., the small, scattered villages of the area had merged into larger communities. Household remains from these settlements suggest differing social ranks within the population. Three centuries later, La Venta reached its height as a thriving society with a thoroughly stratified populace living under the rulership of individuals who possessed the power to have basalt floated in by river from the Tuxtla Mountains and to commission gigantic sculptures and other important public works.

ALTHOUGH the sculptures of La Venta long outlasted the living town—for reasons yet unknown the place was abandoned by about 400 B.C.—none of them are left at the site. In the late 1960s, when oil construction threatened La Venta, they were moved by truck to a park specially made for them in Villahermosa, state capital of Tabasco, 50 miles east. Whenever I'm near Villahermosa, I go out of my way just to visit the park, a little oasis in the middle of a boomtown. I love to walk down its wide gravel trails as they wind past aviaries, crocodile pools, and shady clearings until I come face to face with my favorite Olmec image.

Prosaically labeled *"cabeza colosal no. 1"* —colossal head number 1—it was found in 1925, buried up to its eyes near the base of the great mound at La Venta. Now, retrieved and revered anew, it stares sightlessly with a certain air that seems to me to verge on smugness, perhaps because it has survived a span of time that began long before the Parthenon rose on the heights above Athens.

For many the colossal stone heads remain the most readily recognizable hallmark of the ancient Olmec. So far, 16 complete heads have come to light in the Olmec heartland. These range in size from five to eleven feet high.

For Beatriz de la Fuente, an Olmec scholar at the National Autonomous University of Mexico, the different headdress motifs—from jaguar themes to what may be ball-game helmets—indicate that the stone heads represent individual rulers of the sites where they were placed. If so, they mark the earliest recognizable political portraiture known from the Americas.

A "strange melancholy" pervades much of Olmec art, according to Yale University's Michael Coe. Polished jade figurines often depict sexless, almost infantile forms with cleft heads and fanged snarling mouths. Others depict jaguars—a key Mesoamerican symbol for cosmic and political power—or curious composite beings, part jaguar, part human.

"You can almost call the Olmec the people of the jaguar," says Peter Furst, an anthropologist at the University Museum in Philadelphia. "In tropical America, jaguars were the

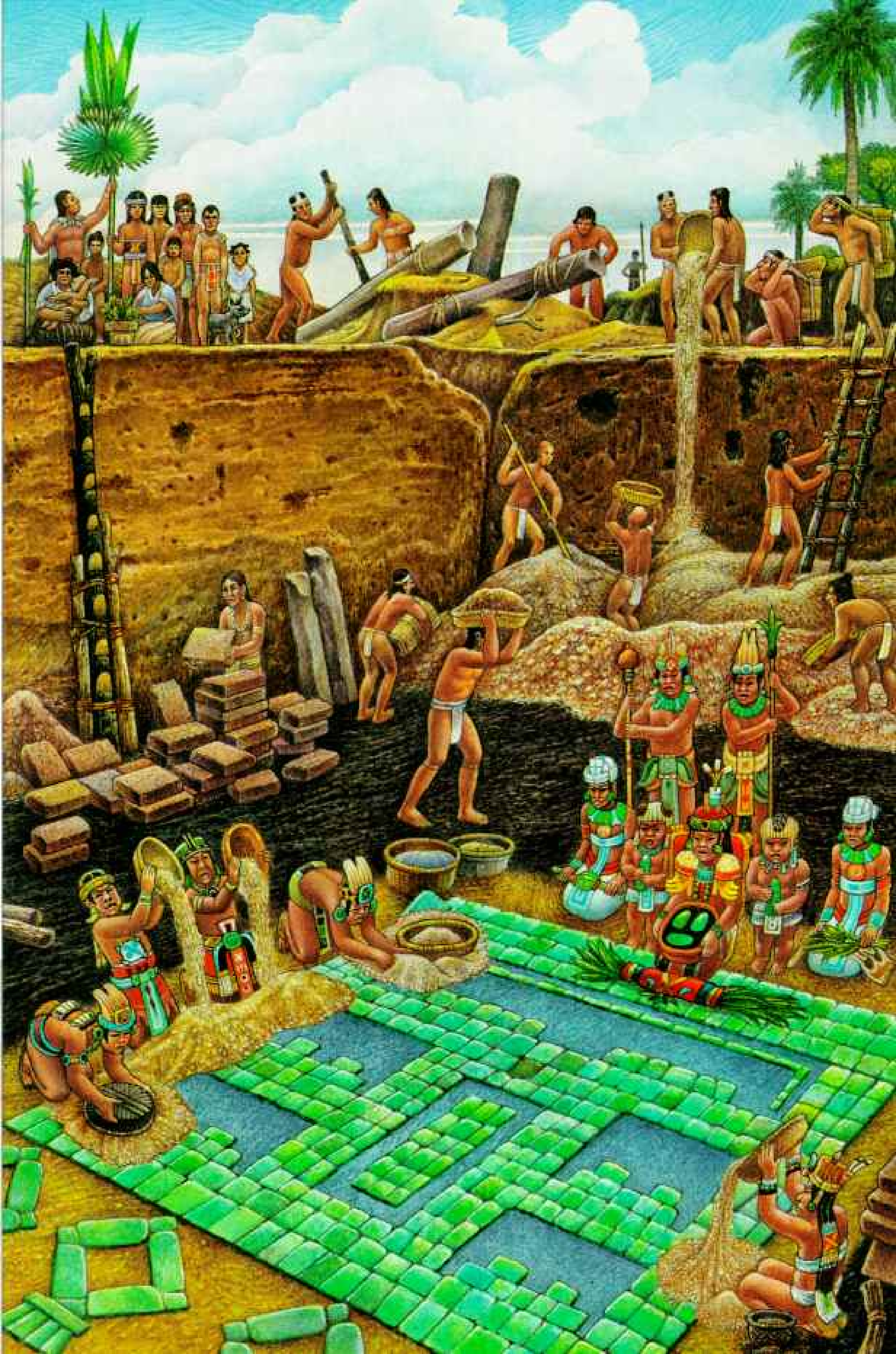
IN WORSHIPFUL POSE, two Olmec with unique headdresses pay homage to a jaguar at El Azuzul near San Lorenzo. A laborer cutting brush found the sculptures in 1987. To draw tourists, a local landowner built this shelter for the artworks, which he refuses to give to the Mexican government.

shamans of the animal world, the alter ego of the shaman. They are the most powerful predators. That's why in Olmec art you get these combinations of jaguars and humans."

THE ARCHAEOLOGICAL RECORD is nearly silent on what happened in the Olmec heartland in the centuries following the demise of La Venta. But in 1986 an important clue emerged from the waters of the Acula River, near La Mojarra, a small ranching settlement northwest of San Lorenzo. According to locals, some men were placing log pilings for a boat dock on the east bank when one of them slipped and stepped on a large smooth stone about six feet underwater. It was a four-ton slab of basalt, a monument, or stela, about eight feet high and five feet wide.

When I first heard of the monument, I couldn't believe something rumored to be so big and beautiful really existed. As soon as I could, I went to the Museum of Anthropology in Xalapa to see it. Inside, Fernando Winfield Capitaine, then director of the museum, took me to a basement storeroom where he removed a protective tarpaulin from the stela. I took a deep breath.

Before me stood a man in resplendent garb. Over his upper body he wore a shirt of what looked like overlapping feathers and a gigantic chest ornament depicting the profile of a god draped with oblong mirrors. His towering headdress was dominated by a huge profile with a curved beak or snout and laden with smaller profiles and other icons, including a pointed, serrated object and a procession of small fish (pages 110-11).



BURIED CREATIONS

In mysterious rituals the Olmec at La Venta created stone masterworks and immediately concealed them. About 2,600 years ago workers dug a pit 23 feet deep in a courtyard, spread a base of sticky tar from petroleum seeps, and laid out blue-green serpentine blocks. They bordered the image with yellow clay, tamped blue clay in central openings, then covered it all with layers of colored clay.

In 1943 archaeologist Matthew Stirling and his crew dug for two months to remove tons of rubble. What was the impressive mosaic they uncovered, now preserved with other La Venta artifacts in a Villahermosa park (above)? Was it so sacred that it had to be concealed?

If a notch on one side is the forehead cleft typical of Olmec deities, the image may represent a jaguar mask. But if the notch belongs at the bottom, as Kent Reilly of Southwest Texas State University believes, the central column could symbolize the sacred tree of life.

Another extraordinary offering from La Venta may record an actual event (below left). The eight-inch figurines of serpentine and jade have deformed skulls and bear traces of sacred red cinnabar. The stone axes beside them may represent the columns lining some La Venta courtyards. Inexplicably, about a hundred years after burial the assemblage was uncovered and then reburied.

La Venta was long believed to have been a ceremonial center used only for ritual. Recently excavators have uncovered signs of an active town: house floors, serpentine workshops, utilitarian stone tools, and even remains of ancient meals—corn, beans, fish, deer, and dogs.

NATIONAL MUSEUM OF ANTHROPOLOGY, MEXICO CITY (ABOVE);
PAINTING BY FELIPE DÁVALOS

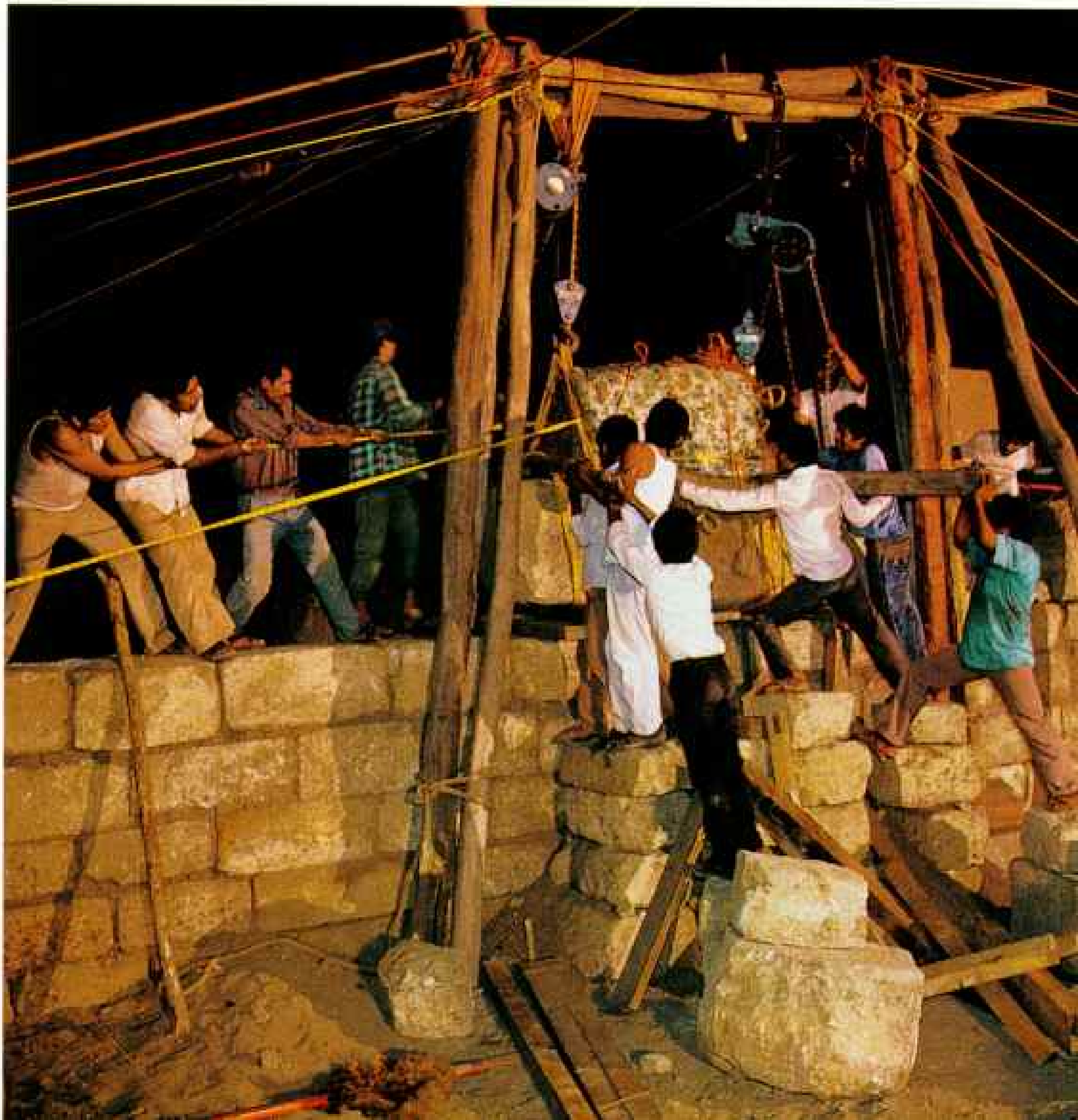
At first I couldn't see the hieroglyphs very well but soon realized that the stone was covered with glyphs, hundreds of them. Incised above and beside the figure were 21 glyph columns, one of the longest texts ever found in Mesoamerica.

I had seen stelae from all over Middle America, and I knew immediately that this one was special. Even as I ran my hand over the relief carving and moved my flashlight to reveal its details, I had the feeling that the La Mojarra stela would rank as one of the most important single stones ever found in Mesoamerica. Fernando had already recognized its significance. For the next ten hours he helped me inspect and photograph the stela for the drawing I planned.

I realized that the inscription included two dates in the Long Count system, a calendrical notation used later by the Maya to give the number of days elapsed since a base date. From what we know, the two main dates on the La Mojarra monument correspond to May 21, A.D. 143, and July 13, 156.

Because of these dates, the elaborate costume that anticipates later Maya depictions of rulers, and the location of the find, I knew we were looking at a piece suspended in time between the Olmec and later cultures. But no one could read the story it told until two scholars deciphered more than half the glyphs this year, after two years of painstaking detective work.

For Terrence Kaufman, a linguist at the University of Pittsburgh, and John Justeson, an anthropologist at the State University of New York at Albany, deciphering the La Mojarra stela was one of the biggest intellectual challenges they had ever faced. "It was a



OLMEC INFLUENCE, if not Olmec people themselves, reached more than 300 miles west of La Venta to a site called Teopantecuanitlán. There four fearsome faces reflect Olmec-style features—ovoid eyes and downturned mouth. With block and tackle, workmen hoist the five-ton monoliths, possibly local versions of the Olmec corn god, back into their original positions on walls facing a sunken plaza.

puzzle," says Justeson. "They were literally spelling things out on the monument, and you had to use your wits to find clues to both the meaning and the grammar."

By comparing an ancestral form of local Indian language with the patterns on the tablet, the researchers put together a partial syllabary. It was like using Italian and Spanish to reconstruct Latin. Terry and John also realized that the hieroglyphs had some of the characteristics of later Maya writing, providing some small clues to the translation. The biggest help was the length of the La Mojarra text itself, allowing them to determine possible grammatical patterns—which combinations of symbols were verbs, which were subjects, which were objects, and so on. They could guess at what the La Mojarra text said, but their final reading could only be confirmed by using another text for comparison, one in the same language and from the same era.

Enter the Tuxtla Statuette (pages 112-13), an almost comical figurine of polished green nephrite that looks like a man dressed as a

duck. John and Terry turned to the statuette while they were struggling with the La Mojarra text. Identical syllables and words appeared on both artifacts. When the scholars' translations of words on the stela worked for the same symbols on the statuette, they knew they had broken the code.

What John and Terry discovered was that the La Mojarra stela was used as a kind of political poster, for it records the exploits of a warrior-king named Harvest Mountain Lord. It tells of his accession to the throne and the rituals of sacrifice that celebrated each new rise in power. The story ends with the king crushing a coup led by his brother-in-law.

But the most important information gleaned from the La Mojarra carving is the language in which the text is written, perhaps a direct descendant of the language the Olmec spoke. "The language that we found in the text is Zoquean, an early ancestor of four languages spoken today in Veracruz, Tabasco, Oaxaca, and Chiapas," according to John. "We may well have discovered the linguistic identity of the Olmec themselves."

EARLIEST WRITING yet deciphered in the New World consists of 465 glyphs carved on an eight-foot stela recently found in a river near La Mojarra. The text records the dates May 21, A.D. 143, and July 13, 156, perhaps marking the reign of a warrior-king called Harvest Mountain Lord, according to his name glyphs (facing page, in red). Descendants of the Olmec or a related people may have carved this record, which predates Maya glyphs.

AS INVESTIGATORS of the Olmec now realize, the stories of San Lorenzo, La Venta, and other centers form only a part of a grander one, and for it we must expand the scope of inquiry to a much wider area of Mesoamerica where other discoveries are causing us to reconsider the way we define the Olmec civilization.

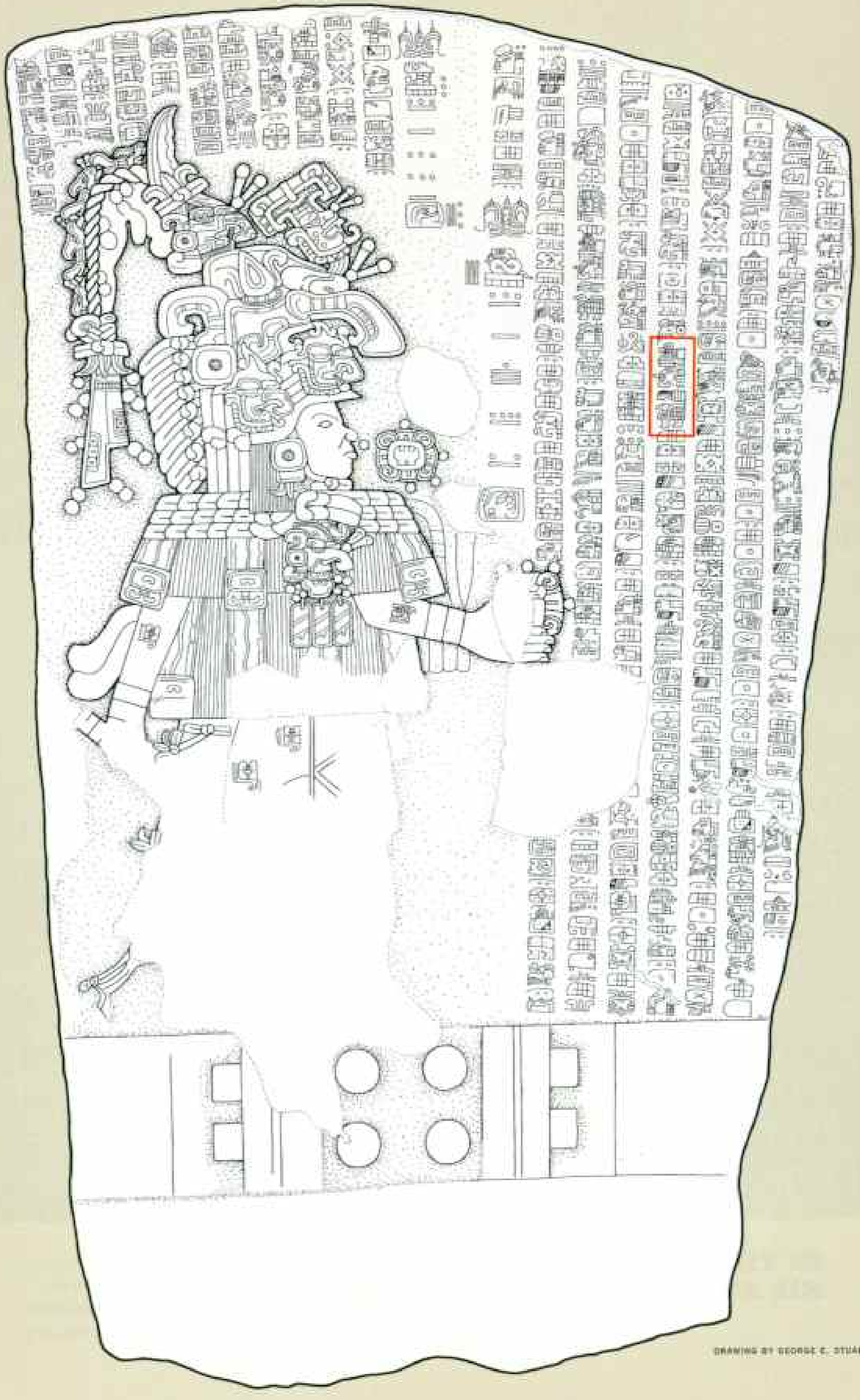
From the highlands of central Mexico all the way to the western reaches of El Salvador—an area roughly 20 times the size of the Gulf Coast heartland—researchers have found signs of Olmec culture. At Tlatilco—site of an ancient village only a few miles from Mexico City—wings, claws, snarling mouths, and other Olmec art symbols decorate the ceramics.

At Chalcatzingo in the state of Morelos, excavations by David Grove have revealed that the site was an important hub of the extensive Olmec trading network. "It's an outpost in central Mexico with about 30 monuments carved in Olmec style," he says. "It had very strong links to the Olmec and probably served as a center through which greenstone and other valuable raw materials moved between central Mexico and the Gulf Coast. I think the chiefs of the village adopted the Olmec symbol system." Grove bases his ideas mainly on the site's bas-reliefs, which are filled with so many symbols that one researcher called Chalcatzingo "a giant 'manuscript' painted and carved on the side of a mountain."

Some 700 miles to the southeast, Olmec-style pottery and jewelry turned up with pre-Maya burials deep beneath two of the suburban courtyards at Copán in Honduras. Interments at Cuello, Belize, also contained artifacts that are Olmec-like in design.

How did Olmec material become so scattered over Mesoamerica? Traditional explanations, based on the assumption that it spread outward from the Gulf Coast center, include the usual suspects in such movement—trade, military conquest, or religious expansion. To many experts, however, such arguments appear to be much too simple. The answers may come from a handful of sites such as Chalcatzingo, those on the Pacific coast region of Chiapas and Guatemala, or Teopantecuanitlán, discovered deep in the hills of Guerrero state.

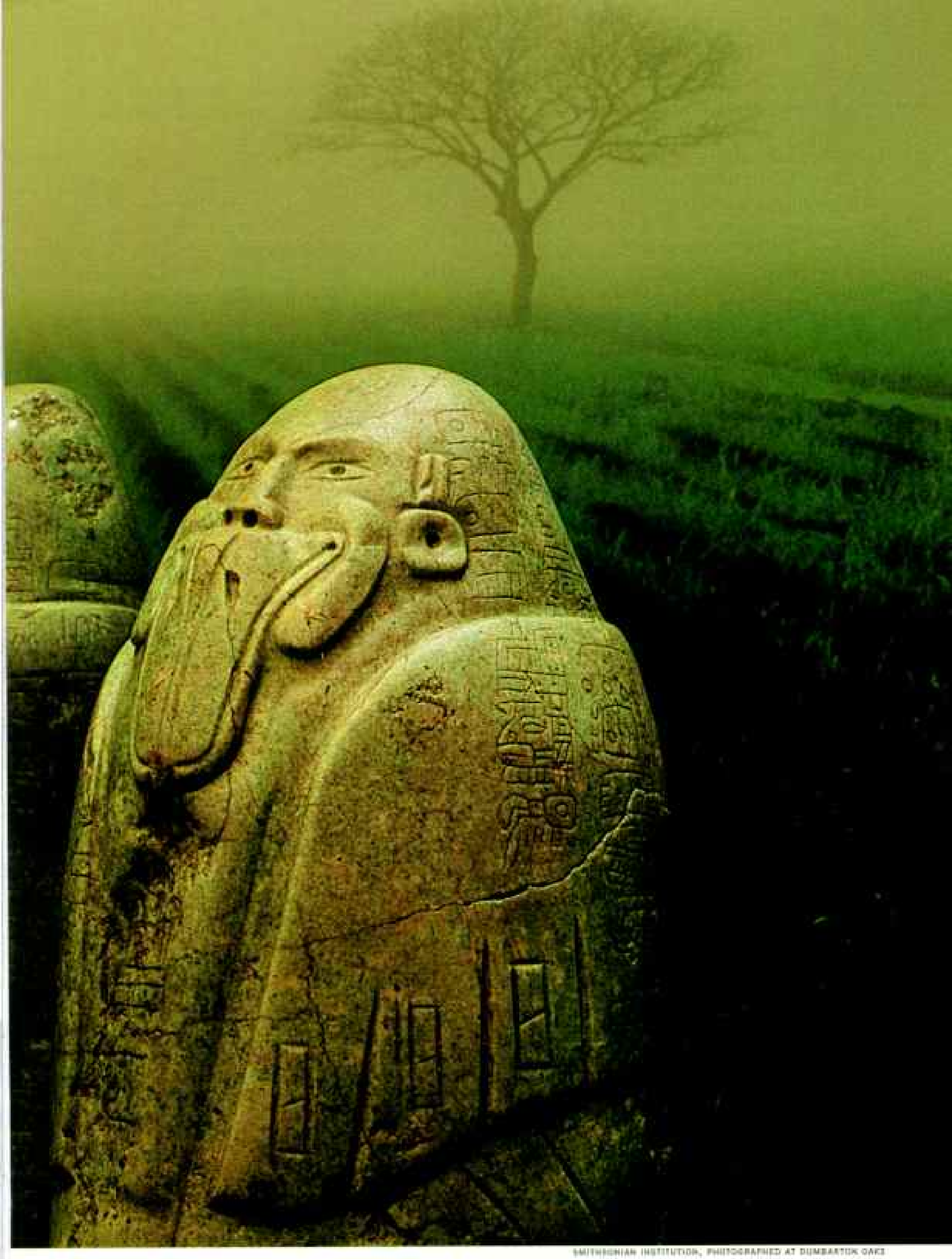
Teopantecuanitlán, or the "place of the temple of the jaguar gods," rests in a wide



DRAWING BY GEORGE E. STUART

IN THE GUISE OF HIS ANIMAL SOUL

A shaman dons a duck mask, his animal alter ego, for a rite performed in A.D. 162. This six-inch nephrite artifact, known as the Tuxtla Statuette, was unearthed 40 miles from La Mojarra



SMITHSONIAN INSTITUTION, PHOTOGRAPHED AT DUMBARTON OAKS

by a plow—as suggested by the photographic backdrop above. In an astonishing coincidence, his left shoulder bears the name glyph of the spirit companion of Harvest Mountain Lord.

Epigraphists used the statuette's glyphs, Maya symbols, and an early form of Zoquean, a language ancestral to four spoken in the area today, to decode the La Mojarra stela.

valley near the juncture of the Amacuzac and Balsas Rivers, some 200 miles west of Tres Zapotes. There, since 1983, archaeologist Guadalupe Martínez Donjuán of the National Institute of Anthropology and History has meticulously excavated what is turning out to be a major Olmec site. At its center Martínez has traced an 800-year sequence of construction beginning as early as 1400 B.C. The structure was dominated by a sunken courtyard built in the mid-years of that span and adorned with jaguar heads carved in travertine and placed in prominent locations on two of the four enclosing walls.

"This should really be no surprise," says Martínez. "Olmec material has been coming out of this area for years."

Within a narrow strip along the coast that stretches from Chiapas into El Salvador lie a dozen important sites, including Abaj Takalik, Chalchuapa, La Blanca, and others whose histories of occupation extend back to around 2000 B.C.

Archaeologist John Graham of the University of California at Berkeley, who excavated Abaj Takalik in Guatemala, believes it is possible that this Pacific coast area—and not the Gulf Coast region after all—may indeed have been the Olmec heartland.

Here the matter rests. Perhaps in the end, the Olmec of the Gulf Coast will turn out to be what Norman Hammond of Boston University calls "more of a sister culture than a mother culture, or, at best, a sort of first among equals."

Whatever the final verdict, the eight centuries of the Olmec brought forth some remarkable achievements, including the emergence of Mesoamerica's first recognizable art style, its first truly monumental art, and the first signs of the enormous managerial talents necessary for the survival and prosperity of urban society in a capricious and sometimes threatening natural setting.

NATIONAL MUSEUM OF ANTHROPOLOGY (ABOVE); HUNTINGTON FREE

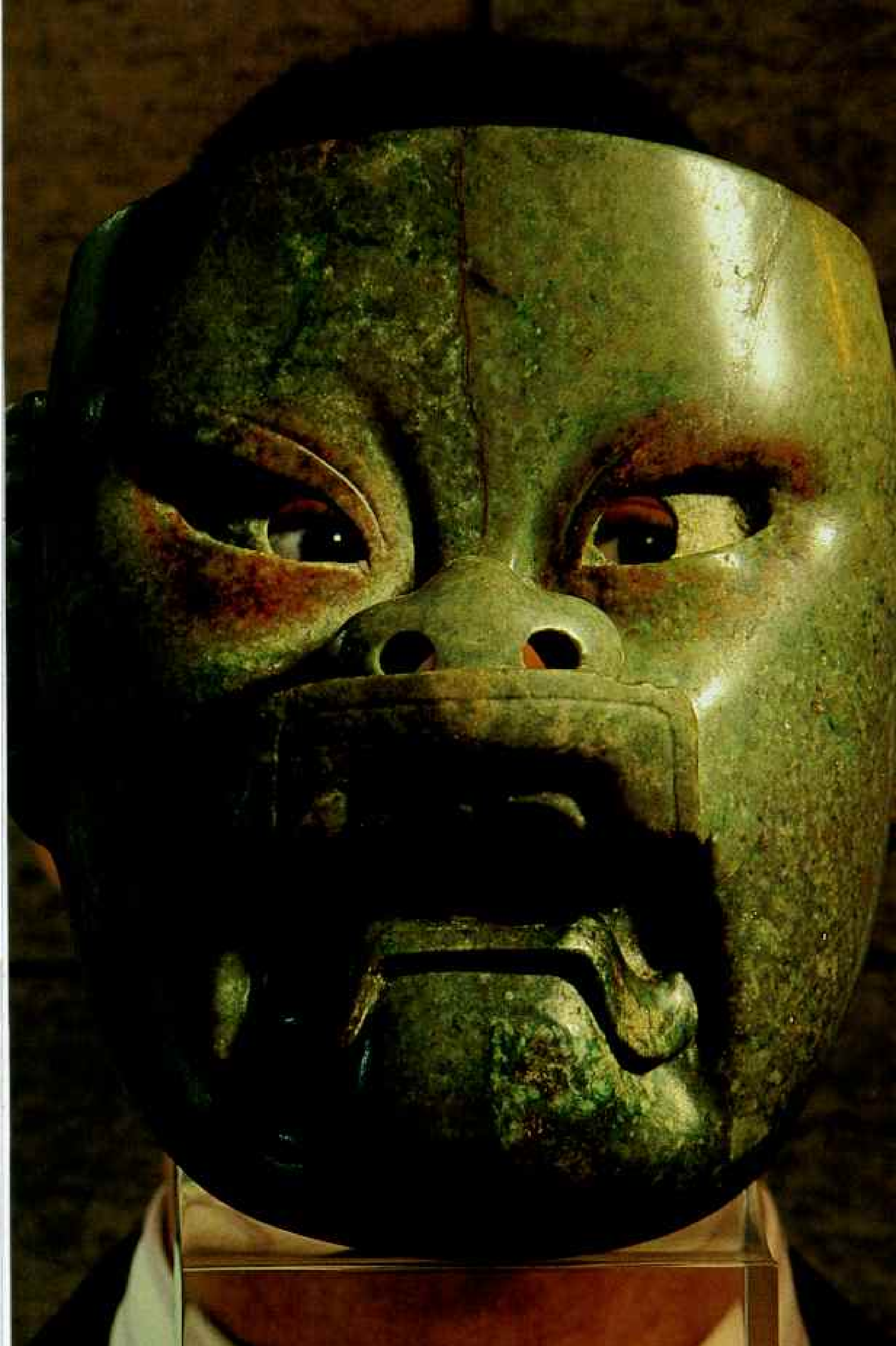
PRECIOUS JADE survives to prove Olmec artistry and hint at Olmec beliefs. The ceremonial ax bears the cleft forehead and flame eyebrows of a deity. The jade mask, here concealing a museum guard, was too heavy to wear and may have been a funerary offering. Of unknown provenance but clearly Olmec, it remains another puzzle in the unfolding story of the Olmec.

THAT THREAT took a different form in the late 1960s, about the time I first gazed upon La Venta and wondered if it could endure our times. The slope of the great mound glowed with the reflected light of countless natural-gas flares from the adjacent oil refinery, and iridescent scum shone in the nearby swamp. I was convinced that the site was doomed.

Happily, I was wrong. Since 1984 La Venta has taken on a new life. The modern houses that recently encroached upon it have been removed, their families relocated, and a splendid new museum and visitor center built.

Not so long ago, Rebeca González took me on a tour of La Venta, where earlier generations of investigators had found enough surprises to fill all their lifetimes. From the summit of the main pyramid, I saw the site with a renewed conviction that the next generation of archaeologists will perhaps fare even better and come to know much more than we do about those who lived out their lives there.

For me, no amount of information can dispel the aura of La Venta. In the twilight of that tropical day the great platform of the Stirling Acropolis, named in honor of Matt, seemed doubly ancient, its edges now softened by more than 2,500 rainy seasons and the shadows of a humid evening. Beneath it and inside countless other mounds of the same epoch, I realized, lie many more Olmec secrets. As we descended the slope for the drive back to Villahermosa, I wondered if someone out there might be digging a fishpond or kicking at some half-buried stone in a field. □



THE HARLEQUIN DUCK

By DOUGLAS H. CHADWICK

Photographs by BATES LITTLEHALES

Bird of White Waters

Pounding surf and white-water rapids—that's home to the harlequin duck. For eons these birds flourished along the northern rims of the Atlantic and Pacific Oceans; now, with their numbers dwindling, their future seems as foggy as this shore in Washington State, where three drakes woo a harlequin hen.

I WENT CROSS-COUNTRY SKIING in Glacier National Park early one Montana spring. A warm wind carried butterflies gently from willow catkin to cottonwood bud even as it loosed avalanches overhead that made the day tremble. As the river I was following swung around the ankle of a mountain goat cliff, it raced down a series of ledges. The white water looked overpowering. Yet two pairs of small ducks were riding it, shooting through spouts and whirlpools—then flying upstream to ride it again. They would dive into the center of a sluice and surface 20 seconds later at exactly the same spot, kayak down some rips and curls, peel off into the eddy behind a boulder, and submerge once more. Through the crystalline pool there I could see them probing like trout among the rounded bottom stones.

Sporting the stripes and patchwork pattern of his namesake—the harlequin clown—this dapper duck is a bachelor that migrated from the Pacific coast to Montana for the spring breeding season. Even if he hooks up with a single hen, he won't stick around for long. Once hens begin incubating their eggs in early summer, most drakes cruise back to the coast to molt.

The females were a soft brown with white patches on their cheeks and brow. The males were mostly the blue-gray of storm clouds, yet their sides were burnished red. So was a wedge along their crown. And an extravagance of white dots, commas, and stripes, some outlined in black, quilted other parts of their head and body. The birds looked closer in size to a jay than to a mallard. Instead of quacking, they spoke in varied whistles, at times throwing back their heads to give off a keening cry. When they flew, they always kept within a few feet of the water, matching the channel's every twist and turn.

I had never seen anything that looked or acted like these birds, and I have been gathering information on them ever since I skied back home. It led to a good deal more than ducks. I began to learn how the energies flowing through an environment shape whole communities of life. And while every study of nature is ultimately a study of connections, the species I first met at a cascade in the wilderness also showed me how widely those threads have become attached to the human sphere.

"Wherever harlequins are found, they seem bound

PAUL SCHOFIELD

Precocious paddler: Harlequin ducklings swim days after they hatch, usually venturing out under the watchful eye of the mother hen. Although ducklings can't fly until they're eight weeks old, some hens take off before then, leaving their broods behind to fend for themselves.

ON THE STAGES OF EUROPE once strutted a figure told by his costume of patchwork colors and curiously painted face—a histrionic, or theatrical, clown. This duck was named for him: the harlequin, *Histrionicus histrionicus*, also known as the circus duck, painted duck, totem pole duck, rock duck, mountain duck, glacier duck, white-eyed diver, squeaker, squealer, blue streak, and, together, as the lord and lady. As yet another name, the sea mouse, suggests, there is a different dimension to the animal's life. After rearing their young on mountain streams each summer, harlequins return to spend the rest of the year along rocky ocean coasts. One of the smallest sea ducks, they stay the closest to shore, feeding in the intertidal zone where surf meets stone.

One February I went with biologist Vernon Byrd of the Alaska Maritime National Wildlife Refuge to Shemya Island near the end of the Aleutian chain. While blizzards and rain squalls took turns slanting out of the clouds, we circled the isle to census harlequins, eiders, and rare emperor geese. Two peregrine falcons and a white-tailed eagle blown across from Siberian shores went into our notebooks the first day as well.

"We keep track of sea otters too," Vern said, pointing to a raft of nearly 50 breaking apart sea urchins to eat. "Notice the ducks swimming close by the otters? I think they've come over to dabble at spilled urchin roe."

I soon learned not to waste time scouting for harlequins along quiet stretches of beach. In the habitats they chose, waves toppled and roared spray at the sky. Often the birds were where they risked being smashed against ledges if they mistimed a single dive. Harlequins have smooth, densely packed feathers

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DOUGLAS H. CHADWICK has penned 13 stories for the magazine, most recently "The American Prairie" in the October issue. Former staff photographer BATES LITTLEHALES illustrated some 40 articles during his 37 years at the Society.

to white water in untamed landscapes."

that trap a lot of air within them. This is vital for insulating such small bodies against the chilly waters they ply. It also makes them exceptionally buoyant. You can tell harlequins by the way they bounce up like corks after dives and ride high on the surface, skimming lightly as bubbles over ordinary swells. When pressed, they can lean forward, put their unusually strong legs in gear, and plane ahead like little boats with big outboard engines.

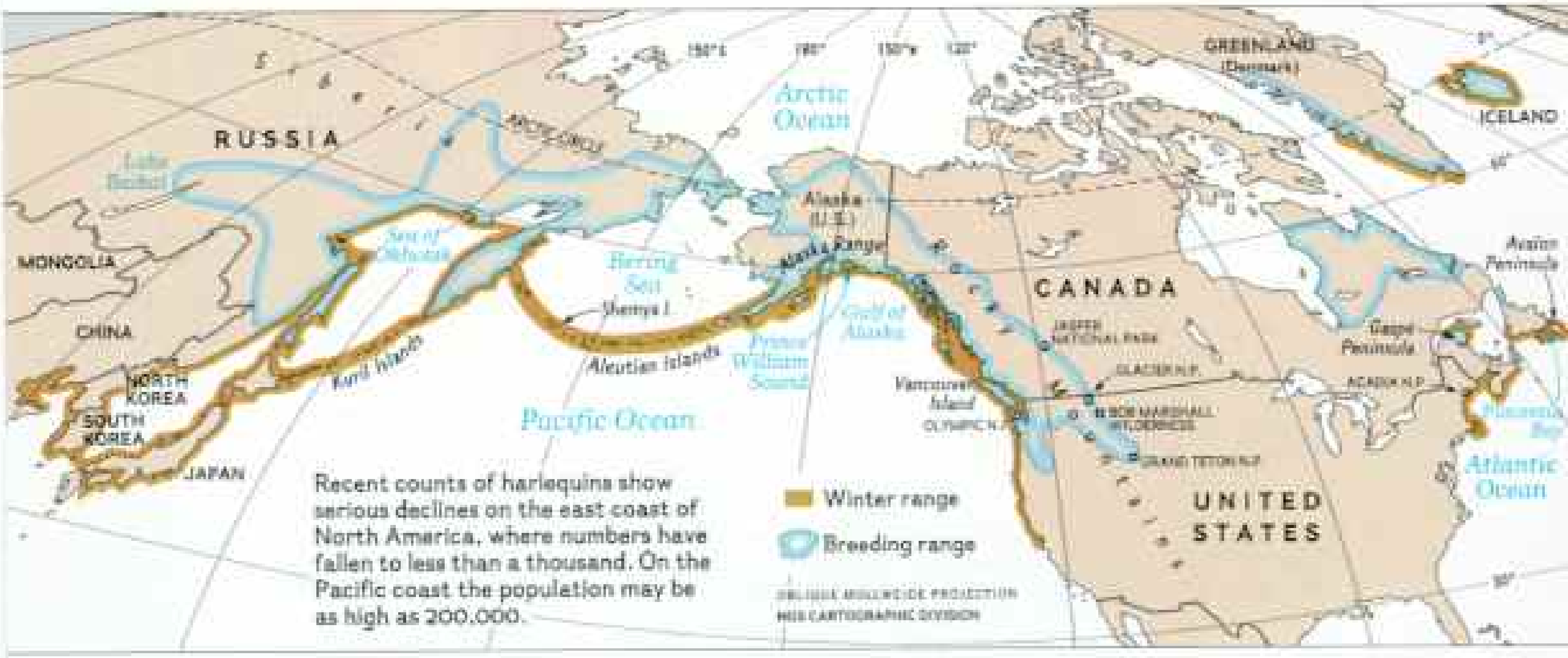
Still, I saw harlequins get caught in the leading edge of breakers—lifted, twisted, whipped around like loose seaweed. Some managed to break the hydraulic grip and kick down into the curl's glassy depths. Others were spewed between teeth of dark volcanic rock in a surge of foam. Surfer ducks. A 19th-century taxidermist who prepared mounts from nearly 90 harlequin specimens noted that he had never seen birds with so many broken and mended bones.

We land dwellers sense disaster when we look at a violent shore. Yet a host of marine invertebrates have not only adapted to such places but abound there. The harder water is churned, the higher its oxygen content, the more often nutrients flow by, and the faster waste products and smothering sediments get whisked off, all of which encourage a greater abundance and diversity of life. Similarly, as trout fishermen can tell you, the riffles and rapids of fresh water support a richer concentration of aquatic insect larvae than slower moving parts of a mountain stream. In short, fast water means a fuller larder for whoever has the skills or risktaker's heart to get at it. Harlequins have both.

Wherever harlequins are found, they seem bound to white water in untamed landscapes. Few people know of them, despite that long list of common names. Scientists began to study the species only recently—mainly out of alarm over apparent declines.

The only duck of the Northern Hemisphere dependent on turbulent mountain streams for part of its life, the harlequin exists in two separate populations, Atlantic and Pacific. Of the Pacific group, at least 100,000 to 200,000 are tied to North America. The majority winter along the Aleutian Islands and portions of the Alaska coast farther south. British Columbia claims around 12,000 wintering birds; Washington, several hundred; Oregon and California, these days, just a handful or two. Although many nest in coastal mountains, some migrate as far inland as the Yukon and the eastern slope of the Rockies in Alberta and Montana. Harlequins also inhabit eastern Asia, from Siberia to Japan; in what numbers is anybody's guess.

Of the Atlantic group, Iceland and Greenland each claim an estimated 5,000 to 10,000. Fewer than a thousand occupy eastern Canada and the U. S., which may have once held the Atlantic's greatest share. The survivors breed primarily in Labrador, Newfoundland, and Quebec's Gaspé Peninsula and winter off



Recent counts of harlequins show serious declines on the east coast of North America, where numbers have fallen to less than a thousand. On the Pacific coast the population may be as high as 200,000.

"When they flew, they always kept within a few feet of

the water, matching the channel's every twist and turn."

■ "Scientists began to study the species only recently—

Maine, with a few dozen continuing as far south as Sachuest Point, Rhode Island.

AT 4 A.M. Glen Mittelhauser's alarm went off, and he arose to start the cabin's woodstove and turn on the radio for a weather report. It said: Howling winds; stinging sleet; stay home. Glen said: "Could be worse. Let's roll." Hoisting packs, we started off in the dark, breaking a trail through the snow across Acadia National Park on Isle au Haut, Maine's outermost big island. The ducks were on its most remote shore, several miles away. Glen planned to cover another ten miles of the ragged sea edge once we reached it. By noon we had passed Squeaker Cove and were struggling to stand up against the wind lashing Western Head. To either side of us and around lesser islands nearby wintered 400 to 500 harlequins—at least 50 percent of those left on the east coast.

An early culprit in this population's collapse is easy to finger: unchecked hunting of seabirds. Many species were able to recover after game laws took effect. The harlequin continued to decline. Not that anyone was paying much attention.

Tightening his parka hood, Glen shouted into the wind: "Harlies have too strong a taste to be considered good eating. But people went on taking them for sport—they're fast, tricky targets—and for trophies because the drakes are so colorful. You could still bag five a day in Maine through 1985. The hunting season was finally closed in 1989"—largely because of Glen's tireless surveys, conducted on a shoestring budget. "Yet I'm finding what looks like a downturn in numbers since then," he concluded, offering only a puzzled shrug.

We'll never know how many Atlantic breeding streams have been emptied, possibly by overharvesting at sea combined with inland siltation, pollution, dam building, and other development—the same forces that laid waste to the region's salmon runs. Virtually all the remaining birds now fly up the Canadian coast to breeding ranges to the north.

I flew to Newfoundland to meet Ian Goudie, a biologist for the Canadian Wildlife Service. A day later I was on the Avalon Peninsula and once again headed for the most rugged, uninhabited headland around.

Where the tide rips swirl
And the wild ducks whirl
And old Neptune calls the number
'Neath the broad Atlantic combers.

Eight feet up a maple snag in Washington's Olympic National Park, wildlife biologist Fred Sharpe examines his rare find: a harlequin nest in a tree cavity. The eggs, swaddled in a blanket of down, may be safer up here than in nests closer to the ground, where the river sometimes swells and washes them away.

mainly out of alarm over apparent declines."

As we sang the old dory fishermen's tribute to Cape St. Mary's that evening, the lighthouse keeper, Vincent Kehoe, plucked a guitar. Ian added a flute, and a gale strummed the whole building, loudly and incessantly, having nothing for thousands of miles beyond to play on but the sea.

We hiked the promontory rim the next morning, checking each icy foothold twice before leaning out to scan the surf zone, for it lay hundreds of feet below. Several thousand

harlequins could still be found off Cape St. Mary's in the 1950s. In 1979, 140. We found exactly 20. As far as Ian knew, they were the last flock in this once important wintering area. We were watching them feed in the waterfall created by surf streaming off a sea stack when a noise louder than the waves jerked our heads up. *BOOM! BOO-BOOM!* Poachers had ridden into the reserve on all-terrain vehicles and were firing shotguns at eiders across a cove. They saw us. They went on firing.

"I'm afraid some Newfoundlanders don't draw much of a line between poaching and their tradition of living off the land and sea," Ian said. "They shoot seabirds both spring and fall as they migrate along the coast, and through the winter when fishing is slow. Wardens tend to take a hands-off attitude. One I know who didn't got his house burned down. Not long after I gave a talk at a nearby fishing village about the need to go easy on harlequins, I found a dead one hung from the power line across the road—a reminder to butt out."

I was already disheartened enough. Where spray turned to slush and icicles on the ledges beneath us, seabirds lay preening oil off their feathers and slowly freezing to death. They included murres, hundreds of eiders, and the harlequin's closest relatives, old-squaws (or long-tailed ducks).

"It happens every year," Ian grumbled. "Ships pump their bilges and holding tanks on the way in or out of Placentia Bay just west of us. There are stations available to take the waste, but too many captains can't be bothered with the extra effort and cost. An oil refinery was reopened on the bay in 1986. It's only a matter of time before we have a major spill."

IN 1990 THE HARLEQUIN was listed as endangered in eastern Canada, becoming the first North American duck to reach such critical status in modern times. The only one to become extinct was the Labrador duck in the 1870s. Some think it shared the harlequin's trait of remaining very close to shore.

The Pacific harlequin population may be headed in the same direction: down. Siberian investigators list overhunting as a major factor. Elsewhere, the causes are murkier.

I began exploring what may be British Columbia's most important seabird wintering and migration area—the 150-mile-long Strait of Georgia, between the forested mountainsides of Vancouver Island and the mainland. Development is sprawling surprisingly fast up

Hurdling rapids rather than running them, a drake takes off to find a calmer stretch of McDonald Creek in Montana's Glacier National Park. White water creates an oxygen-rich habitat for midges and stone fly larvae—two staples of the harlequin's freshwater diet.

the coasts. New dream homes and marinas claim the beaches; motorboats, the bays. Increasingly, harlequins are left to hug shores protected either as reserves or by their own rugged inaccessibility. Before looking further into what might be undoing the harlequin, though, I wanted to know more about what goes into the making of one.

By mid-March, I had picked a pair of small, unspoiled (and best left anonymous) islands in the strait for detailed observations. Typically the harlequins were scattered in small flocks along particular beaches: a pair here, five there, once in a while 15 or 20. I could pitch a tent just above the high tide strand and wake to watch them swim past my doorway in the oyster light of an overcast dawn.

At low tide I went out to see what the seafloor looked like where the ducks had been diving—another chance to go beachcombing in the name of science. Green and purple shore crabs scuttle-scritched away to hide beneath rocks. I'd often seen such legs wriggling from the sides of harlequin mouths. The birds used their short, sturdy bill with its slightly thickened hooked nail at the tip to pry limpets off the same stones. And although chitons, a flatter snail relative, were hard for me to jimmy

loose even with a penknife, harlequins took them too. Shrimp-like amphipods and periwinkle snails form another important part of their diet, along with marine worms, small urchins, young starfish, and little crevice-dwelling fishes—a greater variety of marine life, all told, than is sampled by almost any other waterfowl.

As the days passed, harlequins became more and more scarce in their usual haunts. Herring had meanwhile swept by the shores of one island and left the heaviest spawn in at least a decade. The partial bay between the island's rocky headland and outlying reefs made a natural theater, borders glittering with heaps of silver caviar, and that is where I found the ducks gathered.

My telescope turned into a kaleidoscope. I ended up tallying nearly 1,600 harlequins within less than a square mile, easily the largest single concentration ever recorded for the species. (A year later I saw more than 2,000 in the same place.)

They mixed early courtship with their feasting. Harlequins remain loyal to both wintering and nesting ranges from one year to the next. Also, presumably, to their mates. However, bachelors seem to think it's worth checking to be sure. And there are always females in their second or, occasionally, third year ready to breed for the first time. Mated or not, a hen in this crowd was likely to have two, three, or even six bachelors in bright new spring plumage following close upon her tail feathers, pumping their heads up and down.

IT WAS TRULY HISTRIONIC out there. The seawalls echoed the sound of hard-paddling chases and skirmishes, the slap of wings on water from a bathing display sparked by aggression, and, always, the concert of harlequin piping, whose high pitch seems designed to carry above the rumblings of white water. In addition the spawn had attracted buffleheads, mergansers, cormorants, loons, goldeneyes, and guillemots; flotillas of scaup and scoters; wheeling bald eagles by the score; and at least 10,000 gulls. The congregation continued to build as migrating flocks stopped in, drawn by the clamor and great cloud of wings. Birds largely ignored the harbor seal heads bobbing among them. But the sight of sea lions surfacing with mouths full of herring sent harlequins rushing for the safety of shore. Farther out, orcas chased the big fish chasing the herring.

The bounty couldn't have come at a better time for harlequins about to embark on journeys inland to face the demands of producing young. An old theory holds that they migrate somewhat like salmon, following the exact course of rivers upstream toward their headwaters rather than flying overland. Some definitely do, though those headed across mountain ranges obviously have to improvise. Once at their chosen stream, pairs hunt hard to make a meal from the likes of stone fly nymphs and blackfly larvae. Courtship grows more intense, occasionally overriding other pressing business. Like steering: A Glacier National

"If these birds are in trouble, some of the grandest

Park drake I first noticed in the shadow of Heavens Peak no sooner mounted a hen than the two found themselves yanked backward into rapids and bounced downstream for a hundred yards. They made love all the way.

Sometime in May, slightly later farther north, the females grow markedly warier and spend longer and longer periods prospecting for nest sites among brushy banks. Once a hen lays her eggs—usually four to seven—and starts sitting tight, the drake drifts away downstream and soon flies back to the coast.

To get his hands on two harlequins, zoologist Dave Genter strung a mist net across Montana's Marten Creek. To help track them, he tagged each duck by inserting a wire through a lateral nostril. The tags don't hurt and have helped biologists determine that harlequins return to the same streams every spring.

At this stage the hen's sensitivity to disturbance is extreme. "Harlequins normally avoid places where they don't have good visibility and quick access to the current for escape," Dave Crowley, a researcher with the Alaska Fish and Game Department, informed me as we camped by a salmon-spawning stream near the coast. Midnight-sun colors smoldered on the glaciers above us, and the birds swam through their reflections.

"I never saw them use certain banks for hauling out to rest and preen until brown bears that fish here trampled down the tall grasses, opening a view. The ducks usually choose a midstream boulder or the downstream point of a gravel bar for their loafing spot."

Even there they like to be where ripples lap at their feet. Should a mink appear or a goshawk come streaking out of the trees, the ducks are underwater in an eye blink, lost among the swirls. If they show themselves at all before rounding a bend, it may be like little crocodiles, with only eyes and nostrils poking above the surface.

Imagine how vulnerable a hen might feel when the time comes to keep among thick vegetation for 28 to 30 days of incubation. The hideaway can't be very close to the water's edge either, or runoff from snowmelt and rainstorms will surely sweep away her nest. That happens often enough as it is when mountain floods overwhelm even tall banks.

Once the males have gone, renesting—as common puddle ducks do—is out of the question. There are years when the harlequins throughout a region produce virtually no young, the only success coming from hens that find nest sites high on a streamside cliff ledge or in a tree cavity.

After the young hatch, the mother duck usually leads them to the same places adults take refuge during heavy snowmelt: backwaters and slow-moving channels. Although the risk from predators is high there, inexperienced ducklings would stand less of a chance against the one-way rapids waiting close by. Their white-water skills improve quickly as they grow, of course. But they still can't fly—not until late July or August. By September they'll be ready to return seaward with their mother.

The river never quits pushing. I've looked

settings . . . on the continent may be too."

on as broods tumbled down cascades and over waterfalls. Some became temporarily separated, and some . . . I couldn't tell. Other families cornered by rapids leaped onto shore and put their strong legs and agility to work hiking through the woods, along cliffs, and over log jams to reach friendlier water.

I used that option time and again while wading behind Frances Cassirer, a biologist with the Idaho Department of Fish and Game, as she searched the northern reaches of the state for harlequins. They used to be recorded as far south as Colorado. No more, and now Idaho is down to perhaps 50 pairs. The birds appear to have retreated over the decades toward the Panhandle, where the last woodland caribou in the lower 48 roam forests with cedars a thousand years old.

"These little ducks are so beautiful and, at the same time, so tough," Frances told me. "And I love where they live. They don't have too much breathing room to start with, given their low rate of reproduction and specialized way of life. Before we can protect the habitats where they're still found, we need a clearer idea of what the critical elements are."

The amount of effort required to gather each scrap of such data is either inspiring or ridiculous, depending upon the slipperiness of the log you've chosen to crawl along in hip waders, trying to cross some uncompromising piece of water.

A feathery plumage of ferns lit with calypso orchids lined the banks of Gold Creek. Kingfishers and ouzels flashed by through the dappled light. The steep-sided canyon was a ribbon of primeval woodland within a national forest undergoing heavy timbering.

"One thing we feel sure of," Frances went on, now edging handhold by handhold along a rock overhang, "is that harlequins do best where the riparian zone is still solidly intact."

Logging can make flooding more frequent and severe, and the extra sediment that runs off cutover sites can pave over the food supply in clear-running waters. Current regulations require that loggers leave only a five-foot-wide strip of protection along some smaller streams. Better regulations could change that. Could they also overcome the effects of humans and noisy machines in the backcountry at a time when hens are easily stressed?

In Wyoming, biologist Rick Wallen found that harlequins in Grand Teton National Park didn't produce as many young on streams frequented by hikers and fishermen as on similar streams with fewer visitors. A recent sharp rise in commercial raft trips down the Maligne River in Alberta's Jasper National Park paralleled an equally sharp drop-off in the reserve's largest group of harlequins, which float the same waters.

THESE FINDINGS are clues, not conclusions; the race to gather enough knowledge in time to help the harlequin just got under way. Here is a new clue: As almost everyone knows, the supertanker *Exxon Valdez* made a hell of a mess when it struck a reef and poured 11 million gallons of crude oil into Prince William Sound in 1989.*

*See "Alaska's Big Spill—Can the Wilderness Heal?" in the January 1990 issue.

A sickening sheen still lingers on mussel beds in Alaska's Prince William Sound, where the Exxon Valdez *spilled 11 million gallons of oil in 1989. Harlequins once fed and bred here, but oil contamination has virtually halted reproduction.*

What only a few knew until just lately, when Alaska released studies withheld until lawsuits were settled, is that harlequin ducks were one of the hardest hit species. Almost all those left in the area have been unable to reproduce ever since the spill.

Bouncing along past the shores in a boat with Sam Patten, the state Fish and Game Department's principal investigator of oil damage to seabirds, I had trouble understanding what was wrong at first. Beaches worked over by cleanup crews had grown back a healthy-looking coat of barnacles and kelp. The only black stripe was that made by a common marine lichen, and the Alaska Range beyond gleamed as whitely as on any June day in history.

"The enemy has not left," Sam said. "It's just gone into hiding." And he showed me where, digging a foot-deep trench into a cobble beach. Within seconds, oil began to stain the edges and seep down to make chemical rainbows atop the water. The stuff had a sharp, biting smell. Sam said that was the signature of volatile hydrocarbons, the portion of oil most toxic to organisms.

"The solvents used during cleanup did little more in some cases than cause oil to run off the top of the rocks to the underside," he observed. "Some percolated on down into the sand and sediments, as you can see. At the moment, mussel beds are our prime concern. The byssal thread mats that mussels use for attachment trap layers of fine sediments close to the surface. Those sopped up oil like a sponge."

River otters, juvenile sea otters, goldeneyes, scoters, and harlequins, among other animals, take in oil directly as they feed on contaminated mussels. Their foraging also

uproots the byssuses, creating mini-spills. Storms that break apart whole sections of mussel beds release still more oil. The amount is not great. Unfortunately, it doesn't need to be.

"Two milliliters of weathered oil—about a third of a teaspoon—was given to wedge-tailed shearwaters in an experiment," Sam told me. "Half got it in capsules. The others had it dabbed on their breast and ingested it through preening. Not many in either group laid eggs the next season, and very few of the eggs that they did lay hatched."

Gail Evanoff is neither a scientist nor an environmental lobbyist. She and her husband are Native Americans who live on Prince William Sound. We were drinking tea in their home at Chenega Bay one rainy afternoon when she put down her cup and said, "You can't believe how rich this land was. We lived off those beaches. We did everything there. Hunted. Fished. Gathered mussels and limpets, sea urchins, gumboot chitons. The bay was full of sea otters. Right across on Bettles Island was a seal rookery. Every night this time of year, you would hear them and sea lions crying and making all their noises. Now the bay is . . . so quiet. We can't find anything here to subsist on, or if we do, we want to leave it alone so it can come back. Plus we have that fear that everything has been exposed, tainted—that ten years from now I'll get a cancer from the fish I've eaten. We don't trust our beaches any more."

Two milliliters. I remembered the emperor geese on Shemya Island whose white heads showed dark blotches. I had thought such birds were juveniles. Biologist Vernon Byrd said juvenile patterns were different; it was oil. That night, when I took off the parka I had worn while sliding among beach rocks to spy

PHIL SCHOFIELD

The harlie doesn't have an easy ride ahead, considering trends these days: development that dams the duck's waters and industry that pollutes it, hikers who disturb the bird and hunters who shoot it. Those are strong currents to buck in any effort to save this duck.

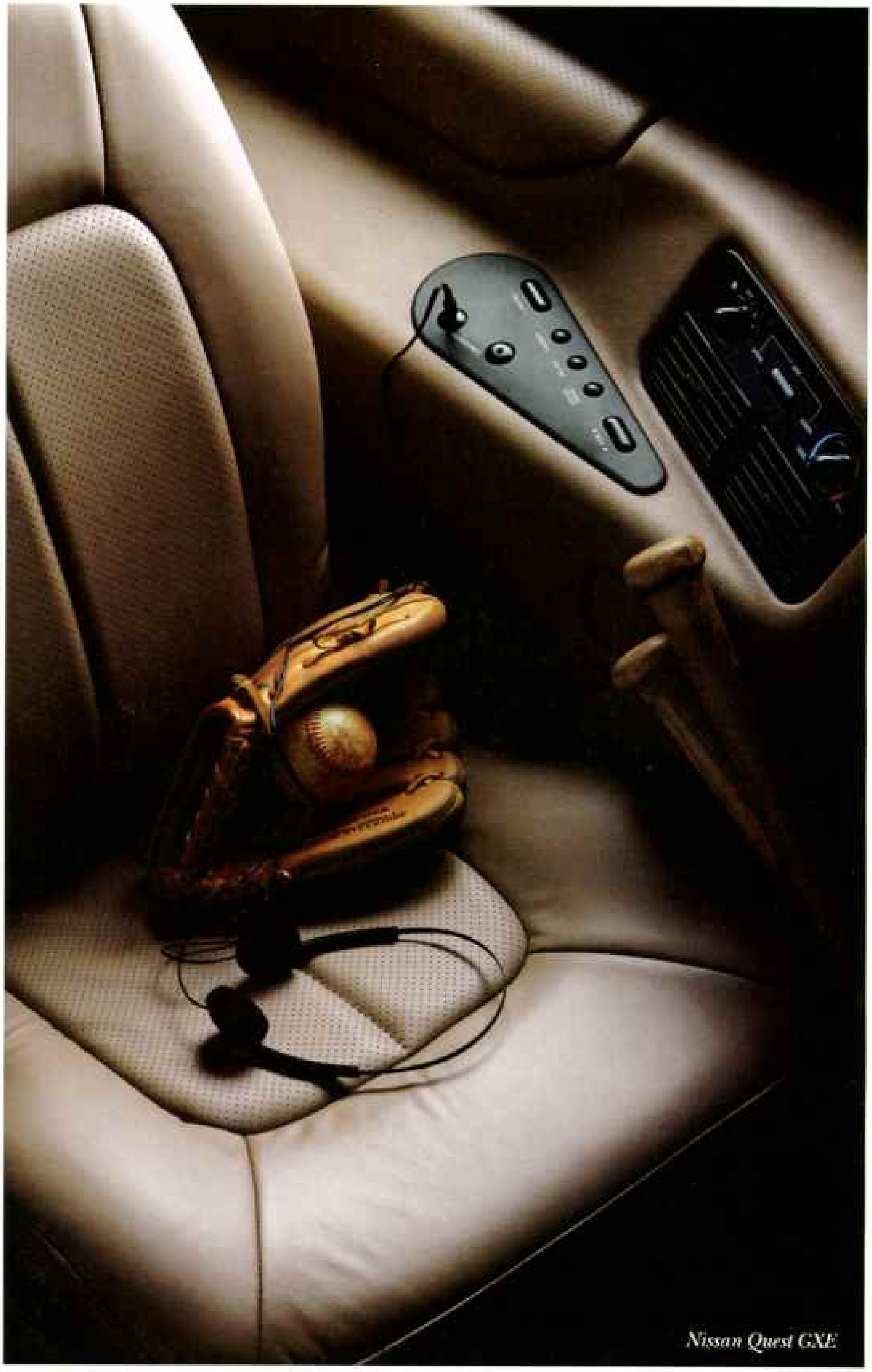
on harlequins, I found it was smudged as well. This Aleutian isle has no major port or heavy industry. None lies anywhere near. But, as throughout the seven seas, little clots of petroleum spread from shipping lanes and wash in to collect at the intertidal zone, exactly where emperor geese and harlequins feed.

ONE AUGUST I WENT into the Bob Marshall Wilderness to count harlequin broods with Dave Genter, director of Montana's Natural Heritage Program. We rode horseback upstream along the Sun River for three days. Then the river grew small enough that I could walk right in it, so for the next several days I waded through ripples of light up and over the Great Divide. The air smelled like huckleberries and subalpine fir. Dave went out from camp to call for boreal owls one night, and a wolf answered.

Partway down the other side, on the Middle Fork of the Flathead River, I climbed into an inflatable kayak with Genter's assistant, David Lee. The two of us continued for three more days through rapids that would roll and scour us like a washing machine, then suddenly hand us over to water so silken, shimmering through a canyon so magically sculpted, that we spoke in whispers if we spoke at all.

We never saw a single harlequin. The problem had nothing to do with humans. Floods had torn away roads and bridges downstream that spring. Apparently they had claimed most of the nests in the backcountry as well. Still, the birds were all around me in spirit; I could hear the waters talking to the mountains about them. I didn't have to see any. I only needed to know that they would return.

In 1991 *Histrionicus histrionicus* was officially declared a candidate for the U. S. threatened and endangered species list, an admission that it may be headed toward the point from which it can never return. Resource managers have come to speak of the harlequin as a sensitive, or indicator, species. It means they recognize harlequins as being among the very first to reflect changes to pristine environments. It follows that if these birds are in trouble, some of the grandest settings and most vital wildlife communities on the continent may be too, for it is among them that harlequins have chosen to make their last stand. Where someone else might look and see only odd little ducks, I found a species that indicates realms of natural splendor and wild surprise. It can't flourish without them, and neither, really, can we. □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Forum

Lightning

The July 1993 issue with the dramatic cover had particular meaning for me. For hours I had been watching heavy, dark clouds forming overhead. The 68° temperature seemed too cold for thunderstorms. I went to the mailbox, noticed the "Lightning" cover, and, as if on cue, the first bolts cracked through that canopy of dark clouds. The rolling thunder set off my neighbor's burglar alarm. Heavy hail began to fall, and in moments this northeast section of Seattle was the vortex of blinding bolts. I turned to the feature story and read that the Pacific Northwest has very damp air, low mean temperatures, and sees almost no lightning. I wonder if E. P. Krider and Martin Uman, who invented the nationwide detection system to show lightning flashes on a computerized map, plotted this Washington State storm.

MARGARETHA H. VINCENT
Seattle, Washington

We at the Boston Museum of Science were looking forward to seeing our Van de Graaff generator (pages 86-7) and were very happy with the article and fantastic pictures. Unfortunately the description of why Don Salvatore is safe inside the "bird cage" near the generator is a problem. You state that the artificial lightning passes *through* the metal frame. What is protecting Don, as well as motorists in thunderstorms, is the fact that the electricity passes *over* the outside of metal surfaces and down into the ground. About a hundred years ago, Nikola Tesla discovered this property of high-voltage electricity, called the skin effect. During our demonstrations we show the audience that as the cage is struck by lightning, we can actually touch the inside and not feel any shock.

MICHAEL FETSKO
Boston Museum of Science
Boston, Massachusetts

Readers might like a glimpse of how we adapt in the "lightning capital of the United States." Making concessions has become second nature to us at the first roll of thunder—a daily occurrence each summer. Computers are switched off, telephone conversations are cut short, we climb out of pools and showers. Little League baseball games are postponed, and folks flee golf courses and beaches. While nature runs its course, we slow down.

PHYLLIS EDWARDS
Clearwater, Florida

Northern California

Northern Californians may make some valid points for secession from the rest of the state, but I hope it never happens. California is the unique and wonderful place it is because of the diversity of geography, climate, people, industry, and lifestyles. Separating northern and southern California would eliminate not only much of that diversity but central California as well.

GAIL WILKINSON
Fresno, California

Next time you visit northern California, please tell those folks to "get a reality check." All this separate talk is a colossal waste of time. I've heard similar emanations from the Finger Lakes region about the New York City megalopolis. Many people in southern Illinois feel that Chicago politicians control the entire state. Let's get together and do something constructive to solve the problems of the Golden State.

TERRY TILTON
San Diego, California

I live in the future state of northern California and was disappointed with your article. While the coast here is spectacular, virtually all the people and most of the economic activity of our future state are concentrated in the Sacramento Valley. Your article dealt predominantly with the coastal periphery, including 12 of 22 photographs. Also you suggest that the major economic activities are redwood logging and fishing. You barely mention agriculture, which makes a far greater contribution to our economy. And you overlook the importance of higher education to the future; we have state universities at Arcata, Chico, and Rohnert Park and a U.C. campus at Davis.

SCOT HOLLAND
Geography Department
Butte Community College
Oroville, California

Could it be that Darkmoon, the anonymous tree squatter (pages 70-71), has a problem with the responsible management of the abundant forest resources that make natural wood products available and affordable? Perhaps it is only coincidence that he lies on a sheet of plywood, writes on a tablet, reads a Dr. Seuss book, and seems to be gazing at a roll of toilet tissue, all of which are derived from a renewable resource, trees.

KEVIN S. MCELWEE
Marquette, Michigan

New Zoos

The trend of building "megazoos" where animals can have a place safe from poachers and the next best thing to their natural environment is a great thing. Think of the minds of our children and what could be lost forever if we didn't have zoos to spark their interest. I would rather take my children to

"The first time I gave her a diamond ring she cried and called her mother."

I'll always remember that face. The smile bordering on a tear. Silence as powerful as music. Eyes as lively as the diamond I nervously slipped on her finger. And now that we have come so far together, perhaps now is the moment to celebrate that love, once again, with a diamond as exceptional as our love.

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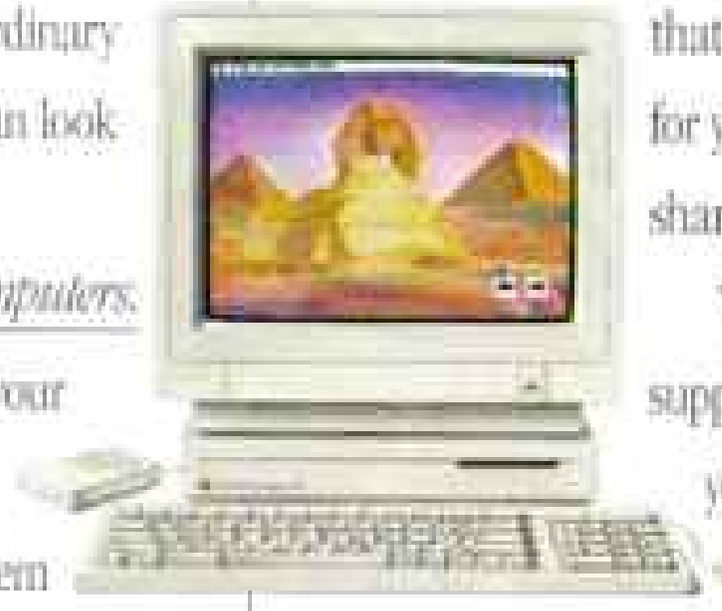

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The Family Macintosh

the zoo to see an endangered animal up close and personal, than show them a picture in a magazine or history book.

ANNA M. FRANCIS
Kansas City, Missouri

Zoos with concrete scenery for lifelike appearances may make us feel better, but they don't do the trick. They have no native bugs, no bark to munch, and water with chlorine and fluorides. If kids need to know about animals, how about wide-screen images and surround-sound in the concrete chambers presently confining animals.

GINO GIGLIO
New York, New York

Having retired after 25 years with the Miami Seaquarium, I am proud that we were able to develop the world's first captive-breeding herd of the endangered Florida manatee. As the herd expanded, we sent individuals to new homes at Homosassa Springs, Sea World of Florida, and the Living Seas at Epcot Center; all now have manatee breeding and public-education programs. The questions regarding release back into the wild are far easier to resolve than the absolute finality of extinction.

WARREN ZEILLER
Florida City, Florida

Reading "New Zoos," I was reminded of a visit to the San Diego Zoo several years ago. As I progressed through the exhibits, I became depressed and eventually scrambled, weeping, to exit the park. I cannot prove that animals suffer, nor can I provide evidence that they are conscious of their captivity, but I believe with everything that makes me human that exhibiting animals is wrong.

TERESA MORAGA
Fair Oaks, California

As a zoo student and marmoset and tamarin keeper, I was happy that you showed the positive side of zoos. Many visitors cannot imagine the work and effort done for and with the animals.

BETSY STEVENS
Gainesville, Florida

Cyprus

Tad Szulc's article "Cyprus: A Time of Reckoning" recalled bittersweet memories. In 1972 I spent two months there, mostly around the old medieval city of Kyrenia on the north coast. I slept in an olive grove belonging to a Greek Cypriot who owned a little café. In return for my help in harvesting olives, he fed me and introduced me to the hospitality that I found in all Cypriots—Greek and Turkish. In Kyrenia then they lived together in peace. Lawrence Durrell's *Bitter Lemons* is recommended reading for anyone wishing to know how the birthplace of Aphrodite could also have bred so much sorrow.

LARRY KILBOURNE
Centreville, Virginia

The article does not mention that while Greek Cypriots agreed to negotiate on the basis of the current UN plan, the Turkish Cypriot leadership has rejected it. The Security Council implicitly blamed the Turkish side for the continuing stalemate in resolution 789 of November 1992.

ANNE M. RICE
Great Falls, Virginia

On several occasions the term "Mass" was used to identify the eucharistic service, but in Orthodox Christianity that service is properly referred to as the "Divine Liturgy." It is Roman Catholics who celebrate Mass.

PERRY MICHALOS
Milwaukee, Wisconsin

As a Turkish Cypriot and a member of the Society, I was delighted to see a relatively objective account of the Cyprus problem. The aerial photograph of Nicosia with its medieval walls is a view that I have never seen of the town where I was born.

SIBEL ERDURAN
Ithaca, New York

Tad Szulc took care to present both sides in this delicate matter, but he didn't mention the role of EOKA, a Greek terrorist organization that wanted *enosis* (union) with Greece. After failed assassination attempts on Makarios, EOKA led a coup backed by the Greek government. If Turkey had not invaded Cyprus, Turkish Cypriots would be at the mercy of Greeks. I cannot see the logic of the Greek Cypriots in not accepting Rauf Denktaş's demands. Equal political representation and separate sovereignty, like the Swiss cantons, is a valid suggestion and would promote harmony and democracy.

MATTHEW E. AMITRANO
Kenilworth, New Jersey

Novel Is Pure Fiction

I have just finished reading *The Bridges of Madison County*. One of the main characters, Robert Kincaid, is said to have been employed by NATIONAL GEOGRAPHIC for a time and assigned to photograph the covered bridges of Madison County, Iowa, for a 1966 issue. I would like to know if you have any copies of this edition.

MANUELA ANTHOU
Canonsburg, Pennsylvania

There is no such edition. There never was a Robert Kincaid associated with the GEOGRAPHIC, and we have never published an article on covered bridges—in Iowa or elsewhere. Bridges, *as its author has said, is entirely fictional.*

Letters should be addressed to FORUM, National Geographic Magazine, Box 37448, Washington, D. C. 20013-7448, and should include the sender's address and telephone number. Not all letters can be used. Those that are will often be edited and excerpted.

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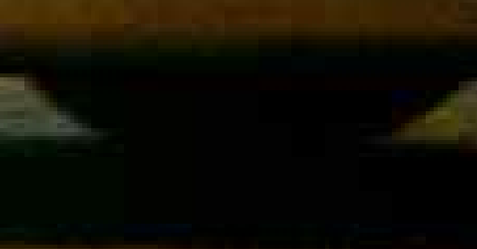

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NUCLEAR ENERGY MEANS CLEANER AIR

1) Name the river of 26,000 miles that rises in the Tangla Mountains of central China.

2) What island was discovered in 1642 by the Dutch navigator and now bears his name?

3) Name the city that is the site of the headquarters for the International Committee of the Red Cross.

These are just a few of the questions that teams of students from the United Kingdom, Russia and the United States correctly answered during the first International Geography Olympiad held in London this summer.

While the American students won, all the students can be proud of their individual achievements and exemplify what can be achieved when geography education is taken seriously by students and the schools they attend.

To support geography education in the United States and abroad, Citibank MasterCard® and Visa® is the proud sponsor of the International Geography Olympiad and National Geography Awareness Week. Good business and good citizenship require all of us to know more about the world that we live and interact in. If you'd like to help, write to your local school board and insist on better geography education in our schools.

To check your answers to the three International Geography Olympiad questions above, turn this page upside down.

Water Matters: Every Day, Everywhere, Every Way
National Geography Awareness Week
November 14—20, 1993

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Answers: 1) Mekong River, 2) Tasmania, 3) Geneva.

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Geographica

Glow-in-the-dark Colors Expose Termite Secrets

Mere mention of their name strikes terror in most homeowners—termites, the jaws of the underworld that can reduce one's castle to a pile of dust. Yet as the U. S. billion-dollar-a-year termite-control industry seeks alternatives to chemical pesticides, it runs up against a brick wall: Science knows surprisingly little about how termite colonies behave.

To learn more, Brian Forschler of the University of Georgia has hit on an ingenious way to track the subterranean, wood-gorging insects. He sprays them with a crayon-box array of fluorescent paints.

Forschler sets wooden lures below ground in a measured area. When he pulls up each "wood sandwich," he dusts the clinging insects with red, blue, green, or magenta paint and replaces the lure. Later he removes it and others nearby, examines the colored insects under ultraviolet light (above right), counts them, and checks how far they have moved and if any of the original groups have merged. Thus he can determine a colony's territory.

Colonies in Georgia average about 150,000 termites, foraging for what wood they can find within a 170-square-foot range. As Forschler continues his research, with support from the National Geographic Society, he will investigate how colonies behave in different soils and why populations rise and fall.

PETER MENZEL

After Eruption, a Dead Lake Revives

The cataclysmic eruption of Mount St. Helens in 1980 (NATIONAL GEOGRAPHIC, January 1981) turned pristine Spirit Lake (below left), five miles away, into "a roiling, steaming body of degraded water choked with logs and mud." Tens of thousands of trees and tons upon tons of volcanic debris crashed into the lake, raising its surface level almost 200 feet and enlarging its area by a third, according to Douglas Larson, an Oregon limnologist. Countless organisms, from fish to plants to plankton, vanished.

Today Spirit Lake, a showcase of nature's recuperative powers, brims with life and is once again almost transparent (below right). Microscopic plankton, borne by wind and birds, is thriving—"a blizzard of invertebrates," in Larson's words, that nurtures an array of plant and animal life. Ironically, the water now contains more nutrients than before the eruption, when the lake was too pure to sustain a trout population and had to be restocked annually for sportfishing. Now "it could support a lot of fish," Larson says, though no restocking is planned. The U. S. Forest Service, which oversees the area, prefers to let the lake recover naturally.

JOHN MARSHALL (LEFT) AND BRETT BAUNTON, ALLSTOCK

National Geographic, November 1993

THE BAYER FACTS: ASPIRIN

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Geographica

JAY DICKMAN

Crow Arrow Throwing: More Than Just a Sport

To Kevin Dust (above) and many of the 7,000 Indians who live on the Crow reservation in southern Montana, throwing a lancelike arrow 40 yards means more than physical skill.

Arrow throwing developed in the early years of this century both as a sport and as an important ritual. Older Crow men teach children how to make the four-foot-long arrow—and explain its importance to their culture. The youngsters carve the shaft from ash or chokecherry, paint it, adorn it with three feathers to help it fly true, and attach a sharp metal point. When teaching the craft, elders pass on lore about the clan and about the old days when men used bows and arrows to hunt for food on the Great Plains. When an arrow is finished, it is blessed in a ceremony; its young maker is told to bring prestige to his clan by mastering the throw.

Hundreds of Crow gather in annual tournaments where throwers take aim on a smaller arrow. They earn points for striking close to the target arrow, touching its feathers, even splitting its shaft. "To be considered one of the best throwers is a real honor," says Crow cultural director John Pretty On Top.

R. SUREHIAN, NATURE

A History Mystery: Silk in a Mummy's Hair

"It's a nice short story," says chemist Gert Lubec. "We were looking at a mummy's hair, we found a piece of silk, end of story." But not so simple: The few strands of silk that Lubec and his Vienna University team saw under their scanning electron microscope (left) turned up on the mummy of a female from Egypt's Dynasty XXI (1069 to 945 B.C.)—suggesting that silk may have reached the West almost a thousand years earlier than once thought.

Lubec had acquired the mummy to pursue his study of the chemical structure of hair; the silk was a surprising bonus.

Silk specialists agree the discovery is significant and are puzzled about how the threads reached Egypt. The Chinese began to raise silkworms and weave silk fabric at least 4,000 years ago. But they tried to keep the process secret and limit the export of silk, silkworms, and silk technology. Still, fabric could have been smuggled out or bartered by border tribes with contacts to the west, says silk expert Irene Good of the University of Pennsylvania, who hopes to analyze the silk fragments.

A Robin's Song Reveals Its Home Region

Southern swallows don't sing in a languid drawl, nor do Spanish sparrows roll their *r*'s, but birds do develop regional accents. Lance Workman, a Welsh animal psychologist from the University of Glamorgan, has learned that robins in Wales and England sing different songs. In fact, a Sussex male was so vexed to hear a recording of a Welsh bird that he puffed up his feathers and attacked the tape player.

"In each phrase of its song a robin has several elements—a twitter, a cheep, whatever—and it will vary the order and pitch from area to area," says Workman. He recorded songs of Welsh and Sussex robins, converted them to pictorial representations of phrase length and pitch, and found the songs could easily be identified by region.

Young robins learn their dialect by hearing the song of adult males. A song may define territory and encourage the mating of birds that are genetically better suited to a specific area. Regional variations have been found in finches and sparrows, but Workman is the first scientist to document them among robins.

RICHARD THOMPSON

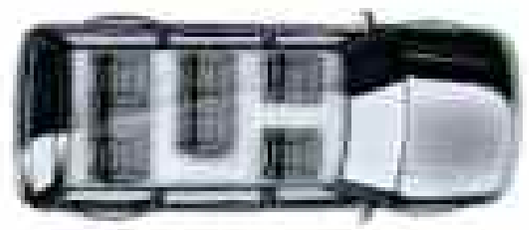
National Geographic, November 1993

MERCURY VILLAGER It's true that the competition may not be all that excited about the overwhelming success of the Mercury Villager.

After all, Villager *is* the only front-wheel-drive, V-6 powered minivan that gives you the smooth, quiet ride and easy handling of a Mercury.

Our competitors would breathe a lot easier if you didn't know about Villager's innovative sliding rear seat that easily slides forward to make extra room for additional

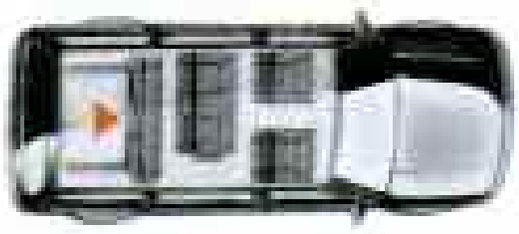
Villager's innovative sliding rear seat moves forward in seconds for extra cargo space. Its removable middle seat provides even more cargo space.

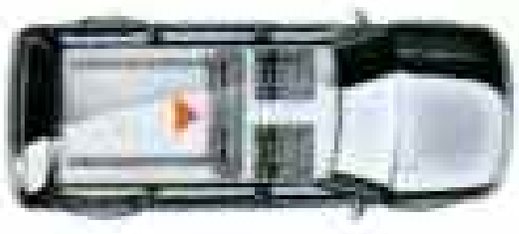


Our Competitors To Turn This

LINCOLN-MERCURY DIVISION Ford Built-up—together we can own less

cargo Or about Villager's standard four-wheel anti-lock brakes, available CD player, power moonroof and keyless entry system The kind of amenities that separate a Mercury minivan from just an ordinary minivan.

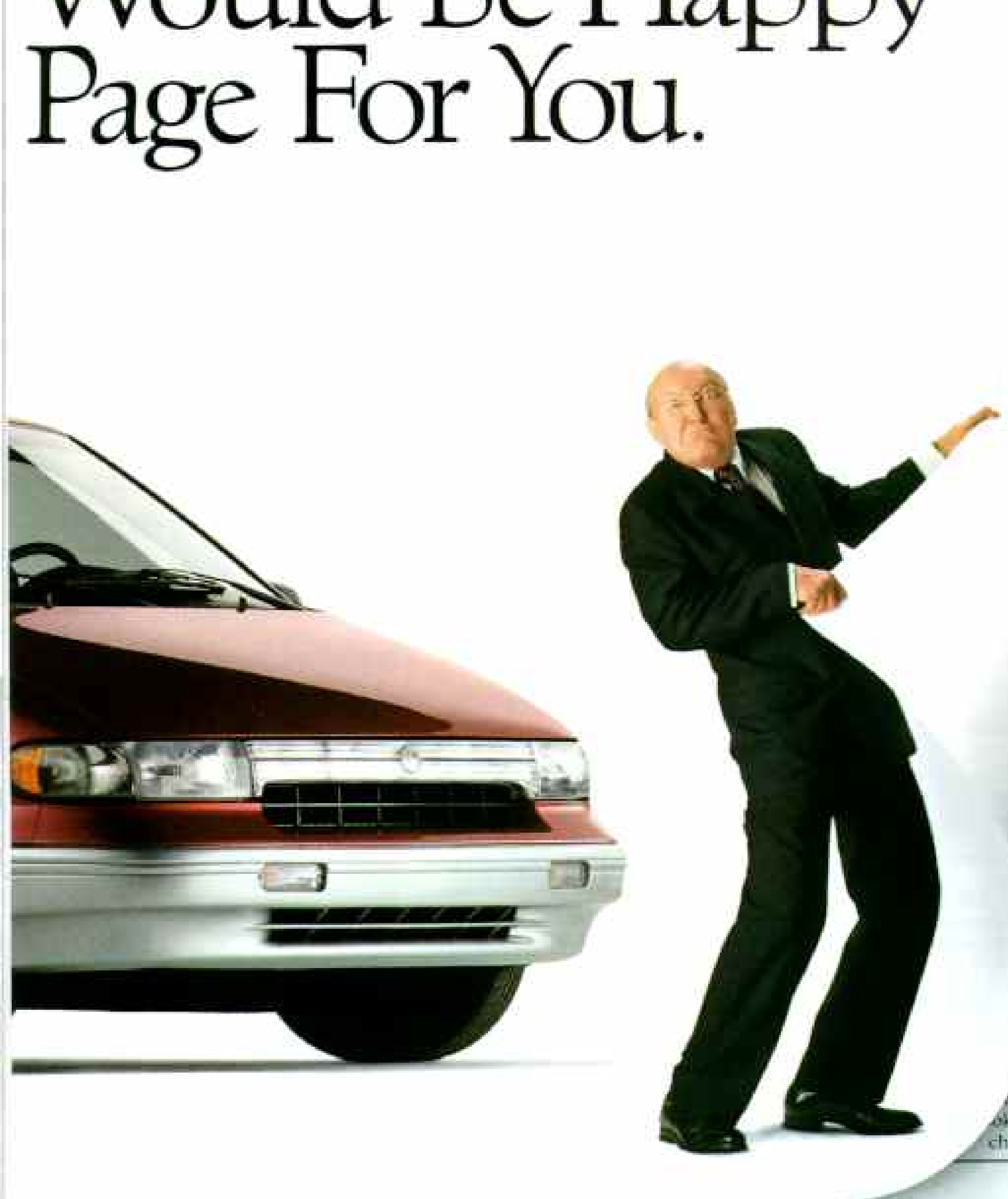




So if you want to know more about the Mercury Villager, we suggest you take it for a test drive or call 1 800 446-8888. And pay no attention to that gentleman in the lower right-hand corner.

MERCURY
ALL THIS AND THE QUALITY OF A MERCURY

Would Be Happy Page For You.



Canon Endangered Species Series - Featured in National Geographic since 1981

WILDLIFE AS CANON SEES IT

Babirusa
Genus: *Babyrousa*
Species: *babyrussa*
Adult size:
Length, 89 – 109 cm;
tail, 20 – 30 cm
Adult weight: 60 – 100 kg
Habitat: Tropical forests near water on Sulawesi and nearby islands
Surviving number:
Unknown
Photographed by
Jacques Poulard

Babirusas slush through the muddy banks of a river deep in the swampy forests of Sulawesi. This wild hog's name means "pig-deer," and is derived from the curling, antler-like upper tusks of the male. According to native legend, the babirusa hangs itself from a tree branch by these tusks when it sleeps. Threatened by habitat loss and poaching, the babirusa requires careful protection within its remaining habitat. 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 babirusa and our entire wildlife heritage.

Geographica

BENOY K. BEHL

Striking New Images of Cave Paintings in India

Radiantly aglow, this lotus-carrying Buddhist deity called a bodhisattva assists others on the path to enlightenment. The mural and hundreds more, painted during the 5th century A.D., have survived in the dim recesses of man-made caves near Ajanta in central India. A patient Indian photographer, Benoy K. Behl, using no lights and setting exposures of as long as 20 minutes, has recorded the murals at a level of detail and luminosity not seen before.

The bat-infested caves were unknown to the outside world until they were discovered by British soldiers early in the 19th century. The murals at Ajanta, a Buddhist monastic center, are considered the finest examples of early Indian painting; their scope and beauty led UNESCO to declare Ajanta a world heritage site. But the art is barely visible to visitors because the Archaeological Survey of India bans artificial light, fearing damage to the paintings.

Behl's photographs, made in 1991 and 1992, capture the painted tales that, he says, "have the breath of inspiration. They are touched by Buddhism's compassionate view of life."

The Long, Slow Death of a Jewish Language

For 500 years after Spain expelled its Jews in 1492, many of their descendants spoke Ladino, a language based on medieval Castilian Spanish and written in Hebrew characters. At the peak of its use before World War II, hundreds of thousands of Sephardic Jews in various outposts of the Diaspora spoke Ladino. Now, fewer than 100,000 worldwide, such as Sol Davidson (below, standing) and Leo Barocas at Brooklyn's Sephardic Home for the Aged, still converse in the archaic language.

The death of Sephardic Jews in the Holocaust and the assimilation of survivors in Hebrew-speaking Israel and elsewhere have helped bring about Ladino's imminent demise. And 20 to 50 percent of the world's 6,000 languages share its fate, says Michael Krauss of the University of Alaska at Fairbanks, a specialist in endangered languages. Causes include urbanization, the spread of mass media, economic pressures, and genocide. Ten major tongues, led by Mandarin Chinese, English, Hindi, and Spanish, are spoken by more than 50 percent of the world's population.

ALEX MACWILLIAM

JONATHAN BLAIR

Within Common Quartz, a Common New Mineral

Every year scientists add dozens of new minerals to the more than 4,000 recognized by the International Commission on New Minerals and Mineral Names. Most are rare; some are found in only one location. Not this time.

Reading an obscure German scientific journal, Princeton mineralogist Peter Heaney learned about a new mineral found in quartz from Mogán in the Canary Islands. Heaney and Jeffrey Post, head of the Smithsonian Institution's Department of Mineral Sciences, began to study quartz in the museum's collection using X-ray diffraction and electron microscopes.

Amazingly, the new mineral called moganite, invisible to the naked eye, turned up in almost all fine-grained specimens—like the highly polished agate above—from all over the planet. Only a variation in atomic structure distinguishes the quartz crystals from those of moganite.

The mineral is especially common in cherts from dry lake beds that can indicate the presence of oil, so moganite may help pinpoint sites holding petroleum deposits, Post and Heaney believe.

—Boris Weintraub

National Geographic, November 1993

Recently, the Statue of Liberty represented more than just freedom. Due to cracks and corrosion in the iron pipes running beneath her, she stood for a towering repair cost. But by using an innovation called Driscopipe®, created by Phillips Petroleum, replacing the existing pipes was unnecessary. And a job estimated at $17 million was reduced to $600,000.

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NATIONAL GEOGRAPHIC MAGAZINE

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To Its Long List Of Safety Firsts, The Toyota Previa Now Proudly Adds A Second.

The Toyota Previa was the first minivan in America to meet all Passenger Car Federal Motor Vehicle Safety Standards.* Then it became the first to do so with an air bag. In fact, last year it was *still* the only one. But now, that's no longer true. Because now, Previa no longer has just *an* airbag. It has two.

The 1994 Toyota Previa. With driver- and passenger-side air bags,** standard. Plus a host of other standard safety features and available Anti-lock Brakes (ABS).

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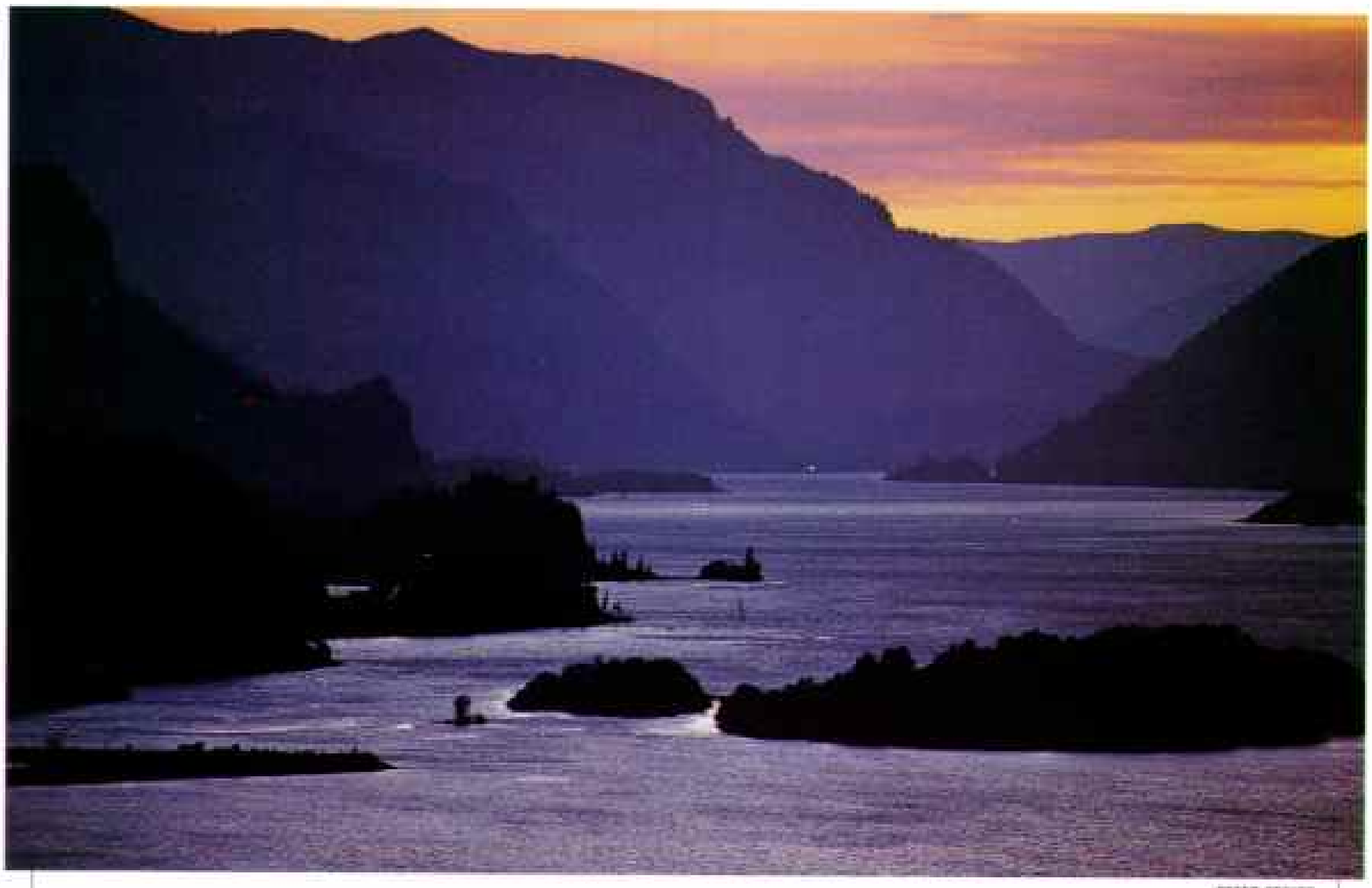
Call 1-800-GO-TOYOTA if you'd like a Previa brochure and the location of your nearest dealer. *Except LE model with optional privacy glass due to window tinting. **Always use your seatbelt. Dual air bags are a supplemental restraint system (SRS). Do not use rear-facing child seat in front passenger's seat. The force of the deploying air bag SRS may cause injury. Please see the Owner's Manual for instruction on child seat usage. †J.D. Power and Associates 1993 Initial Quality Study℠. Study based on 11,719 consumer responses indicating owner-reported problems during the first 90 days of ownership. Includes compact van owner responses. Buckle Up! Do it for those who love you. ©1993 Toyota Motor Sales, U.S.A., Inc.

On Television



PETER ESSICK

America's Fresh Water: Plumbed to the Depths

As the Columbia River slides past islands in the deep purple quiet of dusk, it is nearly impossible to believe that you are looking at one of the most endangered rivers in the United States.

Fresh water: We drink it, bathe in it, grow our crops with it, generate electricity with it. We have dammed it, diverted it, drained it—and in forcing it to do our bidding, we have abused it.

"The Power of Water" reveals how urgently fresh water affects lives and livelihoods—from the Columbia River to Florida's Everglades, from the Great Lakes to the Ogallala aquifer. The film, part of the Society's Fresh Water Initiative, leads the 1993-94 TV Specials.

"My interest," says producer Susan Winslow, "has always been in portraying character." To this end she sought out people whose daily lives are intertwined with water.

She found Patricia Mulroy, the general manager of the Las Vegas Valley Water District. Mulroy argues for more water for urban users along the Colorado River, a major source of surface water for 20 million people in seven southwestern states. In the early 1930s Hoover Dam sounded the starting gun to an era of dam building in this land of little rain.

No river system is more dammed than the Columbia/Snake system, with 30 major blockages on the main stem. "Cash register" dams produce cheap electricity but have nearly destroyed a once thriving salmon fishery. Fourth-generation gillnetter Kent Martin and his wife, Irene, realize that their way of life is dying with the salmon.

Kansas farmer Rodger Funk sees upheaval, if not in his lifetime then in his son's, as the fossil water of the Ogallala aquifer is depleted.

Around the Great Lakes, industrial waste has poisoned river sediments, and the folly of pollution has spurred activism. Margaret D. Heaney's elementary students in Buffalo, New York, call themselves the "Buffalo River Rats," as they work to save that waterway.

Decades of drainage and channelization have disrupted natural processes in the Everglades. In Florida's "river of grass" 90 percent of the nesting wading birds have vanished, though work has begun in reallocating water in the wetlands to mimic nature's ebb and flow.

"There is a saying in the West," Winslow recalls: "Water flows toward money." Now it flows away from the old masters—ranchers and farmers—toward the new: cities, recreational users, and environmentalists. Whatever their use of a precious resource, Winslow has found "people who can remind us not to take water for granted."

"The Power of Water," Special on PBS, November 10, 8 p.m. ET.

Where else can a parent earn college credit during nap time?

As her toddlers doze peacefully, a mother of three hears the pounding of Confederate cannons. And the sad strains of an old country fiddle.

She is quietly completing part nine of Ken Burns' epic series "The Civil War." One of 62 telecourses offered in Public Television's Adult Learning Service.

A program that reaches out to over a quarter of a million people each year. Providing educational opportunities that might otherwise be unavailable.

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Rain Forest Rescue.

The National Arbor Day Foundation

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Available Integrated Child Seats

LUMINA
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Earth Almanac

ROD NAKAMURA

Thar She Blows—a Rare Western Pacific Gray

Scientists are intrigued by this photograph of a gray whale straining sand from the seabed to feed on small shrimplike organisms. Such behavior has been observed among grays in the eastern Pacific. But this whale and two others were seen traveling together last April off Japan's Izu Peninsula in the western Pacific, where the species was hunted to near extinction more than 50 years ago.

"This is exciting news, a rare sighting," says biologist Steven L. Swartz, who wrote about grays in the June 1987 GEOGRAPHIC. "The western Pacific population was essentially 'whaled out' by the Korean fleet prior to World War II." Sporadic observations of survivors, which may summer north of Japan and winter south of Korea, spur hope for recovery.

Almost all grays live in the eastern Pacific, traveling between Baja California and the Arctic. An international treaty banned commercial whaling in 1946, and the grays have rebounded from a few thousand to 23,000. The U. S. Fish and Wildlife Service may soon approve a proposal to remove eastern gray whales from the endangered species list.

Saving the Big Trees—a League of Their Own

"The forests of redwood . . . culminating in the superb woods of Bull Creek flats are incomparably grand . . . [and] should be preserved."

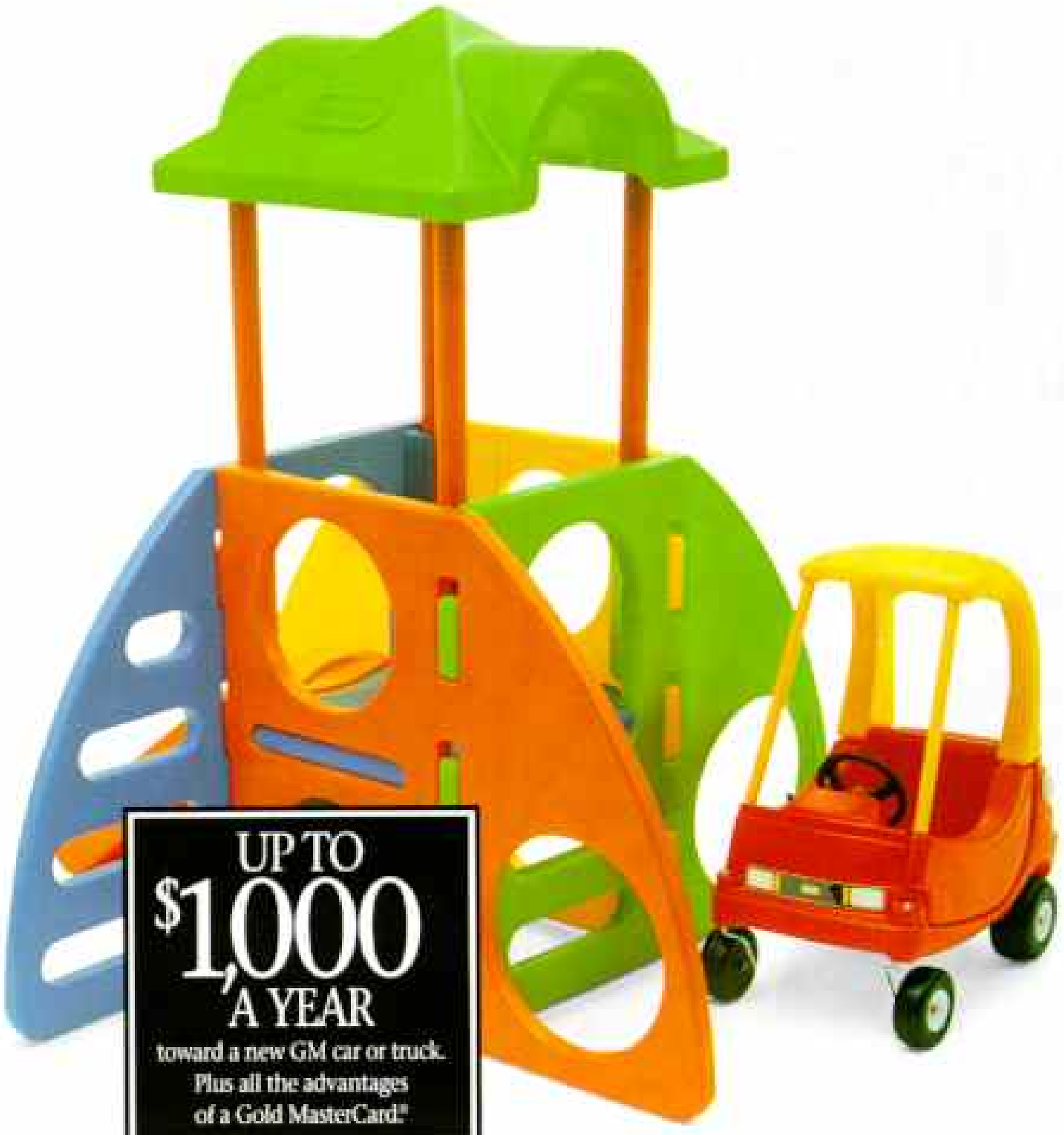
Founded in 1918, a year after preservationists Henry Fairfield Osborn, Madison Grant, and John C. Merriam made this plea, the Save-the-Redwoods League is now celebrating its 75th anniversary.

Today coast redwoods, earth's tallest trees, some more than 2,000 years old, are protected in 35 state parks. These forest monarchs (below) tower within Redwood National Park, established in 1968. League members have donated 73 million dollars to save 260,000 acres of redwoods, worth more than five billion dollars in lumber value.

Early GEOGRAPHIC Editor Gilbert H. Grosvenor served on the league's founding council. Decades later WORLD magazine promoted a campaign that raised $15,000 to purchase Children's Grove, dedicated in 1983. The league's executive director, John Dewitt, hopes it can buy 70,000 to 90,000 more acres to complete the redwoods parks. "The challenge is like finishing Schubert's *Unfinished* Symphony," he says.

DAVID MUENCH

National Geographic, November 1993



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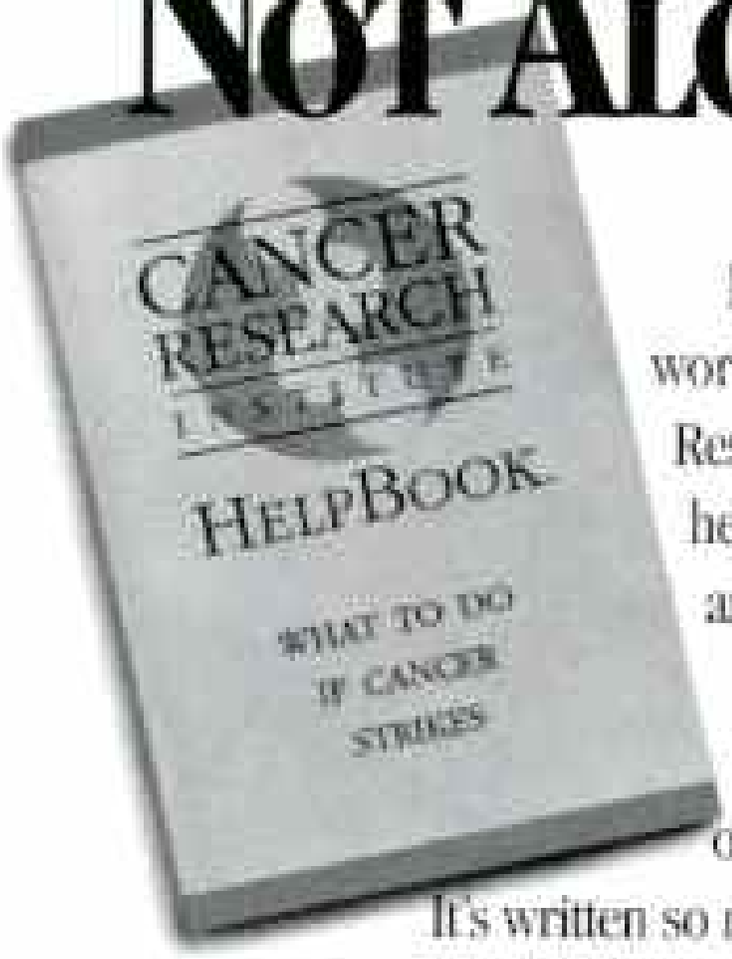
If The Thought Of Cancer Scares You, You're Not Alone.



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Celebrate the wild creatures—and the beauty of the wilderness in which they live—with the totally new experience of Art in Concert. Discover the subtly camouflaged wild things in a limited edition fine art print by Bev Doolittle, the most sought-after artist in print, and listen to their sounds come alive in a compact disc by Paul Winter, the creator of "earth music." Available exclusively at your authorized Greenwich Workshop dealer. The compact disc is not available separately until 1994.

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Earth Almanac

Something Wicked This Way Flies: the Skua

"A wanton and relentless ogre . . . . forever watching for neglected young of penguins . . . . dismembered carcasses strew the ground." Ornithologist Robert Cushman Murphy minced no words when describing the feathered furies called skuas.

These masters of mayhem breed both in the Arctic and the Antarctic: the great skua of the North Atlantic, the south polar skua, the Chilean skua, and the Antarctic skua of the Falkland Islands.

Like their gull relatives, they scavenge ships' wakes. But these rapacious predators have hooked bills and sickle-like claws. The final sight for their prey—gulls, petrels, even sickly newborn lambs—is flailing wings with a 4.5-foot span as a skua strikes like a three-pound cannonball. Robert Furness, an authority on the birds, was asked if he had had any memorable experiences with skuas. He replied, "Being knocked cold by one."

TRENT GARTNER

Spiders Tested to Duplicate Super Silk

Stronger than steel, more elastic than nylon, and tougher than a bulletproof vest, spider silk may spin a web of new products—if it can be synthesized.

DAN MCCOY, RAINBOW

Since 1988 molecular biologist Randy Lewis has been unraveling spiders' secrets at the University of Wyoming. He usually works with a leggy, hand-size spider, the golden orb spinner, that makes seven different kinds of silk from seven different glands. To harvest the silk, Lewis grasps a thread from an anesthetized spider (below left) with a forceps and draws it out onto a spool. The spiders are "silked" three times a week, each yielding about a hundred yards at a time.

Lewis hopes to isolate the key silk-making gene, transfer it to a bacteria culture, and grow silk. In about five years, he thinks, synthetic silk will be used as ligaments and sutures, in car bumpers, even in landing cables on aircraft carriers. "Spider silk absorbs more energy before it breaks than any other material on earth," he says.

NICK GEORGIADIS

Can DNA Track Origin of Elephant Ivory?

Firing a shot for conservation, a researcher aims a dart that extracts a tissue sample from an elephant in Kenya's Amboseli National Park. The question: Are African elephant populations different enough from one another that a tusk's geographic origin can be traced by its genetic makeup? If so, DNA testing could be a key detective tool for distinguishing between legal and illegal ivory if the current ban on ivory trading, in effect since 1990, is modified.

Funded by NYZS/The Wildlife Conservation Society, a team led by genetics researcher Nick Georgiadis has sampled elephants in several African countries and found enough genetic differences to trace the source of individual tusks to savanna or forest regions. Georgiadis can extract DNA from tissue fragments at the base of a tusk—but not, so far, from the ivory itself, which could allow both carved and raw ivory to be tested. "But even if the method were foolproof, it would still depend on authorities' ability to intercept illegal consignments in the first place," he cautions.

—JOHN L. ELIOT

National Geographic, November 1993

This is the Eagle Vision TSi.

Some people might be surprised to learn that this is an American sports sedan.* But, because of its 24-valve 214 horsepower engine, anti-lock brakes, driver *and* front passenger air bags,† Eagle Vision has a lot of people turning in their imports. We're not really surprised by this. We view it as a new kind of...foreign trade agreement.

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A SPECIAL EDITION OF NATIONAL GEOGRAPHIC

Water

Water blessed our nation this year and cursed it. Downpours ended California's drought, but a dry summer seared South Carolina. The Midwest still reels from flood. Water is on everyone's mind.

Two weeks after this issue arrives, members will receive a special edition devoted exclusively to water. The report, more than two years in the making, is the magazine's contribution to the National Geographic Society's Fresh Water Initiative. It is the first extra issue since the February 1981 special report on energy.

Many people contributed to "the water issue," among them freelance writer Michael Parfit. "Wherever I went, it was raining," remembers Michael, who criss-crossed the continent in the small airplane he calls "my car." While he was camping outside Paris, Texas, a cloudburst nearly washed his tent away—with him inside.

Freelance photographer Peter Essick got wet too. As he landed in Alaska, his seaplane's pontoon filled with water. Before the plane capsized, the pilot lobbed his two-way radio into a snowbank and Peter grabbed his waterproof camera case. They swam to shore, built a fire, and waited six hours for rescue.

Jim Richardson finished work on the special issue's Mississippi segment last winter. He returned in July to photograph the runaway river. "It's incredible," he reported via cellular phone. Beside him, a wall of wet sandbags strained to hold the swollen Mississippi. "This river is like a big animal. It doesn't have to do much to hurt you."

ANNIE GRIFFITHS BELT, JEFF COOK (BELOW)

PETER ESSICK

MICHAEL PARFIT (TOP) SEMS ACROSS FLATHEAD LAKE NEAR HIS MONTANA HOME IN THE RAFT THAT ACCOMPANIED HIM ON HIS 23,000-MILE JOURNEY. SALVAGERS RETRIEVE PETER ESSICK'S SEAPLANE IN ALASKA WATERS (LEFT). IN KEITHSBURG, ILLINOIS, JIM RICHARDSON FOCUSES ON ATTEMPTS TO RESTRAIN THE RAMPAGING MISSISSIPPI RIVER.

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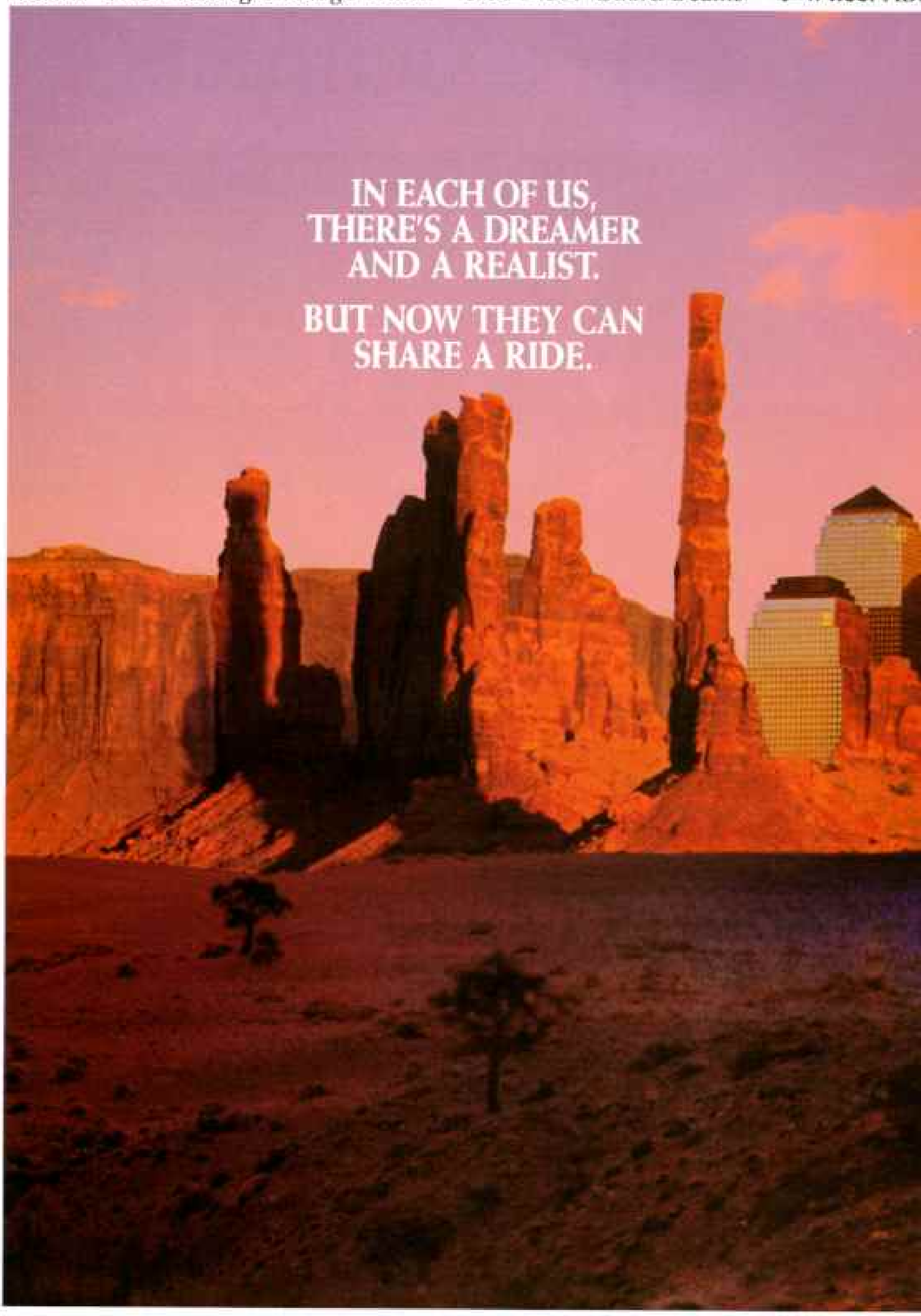

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