

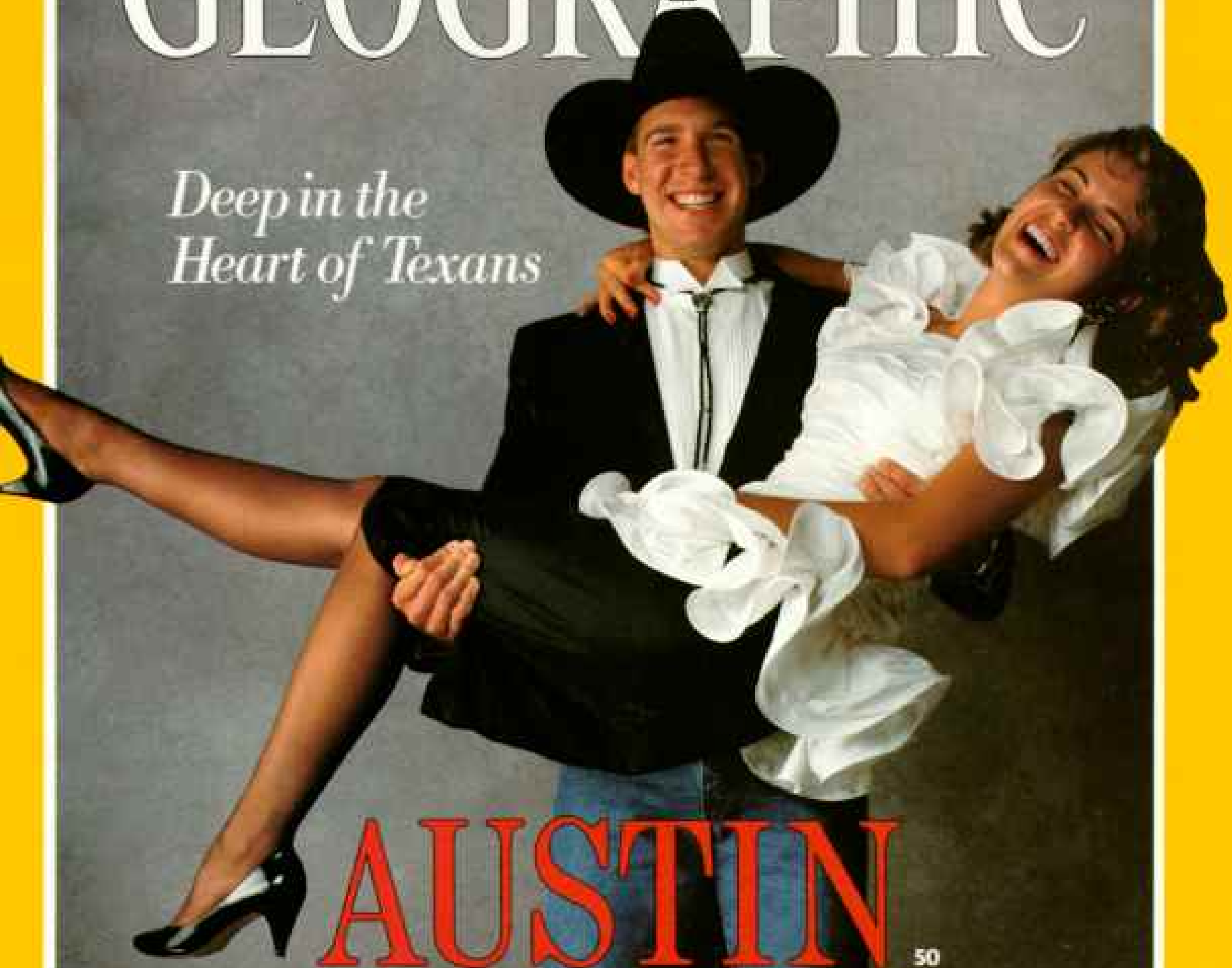
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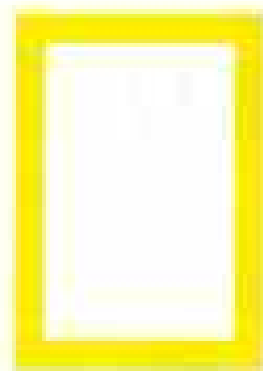
*Deep in the
Heart of Texans*



AUSTIN 50

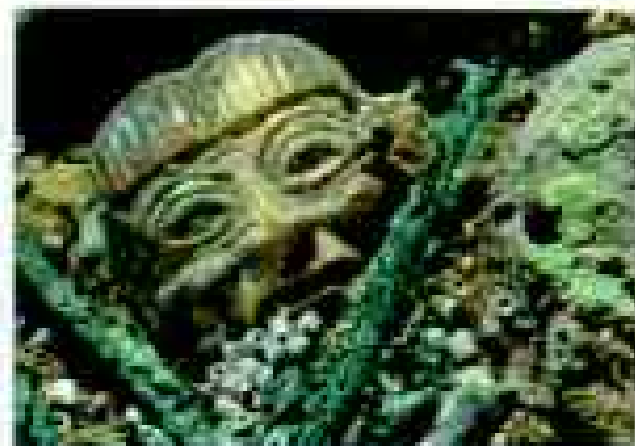
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GOLDEN FACE PEERS FROM THE PAST

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A mud-brick pyramid complex in northern Peru has yielded another astonishing find of gold and silver buried with a Moche lord nearly 2,000 years ago. Project director Walter Alva and photographer Nathan Benn record the trove of priceless artifacts.



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The most mountainous of Caribbean islands harbors one of the world's last oceanic rain forests. Yet the wet climate and rocky shores have hindered the flow of tourists—and money—to this impoverished nation, report Robert Booth and photographer Bruce Dale.



GREY GRASSHOPPER IN DOMINICA

COVER: Tracey Hanslik and Sloan Teeple kick up their heels at the Austin High School prom in a city of high hopes and higher spirits. Photograph by Michael O'Brien.

THE MOCHE OF ANCIENT PERU

By WALTER ALVA

DIRECTOR, BRUNING ARCHAEOLOGICAL
MUSEUM, LAMAYEQUE, PERU

Photographs by
NATHAN BENN

New Tomb

CATCHING THE SUN for the first time in nearly 2,000 years, a wrinkled gold head about two inches high lies as we unearthed it from a Moche tomb near Sipán, Peru. Perched atop shell and stone beads, the head was one of ten that were once linked to form a gorgeous necklace for the tomb's royal occupant.

Incredibly we found five other large necklaces, three of silver and two of gold, plus an assortment of gold objects, finely crafted nose ornaments and other jewelry, and large figurines of gilded copper. These treasures surpass an earlier excavation I directed at Sipán (*NATIONAL GEOGRAPHIC*, October 1988) for the distinction of the richest unlooted tomb excavated in the New World.

Who was the occupant? I call him El Viejo Señor de Sipán—the Old Lord of Sipán. Possibly he was a forebear of the warrior-priest, the Lord of Sipán, whose tomb we had discovered in 1987.

We believe that at least three other tombs remain to be excavated at this site, probably the richest in the Moche domain, which stretched for 250 miles along Peru's northern coast in ancient times. In them we hope to discover other chapters in the book of these little-known Peruvians, masters of metalworking and irrigation, who never achieved a written language. Instead, they told their story in finely crafted precious metals and exceptional pottery, and they challenge us to interpret it.



of Royal Splendor





A necklace of gold spiders atop their webs—with human faces on their backs—



adorns the royal remains, flanked by pots that may have contained offerings.



DESIGNED BY H. TOM HALL



AFTER THREE YEARS at Sipán, my wife, Susana Meneses, also an archaeologist, and I (above) anticipate at least five more years of work uncovering the remaining tombs. Susana and colleague Luis Chero have charted levels of the Sipán platform (top) that date from perhaps A.D. 100 at the

bottom to about 300 at the top. As time passed, the Moche simply added new layers to the existing structure. The third level had a covered corridor, whose function we can only guess. The structures on the various levels may have been temples. The tomb of the Old Lord of Sipán, the earliest burial, occupies the bottom

layer (above right). The tomb of what may be his descendant, the Lord of Sipán, was discovered in the top layer, along with the tomb of a priest. Sipán's treasures lay hidden in the earth until *huaqueros*, or grave robbers, dug a 23-foot shaft into the platform in 1987. As the treasures began to appear on the art market, Sipán became



a major site, and my life changed abruptly when I went there to direct the salvage excavations.

It was like coming home. As a boy I had spent time with a friend of my father's who had a special love for the Moche. I remember going to his house and being fascinated by the artifacts and sketches he made of Moche life and battle scenes.

New Tomb of Royal Splendor

I carried this fascination with me as a student, but later my academic interests shifted to the beginnings of Peruvian civilization, and I worked on sites related to that period. I was in the process of publishing my data when the grave robbers uncovered the Sipán treasures. So I returned to the Moche.

Nearly every day, teachers

bring their students from local schools to view the site and get a better understanding of their heritage. The huaqueros would like to pay us a visit too, but policemen with guns stand guard at all times.

Thus the Moche exert a continuing attraction. I consider myself their prisoner here—their happy prisoner.

DIGGING DEEPER, we uncovered the funerary mask (right), which had slipped off the Old Lord's fragmented skull. The mask has a right eye made of shell. As with several other masks found in the dig, the other eye socket is vacant.

Below the mask lies an array of gold and tarnished silver heads that make up the necklaces of the Old Lord. The long bundle at his side contains spear-throwers and spears that had been ritually broken before being deposited at the site.

Numerous fan-shaped rattles lie around the Old Lord's midriff. The hollow spheres on their circumference contain small copper balls for producing sound. At center stands a deity who holds a *tumi*, or knife, in one hand and a human head in the other, earning him the title of "the decapitator."

The remains of several textiles partly cover the legs. Like Moche textiles from other sites, these show moisture damage, probably from devastating El Niño rains that periodically drench Peru's coast.

Removing the funerary mask revealed a solid-gold nose ornament (facing page) along with spools worn in the ears, their stems inserted in earlobes.

Below the rattles stretches the arc of a solid-gold backflap, worn to protect one's posterior in battle. Ordinary warriors wore backflaps of copper. The carrot-size pieces of shell that formed a pectoral, or chest covering, are draped over the legs.

Though gold objects in the tomb retained their luster, silver pieces tarnished.

Objects of gilded copper, such as the funerary mask, were especially vulnerable to corrosion; over the centuries the copper oxidized and hid the gold layer. To restore them, we plan to use methods recently

In death the Old Lord of Sipán took with him treasures that lent power and authority to his life. Ravaged by time, they can be chemically restored.



devised in Switzerland and West Germany. First, an object is treated with a plasma of hydrogen and methane that softens the incrustation, which then can be removed by scalpel. The surface layer of oxidized copper

covering the original gold is removed by a soft rubber tool.

Further treatments with hydrogen, methane, nitrogen, and argon remove chlorides and protect the objects against further corrosion.







AFTER performing a cursory cleaning of some of the artifacts, we placed them in their original burial positions around the head and chest of the Old Lord. The gold nose ornament—left, at top—is seven and a half inches wide and rests below the pieces of his skull.

Nearby are four earspools, two gold and two silver, whose tiny movable disks may have reflected sunlight. Between the two spoils, at center, is an exquisitely crafted nose ornament of a stingray mounted on a silver oval.

Below are the gold heads of feline figures, symbols of power and divinity in Moche iconography as well as in other Peruvian cultures. The feline figures typically appear in scenes of sacrifice and torture. These heads were strung together to form a necklace for the Old Lord.

Our excitement grew as an excavator's brush and spoon (above right) promised a spectacular find. Further digging (far right) began to reveal a miniature figure holding a gold war club and shield.

We marveled when the piece came to light, a nose ornament of a tiny warrior-lord mounted on a tarnished silver plate weighing only three ounces (right). He wears a headdress of thinly hammered gold with an owl in the center. His turquoise eyes have pupils of black stone, and his own nose ornament actually moves. The war club also has a sharp end that permits it to be used as a spear.

Considered in terms of craftsmanship and delicacy of execution, this is a spectacular find, one of the most beautiful nose ornaments ever found in the Americas. It will rank as one of the finest objects produced by the Moche.







THE SIZE of a crab deity astounded us. With the head and legs of a human and the carapace, legs, and claws of a crab, the gilded copper piece is more than two feet tall—unprecedented for Moche figurines. A painting suggests its original beauty (below).

Found below the funerary mask of the Old Lord (facing page), the enigmatic figure with raised arms was once mounted on a fabric banner covered with gilded metal plates. We call him Ulluchu Man, because the banner yielded some of the first samples of this ancient fruit yet discovered.

The ulluchu is laden with symbolism, usually appearing in scenes relating to war and the ritual drinking of a prisoner's blood. One theory suggests that the ulluchu is part of the papaya family and has anticoagulant properties, useful to forestall clotting before a man's blood was consumed.

That such bloody business would go hand in hand with masterpieces in metal and clay remains a piece of the puzzle of the mysterious Moche.



PAINTING BY N. TOM HALL



Masterworks of Art Reveal a Remarkable Pre-Inca World

By CHRISTOPHER B. DONNAN

DIRECTOR, MUSEUM OF CULTURAL HISTORY, UNIVERSITY OF CALIFORNIA, LOS ANGELES

Photographs by NATHAN BENN

THE NAKED PRISONER stands tied to a tree, his arms bent around its trunk, his mouth open in a cry of pain. His face has been peeled away, leaving no lips to cover his teeth and only cartilage where his nose had been. He strains to avoid a vulture that is pecking out his right eye.

This event occurred about 1,500 years ago, but the prisoner stands frozen in the same stance today, a testimony to the skill of the Moche potter who immortalized his agony in clay (page 30). Though these early Peruvians had no written language, they left a vivid artistic record of their life, culture, and mores in beautifully modeled and painted ceramics, exquisitely crafted objects of precious metals, and sumptuous textiles.

During the first century A.D. when the Roman Empire was approaching full expanse, the Moche people were evolving one of the most remarkable civilizations of the ancient world. To sustain it, they harnessed rivers spilling from the gray-green Andean cordillera, channeling them into a network of irrigation canals that watered arid coastal valleys.

Lush fields sprouted in the nearly rainless climate, producing crops of corn, beans, avocados, squash, chili peppers, and peanuts. From coastal waters cooled by the Peru, or Humboldt, Current, Moche fishermen harvested a rich catch of fish, shrimp, crabs, and mollusks. Llamas, guinea pigs, and Muscovy ducks varied the diet.

With the leisure allowed by abundant food, Moche craftsmen invented new techniques to produce their artistic masterworks. Fifteen

Simple lines and subtle modeling define the features of a nearly life-size face that adorned a large clay jar. Probably a portrait of a noble who lived around A.D. 400, this masterpiece exhibits the engaging realism of the best Moche art.

Sophisticated in working many materials, Moche



craftsmen were probably the first in South America to produce pottery from molds. A two-piece mold for shaping the bell of a trumpet shows the back and front of a prisoner with his hands tied behind him (above). It is in the art of the Moche, a people who never developed writing, that we find a vivid record of their lives.

centuries before the taming of electricity Moche metalsmiths invented a method of electroplating that works without an exterior source of current to deposit thin layers of precious metal on copper.

Without easy explanation, by A.D. 800 Moche civilization had disappeared. By the time the Spaniards arrived in the early 16th century, periodic deluges from the destructive weather system known as El Niño had eroded their mud-brick pyramids, platforms, and palaces. In some areas sand dunes moved in to bury their fields, canals, and villages.

WHO WERE THE MOCHE, and what brought about their amazing florescence of art and technology? These questions have been the focus of my research for a quarter century. Like pieces of a puzzle, answers are slowly being assembled by other researchers and me. In recent years the outlines of the magnificent Moche civilization have begun to emerge.

Compared with the empires of their successors, the Chimú and the powerful Inca, the realm of the Moche was tiny. The core area encompassed less than 250 miles of coast from the valleys of Lambayeque to Nepeña. Along that seemingly inhospitable coast their settlements followed valleys no more than 50 miles inland, until floodplains narrowed into the canyons of the Andes.

The most visible remains of the Moche today are their large truncated pyramids, also called *huacas*, that rise dramatically out of agricultural fields or loom along the barren slopes above the floodplains. Though some of the smaller pyramids and burial platforms are destroyed each year to create land for farms and growing towns, hundreds still stand.

The pyramids at Pampa Grande in the Lambayeque Valley were once surrounded by a sprawling urban center that apparently supported 10,000 people. A burial platform at nearby Sipán yielded a royal tomb in 1987 whose spectacular collection of gold and silver ornaments ranks it as one of the richest in the New World. Now it is eclipsed by another Sipán tomb (article, pages 2-15).

Near present-day Trujillo the Moche erected their most massive structure, Huaca del Sol—the Pyramid of the Sun. Towering 135 feet above the coastal plain, it sprawls over 12.5 acres—an area almost as large as that covered by the Great Pyramid at Giza in



Egypt. In its time it was the largest edifice in South America.

The invading Spanish, lusting for gold, diverted a river to scour away a side of the Pyramid of the Sun. They formed a company and sold stock to investors. The operation produced great quantities of gold objects, callously melted for bullion.

Across a sandy plain from the pyramid, beneath a peak called Cerro Blanco, stands the smaller Huaca de la Luna—Pyramid of the Moon. Here scientific knowledge of the Moche began with excavations in 1899 by Max Uhle, a pragmatic 43-year-old German with a big bushy mustache and a doctorate in Chinese linguistics.



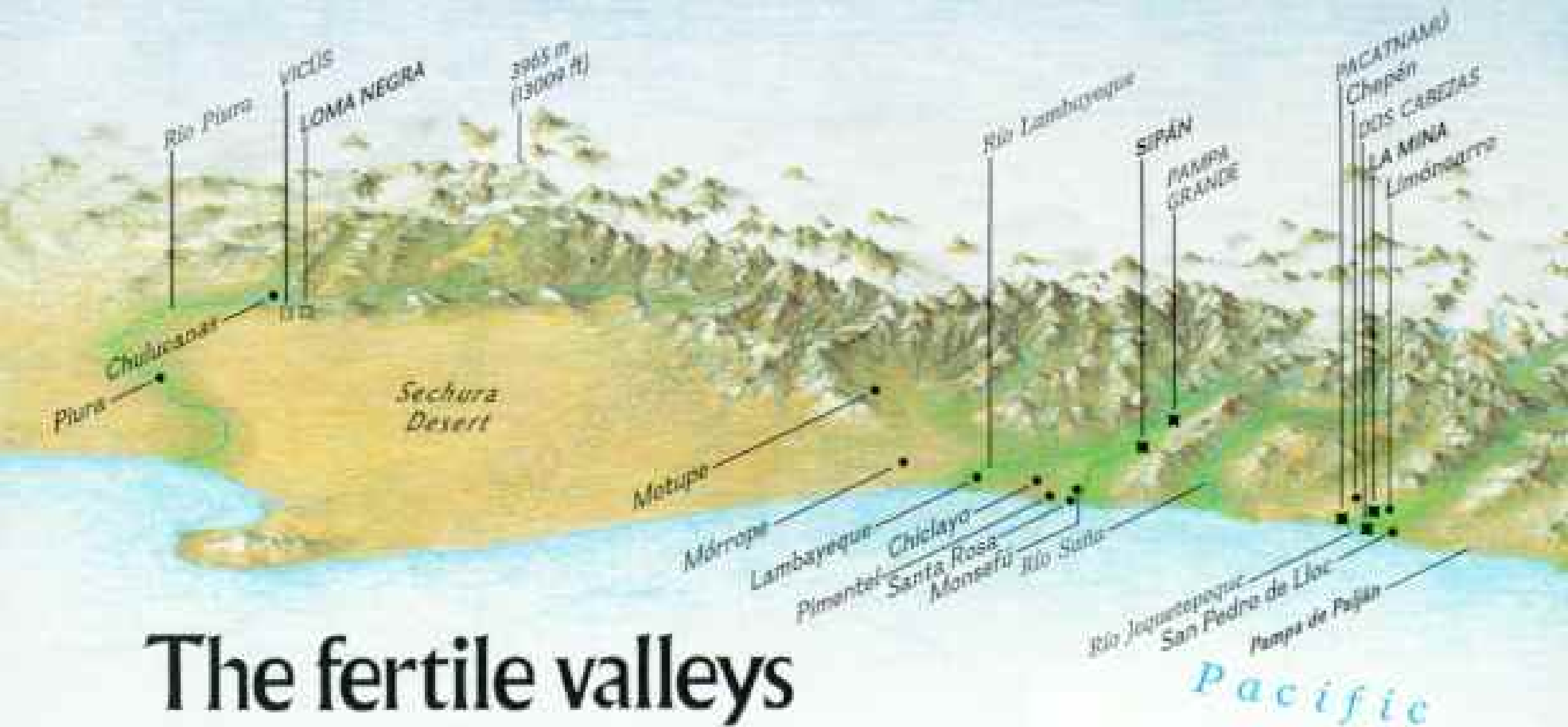
Uhle excavated and cataloged 31 graves at the foot of the Pyramid of the Moon. This site, called Moche for a nearby village, eventually gave its name to the entire culture. Uhle's collection of Moche material, maintained at the Lowie Museum of Anthropology at the University of California, Berkeley, still ranks as one of the finest in the world.

But it was a Peruvian, Rafael Larco Hoyle, who made the greatest contribution to our understanding of Moche civilization. Growing up on his family's sugar hacienda north of Trujillo in the heartland of the Moche realm, Larco inherited his father's passion for collecting antiquities. He excavated Moche cemeteries and ceremonial sites and also

Caught in mid-chatter, a monkey clutches a *pepino*, a fruit cultivated by the Moche.

Cocking its head, a llama stands squarely under pack bags loaded with large jars. The Moche's only beast of burden, the llama was also food and a sacrificial offering. Another animal important in ritual, a deer nuzzles her fawn in a moment of tenderness.

These figures, like most great images in Moche ceramics, appear on bottles with stirrup spouts, named for the distinctive curving shape.



The fertile valleys of the Moche



Cutting across the coastal desert of northern Peru, rivers flow from the Andean cordillera to the Pacific Ocean.

From about A.D. 100 to 800 the Moche made their home in the valley oases that these rivers created, irrigat-

ing their crops with precious river water. The core of their realm extended some 250 miles between the Lambayeque and Nepeña Valleys, though artifacts have been found in the Piura Valley to the north and the Huarmey Valley to the south. To sustain a shared culture, Moche living in separate river valleys must have been in regular communication. But current evidence suggests that the greatest gap, the barren 40-mile-wide Pampa de Paján, divided the Moche into northern and southern groups that displayed distinctive architectural and ceramic styles.

Moche archaeological sites

- Core-area site
- Provincial site
- Cultivated land in green
- Present-day city/village

Scale varies in this perspective.

made purchases from the private collections of other Peruvians.

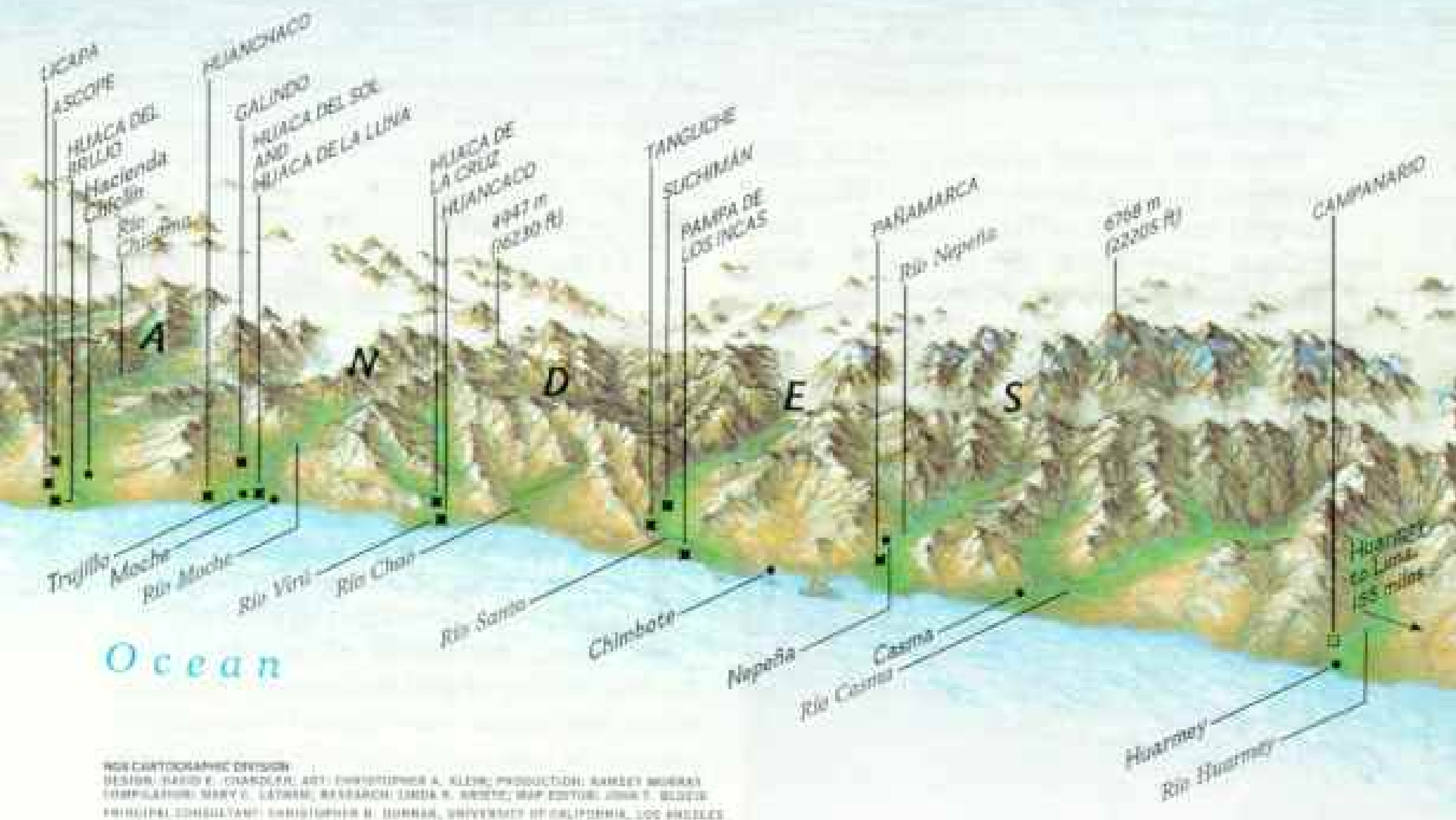
Larco's collection eventually totaled 40,000 pottery vessels, along with thousands of wood, metal, and textile artifacts that overflowed through 17 rooms at the Hacienda Chiclín.

Though not formally trained in archaeology, Larco was the first to attempt a systematic reconstruction of the culture of the Moche. He accomplished this through excavation, painstaking observation of Moche iconography and art, clues provided by early Spanish documents, and analysis of cultural traditions still practiced by the people of northern Peru.

This massive collection of pre-Columbian material was ultimately moved to Lima, where it reposes in the splendid Rafael Larco Herrera Museum, named for his father. Roaming the tall stacks and display cases there, one is struck by the artistic achievement of Moche potters.

In clay these masters of sculpture brought animals, plants, and anthropomorphic deities and demons to life. They re-created hunting and fishing scenes, mountain tableaux, combat rituals, and elaborate ceremonies. They depicted the pomp and power of enthroned rulers as well as the plight of the sick, the maimed, and the blind.

Violence and death stalk prisoners of war in some scenes. Spared on the field of battle, prisoners are apparently brought before tribunals



TOP CARTOGRAPHIC DESIGN: DESIGN: JAMES E. COARDLEY; ART: CHRISTOPHER A. KLEIN; PRODUCTION: BARNEY MURRAY; CONSULTING: MARY C. LATRAN; RESEARCH: LINDA R. BRYCE; MAP EDITOR: JOHN T. BLISS; PRINCIPAL CONSULTANT: CHRISTOPHER B. HARRIS, UNIVERSITY OF CALIFORNIA, LOS ANGELES

where their throats are cut and their blood consumed by those present. Curers whose patients die may be killed and their bodies devoured by vultures. Decapitation and dismemberment are also shown.

Moche potters were remarkably skilled at rendering facial features, specializing in the subtle nuances of individual personality. Portrait vessels allow us to meet specific people who lived in Moche society some 1,500 years ago and to sense something of their personal qualities.

IN ADDITION to three-dimensional sculpture, the Moche potter was skilled at decorating vessels with low-relief designs. Among the most popular scenes are skeletonized death figures holding hands while dancing in long processions to the accompaniment of musicians.

In a manner reminiscent of the Greek vase painters of ancient Athens, potters developed a technique of painting scenes on ceramic vessels. Over a period of several centuries the painters became increasingly skillful at depicting complex and lively scenes with multiple figures. Because of their complexity and detail, these scenes are of key importance in reconstructing Moche life.

Donna McClelland, my research associate, has worked for many years reproducing these ancient vase paintings with pen and ink. In the

process she began to recognize the work of individual Moche artists. Two or more vases could be attributed to the hand of a specific painter because of the idiosyncrasies of his style—generally the unique way he drew faces, hands, and feet, as well as the details of clothing and ornament. Thus we are able to identify the range of scenes an artist would paint and how innovations made by one artist sometimes influenced subsequent painters.

The early introduction of molds and stamps brought efficiency to the production of Moche ceramics. By pressing moist clay into the halves of a mold, it was possible to produce an object much more rapidly than by modeling it by hand. Even portrait-head bottles were made in two-piece molds. Similarly, the use of stamps facilitated the decoration of ceramic vessels with elaborate low-relief designs.

Mold-making technology resulted in many duplications of individual pieces. There are almost no unique ceramic objects, since any new pot could be copied by simply making a mold of it. As a result, elaborate ceramics became more available to a wide range of people and less effective for showing the power, wealth, and social status of the elite.

In contrast, metal objects, particularly those of gold and silver, were high-status items from the earliest Moche period. They continued to be the exclusive property of the elite, not only through the span of Moche civilization

but also in all subsequent civilizations of the Andean area.

When the Spanish arrived in Peru, they marveled at the sophistication and beauty of the gold and silver objects produced by Inca artisans. They noted that metalworkers did not use bellows to create a forced draft of air in their furnaces but instead used lung power to blow air into the coals through long tubes. A ceramic bowl portraying metalworking shows that the Moche used similar blowtubes more than a thousand years earlier.

With stone hammers the Moche flattened



With the utmost care a man cups his hands around a ritual offering of food in two stacked gourd bowls. A third gourd, inverted, acts as a lid. Commonly used in daily life, gourds indicate a ceremonial context when stacked like this. Though visible, the food in the bottom bowl is impossible to identify. Elsewhere in Moche art, offerings clearly include corn, peanuts, birds, and fish.

Although among the most sophisticated potters in the Americas, the Moche did not use ceramics for ordinary tableware. Their plates, cups, and bowls were made from gourds.

and smoothed metal into sheets of uniform thickness and then pounded these to create objects in low-relief and three-dimensional sculpture. They excelled at joining metal pieces by edge welding, crimping, and bending tabs that projected through slits on adjacent pieces. They were sophisticated at alloying metals, using gold, silver, and copper in various combinations. Their technology embraced lost-wax casting, with which they created complex three-dimensional sculptures, some with interlocking, movable parts.

TO THE MOCHE it was important to make metal objects appear to be pure gold. To this end they developed ingenious techniques of gilding. Items made of an alloy of gold and copper, or of gold, silver, and copper, were treated chemically to remove the base metals from the surface, leaving the gold in place. Subsequent heating of the object would cause the gold to consolidate on the exterior, giving the object the appearance of pure gold.

Heather Lechtman of the Massachusetts Institute of Technology recently demonstrated that Moche metalworkers also developed a means of gilding copper objects by electrochemical plating. How was this achieved? Using corrosive minerals locally available to Moche artisans, such as ordinary salt and potassium nitrate, Lechtman succeeded in duplicating the characteristics of Moche gold plating with copper pennies.

Here's how the Moche could have done it: First, metalworkers dissolved gold in a solution of water and corrosive minerals, to which they added a compound like bicarbonate of soda to achieve a pH of about nine. A clean copper object dipped into this solution served as both anode and cathode. In this way an electric current was maintained, and a microscopically thin coating of gold formed on the surface of the object when gently boiled. Then the object was heated to between 500° and 800°C (932° to 1472°F) to permanently bond the gold to the copper.

Although Moche ceramic and metal objects are generally well preserved, only a few Moche textiles have survived, but these provide ample testimony to the skill of Moche weavers. They wove rich fabrics from native cotton and wool, using backstrap looms developed by their predecessors in the Andean area. Their finest textiles were tapestries, woven with

multicolored wool yarns. They introduced a variety of twill weaves, and these came to characterize their textile production. They covered woven garments with gilded metal platelets to produce clothing that gave the appearance of being made of gold.

Moche artists also expressed themselves in carved and inlaid bone and wood, carved stone, and colorful murals painted on the walls of religious structures.

From the potter to the muralist the combined output of Moche artists comprises thousands of objects that offer tantalizing views of Moche life. Fascinated with Moche art, and hopeful that it could be analyzed to provide insights about their culture, I began to photograph all that I could get access to in museums and private collections throughout the world.

Now, after two decades, the Moche archive encompasses more than 125,000 photographs of artworks, systematically organized for iconographic research. Located on the campus of the University of California at Los Angeles, it is a major resource for Moche scholars.

In the early stages of developing the archive the subject matter of Moche art seemed almost infinite. But as the collection grew, I began to realize that many everyday activities, such as farming, cooking, and pottery making, are never shown. We see nobody laying up mud bricks, thatching a roof, or making a wattle-and-daub wall. Why are everyday activities such as these ignored?

After studying thousands of examples of Moche art, identifying and correlating patterns and themes, I have found that things are often not what they seem. What appears to be a deer hunt for food is actually a ritual in which high-status individuals, sometimes seated on litters, kill the deer ceremonially in a way similar to the sacrifice of prisoners of war.

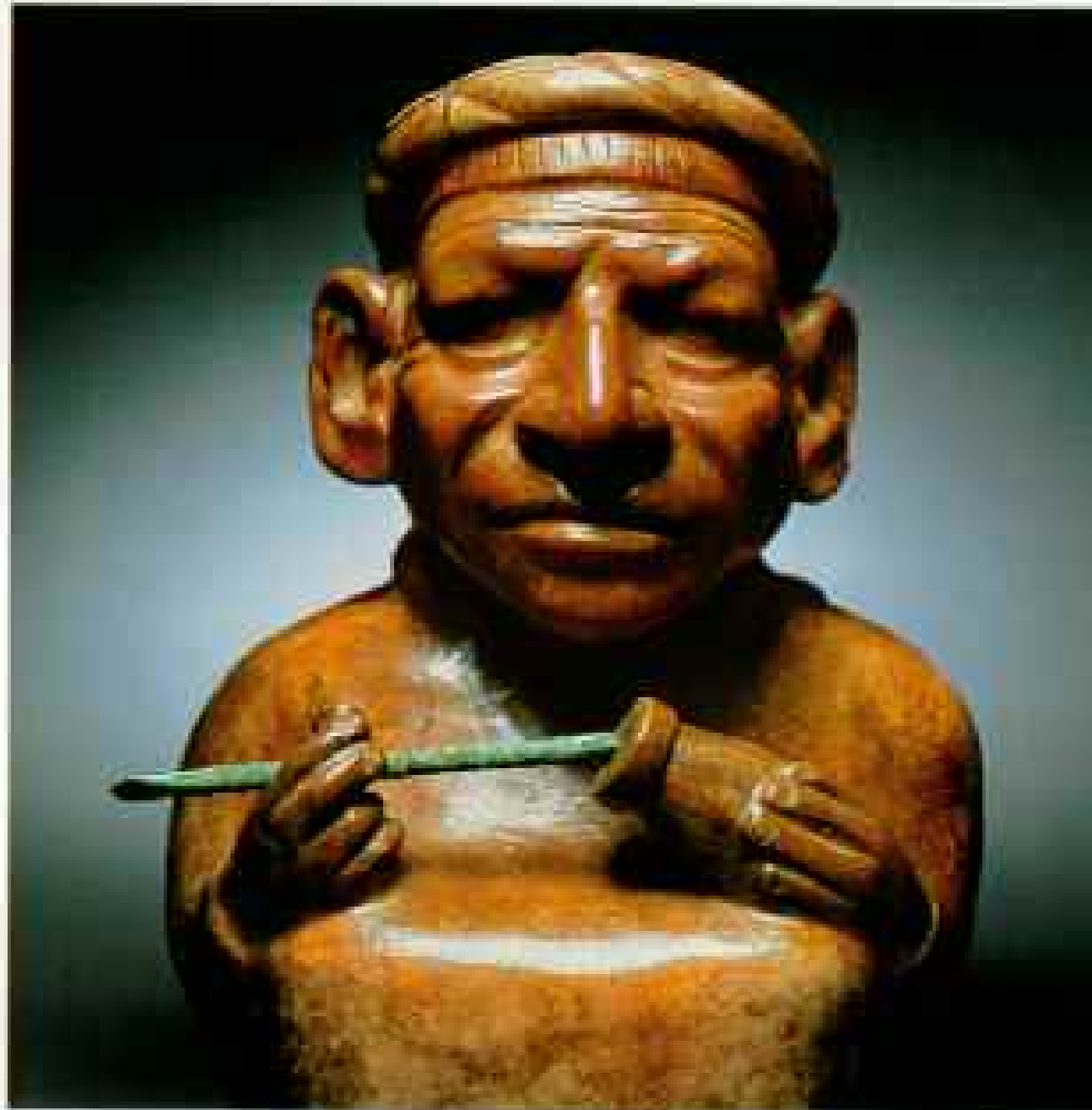
Similarly, fine-line drawings of sea lion hunts actually depict the ritual quest for stones contained in the creatures' stomachs and believed to possess magical properties. These stones are deemed important even today by north-coast shamans because of alleged strong curative properties.

Even the mundane act of washing one's hair or grabbing that of an opponent is an act rich in symbolism. In the Andean world at the time the Spanish came, hair embodied the essence of a person. Not until a child's hair was cut did he or she receive a name.

Though Moche artists depict a variety of

erotic behavior, they never show procreative sex. Early Spanish records inform us that north-coast people frequently practiced sodomy and held ceremonies that included orgies. I am confident that the erotic activities shown in the art were part of religious rituals and not the sexual activity of ordinary life.

I now realize that art expresses the religious and supernatural aspects of Moche culture and that virtually nothing of everyday life is illustrated for its own sake. Still, with its technological sophistication, aesthetic mastery, and wide range of subject matter, Moche



A face full of character shows Moche portraiture at its finest. Part of another stirrup-spout bottle, this man is using coca in the same way modern natives of the Andes do. Having placed a few dried leaves in his mouth and formed them into a quid, he now takes powdered lime from a gourd with a spatula to put into his mouth. The lime cuts the bitterness of the coca and helps extract the small amount of cocaine in the leaves. In the Moche's frequent depictions of this activity, the gourd always has a flange created by running the spatula, moist with saliva and lime, time after time around the rim.



A treasure fit for the high and mighty, nosepieces and other objects of hammered gold and silver make a dazzling display. Each shows a different motif from the rich Moche repertoire, including seabirds, crayfish, land snails, iguanas, and spiders. The nosepieces,



PHOTOGRAPHED AT THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY

more than eight inches wide and nearly five inches high, would have hung from a pierced septum. Probably looted from royal tombs at Loma Negra in the Piura Valley, they reflect the tremendous wealth concentrated at the top of Moche society.

art ranks among the most remarkable in the ancient world.

The artistic and technological achievement of the Moche intrigues: How did a people suddenly rise to such a sublime level of excellence? What genius of organization spurred the construction of the Pyramid of the Sun or the labyrinthine network of irrigation canals? What triumph of intuition and experiment produced electroplating of precious metals? Whence the artistic spirit that suffused the hands of potters to capture human personalities? And whence the delicacy of touch that crafted the gold and silver ornaments of status?

Clearly there must have been highly skilled specialists who underwent an extensive apprenticeship in order to master their trades. But what was it about Moche society that nurtured the extraordinary flourishing of art and technology?

Archaeological research has shown that the valleys occupied by the Moche had a high density of people, supported by crops watered by their ingenious canal system. In the Jequetepeque Valley, Herbert Eling of the University of Texas at Austin recently concluded that the Moche cultivated about 100,000 acres—a figure surpassed by modern Peruvian farmers only in the past 20 years.

The hierarchy of power and authority necessary for such a system also would have been required for the construction and maintenance of the massive mud-brick pyramids. The Pyramid of the Sun contains more than 140 million mud bricks, estimated to weigh more than four million tons.

When the Spanish hydraulic looting operation washed away a sizable portion of this structure, it revealed a cross section showing a complex construction sequence. Analyzed by





The smallest details show the skill and style of Moche metalworkers. On a pair of gold ear ornaments, shown almost actual size above, running figures appear in a mosaic of gold, semiprecious stones, and shell. An extraordinary invention, the Moche's electrochemical-plating process gilded a copper mask (left), glittering after a cleaning. Patches of gold on a corroded copper insect (right) and mirror handle (far left) hint that these were similarly gilded.

PHOTOGRAPHED AT THE METROPOLITAN MUSEUM OF ART



More akin to folk art than fine art, this crudely formed scene seems to show a curer treating a patient. No one knows why the curer holds a hand to her mouth or who the person lying to the side is. Generally Moche potters portray the curer as a woman wearing a shawl. On some pots she is part owl, perhaps a symbol of summoning the spirits. The curer may have been executed if she caused the patient's death. Several fine-line drawings on bottles show what are thought to be a patient's burial and birds pecking at the curer's nude corpse, possibly preventing her from returning in another life.



Michael Moseley of the University of Florida at Gainesville and Charles Hastings of Central Michigan University, this cross section reveals an original pyramid that was enlarged on many occasions over a period of centuries.

Each new construction phase encapsulated the previous one with a thick mass of mud bricks. The bricks in each construction phase were laid up in segments, each being fairly homogeneous in size, form, and soil composition, as though the segments had been constructed by distinct labor forces.

Moseley and Hastings suggest that Moche

society was organized in many ways like the Inca Empire. To accomplish monumental construction tasks, each community contributed what amounted to a labor levy. Work parties from a community were assigned to build a designated section of a project. The workers made their own bricks and transported them to the site. This activity implies a highly organized population, with a well-established hierarchy of power and authority.

The people who built these great structures were no giants. I learned much about their physical being while excavating at Pacatnamú, a spectacular site perched on high cliffs overlooking the Pacific Ocean.

My excavators were digging postholes for a guardhouse on what we thought was a sterile portion of the site. I heard one cry out "*¡Tumba!—Tomb!*" The worker's shovel had grazed the edge of a Moche mummy bundle, breaking through the decomposed textile shroud to expose the hand of an adult female. Soon several more burials were found. We had located an unlooted cemetery—a rarity for this plundered area.

Over the next three months we excavated 65 graves, a record for a single Moche cemetery. They held the bodies of people of all ages, from infants to the elderly—a cross section of the Moche population.

John Verano, a physical anthropologist with the Smithsonian Institution in Washington, D. C., studied the bones. "Men averaged five feet three inches tall," he reported, "women just under five feet." Many women lived into their 50s, and a few reached their late 60s. "They must have been like someone in modern society who lives to be 100," said Verano. Nearly all the males died before reaching 50, many of them as adolescents or young adults. Was this difference a result of more dangerous activities among men or greater susceptibility to disease? "These are questions we are working to answer," he concluded.

MOCHE SOCIETY reached beyond its frontiers to explore and trade: hundreds of miles to the south into what is now Chile to get lapis lazuli for jewelry; hundreds of miles to the north for spondylus shells for ornaments; into tropical forest areas to obtain the boa constrictors, jaguars, parrots, toucans, and monkeys so accurately and sympathetically portrayed in

Moche jewelry and finely modeled ceramics.

The Moche probably did not have money or markets. But it seems reasonable to surmise that they practiced the system of redistribution characteristic of Andean societies at the time of European contact. A local lord received food and commodities from his subjects, which he distributed to those of lesser rank. Thus vast quantities of raw materials and handmade goods were systematically collected for redistribution by the state.

The surplus supported a corps of full-time craftsmen. Some of their objects were used by the lord to demonstrate his power and wealth; others he gave to lesser lords to maintain social and political allegiances.

When skilled craft specialists were supported in this way, an ideal climate was created to stimulate artistic excellence and innovate sophisticated technology for the production of goods for the elite. Recent finds teach us that the pinnacle of Moche society soared much higher than we had imagined—the rich were incredibly, astoundingly rich.

Who were they?

In February 1987 a gang of grave robbers sank a 23-foot-deep pit into a mud-brick platform near the village of Sipán. Their loot of uniquely crafted gold and silver pieces began to surface on the antiquities market, and it became clear that Sipán was a major find. Policemen with submachine guns stood guard while Peruvian archaeologist Walter Alva began the excavation of what are proving to be the New World's richest tombs.

Here Alva unearthed the bones of a warrior-priest, an individual whose ceremonial role I had identified ten years earlier through the various depictions of him in Moche art.* The warrior-priest presided at a ceremony in which prisoners of war were sacrificed, their blood consumed, and their bodies dismembered. In his tomb at Sipán, the warrior-priest was accompanied in death by other individuals—perhaps servants, guardians, or relatives—and a rich hoard of gold, silver, and gilded copper ornaments.

Now Alva has excavated another tomb of a royal person, buried with ornaments of a size and form never before seen. The Sipán story does not stop here; Alva counts at least three other tombs whose riches still wait to be unearthed.

As the archaeological excavations at Sipán proceeded, grave robbers discovered another

A one-of-a-kind composition roughly modeled on a stirrup-spout bottle looks like a man bent over a large flaring bowl to wash his hair. But things may not be entirely what they seem in Moche art. It is highly likely that the subjects the artists depicted were religious rather than secular activities; this would have been clear to any Moche viewing them. For instance, deer hunts—surely ceremonial—appear frequently; agricultural activities, not at all. This scene may well show a man washing his hair. But it also may have mystical and ceremonial overtones, given the apparent importance of hair in this culture.



royal tomb at a site about 50 miles to the south. The first objects began to appear on the antiquities market in October 1988—headdresses, beads, and ornaments of gold and silver, a gold trumpet, and beautiful ceramics.

I learned that these treasures had been looted from the lower Jequetepeque Valley, so I searched the area in vain for the telltale backfill that normally results from clandestine plunder. Returning to Peru in March 1989, I learned of additional pieces, said to have

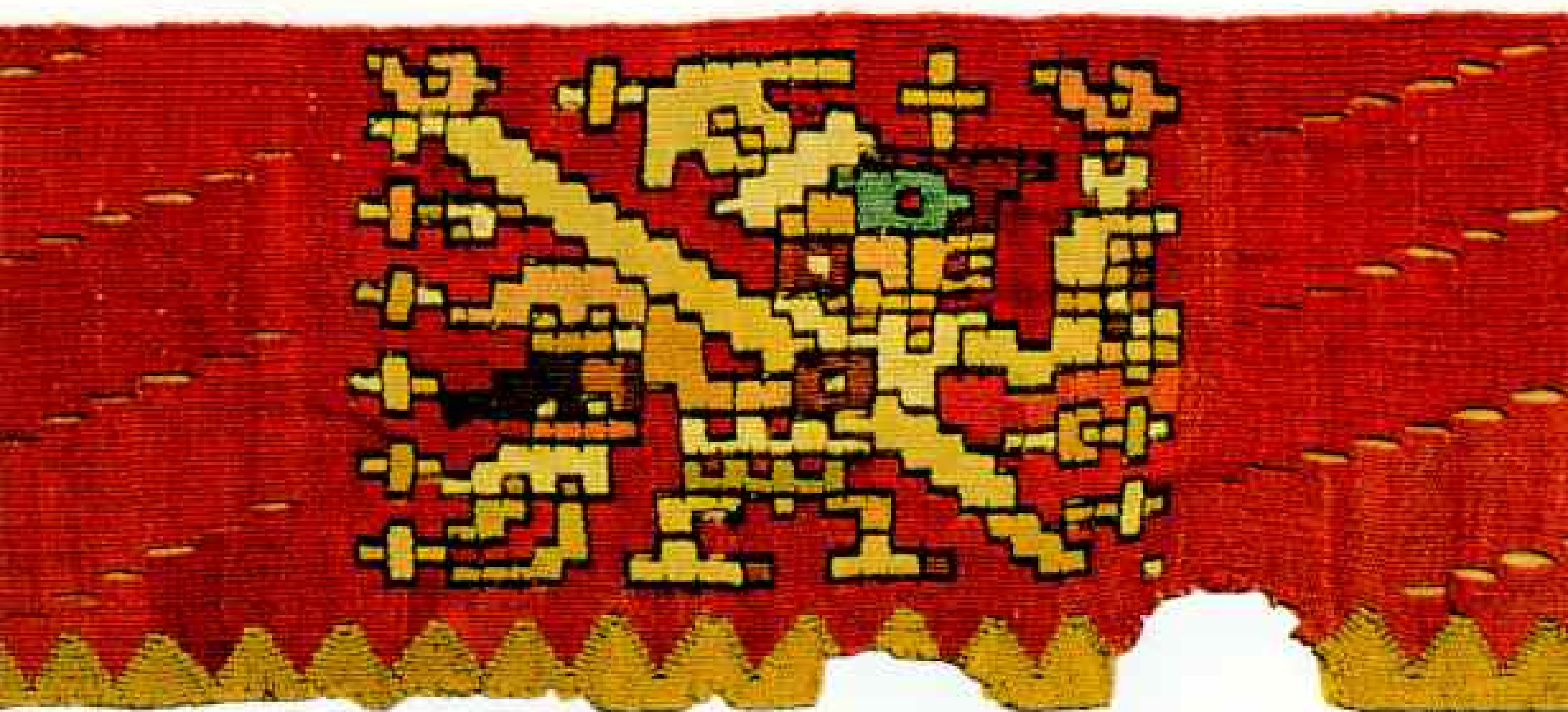
*See "Unraveling the Mystery of the Warrior-Priest," in the October 1988 *GEOGRAPHIC*.



Scenes of naked violence may seem grisly but probably had powerful religious significance for the Moche. Dubbed "the decapitator," a fierce supernatural creature has cut off a human head with a *tumi*, or ceremonial knife. A vulture pecks at the eye of a man, possibly a criminal, who has been stripped, tied to a tree, and has had the skin peeled from his face. In a typical gesture of triumph, a warrior holds his opponent by the hair as his club makes contact.







recently been removed from the same tomb. Again I searched but was unsuccessful in finding the site.

Two months later, in my office at UCLA, I received a telephone call from Peru: "The tomb has been located. It's badly looted but may be worth a salvage excavation. You'd better come immediately." I was on the next plane to Lima.

Within four days we had protected the tomb from further looting and were carefully excavating what had escaped the grave robbers' shovels. The National Institute of Culture in Trujillo was most cooperative and assigned Alfredo Narváez, one of their best archaeologists, to take charge of the excavation.

The tomb was at La Mina, a conical peak overlooking the valley floor. Dug partly into bedrock at the foot of the peak, the burial chamber was about ten feet by seven feet, with colorful geometric designs painted on its interior walls. It had been roofed about seven feet above its clay floor and then sealed with tons of gravel and rock.

As we removed what remained of the seal, we uncovered six extraordinary ceramic bottles, overlooked by the robbers in their haste to plunder the royal chamber. Four were sculpted to depict seated persons, another an owl, and the last a feline. Three had inlaid eyes of masterfully cut shell; all were nearly identical to the objects appearing on the art market. We also found pieces of gold and copper sheet and bangles—pieces broken from headdresses and jewelry by the grave robbers.

The intricate designs on this rare tapestry, woven on a backstrap loom, represent warriors. Each carries his war club diagonally and holds a ceremonial goblet, perhaps full of blood to be consumed in a ceremony. Atop each goblet sits an ulluchu, possibly a relative of the papaya that may have prevented coagulation when added to blood. The role of the warrior is one of the many things we are still learning about the Moche as we study the rich imagery of their art.

We searched the adjacent area for traces of other tombs, but we found none. Yet this lone burial at La Mina appears to have been every bit as rich as the royal tombs at Sipán and contained many objects of nearly identical size and form.

Moreover, the metal and ceramic objects from La Mina were almost identical to pieces looted nearly 30 years earlier at Loma Negra, a site located in the far north valley of Piura. These similarities suggest that the Loma Negra treasures were also from tombs of royal persons who shared the very pinnacle of Moche wealth and power.

The royal tombs at Sipán, La Mina, and Loma Negra confirm that in Moche society tremendous wealth was concentrated in the hands of a few individuals, who lived in opulence and were surrounded by nobility.

Now it appears that every valley may have



MUSEUM OF CULTURAL HISTORY, UNIVERSITY OF CALIFORNIA, LOS ANGELES

had one or more royal courts, each having little direct contact with the common people, yet connected to one another like the royalty of Europe. And just as European royalty shared a concept of what constituted the trappings of wealth and power, such as crowns, scepters, thrones, and royal carriages, the Moche royalty shared insignia of power and status—gold and silver headdresses, nose ornaments, ear ornaments, and litters.

But unlike European royalty, who passed on their trappings to successive generations of kings and queens, the Moche took their treasures to the grave. Thus the immense wealth of the ornaments and opulent clothing that garbed these rulers was removed from society and had to be replaced by artisans creating new royal attire for the next lord.

The continuing demand for luxury goods must have insured the maintenance of substantial numbers of skilled craftsmen, another factor that would have nurtured the blossoming of arts and technology that characterizes Moche society.

THEN IT ALL CHANGED.

The explanation for that mysterious event may lie in the natural cataclysms that periodically devastate coastal Peru. Calamitous earthquakes uplift and buckle the land; a sporadic weather disruption known as El Niño unleashes torrential rains around Christmas; decade-long droughts shrivel the harvests.

Archaeologist Michael Moseley proposes a

series of catastrophes striking the Moche between A.D. 650 and 700. A massive earthquake, such as the 1970 temblor that killed 70,000 in northern Peru, may have triggered landslides that flushed debris to the coast and deposited it as fine sand in the ocean.

"The sand eventually washed ashore to create large dunes," speculates Moseley. "Propelled by the winds, the dunes moved inland. The result was a sand sea relentlessly inundating farms and villages."

Moseley maintains that this invasion of sand was followed by a devastating drought. Then an El Niño of mammoth proportions struck the already devastated area. The El Niño that hit here in 1982-83 triggered deluges that turned the desert into a swamp, spread disease, and contributed to the destruction of coastal fishing.* Like today's mud-brick shelters, the buildings of the Moche would have eroded under the rains. Irrigation systems would have been overwhelmed. The loss of harvests would have been catastrophic. Amazingly, the Moche recovered. But another El Niño struck about A.D. 750, and this time they seem to have lost—their magnificent artifacts disappear from the archaeological record.

With the sunset of the Moche realm came the end of a golden era. Later civilizations in the area produced impressive ceramics and metallurgy, but they never again achieved the artistic genius and technological virtuosity of the Moche.

*See "El Niño's Ill Wind," by Thomas Y. Canby, NATIONAL GEOGRAPHIC, February 1984.

Enduring Echoes of

DOFFING HIS MASK, a member of Los Panchitos dance troupe takes a breather from vigorous street dancing during a mid-year festival in Monsefú, a town on the northern coast of Peru. With its origins deep in the past, the dance pokes fun at figures of the present.

Coursing through the streets, the dancers enact a sort of morality play in which the wry dramas of everyday life are played out to the amusement of spectators. The finger of ridicule points to a landowner who abuses peasant workers, a judge who decides cases in favor of the rich, a priest who asks for money—indeed, some priest masks have horns.

Though the dances, found throughout Peru, take place within the context of Roman Catholic religious festivals, they originated in pre-Christian times. “Through the Spanish chroniclers we can trace their roots at least to the Inca, and no doubt they go back much further than that,” says Andean scholar Guillermo Cock.

Thus the people of the north coast of Peru hold dual citizenship in the worlds of past and present. Their passports are the activities and arts of the Moche and other cultural predecessors that still endure—dances, pottery, weaving, boat making, ceremonies for the curing of the sick, and the ubiquitous *chicha*, corn beer brewed here from ancient times.



Peru's Past

By MICHAEL E. LONG
NATIONAL GEOGRAPHIC SENIOR WRITER

Photographs by NATHAN BENN





IN PLACE of this eroded *huaca*, or sacred pyramid, at Pampa Grande, imagine a squarish multileveled structure, 125 feet high, with smooth sides, clusters of rooms, flat ceremonial areas, and a gradually-sloping entrance ramp rising on the left. Imagine also

living quarters spreading all the way to the mountains.

That is how Pampa Grande, perched in the strategic neck of the Lambayeque Valley, looked when it was the largest Moche complex some 1,400 years ago. As many as 10,000 people may have lived there. Retainers and

servants to the court lived near laborers who built the grand temples and pyramids and artisans whose wares bore the signature of Moche genius—distinctive pottery, delicately wrought objects in metal, and fine textiles. A lord at the top of this pyramid of human activity



directed the production and distribution of these precious materials.

Not a city in Western terms, Pampa Grande existed to enact ceremonies. The lord presided at such rituals as the drinking of blood from prisoners of war.

Some scholars think that a

prolonged drought about A.D. 550 displaced large groups of Moche living to the south. Pampa Grande may then have become the center of a state holding sway over the Lambayeque and Jequetepeque Valleys.

Pampa Grande's end seems emblematic of the mystery that

surrounds much of the Moche past. The structures associated with the rich and powerful ruling class appear to have been selectively burned, after which the entire site was abandoned. Some scholars have suggested that a peasant revolution might have been the cause.

Looking like the bleached bones of a fossilized beast, a stark restored in the town of Mórrope preserves aspects of pre-Hispanic



colonial church being
architecture.



WEARING a fresh coat of whitewash, the curved rafters and pillars of La Capilla de la Ramada, a 16th-century church on the plaza in Mórrope, display an architectural style depicted on numerous examples of Moche ceramics.

The pillars and rafters of this church were hewed from the *algarrobo* tree, prized for its durable wood. For the roof, builders mixed *caña brava*, wild cane, with a slurry of mud that hardened into a tough substance. Brava's secondary meaning of "brave" is reserved for those who would venture amidst the canes, whose leaves are sharp as surgeons' knives.

For buildings of status and permanence, the Moche chose adobe brick. The biggest Moche pyramid, Huaca del Sol, was built outside the present city of Trujillo. Composed of some 140 million bricks, the Pyramid of the Sun stands 135 feet high and occupies more than 12 acres. When the Spanish arrived, it was among the largest structures in the New World.

The houses of common folk were probably made of wattle and daub.

At many sites people literally built their houses one atop another over thousands of years. For the most part, only the later examples, such as those of the Chimu and the Inca, have tended to survive.

THOUGH TRADITIONAL pottery is slowly being replaced by plastic jugs—cheap, colorful, and “modern”—Mórrope craftsmen still churn out thousands of pots for the towns of northern Peru. They specialize in jugs (right)—some hauntingly similar in shape to those crafted by the Moche—that hold as much as 35 gallons of water or chicha. Made with coils of clay, the jars are formed with paddle and anvil and then fired.

“This specialization is pre-Hispanic,” says Guillermo Cock. “We know that immediately before the conquest, whole villages or at least large groups of people would make a single type of ceramic. The lord would then organize its distribution.”

With their extensive use of molds (lower, far right) Moche potters revolutionized the making of ceramics. A modern potter (lower right) demonstrates the technique with a rare Moche mold. He presses one half of a two-piece mold onto moist clay, then repeats the process with the second half and joins the two. After leaving the clay to dry for about a half hour, the potter removes the mold and smooths the seam between the halves. Then he allows the clay figure to dry a few days before firing it.

Before this innovation pottery making could be laborious; an artisan might spend hours or even days on a single object. With a mold, “unique” pieces could be reproduced in a limitless fashion.





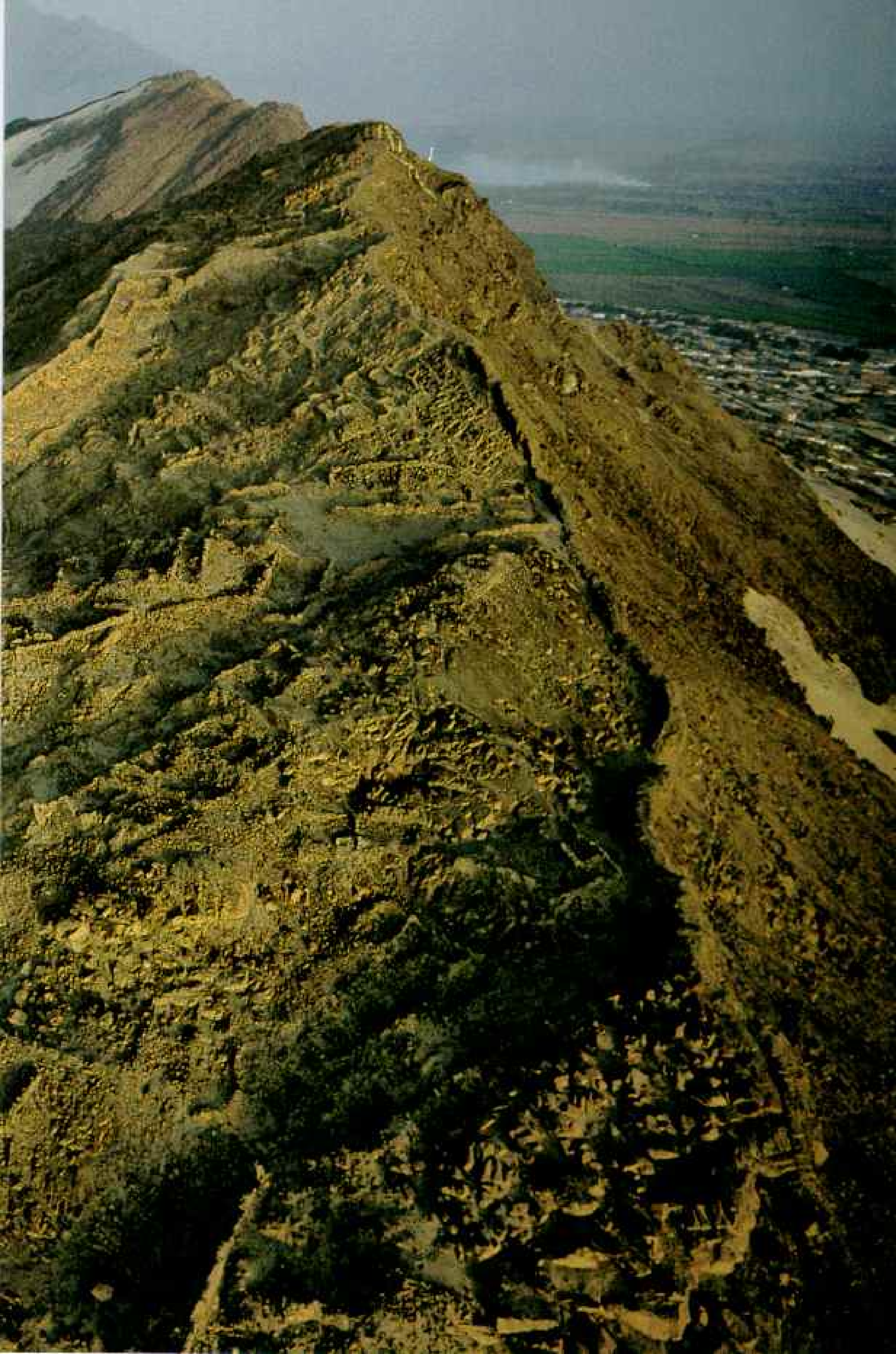
THE FORTRESS of Cerro Chepén (following pages) sprawls across a 1,500-foot-high mountain above the town of Chepén. Girded by massive stone ramparts 12 feet wide at the base and rising as high as 27 feet, the structure is a thousand years older than Machu Picchu, the Inca ruins near Cuzco in southern Peru. The Moche fortress contains the ruins of what may be a palace, at center, and other buildings with hundreds of rooms.

Although never excavated, Cerro Chepén has aroused the curiosity of the few archaeologists who have seen it and marveled at the effort demanded to build the fortress. Its buildings show a capacity for a garrison of about 5,000. "There is information here that will change our perspective on Moche militarism," says Guillermo Cock.

Since there is no water at the site, porters had to climb the steep hillside carrying heavy jugs of water, as well as chicha, for the work force. The people in the surrounding valley must have been rich indeed, with a surplus of food and labor, to have built such a fortress.

Commanding a view that stretched for miles to the north and south as well as from the Andes to the sea, the fortress enabled lookouts to spot anyone approaching. Perhaps Cerro Chepén was the main station in a chain of lookout posts on the mountains along the northern coast.





Though weavers may spend weeks on a single item, the backstrap weaving device—produces goods that may outlast half a century

THE BACKSTRAP LOOM is so called because a weaver wraps a strap around her back and ties it to the lower wooden loom bar. The other end of the loom is anchored to the ceiling or a post. By leaning back and forth, the weaver can adjust the tension of the loom. Her hands are free to insert weft threads or, as this weaver in the village of Santa Rosa is doing, use a wooden tool in her right hand to separate the strands.

The long rectangular piece the woman is making will be shaped and sewed into an *alforja*, the saddlebag carried by people or pack animals. Most Peruvian weavers use both wool and cotton. In the rural areas of the north coast some prefer wild cotton, sometimes homegrown but more often collected from the wild in such colors as brown, burgundy, and violet.

The weaver may spend as long as two weeks to complete a single *alforja*. As more people leave rural areas to find work in town, fewer are left to continue this ancient tradition.

The inventor of the backstrap loom is unknown, but the first representation of such a loom in Peru occurs on an extraordinary Moche pot in the British Museum; it shows a series of women weaving with their looms anchored to poles of algarrobo wood.

Moche textiles from ancient times are rare, because El Niño rains dampened the soil, leaving textiles to rot. Those that have survived show the same high quality, complexity, and detail that characterize their ceramics.



loom — an ancient
of hard use.



FOR WHAT ails them, many Peruvians employ the services of a *curandero*, or curer, a person skilled in the use of herbs and potions to heal bodily ailments and to fend off dark and threatening spirits. Such curers apparently performed similar functions in Moche times; they appear frequently on Moche pottery.

During a curing session in the village of Limóncarro, Pajarito (right), a curer's helper, exhales a mist of water and perfume towards a skull from a pre-Hispanic tomb. Participants believe the spirit of the skull will then protect them as well as the curer from sorcery during the session or perhaps from the evil spells of rival curers. The curers use chants and prayers that come from both pre-Hispanic and Christian sources.

The session, which generally begins around 11 p. m. and lasts much of the night, takes place mostly in total darkness. The curer himself, Maestro Antonio Chávez Soplapuco (lower, far right), uses a flashlight to identify the potions, herbs, and charms that repose on his *mesa*, or curing table. Here he inhales a magic potion. Curers often make potions out of perfume mixed with such items as lime juice, sugar, and holy water. They may also use a hallucinogenic brew made from the San Pedro cactus.

During the night the maestro will take to the sword—the sticks standing upright on the table—and fence with harmful spirits to keep them away from the sufferer. Several healthy participants apparently came for the sounds, if not the sights, of the curing.

Near the village of Motupe (right), Prospero Obando, a cripple, lights candles at the foot of a cross that marks a way station for pilgrims.





In small boats made of bundles of reeds, fishermen harvest coastal Spaniards dubbed the boats *caballitos*, or little horses, for the way

AS IT WAS 1,500 years ago, the boat made of totora reeds is still a familiar sight along the north coast. Off the beach at Pimentel, a fisherman wields a split-cane paddle to propel his craft, which is so small he could pinch the gunwales with his knees as a jockey grips a mount.

Ashore, fishermen mend their craft, stitching in fresh bundles of reeds here and there, and then stack the boats upright to dry. In a concession to the present each boat in this area carries a foam core to enhance buoyancy.

One afternoon a muscular fisherman, barefoot and wearing only black trousers, invited me to watch his launch ritual. He wrapped a cloth around his midriff, cummerbund-like, with a flourish. Using elaborate care, he secured his net and several crab traps to the stern, explaining each step of the process.

Then he bowed in a courtly fashion and took his leave with a smiling, "*Permiso.*" He pulled the boat into the shallow water and mounted it when the water reached his thighs, paddling directly into the breakers en route to the relatively calm water beyond. There he deployed his traps and net.

As the long Pacific rollers spent their energies, it seemed the *caballito* became his vehicle from present to past, to a time when Moche fishermen were memorialized on the wonderful ceramic vessels produced by Moche potters who dwelt on this same coast so many centuries ago. □



waters. Sixteenth-century
fishermen rode them.





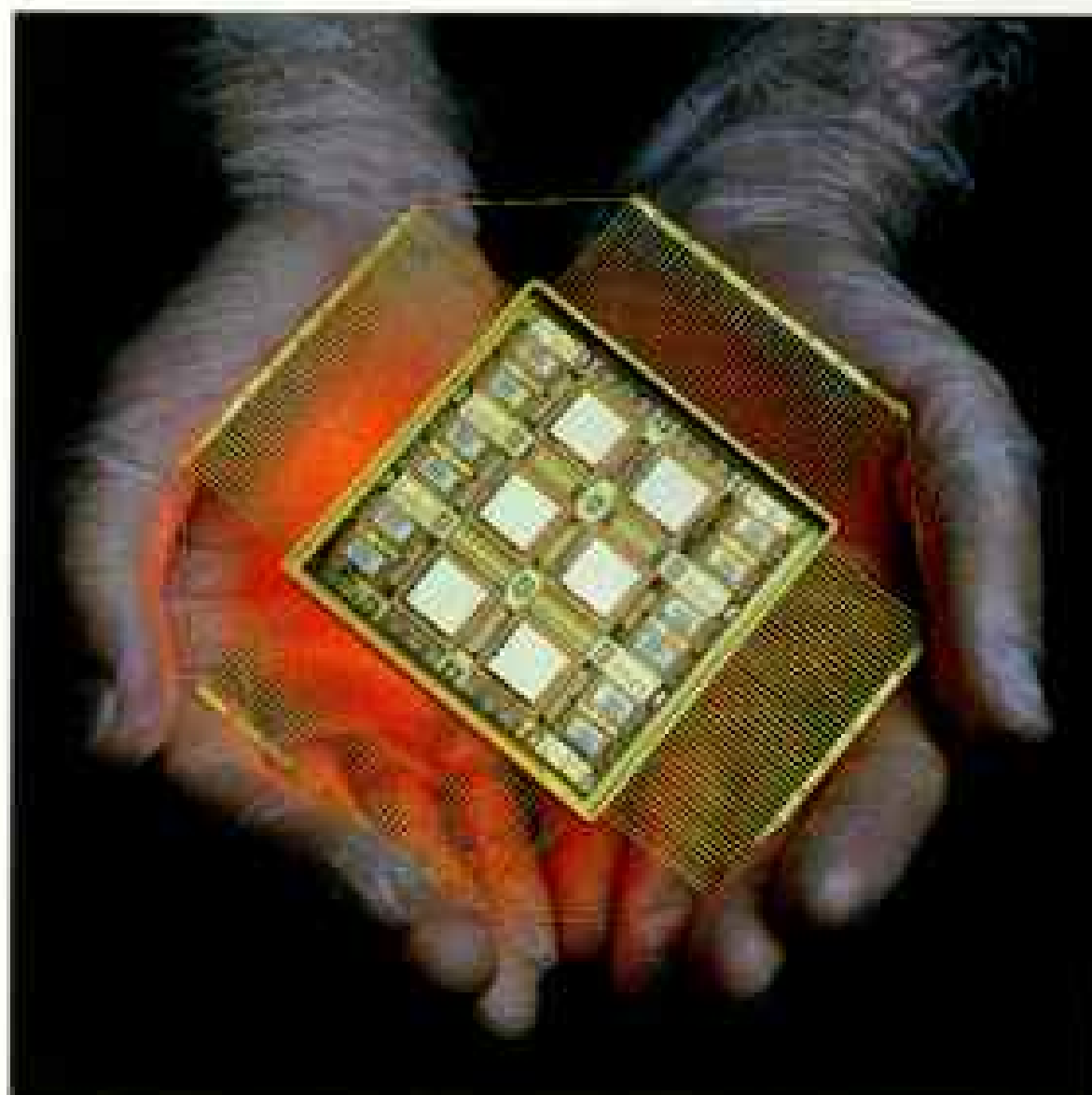
NOT BY ACCIDENT, THE TEXAS STATE CAPITOL DOME SOARS HIGHER THAN THE UNITED STATES CAPITOL.

Deep in the Heart of Texans
AUSTIN

Warmed by Sunbelt growth, Austin grew like a fertilized weed in the early 1980s. Then greed overreached. The underfinanced, overinflated bubble burst, leaving the city sadder but wiser, and as fetching as ever.

By ELIZABETH A. MOIZE
SENIOR ASSISTANT EDITOR

Photographs by
MICHAEL O'BRIEN



Austin thinks small too: A multi-chip module designed by MCG, a research consortium, will help make computers more efficient.

Miss Austin 1989, Annabelle Lares, stands in Threadgill's, a restaurant where singer Janis Joplin got her start.

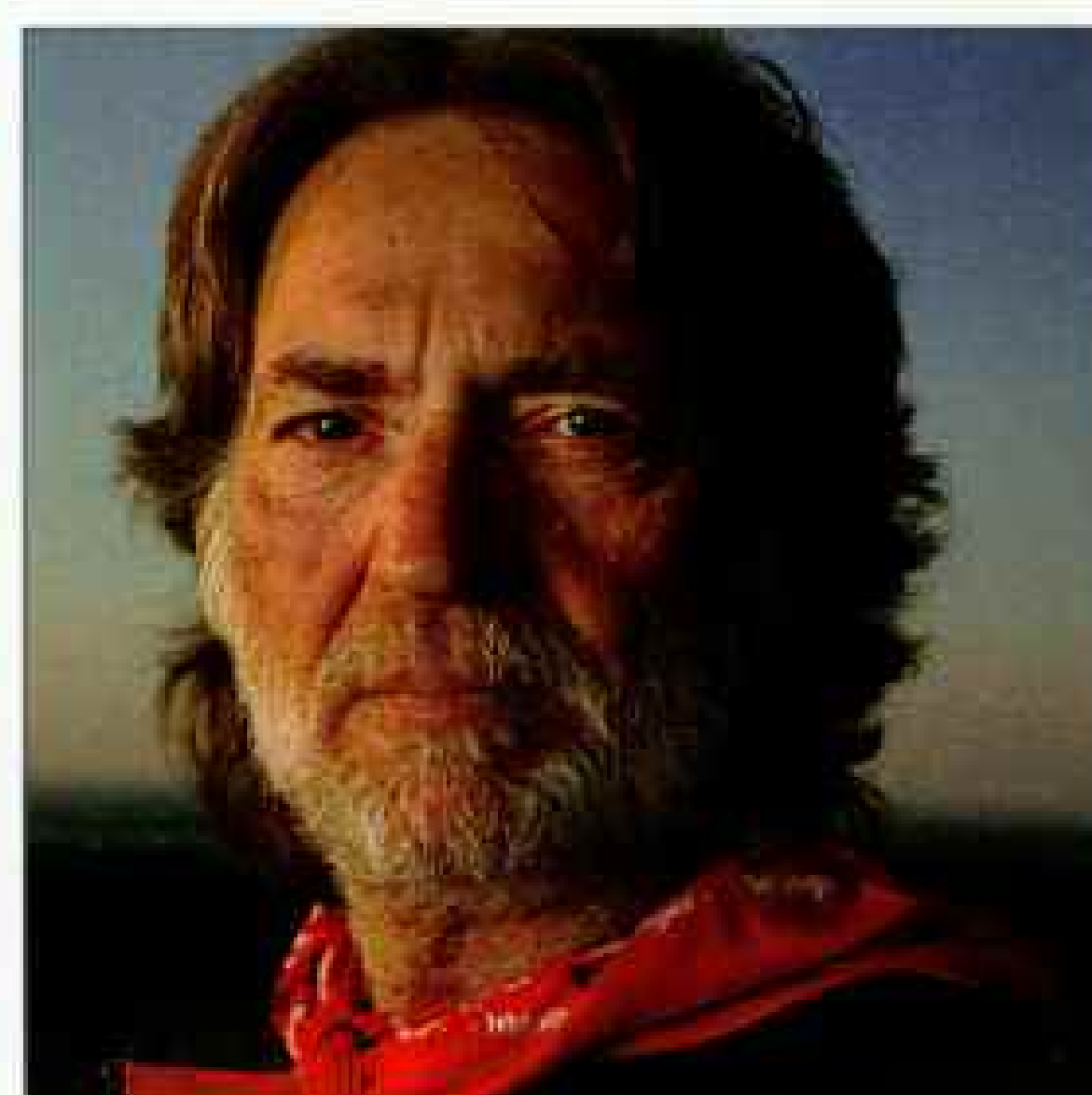
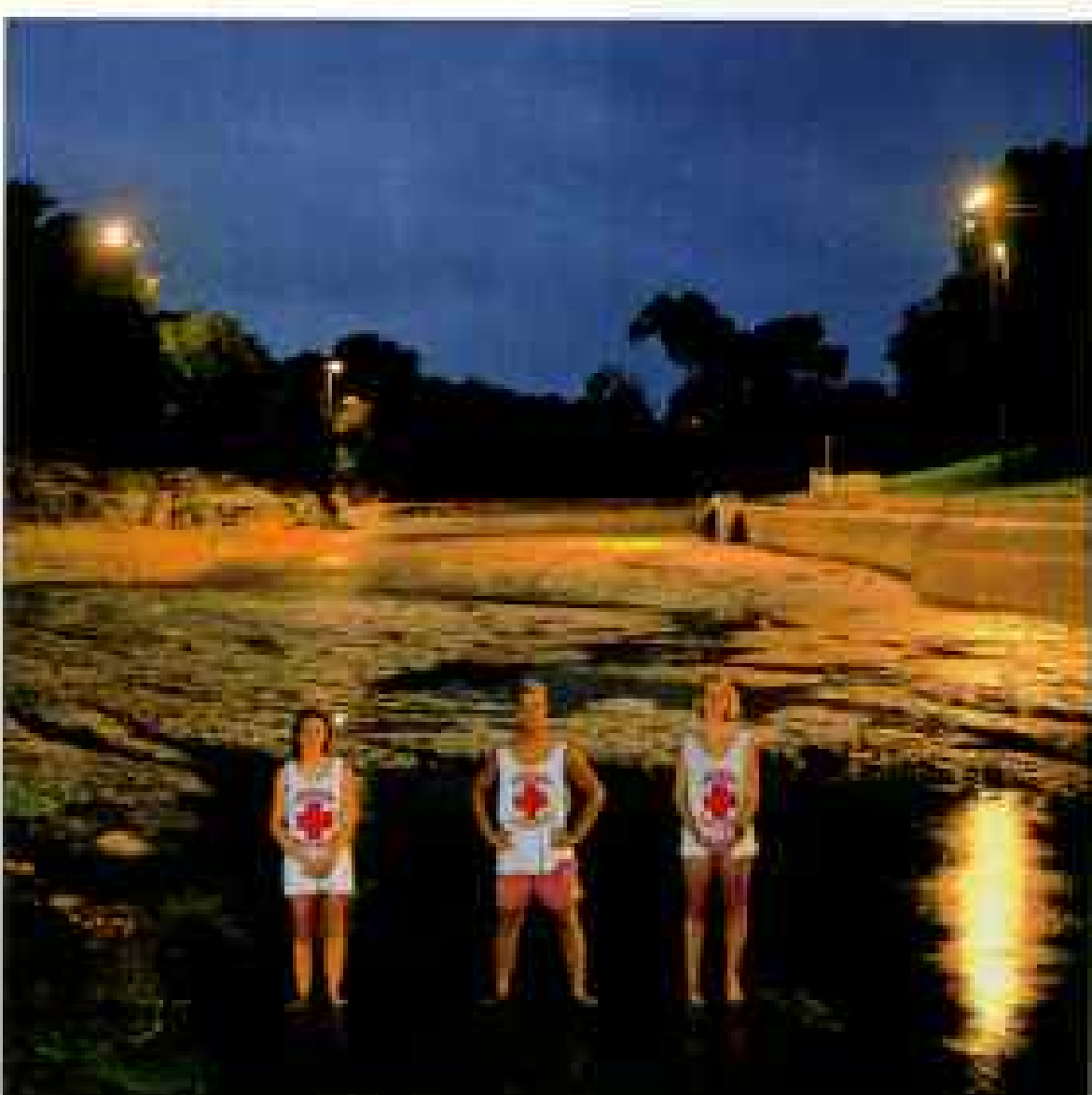
Grandmother of the groom, Eva Buchanan is escorted by great-grandson Joshua McQueen at the wedding of Cheryl Lund and Charlie Webb.



The Texas Navy flag, a copy of which hangs in the state capitol, was flown in 1836 in the days Texas was a republic.

At home on the range, Lady Bird Johnson relaxes at her ranch outside Austin, where, said President Lyndon Johnson, the stars always seem to shine a little brighter.

Investor Robert Baldwin and his wife, Jannis, carved out a hillside to build a Texas-size house overlooking the city.



Barton Springs, the town swimming hole, gets scrubbed down twice a week by its staff. Austin has some 12,000 acres of parks.

At a University of Texas commencement, retired Dean of Nursing Billye Brown, with ceremonial mace, stands by former nursing professor Mildred Tapper.

Though he's on the road again and again, singer-songwriter-star Willie Nelson sooner or later comes home to Austin.



Pre-game passions swell at a University of Texas football game, which begins with the national anthem, attended by Bevo, the Longhorns' mascot, and his handlers, the Silver Spurs. Another (some say the real) anthem follows: "The Eyes of Texas," sung with forefinger and pinkie of one hand extended, as in "hook 'em horns." The Austin campus boasts some 50,000 students and shares in a four-billion-dollar permanent endowment fund that helps it attract a superstar faculty.

THERE ARE three kinds of people in this world, according to citizens of Austin, Texas. Those who know Austin and love it. Those who want to go there and haven't. And the poor benighted souls who don't know what they're missing.

I had been to Austin once, more decades ago than I care to count, but I was then much too young to fall in love. So I returned last year to spend an April in the Texas capital. I came to find out what made the city so special that it was touted as one of the cities of great opportunity in the early 1980s; what had happened to cloud that shining vision; and what Austin was doing to bring it back again.

For all who visualize Texas as flat, brown, and dusty, Austin is enlightening. The city, which lies near the geographic heart of the state, rises on either side of an impoundment of Texas' own Colorado River. Town Lake, as it is called, is bordered on both shores with extensive parkland ribboned with hike-and-bike trails. Barton Springs, a popular swimming hole almost since the city's birth 150 years ago, bubbles up at a constant 66 to 71 degrees in Zilker Park. To the west of the city rises the Hill Country, 32,000 square miles of limestone outcroppings greened with ancient contorted live oaks, scrub cedar, and indomitable mesquite. This is ranching country. East of the city lie rich blackland farms of cotton and sorghum.

New skyscrapers blossomed along Congress Avenue, Austin's main street, in the economic boom of the early eighties, yet the dome of the state capitol and the University of Texas Tower still command the heart and soul of the city.

Some folks call Austin laid-back. Some call it liberal—although one resident allowed that “once you have said Austin is the liberal oasis of Texas, you haven't said a whole lot.” Through most seasons shirtsleeves are more often seen than suit jackets. Strangers offer warm smiles and “hellos” or “howdys.” When I first strolled the downtown streets, I kept thinking I must know these people, until I realized they were just being friendly.

The city's population is mostly Anglo—with 19 percent Hispanic and 10 percent black—yet many of the most popular restaurants are Mexican and barbecue. Here I first discovered the breakfast taco and *wigas*, a delicious amalgam

of scrambled eggs, tortilla bits, tomatoes, and peppers. At dinnertime my greatest dilemma was whether to go for tamales and enchiladas or succulent brisket and gigantic beef ribs.

Austinites sing their city's praises ceaselessly, and they would live nowhere else—although they usually disagree on how the city should be run, what price progress, and even whether they want it to grow or not.

Grow it did in the seventies and eighties. The metropolitan population nearly doubled from 442,000 to 749,000, making Austin “a ‘sunspot’ city in the Sunbelt,” as University of Texas geography professor Christopher S. Davies put it. An influx of computer companies led some wags to call Austin “Silicon Gulch.”

Unlike the boom-bust Texas cities of Houston and Dallas, Austin's meteoric rise was fueled not only by oil but also by the profusion of new high-tech companies.

Expectations soared. Speculators overbuilt and overpriced homes, apartments, office buildings, and hotels. Then came 1986. Oil prices had already begun plummeting.

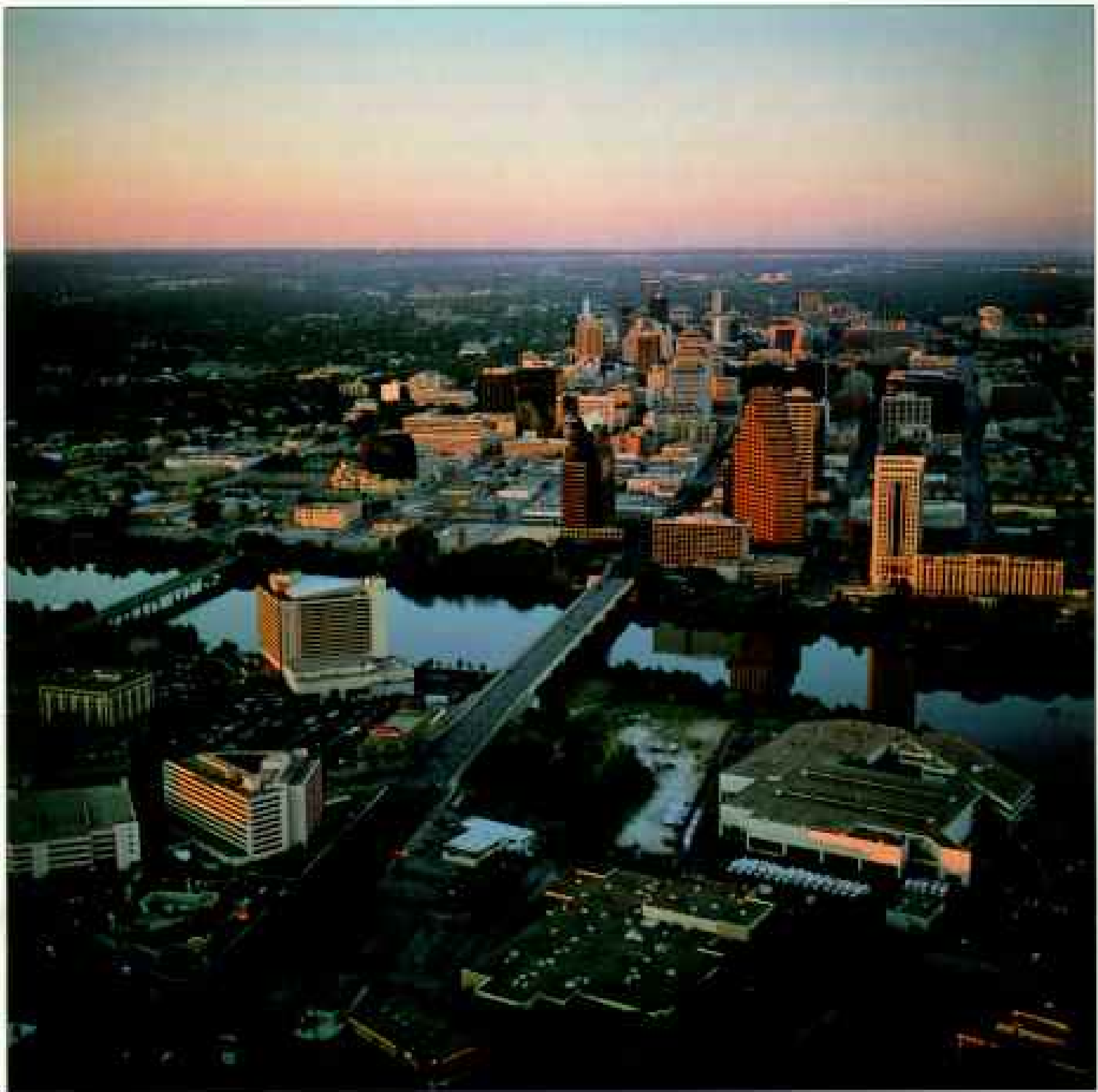
Overextended banks and savings-and-loan institutions soon became a national disgrace. Foreclosures skyrocketed, and property values nose-dived.

Austin followed other Texas cities into a major slump that may or may not have bottomed out. Home sales are starting to pick up. And occupants are beginning to light up the windows of “see-throughs,” those brand-new skyscrapers that have long loomed dark and empty. (At the end of 1987 Austin had the highest office vacancy rate of any large metropolitan area in the nation, 39.6 percent.)

“There are some marvelous bargains to be had here from people who dreamed too big and spent too much money, particularly on downtown office space. Perhaps we were greedy,” declares distinguished Austin resident Lady Bird Johnson. The former First Lady still spends days at the LBJ Ranch, 60 miles west of Austin, but she also has a new house high on a ridge that overlooks the skyline and the lake that threads the city, its parks a testament to her continuing interest in beautification. “I am not sure about the timing of the comeback—who on earth is,” she went on in her soft drawl. “But there is no doubt in my mind that we will.”

So Austin takes a pause, has a second chance to monitor its growth with careful thought and planning. This time, say both citizens and politicians, they'll do it right.





"None who have ever seen . . . can forsake Austin," said a citizen in the 1890s. The Congress Avenue bridge spans Texas' Colorado River, tamed by dams into a string of lakes. Austin straddles a fault that divides geologic zones: hills to the west, plains to the east.

THREE YEARS after Texas declared its independence from Mexico in 1836, President of the Republic Mirabeau B. Lamar sent a scouting party to locate a suitable site for a capital. It would be named for the Father of Texas, Stephen F. Austin—the first major Anglo land entrepreneur in this vast reach west of Louisiana.

Lamar, who envisioned a republic reaching to the continent's west coast, pointed the commission toward the small settlement of Waterloo, where he had recently hunted, declaring the site might be the "seat of future Empire." The commission's enthusiastic report declared that the area "combined so many and such varied advantages and beauties. . . ."

Lamar appointed his friend Edwin Waller to plan the new city on the banks of the Colorado River. "The amazing thing," historian Audray Bateman told me during a driving tour, "is that

Waller laid out Congress Avenue as wide as it is today, with the capitol at the head of the avenue. He planned parks, a place for an academy and a university, and a hospital where Brackenridge Hospital is today."

If it hadn't been for a bunch of pigs, Austin might still be the capital of a Texas republic. The first European nation to recognize the new country was France. Its chargé d'affaires, Alphonse Dubois de Saligny, ordered a servant to permanently dispatch troublesome pigs that had broken into his garden. The pigs' owner, Richard Bullock, then attacked the servant. De Saligny left Austin in a huff, and France withheld a five-million-dollar loan to the republic, damping Lamar's dream of empire.

Austin's most visible remnant of the Texas Republic stands east of Interstate 35—the French Legation, oldest building in the city.

For decades Austin drowsed, a southern town



Swapping strategy, lobbyists wait by a senate committee room at the capitol. Historically, at least, politics here has had a penchant for horse trading, dating from the building of the capitol itself, when contractors bargained for a rail link to cart carloads of granite to the site.

beloved by its residents and too often deserted by its job-seeking youth. "Austin had long been trying to find a better purpose for existing than the capitol and the university," Audray pointed out. "People have always been drawn here—because it was a wonderful place to live, not because you could make money. After World War II the chamber of commerce began a campaign to attract industry. The citizens protested they didn't want smokestacks. Thus it was decided that the industry would be brainpower. This was years before the computer industry. It has finally come true."

Austin now counts more than 250 high-tech companies. One of the first, known today as Tracor, was founded in 1955 by University of Texas scientists and engineers. Dell Computer, one of the most recent, was founded in 1984 by then 19-year-old Michael Dell, named 1989 Entrepreneur of the Year by *Inc.* magazine. IBM,

the largest, employing 7,500, opened a research and manufacturing facility here in 1967 that produces more patents per capita than any other IBM plant. But Austin, as the site of choice for two multimillion-dollar consortiums, Microelectronics and Computer Technology Corporation (MCC) in 1983 and SEMATECH in 1988, earned the envy of cities around the nation.

MCC, a joint research venture by United States companies to combat Japanese gains in the computer field, chose Austin above San Diego and Atlanta—57 competitors in all; 136 cities wooed SEMATECH.

"Why Austin?" I asked Bob Rutishauser, a vice president of MCC.

"First, we wanted to be near an emerging center of excellence in the disciplines important to us—computer science and electrical engineering," he said. "The University of Texas made the commitment to establish 15 million-dollar

Wearing smiles as wide as Texas, Tracey Hanslik and Sloan Teeple skylark at the Austin High School prom. Says Sloan, "I wouldn't even consider living anywhere else." In this city of Peter Pan demographics, more than half the adults are under 35. And Austin has the most highly educated population of any city its size.

chairs in those and related disciplines to strengthen already good departments. And not more than a millimeter behind the university was the quality of life. Researchers we hire are among the best. Most could make three phone calls and have five job offers. So we wanted a location that would be attractive and decided that Austin is first class."

Bob admitted there was some resistance at first. "Why are you plunking us down in the middle of a desert in Texas?"

"So we held our first meeting in Austin out at the Lakeway resort on Lake Travis," recalls Bob, who admits to being a boating addict. "That evening we had a dinner cruise on the lake, and one by one those fellows said, 'Gee, we didn't know Texas was like this!'"

MEANDERING over 19,000 acres, Lake Travis lies just 13 miles west of Austin and draws anglers in search of lunker largemouth and striped bass. Resort communities and homes of the wealthy increasingly line its banks. The lake is one of seven that stairstep 150 miles down the Colorado River to Austin, providing flood control, hydroelectric power, and a water supply for municipalities and farmers.

In a region known for alternating downpours and severe droughts, a stable water supply is devoutly appreciated. A favorite old joke has a Texas teenager tell an immigrant, "I seen snow once." "Yeah," his brother adds, "and it rained once too." At the other extreme, some 20 major floods wreaked havoc along the Colorado between 1840 and 1941, the year the Lake Travis dam was built. Since then, floods have been further between, but not unknown.

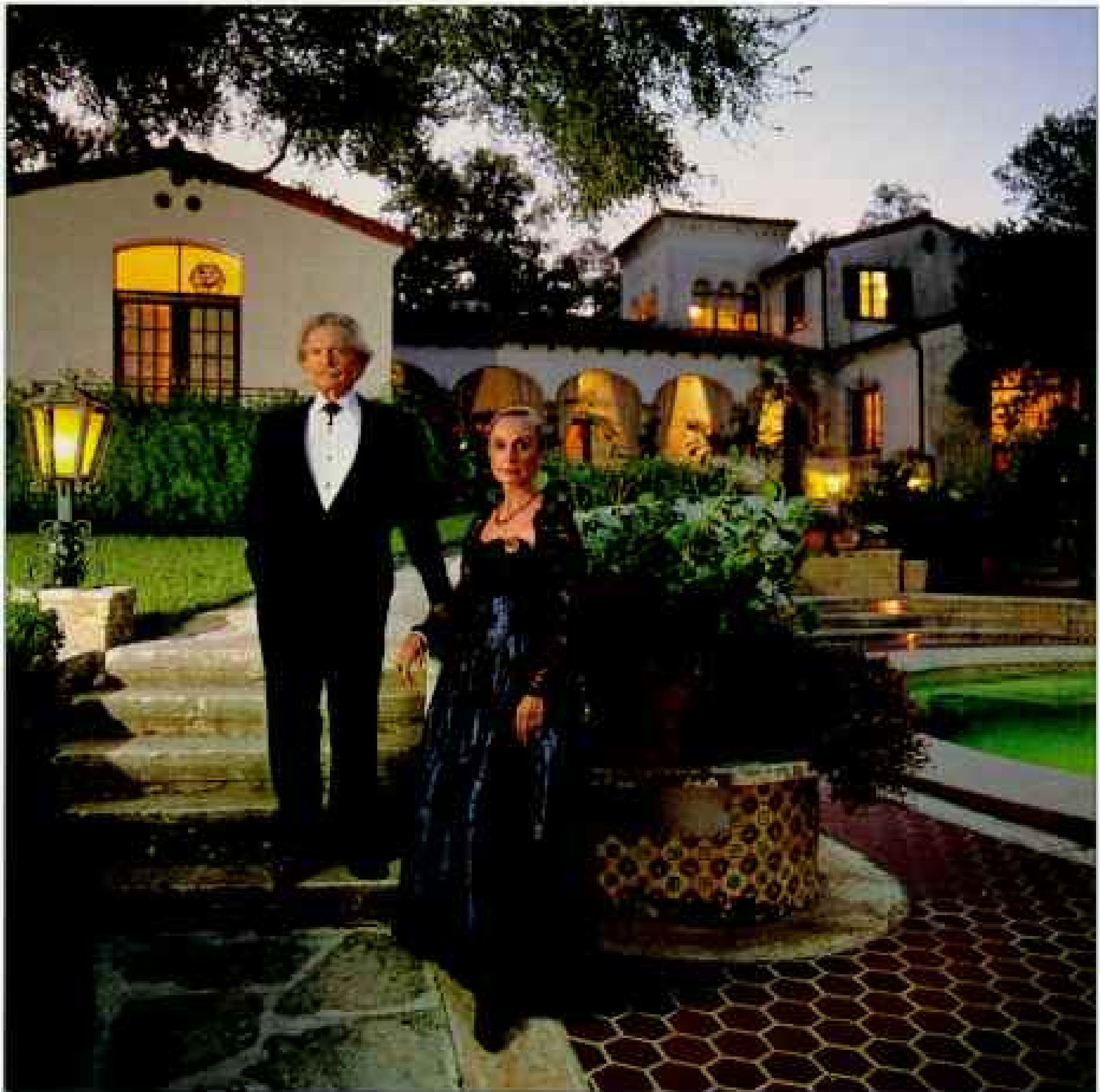
On May 24, 1981, eight inches of rain fell. Soil and trees that had previously soaked up rainwater had been replaced with the pavement of new malls. Shoal Creek, a Town Lake tributary, overflowed, and water rose eight feet above its banks. Thirteen people drowned.

City councilman Max Nofziger is concerned about the stress increased development would put on the fragile limestone hills and the sensitive aquifer that underlies the region.

"In 1986 we passed our Comprehensive







"You can get things done here," avers Jane Sibley, with her husband, D. J., of a city where volunteerism is epidemic. In 1972 she became president of the Austin Symphony, propelling it from the edge of bankruptcy to a healthy two-million-dollar-a-year budget.

Watershed Ordinance that determines how many homes you can build on a tract and restricts building on slopes of 15 percent or greater," Max told me. "Developers don't like that, and several have gotten the state legislature to pass laws to disannex their large tracts to the west. Since it could be ten or twenty years before we could lay water and sewer lines out there, we had imposed limited-purpose annexation. They didn't pay taxes and didn't receive services but fell under our zoning controls—or did until the legislature slapped us back.

"I tell these developers, you ought to be in the Sierra Club, in Earth First, in the frontlines protecting that aquifer, because we have got to have water for people to come here. That's our money in the bank."

Only a blond walrus mustache remains from Max's once completely hirsute face. Like many newcomers in the late sixties and early seventies

he decided to retire after college, hitchhiked into Austin, and has never left. The city's reputation for tolerance, low cost of living, a blossoming music scene, and lakes to play in drew the hippie generation. Long hair is still seen, and New Age stores thrive on incense, candles, and crystals—advocated as natural healing stones for both mind and body.

"A lot of the things that the hippies were into back then are mainstream now," says Max, assertedly the best sidewalk flower vendor in town before deciding to run for city council and for mayor (unsuccessfully). "The environment, solar energy, organic foods."

And music still echoes throughout Austin. The city avidly supports its opera company, symphony, and ballet—but country, rock, and blues make a louder noise nationally, boosted by *Austin City Limits*, broadcast on public television stations for 15 years. Music is another



Stretching out culturally, Austin counts a resident ballet company, a newly formed opera company, numerous theater groups, and more artists per capita than any other city in the state. The dancer from Ballet Austin is costumed for a role in Don Quixote.

non-smokestack industry that the city loves to cultivate.

Clifford Antone, owner of a record store, a recording company, and a nightclub, came to Austin 20 years ago.

"It was the only place in the South where young people with long hair could really hang out without getting their heads beat in. In 1975 I opened a club because I wanted to hear the blues, and it was mostly progressive country around here—Willie Nelson, Jerry Jeff Walker, Michael Murphey, and a hundred more."

The blood-thumping beat really gets going about ten every night at Antone's. Albert Collins played his blues guitar the Saturday night I stopped by. Several hundred fans—black, white, young, old, hippie, yuppie—tapped toes and nodded heads to the beat. Collins at one point stepped off the stage and, pulling his electric cord behind him, sashayed through the

crowd and out to the parking lot. Through it all, Clifford listened enraptured.

"I never get to bed before 6 a.m.," he told me. "For me the music should never stop."

IT NEVER SEEMS TO on Sixth Street. Aficionados can listen to rock, country, reggae, or blues every night in clubs such as Anchovies, Joe's Generic Bar, and the Black Cat Lounge. But on Friday and Saturday nights a five-block stretch resembles Bourbon Street in New Orleans at Mardi Gras. Cars are not banned, but the pedestrian crush keeps traffic to a snail's pace.

More than a hundred Austin clubs offer live music. One of my favorites, the Broken Spoke, sits south of Town Lake—in a section of the city known to some as "Bubbaland."

I asked Cactus Pryor, a well-loved radio personality, to describe a "Bubba."



After nine decades of living, barrelhouse blues musician Roosevelt Thomas Williams, known as the Grey Ghost, has seen and sung it all—of hard days and harder nights, of bad men and worse women. “I may be an old gentleman, but I’m no old fool,” he told the author. “I’ll be pounding the piano until I’m gone.”

“Bubba is a good ol’ boy,” he explained. “Bubba likes the NRA and Bubba dips snuff and Bubba likes Ollie North and Bubba likes to fish and hunt and eat barbecue and talk about women and frequently is found in Texas politics. Dallas is full of Bubbas, but they dress better. Bubbas are hard to not like because they’re friendly. They hate Yankees. Bubba wears cowboy clothes.”

I found plenty of Bubbas at the Broken Spoke one Saturday night when Alvin Crow and his band were playing western swing. Both sexes wore cowboy boots and hats. Six-inch-wide silver belt buckles anchored jeans and whipcord pants. There were also college students in miniskirts and T-shirts, grandmothers in dirndl skirts and ruffled blouses, Hispanics and a scattering of blacks—Austin cultures that mix readily at rodeos and restaurants, festivals and fiestas.

The dancing at the Broken Spoke, a broad, low building with a facade straight out of a Western movie set, resembles some arcane ritual. Gliding counterclockwise, dancers doing the Texas two-step or waltz looked like ice skaters circling a crowded rink.

AT THE CONTINENTAL CLUB on South Congress Avenue the Grey Ghost plays barrelhouse piano Wednesday evenings.

Roosevelt Thomas Williams, 86 years young, runs his gnarled fingers over the keys and sings such standbys as “When It’s Sleepy Time Down South” and “All of Me.” He takes a suck on a lemon he’s brought from home. “It’ll clear your throat most times.”

He says he got the name Grey Ghost back when he was hired to play in various small towns. Someone would meet every arriving train or bus, but Williams was never aboard—yet mysteriously he would show up in time to perform. “They said like a ghost I come up out of the ground, and then I was gone,” he grinned. “I had come and gone by freight train. I would put overalls over my suit and tie, and that’s the way I traveled.”

Just before her death last October, I visited another octogenarian in her neat brick house near the W. H. Passon Society, a black heritage



"It's something we like to do as a family," explains Juanita Sanchez, third from left, of an afternoon game of bingo outside their home in east Austin, where much of the city's black and Hispanic populations live.

organization, and the George Washington Carver branch of the public library. Both were establishments of great pride to Ada Simond, historian, author, and home-economics teacher at Tillotson College—now Huston-Tillotson.

Mrs. Simond, precise of speech and gracious of manner, welcomed me to her home. A painting in her living room depicted an elderly black couple walking hand in hand. "It's called 'Dignity Takes a Stroll,'" she said as she reminisced about the black community.

"When my family came here from Louisiana when I was 12, there were spots of black people in several parts of town—Wheatsville, Clarksville, Masontown. We don't have Wheatsville any more. It was in the university area, where land was in demand. They had a little black school, but when those children got out of sixth grade they had to come over here to the only black high school. This pushed blacks in other

parts of town to resettle in east Austin."

Today Interstate 35 effectively divides east and west Austin, with the majority of the black population living on the east, most in small detached three- or four-room houses.

Mrs. Simond decried the lack of job opportunities for blacks in the new high-tech industries. "Unfortunately, they brought so much of their original help. And although they hired some here, when things began to get bad, these were the ones that were let off."

What about feelings between the black and Hispanic communities?

"There is not a loving relationship. Hispanics and blacks have gotten along better in the past. Now there is competition for jobs, for opportunities. Competition produces stress."

Margaret Gómez, constable of Travis County, was elected from the southeast quadrant, where the Hispanic population is double the 19 percent



A one-man road show struts by on East 11th Street at a street festival. Blacks make up 10 percent of the population; Hispanics 19 percent. But both share only minimally in Austin's financial power—"Sadly, our biggest social problem," says a lawyer.

citywide. I asked her about Hispanic integration into the Anglo community.

"It is much more than in the past," she said, "but I think there are still some cultural lines we need to cross over. We don't socialize as much as we should. We don't spend Sunday afternoons with each other."

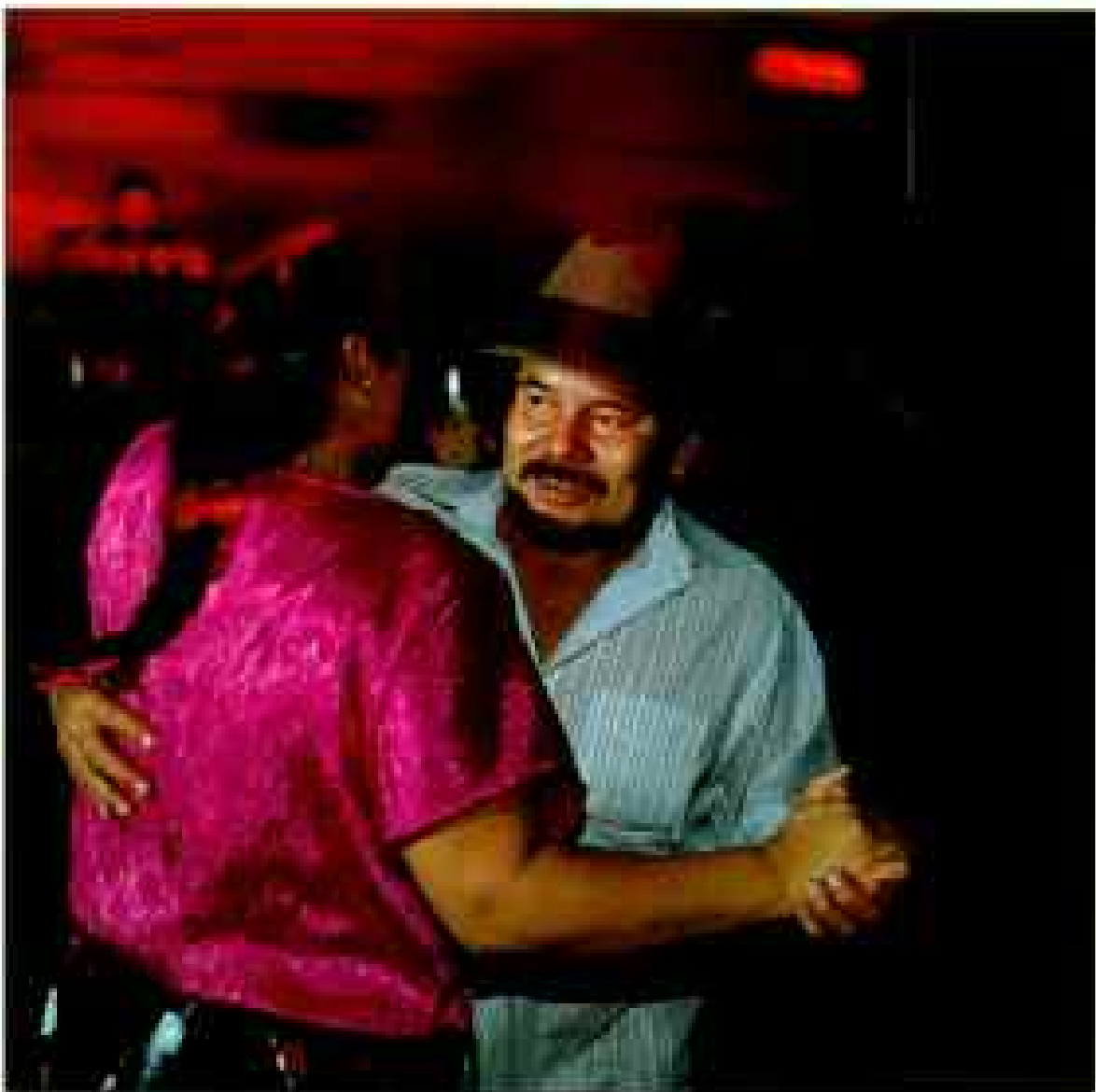
ONE HISPANIC with a broad spectrum of support is State Senator Gonzalo Barrientos.

"When I meet people, they say 'Barrientos, you must be the senator from Laredo or San Antonio.' 'No, I'm the senator from Austin,' I tell them. 'How in the hell did you get elected in Austin?' they ask.

"I like to think that the people in central Texas are very special and vote on record and character—not what a person looks like, man or woman, black, pink, yellow, or whatever."

The senator's office, chockablock with staff and constituents even on a Saturday, reflected the overcrowding that pushed the 1989 legislature to approve a 155-million-dollar renovation and expansion plan for the 101-year-old capitol. The granite statehouse has hosted galas, weddings, funerals. A brothel reportedly operated in its back rooms, and the rotunda was a movie set for *The Best Little Whorehouse in Texas*.

"Texas-style politics has more flavor than any state I know, except maybe Louisiana," declared Liz Carpenter, reporter and former press secretary to Lady Bird Johnson. "We enjoy the banter of politics, the intrigue, the risk. This is a state built on oil (risky), on cattle (risky)—a hailstorm could wipe you out—on timber in east Texas (that is very risky). All the things that made Texas were chancy, and politics is just a continuation. A Texas congressman years ago said, 'We don't have liquor by the





Lone Star Leticia, a Lhasa apso held by Juan Vasquez, wears colors befitting her name.

With youthful insouciance, punkers ignore the signs along Sixth Street, a five-block wall-to-wall lineup of music clubs and restaurants in the heart of downtown.

"If you're worried about calories, don't even smell them," says John Cazares of the world-class tamales made for more than 30 years by his family's Green & White Grocery.



"When I play, everybody dances," says accordionist Johnny Degollado. Austin music speaks more with a twang than a rock beat, though more than a hundred clubs offer everything from blues to Cajun.

Though she wants to be a mom when she grows up, for now it's a cowboy hat for six-year-old Karla Smucker.

For more than half a century Gilbert Alexander has been giving shoes a shine so bright you can use them as a mirror.



Joe Mendieta and Denise Sanchez keep to the dance floor as the Latin beat gives way to a foot-thumping polka at a wedding.

A conservator at the university's Harry Ransom Humanities Research Center takes a fiber from a Chinese drawing. The center owns a Gutenberg Bible and ten million manuscripts, including a draft of Lady Chatterley's Lover.

Urban cowgirls Robyn Bankston, Debbie Kutch, and Karen Roemer rode in the opening ceremonies of the 1989 Austin-Travis County Livestock Show and Rodeo.

drink and we don't have horse racing, so we take all our sins out in politics.' "

I remembered that the legislature had recently OK'd racing, and imbibers have been able to buy a drink since 1971. Wonder what that does to politics.

Liz calls Austin the "Athens of Texas" and claims the city has more writers than any city in the country except Washington, D. C. We were sitting in her glass-walled porch in West Lake Hills, looking to "the landmarks of my youth" as Liz pointed to the university tower and the capitol. Almost every room in her house affords her this view—and glimpses of deer that come to dine on feed she says costs her \$42 a month.

WHY HAS TEXAS produced so many national leaders?" I asked former congresswoman Barbara Jordan, an orator who rose to national attention during the Nixon impeachment hearings, and currently a popular professor at the Lyndon B. Johnson School of Public Affairs.

"There is something about Texans, a strong, independent streak," she replied. "You really want to be able to do it yourself. This uniqueness of mind I think is more to be applauded than condemned."

The LBJ school is part of the university and is housed next to the LBJ Library and Museum, a gargantuan monolith that preserves Lyndon Johnson's papers and memorabilia. Professor Jordan explained the school:

"Johnson got annoyed in Washington that the people who came to be assistant secretary or deputy secretary of first one thing and then another all seemed to come from either Harvard or Stanford. He said to me, 'I know that we have young people in Texas who could come up to Washington; we just need a school down there to educate them. And that is what I want the LBJ school to do.'

"And that is exactly what it is doing. I testified in the state capitol two or three weeks ago before a committee, and there stood three former students now working in Austin, perhaps in Washington tomorrow."

From the plaza of the LBJ Library I gazed at Memorial Stadium, home of the University of Texas Longhorns. How appropriate this proximity of two Texas passions—football and politics. Fall brings multitudes in orange and white, stomping their feet to the beat of Big Bertha, the band's enormous drum.

Another university icon is preserved on the corner of Martin Luther King, Jr., Boulevard

and San Jacinto: the rig from Santa Rita No. 1, the oil well that blew in on university land in West Texas in 1923 to fill the coffers of the Permanent University Fund. The income—one-third to Texas A&M and two-thirds to the University of Texas System—helps make the university one of the nation's richest but is not the main source of revenue. Says Chancellor Hans Mark: "In 1989 UT Austin received 69 million dollars from the fund out of a budget of 580 million. The legislature allocates 38 percent, about the same as to other state schools."

One of the university's great treasures is the Harry Ransom Humanities Research Center, which preserves ten million manuscripts, a million rare books, five million photographs, and an extraordinary theater-arts collection.

Raymond Daum showed me doodles of Henri de Toulouse-Lautrec, an illustrated letter of Henri Matisse, original scores of Claude Debussy and Maurice Ravel, corrected page proofs of James Joyce's *Ulysses*, and personal correspondence of Ernest Hemingway. The collections reflect not only the university's wealth but also the magic of its former chancellor. "Ransom could charm anybody out of anything," Ray told me. One of my favorite bits of memorabilia was a door that visiting authors had signed—Tennessee Williams, Iris Murdoch, C. P. Snow, and Larry McMurry, among others.

The 1989 UT Austin enrollment passed 50,000. President William Cunningham told me: "We can't grow bigger, but keeping enrollment down is difficult. Tuition is only about \$870 for two semesters for a state student, and everyone in Texas at some point in his life wants to live in Austin."

IT ISN'T just the city's ambience that brought Merlin Tuttle to Austin. He moved Bat Conservation International here because "this city has the largest urban bat population in the U. S. Three-quarters of a million Mexican free-tailed bats fan out from under the Congress Avenue bridge almost every evening, spring through fall, consuming 15,000 to 20,000 pounds of insects each night," he said. "That's more than twice as many as emerge from Carlsbad Caverns."

A few darted through the dusk sky, starting their night hunt, wings flickering in the afterglow. Then they began pouring out from under the bridge, great swirling columns climbing into the sky, sweeping toward the horizon miles away like puffs of black smoke.

The bats are in Austin, Merlin told me, because of the ample and diverse insect population



When dusk falls, bats rise from beneath the Congress Avenue bridge to hunt insects. The Mexican free-tails spend April to October here. "Austin is crazy about its bats," a scientist says. Protective, too. A plan for new bridge lights met defeat when it threatened to disturb them.

to the west of the city, where the unplowed land has not been sprayed with pesticides.

Preservation of the Hill Country, habitat of the rare black-capped vireo and golden-cheeked warbler, engages many Austinites.

John Henry Faulk, 76-year-old folklorist whose family came to Texas before it was a republic, laments the inroads of developers. He and his wife, Elizabeth, live in a rambling house hidden among live oaks, cedars, and a miscellany of bushes John Henry has no intention of cutting down. "It gives me a sense of isolation from the downtown hurly-burly, although it's just ten minutes away.

"Austin had a wonderful bucolic quality when I was growing up," he mused, brown eyes twinkling in his elfin face. "But Austin got away from us, Angel." (John Henry has a delightful habit of calling women "Angel" and "Love.") "What they have done to downtown

is criminal. Used to be from any angle the capitol would loom there tall and magnificent and give one a sense of a base, a center, an anchor to living. I was driving down South Congress the other day and there sat the capitol looking like a little fireplug. My greatest disappointment is that we weren't able to summon enough civic responsibility to hold back the onslaught of the developers." He sighed.

"Course I wouldn't live anywhere else."

THERE HAVE BEEN a lot of struggles in Austin in the last 25 years," Mayor Lee Cooke said as we breakfasted at one of the city's 12 new hotels—too many, judging by the vacancy rate.

But the rooms should fill with completion of a 69-million-dollar convention center downtown.

Like Max Nofziger, his more liberal colleague on the city council, the mayor is a relative





Taking a spin with bride Rosemary Murillo, Douglas Elizondo embraces a dream of taffeta and lace. But for Austin the honeymoon is over. The growth that peaked in 1985 ended with a bust that may—or may not—have hit bottom. In one sense it doesn't much matter. A crowbar couldn't pry most folks from this place.

newcomer. Yet seven years after he arrived in 1970 as an Air Force captain, he was elected to the council, and 18 years afterward, mayor.

"How do we grow? How do we protect the natural beauty? In a lot of ways Austin is still growing up, still a city in short pants, but bursting with creativity.

"A lot of people say the sixties were the best times," the mayor went on. "But there weren't 1,500 restaurants here offering all kinds of food. We didn't have a ballet, a lyric opera; the symphony was in the red. Yes, we had less traffic, fewer people, a more laid-back style. There were fewer homes in the Hill Country. There are trade-offs."

DESPITE ITS GROWTH, the mayor said, he thinks Austin is a feeling city. It certainly proved so last summer when the Treaty Oak made national front-page news. The tree—Stephen F. Austin supposedly signed a treaty with the Indians beneath its branches—is a magnificent gnarled live oak, possibly 500 years old. Its 90-foot span of branches shades a small greensward tucked amid car dealerships, trendy antique stores, and 50-year-old residences. Last Memorial Day a citizen reported that the tree was sick. Someone, it was discovered, was poisoning the tree with a potent herbicide.

The city rose up in sorrow and rage. Arborists combated the threat with charcoal to absorb the poison, soil replacement to get rid of it, and injections of microbes to digest the chemicals. Giant screens provided shade in the summer heat, and water was trucked in to mist the ailing tree. A suspect, thought to have applied the herbicide during a bizarre ritual, was arrested. The Treaty Oak still survives, although experts are concerned about its long-range vitality.

I don't worry about Austin. All vital signs point to a healthy future. It has survived its spate of overbuilding and will build again. It cares about its hills, its lakes, its parks—about preserving that special feeling that has endeared Austin to so many. Not really surprising for a city whose citizens rallied to a stricken tree, bringing prayers, flowers, get-well cards—even cans of chicken soup. □



The World's Smallest Bird

Article and photographs by
ESTHER and ROBERT TYRRELL



MALE MELLISUGA HELENAE, LIFE-SIZE

SLOGGING through a remote crocodile swamp near Cuba's infamous Bay of Pigs, we were on a treasure hunt, not for gold but for jewels on the wing. After a year of stalking several of its Caribbean cousins, we had come here to photograph the smallest of the small: the bee hummingbird.

Endemic to Cuba, *Mellisuga helenae* tips the scales at about two grams, less than the weight of a penny (above). Like the 15 other Caribbean hummers we had photographed for our

upcoming book, it inhabits some of the most inaccessible regions we've encountered. After years of studying hummingbirds, we can normally spot them in flight. But when we first encountered the "bee," buzzing and hovering nearby, even we were fooled into thinking it was an insect.

At an estimated 80 beats per second, the bee hummer's wings move so rapidly that the naked eye cannot detect them. Fortunately we came prepared: Included in the 150 pounds of equipment we were lugging

through the swamp were high-speed strobe lights. Only with them could our lenses capture the birds in action, as when a male (left) lifts off from a pencil perch.

Using feeders to lure the birds down from hundred-foot-high trees, we were able to obtain the first photographic documentation of the species. Measuring a bit more than two inches from bill to tail, only the male of the

Hummingbirds of the Caribbean, the second book by ROBERT and ESTHER TYRRELL, will be published this fall by Crown Publishers, Inc.



species ranks as the smallest of birds, since the female, about a quarter of an inch longer, is about the same size as the vervain hummingbird of Jamaica and the island of Hispaniola.

Hummingbirds are typically loners, bonding with the opposite sex for only the few seconds it takes to mate. Many are fiercely territorial, engaging in spectacular aerial battles against other hummingbirds. Indeed, this combative nature may have prompted the Aztec to name a war god after them. Discovering that a female bee hummingbird has stolen its perch, a pugnacious



male prepares to attack (above).

Lashed to a branch with spider webs, the female's nest (below left) is no bigger than a doll's teacup. It is loosely woven of still more cobwebs and flecks of bark and embellished with lichens. The soft lining of silky plant down will hold two eggs smaller than coffee beans. Breeding takes place in May and June.

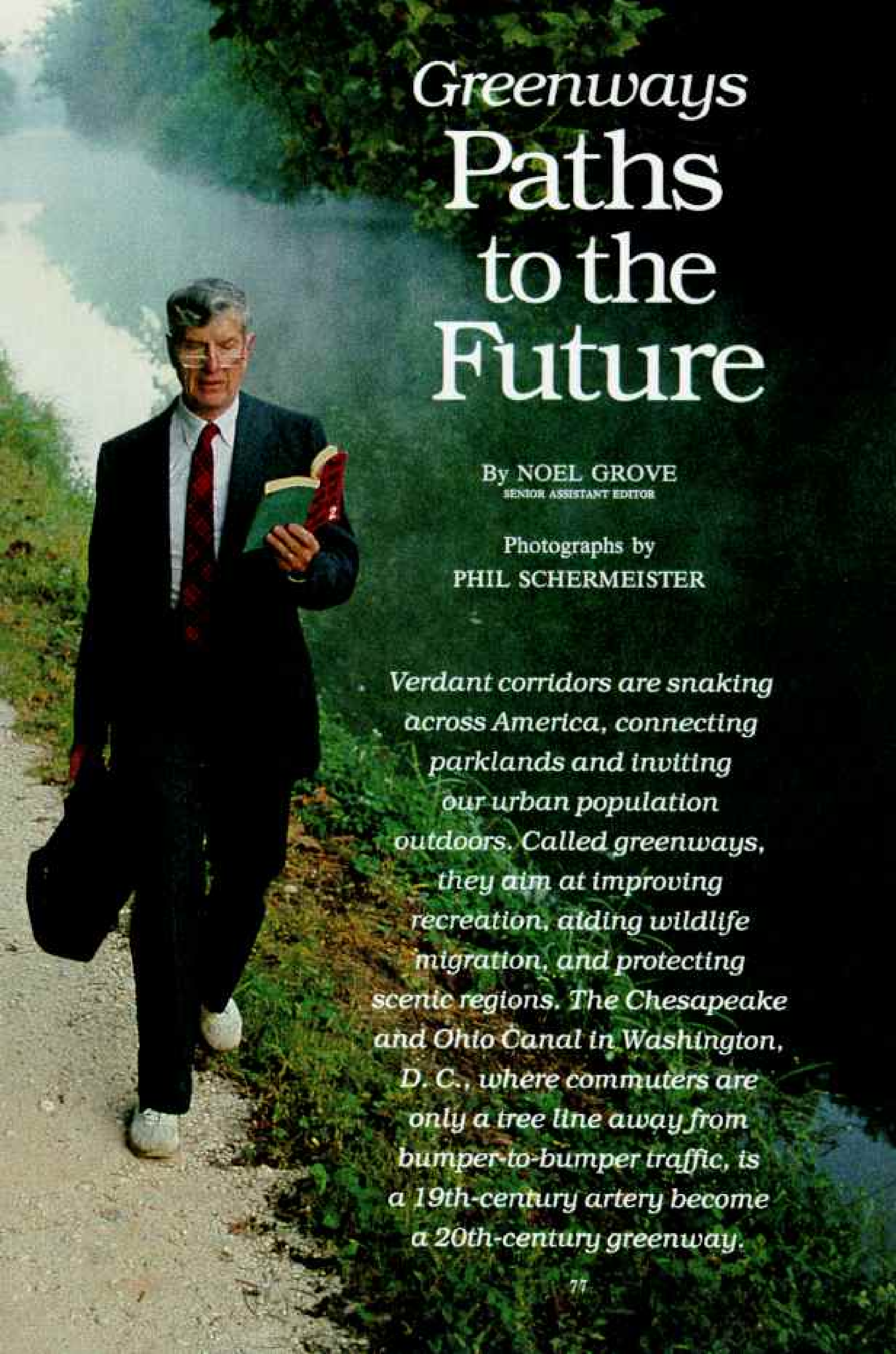
The hummingbird has the highest metabolic rate per unit of body weight in the avian world and requires proportionately large amounts of food. Though tiny spiders, flies, and other insects supplement the diet of the bee hummer, it obtains much of its nourishment from red trumpet-shaped flowers like this coral plant (right), whose blossoms produce copious quantities of nectar. Such plants have evolved to depend on hummingbirds rather than insects as pollinators.

Once relatively widespread across Cuba, the bee hummingbird is now thought to be a threatened species. And despite Cuba's conservation efforts, the diminutive bird is seen only rarely in its dwindling habitat. Just what the future holds for the tiniest of all flying jewels remains an unanswered question. □







A man in a dark suit, white shirt, and red tie is walking on a dirt path. He is holding an open book with a green cover and a red spine. The background is a lush green landscape with trees and a path leading into the distance.

Greenways Paths to the Future

By NOEL GROVE
SENIOR ASSISTANT EDITOR

Photographs by
PHIL SCHERMEISTER

Verdant corridors are snaking across America, connecting parklands and inviting our urban population outdoors. Called greenways, they aim at improving recreation, aiding wildlife migration, and protecting scenic regions. The Chesapeake and Ohio Canal in Washington, D. C., where commuters are only a tree line away from bumper-to-bumper traffic, is a 19th-century artery become a 20th-century greenway.



LIKE MANY of his neighbors, Verne Zickuhr was skeptical about the path being built near his Iowa town. A local group called Heritage Trail, Inc., was turning an abandoned railroad line into a 26-mile hiking and biking route from Dubuque on the Mississippi River to Dyersville. Property owners next to the railroad said the land should belong to them and that a trail would bring vandalism by city tourists.

A retired mason known for principles as binding as mortar, "the kind of guy who made up his own mind," according to a friend, Verne Zickuhr went to see for himself. Beneath limestone



bluffs he saw people pedaling, jogging, and walking in the countryside and passing through the hamlets of Durango and Graf.

"You know something," he told his wife when he returned home, "all those people were smiling."

Verne Zickuhr turned from trail opponent to one of its most diligent volunteers. When he died three years later, he was out manhandling railroad ties to shore up an eroding section of the trail. His son Doug would remember: "He died doing what he loved in a place he loved."

Affection for and commitment to the cause of natural corridors is growing in spirit and in fact all across the United States.

A quick escape from downtown Boston, the two-mile-long Charles River Esplanade, here a man-made island, broadens into a shoreline mall where the Boston Pops performs summer concerts. The orchestra's late conductor Arthur Fiedler launched this tradition in 1929 even as the riverine park was being planned.



Whose land is it? Converting abandoned railroads to recreational trails has met both success and dogged opposition. Iowa's 53-mile-long Cedar Valley Nature Trail breaks at the McKinley family farm (facing page). The McKinleys claimed that the land should revert to them. The Iowa Supreme Court agreed. But a new law allows the land to be purchased by the state under eminent domain.

John Sam Williamson (above) stands against Missouri's proposed 200-mile-long "KATY trail." Two miles of the old Missouri-Kansas-Texas Railroad bisects the farm his family has worked since 1835. "Recreation shouldn't be at the expense of the landowner," he says. "This is where we make our living; this is our home."

Called greenways, these corridors link open spaces and tie an increasingly urbanized population to experiences in the outdoors.

A Florida greenway, for example, runs from Tallahassee to a national forest and on to a national wildlife refuge, passing three state parks and touching three small towns. That comes close to what Vermonter Anne Lusk calls an ideal greenway: one that ties together already existing outdoor opportunities. Lusk pictures such a greenway as a long, green python that has swallowed a litter of pigs.

A greenway and state park in Virginia, built on an old railroad bed, is only 50 to 150 feet wide but 57 miles long. It bloats python-like when it connects with other parklands, then narrows again when it passes through private farmland.

Maryland's Program Open Space has been buying land for 21 years. Early purchases were for parks and endangered wetlands, but now 75 percent are for greenways. Taking the idea even further, Maryland Governor William Donald Schaefer has just appointed a commission of developers, environmentalists, and government officials to inaugurate a statewide greenways program. It would be the first such in the nation.

A proposed circular 400-mile trail following ridgetops in the San Francisco Bay area would touch more than a hundred communities in nine counties, allowing millions to tap into a lofty, fresh-air experience. A footpath winding through the little town of Stowe, Vermont, to the countryside beyond is only five miles long, but making it helped tie a community together.

A“AMERICANS like to be on the move; we're not a people to go to a park and sit,” says Keith Hay, director of the nonprofit Conservation Fund's American Greenways program. “Besides, land is expensive and less available now, which makes it hard to set aside blocks for parks.”

“The word is really a combination of ‘greenbelt’ and ‘parkway,’ taking the better part of each,” says Charles E. Little, author of a forthcoming book on the subject. “Of course, trails and green swaths have been set aside in the past. But the current trend of building these linear, connecting devices that get us out of our cars and into the landscape is a remarkable, citizen-led movement. I estimate about 500 individual projects are under way in the U. S.”

Greenways may be as elaborate as a hiking-biking-riding route, but they can also be as simple and natural—and ecologically important—as a stretch of stream bank left wild.

“Recreation is nice, but it's near the bottom of my list of reasons why we should have corridors of natural land,” Richard T. T. Forman, a landscape ecologist at Harvard University, told me as we wandered near my home in rural Virginia. As we walked, Forman rearranged my view of the landscape.

“See the tree line along that creek?” he said, pointing. “Deer and other wildlife can move along it from this patch of woods to that one on the other side of the field between them.”

“See that rough fence line? Trim away the shrubs and brush and you cut bird diversity by two-thirds.”

“These natural corridors filter water runoff before it enters our streams, protect biotic diversity, preserve woodland habitat,

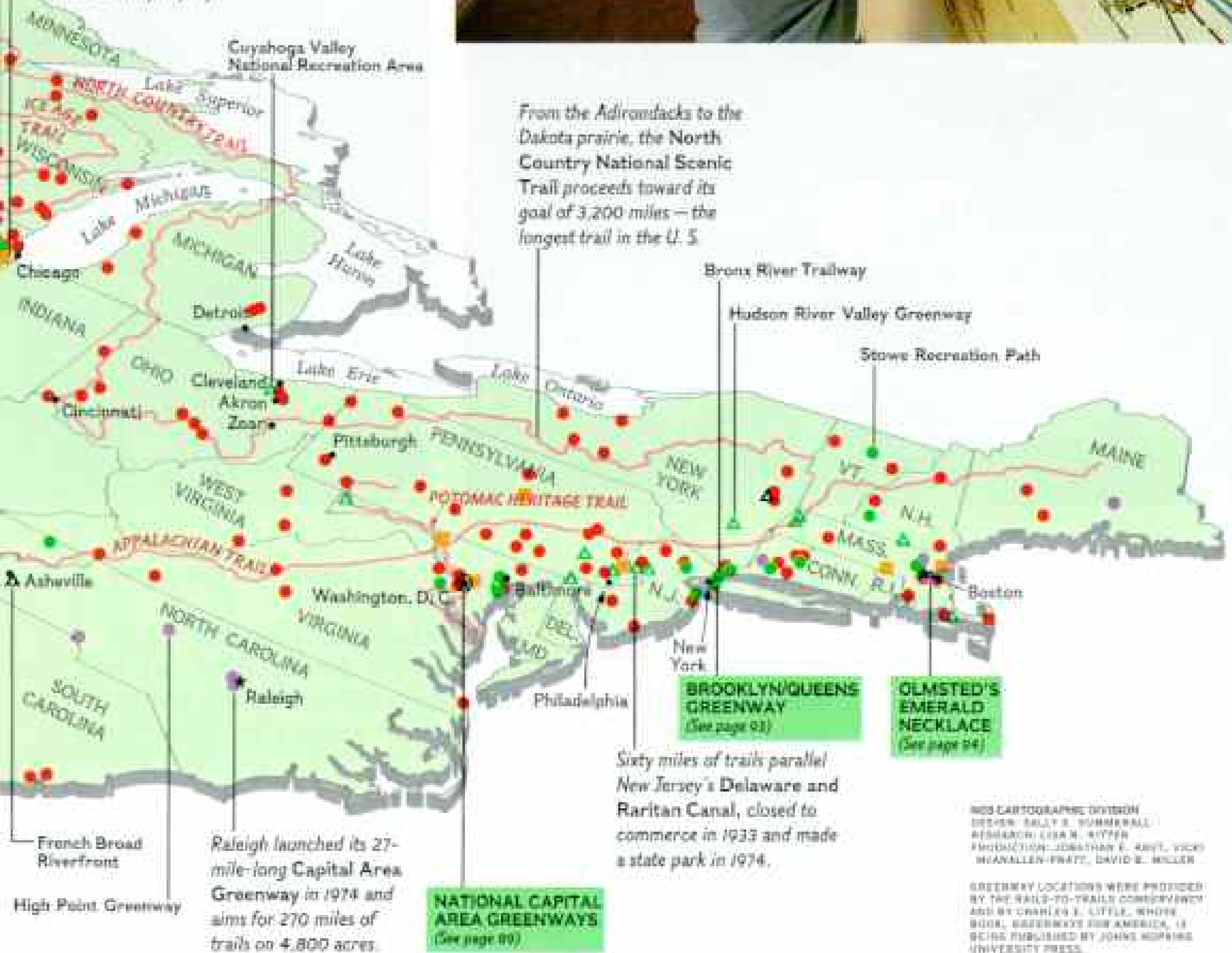


"America today is fast food, fast everything," worries Chuck Flink, part of a volunteer design team gathered to revive the French Broad River in Asheville, North Carolina. The Raleigh landscape architect specializes in greenways, believing they "let us slow down and greet our neighbors, and give us a chance to be more human."



Elroy-Sparta State Park Trail

A journey through history, the 120-mile Illinois and Michigan Canal National Heritage Corridor links downtown Chicago, Indian sites, prairie preserves, and factory towns from the canal's 19th-century heyday.



greatest need cited was for recreational facilities close to home. Urbanization has reduced open land and often made it too expensive to set aside for parks. But corridors such as rivers and streams and old canals and

railbeds lend themselves to renewal as greenways. The commission championed the greenway solution and advised community-level planning. But even before the committee's report, greenways had

been a citizen-led movement.

In a recent development the American Gas Foundation is considering running greenways over pipeline rights-of-way — bringing a national greenway network closer to reality.

A drainage ditch in 1981 (below), centerpiece of a mile-long park in 1989 (right), Little Dry Creek in Englewood, Colorado, epitomizes the potential of an urban greenway. In planning a revitalization of its business district, downstream from these photographs, the Denver suburb discovered that damage from catastrophic flooding of the creek could cost 14 million

dollars. A private company, McLaughlin Water Engineers, Ltd., was “challenged to build a flood-control project that doesn’t look like one,” recalls project engineer John Pflaum. Their award-winning design created more than 20 acres of parkland. The grass helps slow water during infrequent floods, and the bike trail doubles as a maintenance road.



MCLAUGHLIN WATER ENGINEERS, LTD.



even act as air filters when agricultural chemicals blow across the land during application.

“They interrupt the monotony of strip development and tie neighborhoods together. And migration through these corridors may be our best hedge against species extinction from global climate change. You don’t need people walking on greenways to make them useful.”

SOMETIMES ANIMALS NEED GREENWAYS more than people do. Florida has the second largest national wildlife refuge east of the Mississippi River, but even 150,000-acre Loxahatchee is too confining for the endangered Florida panther, of which as few as 30 survive.

“An adult male needs 300 square miles to call his own, and he’ll kill young males he runs across,” said Larry Harris, of the wildlife sciences department at the University of Florida at Gainesville. “So there have to be ways for them to disperse. They don’t like crossing developed areas, and road kills account for 45 percent of their losses over the past decade.”

Panthers have been reported in 58,000-acre J. W. Corbett Wildlife Management Area five miles north of Loxahatchee. To



the south lie 2.5 million more protected wild acres. How much private land would it take to tie all this together? Just 15,000 acres of greenway would give the endangered cats access to it all.

"It's not just panthers that need safe linkage," added Harris. "Nine Florida black bears—a subspecies—were killed on State Road 46 near Orlando in one three-month period."

The road bisects 20,000 acres of Florida-owned habitat, which development in the fastest growing U. S. state threatens to cut off from 430,000-acre Ocala National Forest. If that happens, the news for bears can only get worse.

"All we've got are pieces of a puzzle," said Wekiva River Aquatic Preserve manager Deborah Shelley, pointing on a wall map to other state and federal lands near the Wekiva. "They work now because the pieces are still connected by stocklands."

"Isolate Wekiva forests with more houses and highways, and you lose the black bear and other wildlife. You end up with urban species like possums and raccoons."

And, of course, people. Advocates of greenways for people like to think of a national system that might connect in a giant spiderweb across the United States.

"It's not likely that many people will take off and walk



One of the first rails-to-trails conversions in the United States, the 1967 Elroy-Sparta State Park Trail crosses 32 miles of dairy country in southwestern Wisconsin. Adjacent farmers initially feared vandalism, but "their fears have been unfounded,"



says Jim Moorhead, a state park ranger who works the trail and also relaxes there with his wife, Barbara, and their daughters. Nationally, 250 such trails now cover 3,100 miles—equivalent to the railroad mileage being abandoned each year.



MARIA STENZEL, NATIONAL GEOGRAPHIC STAFF

around the country," said Hooper Brooks of New York's Regional Plan Association. "But having a frontier, an ultimate challenge, is part of the American psyche. A connected, unending system of greenways can create a recreational frontier."

Greenways may be a new frontier in outdoor recreation and ecology, but they are not a new idea. More than a century ago landscape architect Frederick Law Olmsted designed parks and pathways all over the United States that created a sense of urban wilderness.

In Portland, Oregon, public enthusiasm swept the dust off an Olmsted greenway plan now 85 years old.

To help the city gussy up for the 1905 Lewis and Clark Exposition, Olmsted's sons designed a system of parks, trails, and boulevards tying together high ridges with the plains of the Columbia River. Portland built some of the parks in the 40-Mile Loop but not the trail system, despite the architects' suggestion that "a connected system . . . is manifestly far more complete and useful than a series of isolated parks."

When demands for more open space escalated in the early 1980s, citizens formed a 40-Mile Loop Land Trust to revive the Olmsted plan. The result is an interesting mix of volunteerism, political leverage, and scavenging.

"We determine where we'd like the trails, scout the routes, talk to landowners, and get some land donations," said Al

Edelman, former president of the land trust, as we stood atop Marquam Hill overlooking the city.

"A lot of the technical work—route marking, mapping, engineering—is done by volunteers. A summer-employment program for young people provided manpower for actual trail making, supervised by city and state employees. When we need to spend some real money, we go to the city, and since what we are suggesting benefits the public, the city usually provides it."

Housing has crept up the steep slopes of forested Marquam Hill, but there are still ravines too precarious, too flood prone to build on. Through one of them runs the Marquam Nature Trail, insulated from urban sounds by vine maples and Douglas fir. Peering through foliage, I could sometimes see the backs of houses, their leggy supports anchored in the hillside.

I knocked at the door of one.

"The trail played a part in our deciding to buy this house," said Marty Eichinger, a recent arrival in Portland with his wife and a small child. "Within a few minutes of walking on it, you feel as if you are in a forest, even though you're only five minutes from downtown."

Such aesthetic benefits are becoming evident to real estate agents. A Seattle study showed that property sold faster when it faced a recreation corridor.

THE GREENWAYS MOVEMENT has had many roots. One was the passage of a one-cent tax on gasoline in 1964 that gave Wisconsin millions of dollars to buy open space. Landscape architect Phil Lewis was hired to inventory the possibilities.

"I found that 90 percent of the areas with outstanding natural and cultural features were around water, wetlands, and steep topography," Lewis said. "I referred to them as environmental corridors. Sometimes, just for fun, I called them 'E-ways,' for environment, ecology, education, and exercise. For a while the state bought them at the rate of 33,000 acres a year."

Wisconsin's program for acquiring green corridors for bike paths, canoe trails, or merely scenic values became a model for other states to follow. Also, a mounting interest in outdoor activities nationwide spurred trail construction in the 1970s.

But it was the President's Commission on Americans Outdoors (PCAO), appointed by Ronald Reagan in 1985, that brought the word "greenway" into common usage and spread the trail-and-corridor-making fever.

In hearings across the country the PCAO heard a clamor for more recreation facilities closer to home. The answer it recommended was a system of recreational corridors that citizens could enter and use wherever it was convenient to them.

"We can tie this country together with threads of green that everywhere grant us access to the natural world," the commission concluded in a report.

With the federal government operating in deficits of billions, the PCAO suggested that the initiative be taken by the communities themselves. Local action, said chairman Lamar Alexander,



Lobbying with their feet, members of the Coalition for the Capital Crescent Trail keep this abandoned rail line clean "so people can see it as parkland, not wasteland," says Chris Brown, center. The spur runs 11 miles through Washington, D. C., and Maryland. A million people a year use a former Virginia railbed, now the Washington and Old Dominion Trail (map), and Capital Crescent Trail proponents expect similar numbers. Money and bureaucracy present hurdles, but, notes Brown, "assembling a trail here from scratch would be impossible."



"You can't just create a park and assume its animals are protected," says Florida state biologist Jennifer McMurtry. "You've got to guarantee safe passage for them to roam." Greenways are planned to link wildlife reserves along central Florida's Wekiva River Basin (map) as encroaching development threatens animals with genetic isolation and loss of habitat. Leading cause of death for the threatened Florida black bear, vehicles killed 42 in 1989. Warning signs on State Road 46 near Orlando alert motorists.



PAUL BARTON



then Governor of Tennessee, could cause greenways and other parklands to sweep across the country like a prairie fire. Now a nationwide system may be closer than PCAO dreamed. The American Gas Foundation is currently studying the possibility of allowing its continental network of pipeline rights-of-way to be used for greenways.

In 1981 Anne Lusk lit her own prairie fire in Stowe, Vermont. After the vigorous mother of two helped save an old schoolhouse from destruction, she threw herself into getting a recreation path built through and around the mountain-framed ski town. "The community really got behind it," she said, leading me along the winding grass-lined asphalt ribbon at a pace that almost matched her words. "Thirty-two landowners agreed to let the path run through their property. Almost half the \$680,000 cost came from local donations; the rest was federal money.

"People are different on a path," she said as we thumped over a bridge spanning a brook and headed through a park, down the



final stretch to a church. "On a town sidewalk strangers may make eye contact, but that's all. On a path like this they smile, say hello, and pet one another's dogs. I think every community in America should have a greenway."

NOT EVERYONE AGREES. Many midwestern farmers struggling with high operating costs and low crop prices have watched angrily as rail lines crossing their land are turned into walkways used mostly by urbanites. "I get my exercise by working," grumbled a sunburned corn grower.

Some 3,000 miles of railroad tracks go out of service every year in the United States, their transportation replaced by trucking. A four-year-old organization called the Rails-to-Trails Conservancy is urging their conversion to recreation corridors. Of perhaps 150,000 total miles of rail lines abandoned so far, some 3,100 miles in 35 states have become trails.



Farmers argue that land taken for railroads in the past century should revert to them when the trains stop. Trail makers cite 1983 federal legislation suggesting that rights-of-way be "banked" in case fuel costs some day drive us back to trains. The U. S. Supreme Court recently decided that banking the rights-of-way as trails was constitutional.

In Iowa, Tom Neenan felt the heat of opposition when he helped convert an old electric rail line to a hike-and-bike path from Cedar Rapids to Waterloo. "Adjacent landowners said it would attract vandals who would damage their land, shoot their livestock, rape their daughters," said the white-haired former homebuilder, amazement still on his face in the telling.

"The landowners burned a railroad trestle, defoliated trees, and buried boards in the trail with nails sticking up. In fact, the only violence so far has been done by the people who said they were worried about the trail attracting a rough crowd."

The land was finally purchased through private donations and developed largely by volunteers.

My foray on the proposed 200-mile rail-to-trail conversion west of St. Louis—the "KATY trail," for the Missouri-Kansas-Texas Railroad—ended at a fence built by an angry landowner.

"We know 99 percent of the people using it will be good people," said another trail opponent, John Sam Williamson, who farms near Columbia, Missouri. "But one percent may be

bad. On the trail in Columbia a woman was murdered, and they've had some robberies too. Our objection is the way they took the land, but we have some personal concerns as well."

Studies indicate that trails are no less secure than other areas of human use and cause no increase in crime. Seattle law officers pointed out that problems in park areas are usually related to easy automobile access, which is not available on that city's Burke-Gilman Trail. A long-term study of the Appalachian Trail, which passes through both rural areas and small towns, revealed impressively low crime statistics considering the volume of people who use the facility.

"If a corridor runs through a city, you've got to remember you're still in a city," I was told by city planner Bob Mosher in path-conscious Raleigh, North Carolina.

"Our statistics indicate you're probably safer on a greenway than in most areas. People with a criminal mind-set don't usually frequent places like that."

GREENWAYS in New York City? A two-tour Vietnam veteran has already mapped one. "Not many people realize that New York has 40,000 acres of parks, and a greenway is a way of pulling them all together," said Tom Fox, a Brooklynite who calls himself an open-space hustler. "Besides, there are tremendous cultural opportunities along the way. I love the diversity in this city."

Following sidewalks, existing bike paths, and streets when necessary, Fox mapped a 40-mile bike route from Brooklyn's Coney Island to Queens' Fort Totten. We began at Coney Island and were soon riding on the wide sidewalk along Ocean Parkway heading north, Fox a rolling monologue of local highlights.

"See the Russian restaurants? This area is popular with Russian émigrés . . . iron grillwork, we've entered an Italian neighborhood . . . now Jewish temples . . . here's Prospect Park! Olmsted considered it his best combination of woods, water, and a meadow more than a mile long . . . let's stop for a walk through the Brooklyn Botanic Garden. . . ."

Our passage through a down-at-the-heel neighborhood with boarded-up windows and bored-looking residents only added to his optimism: "A greenway allows these people to get out to other areas, just as it allows us to get into theirs," he insisted.

Decaying urban neighborhoods are actually aiding creation of useful open space in New York and other cities. Across town in the Bronx, Rob Feder of the Trust for Public Land (TPL) walked me through vacant lots covered with weeds and trash.

"During fiscal crises in the 1970s a lot of property reverted to the city through tax foreclosures," he said. "These areas will come back some day," he added, as we crunched over broken glass and dried dog scat. "As development pressures mount, we are working with other groups to preserve green oases for people to enjoy. They make a city livable."

TPL is also aiding in the creation of the Bronx River Trailway, a recreational use of now derelict stretches of waterfront. Nationwide, the organization helps form local land trusts to purchase open space. In Ohio, for example, TPL is helping an effort to tie together the cities of Cleveland and Akron with a



Courting attention, young Brooklynites stroll Ocean Parkway on the Jewish Sabbath. Famed landscape architect Frederick Law Olmsted, considered the father of greenways, designed this "shaded pleasure drive" in the 1860s as an approach to his new creation, 526-acre Prospect Park. Extending his vision, the Brooklyn/Queens Greenway (map) will cross Long Island by 1995, joining 13 parks and such landmarks as Shea Stadium and the Brooklyn Museum.

For further information on greenway development write:
AMERICAN GREENWAYS
 1800 North Kent Street
 Suite 1120
 Arlington, Virginia 22209



Bathing alfresco, Gabino Martínez-Paz soaps up in his garden plot in Boston's Back Bay Fens (facing page). A legacy of World War II, the Fenway Victory Gardens thrive in this park "created from foul tidal flats" by architect Olmsted. The Fens are one jewel in the eight-mile-long Emerald Necklace he designed for the city in the 1870s and 1880s (map).



greenway, doing for recreation what was once done for industry.

In the early 19th century the Ohio and Erie Canal allowed boat commerce from Lake Erie to the Ohio River. Cleveland and Akron grew up by the canal, which was abandoned in 1913. The Cuyahoga Valley National Recreation Area was opened between the cities in 1974, totaling some 33,000 wooded acres along 22 miles.

Now a citizens movement led by TPL and the National Park Service wants to tie the recreation area from Cleveland to Akron and 30 miles beyond to the historical village of Zoar. The corridor would include foot-and-bike trails, picnic stops, a pioneer farm and village, and steam engine service, all allowing users to enjoy the outdoors while learning the history of the region. Using donated funds and land trusts, a coalition of citizens, businesses, governments, and organizations hopes to negotiate land purchases into a 60-mile greenway rich in scenery and culture.

PERHAPS NOTHING better reflects the mounting interest in greenways than the earmarking of government funds for their construction. California's Proposition 70, passed in 1988, provides three-quarters of a billion dollars for parks and recreation. Only five million dollars is tagged specifically for trails, but another 120 million goes to local communities for open-space projects, including greenways.

"Greenways with trails are one of the cheapest forms of recreation," said Phyllis Cangemi, whose group, Whole Access, works to make them available to the many Americans who are often excluded from the outdoors—people with disabilities. Stricken with Hodgkin's disease, she powers her three-wheeled scooter on weekend outings and camping trips, and lobbies for firm trail surfaces and paths with gentle gradients.

"Those with mobility difficulties include not only the 16 to 20 percent of the population with disabilities," she told me, "but also older people, and our population is aging."

The demand for neighborhood corridors of recreation knows no age, however, and seemingly no limits. Minneapolis and St. Paul are ahead of most cities in creating trails for biking, walking, and cross-country skiing because, as park board planner Al Wittman told me, "Minnesotans have always had a tradition of outdoor activity. The demand is terrific. When a new trail was installed, kids were riding their bikes a hundred yards behind the asphalt-laying machine."

In Yakima, Washington, I began an evening run a few yards outside my motel, built next to the Yakima Greenway. The path, still under construction, was rocky and uneven, but it curved gracefully beside a clear trout and salmon stream that a few years ago had been little more than a dumping ground.

Financing looked like a rocky road when the project started in an agricultural community with high unemployment. To the surprise of everyone, the first private fund drive yielded a half million dollars. State funds were also squeezed—out of grants from eight different accounts, including an obscure one for Aquatic Land Enhancement. "It's a matter of knowing where the money is and how to get it," said Jim Whiteside, former county commissioner.







In sports-minded Minneapolis —where “it’s not unusual to see people running in a blizzard,” says city park planner Al Wittman—cross-country skiers glide through 750-acre Theodore Wirth Regional Park. Laid out at the turn of the century, the Minneapolis system is one of the earliest urban greenways. The Twin Cities area enjoys 45,000 acres of parkland, 25,000 added since 1974. The nearly completed 40-mile trail around Minneapolis (map) embodies a central greenway tenet: “You can go 15 minutes,” says Wittman, “or you can go all day.”





THE SEARCH FOR MONEY does not stop greenway builders. When city council members at High Point, North Carolina, said the city budget could not afford the entire cost of greenway construction, a citizens group sold "deeds" to foot-long sections of the path. Fifteen hundred miles to the west, trail makers at Pueblo, Colorado, sold bricks inscribed with donors' names and used them for the path's centerline.

Recognizing a demand for outdoor recreation, more and more states are funneling money from special taxes and user fees toward greenways. The National Park Service includes a small division that offers communities technical assistance and advice on greenway acquisition and development.

With its grants from the Land and Water Conservation Fund (LWCF), the federal government has been the single largest funder of recreation corridors. Since its enactment in 1964 as a trust built by revenue from federal property sales, boat fuel taxes, and oil and gas leases on the continental shelf, the LWCF has sent more than a billion dollars toward the building of community pathways.

But federal deficits have all but dried up that source. Only three million dollars a year is currently dispersed for trails, although legislative efforts continue toward the creation of a new federal environmental fund.

Deep pockets are gone from state and local governments as well, which inspires creative financing. Coalitions of public and private groups are being formed to purchase parklands and greenways, spurring connections over ever larger areas. New York State, for example, passed legislation in 1988 that called for study of a Hudson River Valley Greenway along 154 miles of the



scenic river that is sometimes called America's Rhine.

Beer is okay, but glass is banned on Sacramento's 23-mile-long American River Parkway—as is camping. "The homeless problem here is sad," says ranger Dub Roberts.

To the south, two dramatic greenway loops totaling 800 miles are being built around San Francisco Bay (map). As with joggers along the Ridge Trail (facing page), greenway planning faces uphill climbs but rewarding vistas.

"We want to examine every possible opportunity along the corridor—parks, old mansions, preserves, historic sites—and then figure out how to preserve and connect them, so they can be part of an outdoor experience," said Barry Didato, the greenway coordinator for a group called Scenic Hudson, Inc. "With nearly four million people living in the valley and many more expected by the end of the century, we want to plan open spaces for them to enjoy."

"We're not talking about just one trail or one connection but a network of outdoor experiences," explained Frances Dunwell of New York's Department of Environmental Conservation. "It's more a philosophy of future land use for a whole valley."

Or a nation. □



DOMMI



N I C A



Massive and rainswept, this Caribbean island has changed little since Columbus sailed past on Sunday, November 3, 1493, and christened it Dominica for the Lord's day. Towering mountains that define this paradise of nature also create a barrier to agriculture and a difficult life for Dominicans.

By ROBERT BOOTH

Photographs by BRUCE DALE

BOOTH NATIONAL GEOGRAPHIC STAFF





Jewel of 17,000-acre Morne Trois Pitons National Park, Emerald Pool and its cascade delight both Dominicans and tourists. Trails ascend into tropical rain forest, part of the greatest expanse remaining in the Caribbean islands. Dominica offers few beaches for sunseekers. Instead, nature-loving visitors find rich flora and fauna, including 162 bird species such as the imperial, or Sisserou, parrot (above), unique to the island and Dominica's national symbol. Perhaps only 60 of these birds—at 20 inches long the Caribbean's largest parrot—remain in the wild. This bedraggled, captive specimen was rescued from poachers intending to sell it on the black market—a major reason for the bird's endangered status.

Simple pleasures suffice for children home from school in the mountain village of Petite Savanne. The village has long specialized in producing oil from bay leaves, an extract used in making cologne, but the market in the United States and Western Europe can absorb only a limited quantity, frustrating local efforts.





THE FIRST RAYS OF SUN were filtering through the rain forest canopy as my companions and I reached the edge of a deep mountain ravine. Butterflies danced in the rising mist, and the music of a swift-flowing river far below mingled with the notes of songbirds tuning up to greet the day. We focused our attention on the foliage across the ravine, for that was where our quarry should emerge. We hadn't long to wait. First came the distinctive hoarse call, and then the great bird itself, winging by us in a flash of green.

Amazona imperialis, the imperial, or Sisserou, parrot, is among the largest and loveliest parrots in the world. Its red-streaked wingtips span 30 inches. Its tail and back are brilliant green, giving way to an iridescent head set with ruby eyes and, perhaps most striking, an improbably purple breast.

The Sisserou is found only on the impoverished Caribbean island-state of Dominica, which has adopted it as the national symbol. It's an appropriate choice, because both bird and nation share the gift of rare beauty. They also share something else—a daunting struggle for survival.

For the Sisserou, the sad fact is there may be as few as 60 left in the wild. It could be worse. The parrots of most other islands in the region are now extinct from overhunting and loss of habitat. That there are *any* parrots left on Dominica is a testament to the island's most singular characteristic—its topography.

Dominica (pronounced Do-min-EE-ka), 29 miles long and 13 wide, is a vertical land, the Caribbean's most mountainous island, with volcanic peaks rising nearly 5,000 feet. That's high enough to create its own weather, and so Dominica is also the wettest island, receiving 300 inches of rain a year in some areas. With freshwater lakes and 365 rivers (one for every day of the year, it is said), Dominica actually exports water to its drier neighbors.

The climate along with the island's mostly rocky and therefore mostly beachless coastline has prevented the establishment of big-time

A French flavor lingers beneath cloud-wreathed mountains in the capital of Roseau, a port named for a local river reed. Dominicans often speak a French patois, though English is the official language. Some 30,000 people live in the city and its suburbs, where 18th-century estates are being carved up for residential construction.



tourism. The 300 hotel rooms are never full, and at present no island airport can accommodate standard commercial jets. Instead, agriculture forms the backbone of the economy. Just about anything (including fence posts) will take root in the rich volcanic soil. But farming the mountain slopes is backbreaking, often a break-even proposition at best. And so Dominica is also one of the poorest islands in the Caribbean.

Yet the mountains that make life so hard shield one of the world's last oceanic rain forests. They also shield Dominica's culture from the shock of rapid development. Indeed, for good or ill, the mountains in large measure define the island, protecting it and inhibiting it. And it was ever thus.

AROUND FIVE O'CLOCK on the morning of November 3, 497 years ago, a lookout aboard the flagship caravel *Mariegalante* spotted a tall green shape on the horizon. It was Sunday, and Christopher Columbus decided to name the landfall of his second New World voyage Dominica in honor of the Lord's day.

The fleet could find no suitable anchorage along the rugged windward coast and sailed north without landing, but the island made a lasting impression. One expedition member reported: "Dominica is remarkable for the beauty of its mountains and the amenity of its verdure and must be seen to be believed." Columbus on his return to Spain described the island to Ferdinand and Isabella by placing

*"Being independent means a much harder life."
Mary Eugenia Charles, the Caribbean's first
woman prime minister, is up for reelection
this year for a third term.*

before them a crumpled up sheet of paper.

For the next two centuries European powers mainly avoided Dominica in favor of easier prizes. During the 18th century it bounced between French and British control, with Britain securing permanent possession in 1805. The French left their mark, however: Today most of the 83,000 residents, nearly all descended from African slaves of European planters, are Roman Catholic. And though English is the official language, most also speak a French patois. Britain finally granted full independence on November 3, 1978, the 485th anniversary of Columbus's visit.

The colonial powers' long avoidance of Dominica was not due solely to its fierce topography. The Carib Indians who greeted the early Europeans were even more ferocious than the mountains. Caribs had arrived 500 years before, migrating from South America across the sea that bears their name. Fortress-like Dominica became their last stronghold. They called it Waitukubuli, "tall is her body," and they defended it with a vengeance.

Great warriors though the Caribs were, what most horrified and fascinated Europeans was their well-documented taste for human flesh. The Spanish called them Caribales, from which cannibal derives. One account tells that "the Caribbeans have tasted of all the nations that frequented them, and affirm that the French are the most delicate, and the Spaniards are hardest of digestion." In another account a Carib professed to limit his human diet to vanquished Indian foes because "Christians gave him the belly-ache."

But were the Caribs really cannibals?

"Pure fabrication," said Irvince Auguste, chief of the world's last remnant community. Some 3,000 Caribs, most of them farmers, live on a 3,700-acre reserve on the northeast coast.

To visit the Carib chief, I crossed the Concorde River on a wooden footbridge and headed a quarter mile up a well-trodden dirt path, hedged in by banana plants and undergrowth. Along the way I noticed a dugout canoe under construction, filled with boulders to stretch it



into shape. Caribs of old were famous for their boatbuilding prowess. The largest *canoua*, hewn from the trunks of giant gommier trees, measured 30 feet and held 40 people.

Irvince, 27, stocky and serious, lives with his wife and four children in a two-room house with no running water. Three-year-old Diana kept a wary eye on me as Irvince and I settled ourselves on the front stoop.

"Columbus and those who followed were looking for gold," he said. "The Caribs had gold, which they traded for glass beads. When they realized they were being fooled, they started to retaliate. The Europeans tried to enslave them. Captured Caribs killed themselves by the hundreds rather than submit. The Carib people continued to fight—they



High, wild Dominica



"Not the promised land, flowing with milk and honey," would-be British settlers were warned in 1764 of islands including Dominica, last in the Caribbean to be colonized. Early Spanish explorers gave it a wide berth after encountering hostile Carib Indians who had arrived

from South America around A.D. 1000. Britain took permanent control in 1805 after vying with France during the 18th century. Dominicans, most of whom descend from African slaves, celebrated independence from Britain in 1978, but their euphoria was tempered by Hurricane David's devastation the next year.



AREA: 290 sq mi (751 sq km).
 POPULATION: 83,000.
 CITIES: Roseau (capital), 30,000; Portsmouth, 5,000. LANGUAGE: English, French patois. RELIGION: 80% Roman Catholic. ECONOMY: Bananas, coconuts, citrus.

had a right to do so. The enemy had to find an excuse, some false propaganda, to justify their actions. There may have been ritual use of enemy remains, but we have no tradition, no oral history, of cannibalism."

Irvine dreams of a better life for his people while preserving their dimming ethnic identity. "We have come to realize that Carib people are a nation, a tribe," he said.

"Descendants of African slaves are today doctors and lawyers. We need Carib doctors and lawyers, and we need our own secondary schools if our children are to remain Carib. Most of all we need our own financial institution so Carib people can use their land, which is held in common, as collateral for loans. We could then begin to build an economic base."

What are the chances of such autonomy?

"I might not see it," he admitted, "but I'm thinking of my children. There are laws to preserve the wildlife of Dominica. Surely the native people of Dominica should be preserved."

It may well be too late, according to Dominica's president, Clarence A. Seignoret, a cordial, powerfully built man of 71 who is himself the grandson of a Carib.

"They've lost their language," he told me. "Apart from a few of the old ones, there are no pure-blooded Caribs. They are already integrated into Dominican society. At this point I truly feel it is better for them."

I WAS INTRODUCED to the president one Saturday morning as he relaxed in his pajamas on the second-floor balcony of his home on Cork Street in downtown Roseau, watching the passing scene. Saturday is market day, and the narrow streets of the capital were filled with people and pickups converging on the market square, where the Roseau River meets the sea.

Some 30,000 people live in and around Roseau, named for a local reed. A few substantial buildings from colonial days still stand, but mainly the streets are lined with modest two-story structures, some leaning on their neighbors for support but many others in good repair, painted in pleasantly clashing tropical colors. Retail shops on the ground floors compete with innumerable sidewalk vendors, all of whom seem to be hawking the same T-shirts and trinkets. At the dozen or so cafés a thirsty visitor can drink his fill of fresh juices—passion fruit, tamarind, soursop, grapefruit. He can sink his teeth into a double-dip ice-cream

Challenges high and deep stimulate tourism, which has more than doubled since 1980. Off Scotts Head a sunken garden of sponges and coral rewards a visitor, part of a growing stream of divers discovering Dominica's marine life. Ashore, an arduous ten-mile round-trip hike leads through the volcanically active Valley of Desolation to Boiling Lake, a huge flooded fumarole.



Lone constable confronts an increasingly hectic rush hour in Roseau (bottom). There a fish vendor plies a brisk trade, since demand for seafood greatly exceeds supply.



cone at Jaws or into a spicy meat pastry at Celia's Bakery, where, in a somewhat unusual merchandising scheme, he can also choose from a selection of women's underwear.

All in all, there is little visible evidence of the disaster that befell the capital and newborn nation 11 years ago, when Hurricane David sat on the island for eight hours, flogging it with 150-mile-an-hour winds. Forty people died, 5,000 were injured, and two-thirds of the population was left homeless.

"I was home that day," said the president,

when I caught up with him again at his office atop Morne (Mount) Bruce, overlooking the capital. "But I was fortunate: I lost only part of my roof. You have to experience a hurricane to understand it."

Dominica understands well. Just last September, Hurricane Hugo sideswiped the island before devastating Guadeloupe and the eastern Caribbean and slamming into South Carolina. No lives were lost on Dominica, but crop damage was heavy.

"It's happened over and over and over," he said. "We plant a crop, say, cacao; it grows for a period, we get a hurricane, the whole thing is wiped out. And now we have bananas; you only have to blow at them and they fall over."

TRUE. But today it is as much the fickle winds of global economics that threaten the island's principal source of income. Dominica with its steep terrain and small plots can't compete with agribusiness operations like those in Colombia and Ecuador. So for many years Great Britain has bought Dominica's bananas at a premium, out of consideration for its long colonial relationship. But in 1992 Western Europe is set to become a single economic entity—essentially without borders. For Dominica, a catastrophe. The government, as is often the case, must ask for help.

"It's true that we do a lot of begging," said the president, "but we have good leadership. The prime minister is a very strong individual, and she has worldwide respect."

Under Dominica's parliamentary system, the president is mainly a figurehead. The prime minister is the prime mover.

Mary Eugenia Charles (page 107) came to power in 1980 during a period of social unrest following the forced resignation of the nation's first prime minister, Patrick John. (John had, among other things, secretly planned to sign a sixth of the island over to U. S. developers. Later implicated in a bizarre coup attempt involving mercenaries—some of them members of the Ku Klux Klan—he is now in jail.)

British heritage is played out in games of cricket, here improvised by young men at Scotts Head. Although soccer is a strong challenger, cricket remains the national sport. Dominica has won the Windward Islands Goodwill Trophy eight years in a row, and top players have competed successfully in England.



In 1983 it was Prime Minister Charles who, as chairman of the Organization of East Caribbean States, stood beside President Ronald Reagan as he announced the invasion of Grenada. Today she faces a host of problems, but none greater than the specter of 1992.

"We are negotiating, trying to find a solution," she told me in her simply furnished Government Headquarters office. "But with free circulation of goods, how do you prevent bananas that Germany imports from Ecuador from going into England?"

"One thing we must do is bring our production costs down, and this the farmer must understand. But with or without 1992, we cannot expect bananas to be with us forever. The rest of the world is growing them, so our

bit of the market gets smaller and smaller.

"We have to diversify, but farmers are the most conservative people. They don't want to change. So we are using 1992 to prod them. We certainly don't want them to despair."

One farmer not quite despairing but definitely worried is 40-year-old John Augustine. John lives in the precipitous village of Vieille Case on the island's northeast corner.

"Nineteen ninety-two poses a danger," he said, "but I don't think England will turn its back on Dominica. Bananas are all we have.

"The government talks about diversifying, but there are no markets for other crops. In the early eighties the government gave me mango trees—paid me to grow mangoes. Today the mangoes rot on the ground. With bananas



Important steps: Girls await their first Communion in Roseau's Roman Catholic cathedral. Four out of five Dominicans are Catholic, their devotion reflected by a freshly painted church in St. Joseph. Fishermen are feted in Soufriere at the Feast of St. Peter and St. Paul, held in different villages during June and July.

nobody is getting rich, but if you work hard you can just make a living."

As we trudged up and down his six steep acres, I learned how much work it took to produce the fruit that millions of people take for granted when they slice a ripe banana onto their morning cereal. For his efforts John gets about ten cents a pound. In a year, after expenses, he might clear a thousand dollars. Not a whole lot when you have six children.

"It's easy to make children," he said, "but it's not so easy to feed them, you know?" His oldest, Otis, is 18, and John doesn't expect him to follow in his footsteps. "I don't blame anyone for not wanting to be a farmer in Dominica," he said. "It's hard working for nothing."

For John it became harder still last year when Hurricane Hugo flattened his crop, though his house and family were unharmed.

"I am replanting the bananas," he told me with a trace of resignation. "There is nothing else to do in Dominica."

BUT THAT IS NOT ENTIRELY TRUE. In a high remote valley at the opposite end of the island, a promising alternative has taken hold. Since 1984 Windward Islands Aloe, a small Florida-based company, has been successfully growing the spiked plant, a member of the lily family whose leaves yield the gel used in skin creams and myriad other products.

Farm manager Marshall (Barney) Barnard and his wife, Loye, are two of only half a dozen Americans on the island. They live in a two-story house nearly obscured by flowering trees and vines. A magnificently plumed peacock patrols the lawn, vying with hibiscus, allamanda, red ginger lilies, and frangipani.

"How did we come to be here?" Barney, athletic in middle age, his close-cropped hair flecked with gray, considered the question as he showed me around. "Sheer craziness, I guess. That mountain behind you is Morne Fous—Mountain of Fools. When we saw that, we knew we were home.

"We have 80 acres under cultivation, and



we're adding 20 more, but that's not nearly enough to meet demand. Our idea from the beginning was to have an out-farmer program. As of now we've got 50 farmers growing aloe for us. We provide the plants and expertise and a guaranteed market. The government loves it. We also employ 55 people here on the farm, so we are definitely making an impact on the economy."

Back at the house Loyer, a professional artist, had prepared "a little something" for lunch, including ground pork loin *en brioche* and iced passion-fruit tea.

"I love this island," she said. "I love it because it defies taming. If we should ever decide to leave, Dominica will always be a part of our lives."

DOMINICA has been a part of their nearest and only neighbor's life for almost 60 years. Daphne Agar arrived from England in 1932 at the age of 20 and never left. Along with raising a family, she started the local radio station and was managing director of the island's premier hotel. Now retired and a widow, she lives in an 18th-century estate house on Morne Rouge overlooking the Martinique channel.

A handsome, no-nonsense woman, she squeezed two glasses of limeade, and we talked on her patio while a pair of hummingbirds worked the bougainvillea blooms.

"For a very long time nothing changed here," she said. "Even after the war it was still a very simple place. It's not so simple today. People used to grow all their own food. Now they buy Sara Lee cakes from your country. And U. S. television: It's a great source of evil, I think. Not so much the sex and violence—we've always had plenty of both. But it has made people want things that don't really apply to their way of life."

Because of her home's remote location and the demands of upkeep, Daphne has reluctantly decided to move closer to Roseau. She gestured to the extraordinary panorama spread before us. "I'll miss my view of Martinique," she said. "There are a few pleasures of growing older, though," she added with amusement. "One is that I need no longer go to Boiling Lake! But you really ought to go."

Boiling Lake is actually a flooded fumarole more than 200 feet across, the largest of its kind in the world. It lies near the center of 17,000-acre Morne Trois Pitons National

Park in the sulfurous Valley of Desolation, where the island's violent prehistory still percolates. It's a challenging ten-mile round-trip mountain hike and scramble, and go I did, along with photographer Bruce Dale, his wife, Joyce, and the reassuring presence of guides John Stoddard and Bryant Rolle, a forestry conservation officer. The trail can indeed be treacherous: A few days after our trip, a German tourist fell to her death.

We set out early from the village of Laudat, detouring around Titou Gorge, an ancient volcanic fissure with a waterfall at one end that strong swimmers can reach. As the trail started climbing in earnest, I was grateful to the Forestry Division, which had cut log steps over the roughest sections. Bryant pointed out an area of new growth replanted after Hurricane David.

As we moved deeper into the forest, we heard the hauntingly pure two-note call of the *siffleur montagne*, or mountain whistler. The shy bird seemed to be keeping pace with us, though we never caught sight of it. (On another occasion I did have the rare experience of seeing a pair from about 15 feet away. Small and rather drab, their glory is in their song.)

We had to watch where we put our feet, but it was impossible not to stop and look up at the giants of the rain forest. Huge gommier trees, their smooth thick trunks rising like stone pillars 120 feet above the forest floor, and equally spectacular chataignier trees, anchored by massive buttress roots: These were goliaths that even David couldn't slay.

We paused for a bite and a breather at Breakfast River and checked our canteens. This was the last potable water we would encounter. From here we would scale 3,000-foot Morne Nicholls, then descend into the Valley of Desolation. Already there was a hint of sulfur in the air.

The trees grew smaller as we climbed, giving way finally to the stunted foliage known as elfin woodland. At the summit of Morne Nicholls, surrounded by peaks of startling green, I understood British author Alec Waugh's reaction to Dominica and its dominant color. He "had never thought of green as being a color that could dazzle you . . . that a single color could combine so many varieties of tone and texture." It did so now, everywhere I looked—except for a steaming slice of landscape below us.

After a difficult downhill scramble we

Hand-loaded onto Portsmouth barges (bottom), bananas face rough economic seas. Britain pays a premium for Dominican bananas—more than half the island's earnings—aid at risk in 1992 when Western Europe unifies into a single market. Close cousin to bananas, plantains ride high among Roseau traders.



Isolated in a steep mountain cleft, Petite Savanne rejoices during a ceremony last year inaugurating electrical service (below right). A new school has also lighted an educational lamp for the village's children.

entered the valley, which was anything but green. Virtually nothing grew amid its bare rocks, turned brown and red and yellow from noxious subterranean gases. What water there was ran milky white or ink black from minerals leaching to the surface. We passed vents in the ground that roared like jet engines. The noise and fumes suddenly brought to mind an incongruous image—the New Jersey Turnpike as it passes Newark Airport.

Up one last hill, around a bend, and we stood, exhausted, looking down into Boiling Lake. At first all we could see was a cloud of steam. Then a puff of wind revealed the bubbling belching gray caldron. The world's largest Jacuzzi, I thought, but a bit too warm for comfort. There is a tale of an unfortunate visitor who fell in and was quickly poached.

We broke out our peanut butter sandwiches and washed them down with a celebratory rum punch, complete with freshly grated nutmeg. Getting to the lake had been half the fun, and now seeing it was the other half. Which means that the trek back was no fun at all.

THERE ARE LESS TAXING REWARDS offered by what travel brochures call the "nature island of the Caribbean." Don a mask and snorkel, for instance, and jump in the water. Just about anywhere will do. Ten yards from my hotel room, I made the acquaintance of a pair of spotted moray eels.

For a deeper look I sought out Derek Perryman, who runs Dive Dominica. With coral gardens, sheer undersea walls, and window-pane visibility, Dominica was recently extolled by a U. S. diving magazine as one of the top dive spots in the world.

In Derek's 24-foot outboard, we sped toward Scotts Head at the island's southern tip, scattering leaping balao fish before us. We anchored, got into our scuba gear, and entered a boundless living aquarium. Sunlight played across the bottom, illuminating multitudes of fish of every conceivable color.

Derek tapped me and pointed to something





For two centuries her ancestors repelled European invaders; today Neil Valmond, a pure Carib, welcomes all to her home. About 3,000 Caribs live on a 3,700-acre reserve, where they build individual homes on communally held land. Most Caribs are farmers, but some still fish from hand-hewn dugout canoes.



above us. Silhouetted against the shining surface was a lone translucent squid. It remained motionless as we approached and let us stroke it for a few moments before it jetted into the blue distance. Back on board, Derek said that in all his years of diving, a squid had never allowed him to get so close.

Later he took me to a spot near shore where a hot spring tempers the sea's chill. Curtains of glistening air bubbles rose from the seafloor as I slowly flipped through the warm water toward a rocky beach. I clambered ashore to take a look at a cave Derek had pointed out. A few steps inside, I realized I was in deep guano. The cave was full of bats, big bats, squeaking and rustling in the semidarkness.

(They were fishing bats, and later I saw one in action. Relaxing by a hotel swimming pool one evening, I was surprised when a bat made several low passes over the pool, actually

disturbing the surface. Very confused bat, I thought, until I learned that the swimming pool had previously been an ornamental pool—stocked with fish.)

On the boat ride back Derek voiced concern about protecting Scotts Head from commercial overfishing. "There used to be big grouper and snapper all over the place," he said. "Now the local fishermen are barely making a living. Their sons will never make a living. We should set some of the area aside as a park, a marine nursery. It would be good for the fishermen and good for the divers."

THERE IS PRECEDENT. Such an underwater sanctuary has been established as part of the Cabrits National Park at Portsmouth in the north. Centerpiece of the park is the 18th-century ruin of Fort Shirley atop the Cabrits headland

Will Carib culture survive? Nell's granddaughter Mary weaves traditional Carib baskets to help support her daughter, Janice. But the strands of their language have been lost.

that stands guard over Prince Ruperts Bay, Dominica's finest harbor. The fort is being painstakingly restored by Lennox Honychurch, historian, author, artist, television talk-show host, and former member of parliament. He is 37 years old.

Lennox, tall, with a full mustache framing a ready smile, met me in Roseau in his four-wheel-drive pickup, and we headed for Portsmouth, about an hour away. "When I was a child," said Lennox, "we had to go by boat." Only in the past three decades has Dominica been sewn together with paved roads. Straightaways, however, are as rare as days without rainbows, and only the foolhardy neglect to sound a warning beep at each successive blind curve.

Winding along the coast, we passed through a string of small villages. Always there were more people on the road than vehicles. Everyone seemed to know Lennox, who stopped whenever he was flagged for a lift—one of the reasons he is immensely popular.

He is also immensely knowledgeable, pointing out high coral-laced cliffs raised from the sea by plate tectonics, and wild cotton, once used by the Caribs to make loincloths. The quiet fishing village of Colihaut, he noted, had been a lively center for French coffee planters, sporting 15 taverns.

At Portsmouth we dropped off our remaining passengers and turned onto the rough road to Fort Shirley. It's an impressive complex, with seven gun batteries and quarters for 600 men. Restoration is complete on several of the stone buildings, though many more await.

"It couldn't have been built without slave labor," said Lennox. "And it was such a deterrent that it was never involved in battle.

"Long before the fort, ships regularly stopped here to take on fresh water. Drake, Hawkins, Nelson—they all came here. The Jamestown settlers stayed two days before sailing for Virginia."

History will soon repeat itself, but this time ships will be unloading, when construction of a new cruise-ship dock is completed. Tourism



is a subject that Lennox views with caution.

"It needs to be upgraded," he said, "but it must be designed for this specialized market. We should never become like Antigua with its casinos and free ports, prostituting our island to anybody who can flash a little money.

"Dominica is a rural farming community. People cannot expect it to provide them with the U.S. life-style they see on TV. When Dominicans talk about their standard of living, they don't tend to take into account natural things, like being able to dive into a river and drink the water they're swimming in.

"What we have to do is narrow the gap between expectations and reality, through tourism but more through agro-processing—getting away from our monocrop and making products from our raw materials. Keep the money here and provide employment.

"Dominica," he said, "is at a crossroads,

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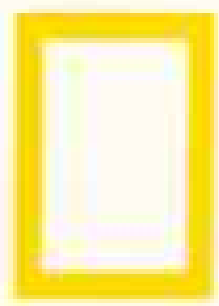
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Education Foundation

THE NATIONAL GEOGRAPHIC SOCIETY

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GTV: Video Power for Young Minds

Use the instant access of the videodisc to the interactivity of the computer and what do you get? A remarkable new teaching tool from the Society called GTV.

"With GTV I might have liked school," says film producer George Lucas, a member of the National Geographic Society Education Foundation's board. "Stimulation is the key to motivation."

Using software developed by Lucasfilm Learning Systems, teachers and students become "program directors" of lessons in American history by selecting segments from the wide variety of materials stored on GTV videodiscs and arranging them in any sequence.

superintendent Stan Herman dropped by, he found a stack of empty milk cartons in a hallway. "That's how much milk a baby whale drinks from its mother every day," explained a second grader. "We figured it out in math class."

Proximity to the Pittsburgh Zoo was one reason for the new emphasis, says superintendent Dick Wallace. Children enjoy the use of a discovery center built at the zoo by vocational students at city high schools. A grant from the Education Foundation helped out with teacher training and educational materials.

How's enrollment at the new school? Up from 405 to 535 students, says principal Paula Howard. The program is so popular it's being expanded to two middle schools. As one parent put it: "You cannot walk into that school without getting excited."

Kentucky Teachers Get a Helping Hand

Beginning this fall, fourth-grade teachers throughout Kentucky will be using a free resource guide on Kentucky studies. Working for more than a year under the guidance of the state's Department of Education and the Kentucky Geographic Alliance, educators collaborated to produce "Kentucky: A Geographical and Historical Perspective." The project was triggered by a three-year, \$300,000 commitment from the Education Foundation, the Kentucky Department of Education, and the Kentucky Educational Foundation. Support will also be used to develop resource guides in U.S. studies for the fifth grade and in world studies for the sixth grade.

Notes on Contributors: Making a Difference

Since the Education Foundation was launched in 1988, its assets have increased to more than 30 million dollars. Grants awarded in 1989 supported training in geography for 29,000 teachers.

Among recent contributors the Phil Hardin Foundation gave \$250,000 to create the Mississippi Geography Education Fund. Bell Atlantic gave \$750,000 to establish an endowment named for former Bell Atlantic CEO Thomas E. Bolger. Westvaco launched the Education Foundation's annual corporate support program last year with a five-year pledge totaling \$200,000. All three gifts were matched by the Society.

Tennessee students followed up their slogan, "Geography makes 'cents' for Tennessee," by presenting the Society with a wheelbarrow full of pennies. Their \$3,326—matched by the Society—was given on behalf of every student in the state.



FEACHAM HISTORICAL ASSOCIATION, FEACHAM, VERMONT

In the days of the one-room schoolhouse, students relied on blackboards and primers. Today history and geography come to life through the advanced technology of National Geographic's GTV videodiscs, which contain two hours of video segments with movie footage, 1,600 still images, and 200 maps.



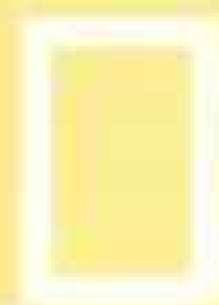
Classes in San Francisco's middle schools are having the first go with GTV, which was installed at 20 sites this spring thanks to contributions from Apple Computer, the Pacific Telesis Foundation, and the Society. The state of California provided substantial support to develop the GTV system.

Pittsburgh Dedicates a School to Geography

A great adventure is under way in Pittsburgh, where school officials have transformed a neighborhood elementary school into a laboratory of geographic education.

Children attending the Fulton Academy of Geographic and Life Sciences still learn the fundamentals. But their lessons are taught with a special emphasis on geography and the life sciences.

As part of a recent teaching unit, for example, students learned about whale habitats, sang songs about whales, and made paper whales in art class. When associate



Yellowstone Booming, Blooming After Fires

Visitors to Yellowstone National Park this summer will find a riot of wildflowers, close-to-normal animal populations, and huge numbers of their fellow humans. That's the word from scientists who have been closely monitoring the park's plants and animals since the giant fires of 1988.

"The lodgepole pine sprouted right on schedule last spring—the new forest has been born," says John Varley, the park's chief of research.

"The meadows were just glorious last summer," he continued. "Along the northern range where sagebrush grassland burned, it was by any measure the most wonderful wildflower show in any-

body's memory." Most of the flowers, fertilized by ashes, resprouted from root stocks. The show will be repeated this summer as flowers burst from last year's seeds. The burned forest floors, however, will take another few years to regain their ground cover.

Varley says that the park has had "an explosion of biological diversity." The fires spread in an uneven mosaic pattern, which promotes diversity of regrowth.

Small animals such as rodents survived at rates higher than expected. Elk and bison counts dropped by less than 20 percent; much of the mortality was due to a combination of 1988's drought conditions and the severe winter that followed rather than to the fires. Two grizzly bears are missing (or their radio collars are no longer transmitting), but no black bears seem to have been lost. Fish populations appear to be about normal. Large increases in the number of birds are expected after an insect boom that is currently under way. Visitors are booming too: 1989 was a record year for attendance.

Oh, yes. Varley had predicted in 1988 that mosquitoes would soon be back in force. Are they? "Absolutely," he says, "there's no shortage of them."

—DAVID JEFFERY

Author of "Yellowstone: The Great Fires of 1988," NATIONAL GEOGRAPHIC, February 1989



ONE YELLOW

The Potato Museum: No Half-Baked Idea

In the big-time museum world of Washington, D. C., it's small potatoes. But Meredith and Thomas Hughes hope that moving the Potato Museum away from the nation's capital will be the first step in turning it into a full-fledged, full-time food museum.

The Potato Museum originated from a project for a class Tom taught at the International School in Brussels, Belgium (NATIONAL GEOGRAPHIC, May 1982). He and his wife began collecting potato-related items, and when they moved to Washington in 1983, they put the collection in the basement of their town house, displaying it only by appointment.

They must vacate their town house this summer and hope to garner support to create a larger, better-funded home for their collection. Meredith and Tom are "serious but not solemn" about potatoes—they call the museum newsletter "Peelings." But they feel that scholars have neglected food, a fundamental part of everyday life. A major food museum, accessible to tourists and researchers, would help.

The Hugheses hope to work full-time tending their museum's library and archives. They also hope to expand the collection, which has everything from 4,000-year-old fossilized Peruvian potatoes and a photograph of Marilyn Monroe in a potato-sack dress to tape-recorded songs about potatoes and several sizes of—what else?—Mr. Potato Head.

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Giving Hmong Jobs in a California Factory

Funny," says Michal Reed, "that a national magazine could have such a positive effect on such a small, local concern."

Reed, a former teacher and writer, was starting to make and sell children's clothes with an educational theme in Porterville, California, when her October 1988 *GEOGRAPHIC* arrived. To her surprise she learned that Porterville was home to a largely unemployed group of Hmong refugees from Laos. She contacted Lao Chu Cha, whom the article named as the community's leader. Reed now employs half a dozen Hmong women in her small factory.

"They sew on pockets, they hem ready-made shirts that need to be altered, they change labels, they do some heat transferring—anything that I do," says Reed (below, at right).

The women, who receive welfare



JAMES A. DUGAN, BLACK STAR

assistance, work fewer than a hundred hours a month so they can retain their medical benefits, and they reimburse the welfare system for the amount of their factory earnings. Husbands, most of whom remain unemployed, take care of the children during working hours. The women are also practicing their English and setting an example: Several other Hmong women, and some husbands and daughters, hope to join them if the clothing line is successful.

Insights Into the Origin of the Mediterranean

Beachgoers look at shifting sands and see a different beach each day. Richard H. Benson looks at shifting continents over millions of years in order to understand how the Mediterranean Sea got to be where it is today.

Benson, a Smithsonian Institution

geologist, has been studying the sea's origin for more than two decades, directing a project sponsored by the Smithsonian and the National Geographic Society. Befitting his subject, he tells the tale in epic terms:

Europe and Africa bumped into each other some six million years ago. Huge channels were closed, ocean currents reversed themselves, and water poured through a corridor in Morocco to create a vast inland sea. The sea-water flowed through the passage with such power that it brought in ocean-dwelling organisms that now live 3,000 feet deep. But new continental movement closed the corridor, and the waters could not be replenished. Some 5.6 million years ago the inland sea—Benson calls it the Palaeomediterranean—began to dry up, leaving mineral deposits on the old seafloor for 700,000 years.

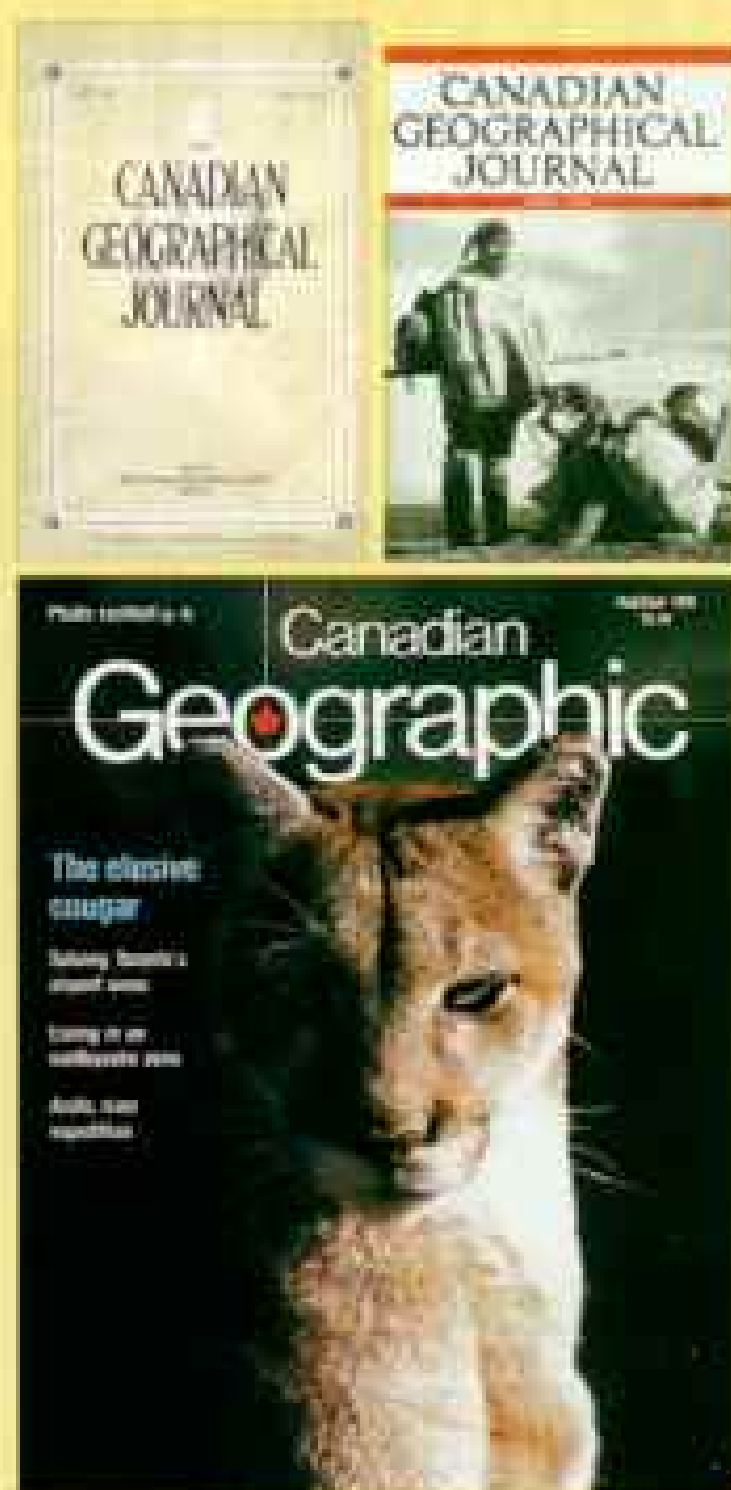
Then came the deluge. The earth shifted yet again, the dam was broken, a new opening was formed. It is what we who came 4.9 million years later know as the Strait of Gibraltar. Water once more poured in from the ocean, creating the Mediterranean Sea.

"Since then," says Benson, "the story isn't nearly as interesting."

Happy 60th Birthday, Canadian Colleagues

In 1929, when he founded a society devoted to the study of Canadian geography, Charles Camsell, a prominent Canadian geologist and explorer, looked southward for inspiration: to the National Geographic Society. The result was what is now called the Royal Canadian Geographical Society, whose publication, *Canadian Geographic*, marked its 60th anniversary in May.

Ian Darragh, the current editor of *Canadian Geographic*, writes that "as the National Geographic Society had done, Camsell announced that the



THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY

Canadian society would be 'open to anyone interested in geographical matters.' " It too would publish a popular monthly magazine, a subscription to which would be one of the main benefits of membership.

Darragh says that circulation of *Canadian Geographic*, now published bimonthly, is 255,000. "Our subject matter is basically Canada," he says. "Ours is such a vast country that we have enough stories to do without going elsewhere."

"We appeal to people from all walks of life," he adds. The magazine's role is "to explain what's going on in the world of research to the ordinary, educated, intelligent reader who isn't a specialist. Camsell wanted a magazine that would be understood."





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MICHAEL S. YEMAGISHI

Move a Lighthouse, Save a Landmark

For several decades the National Park Service has been fighting a losing battle with the Atlantic Ocean for possession of the Cape Hatteras National Seashore and its candy-striped landmark, the Cape Hatteras Lighthouse. In spite of efforts to replenish and protect the shoreline, coastal erosion has eaten away at the beach. Today only 250 feet of sand separates the lighthouse from the ocean, and sea level is expected to rise. Now the Park Service has a plan to move the lighthouse inland at least 500 feet—but not quite yet.

The plan, which could cost five million dollars, is based on a recommendation from the National Academy of Sciences. A committee from its National Research Council concluded that all other solutions were, at best, short term. Reinforcing the lighthouse and moving it along steel rails to a new foundation should protect it for a hundred years, at which time it could be moved again, the committee said.

Many residents of the Outer Banks (GEOGRAPHIC, October 1987) are dubious about the risks involved. Hugh Morton, head of the Save Cape Hatteras Lighthouse Committee, which urges erosion control, says the Park Service may "wind up with a pile of bricks." Robert M. Baker, the Park Service's regional director, says movement will not begin until the threat of losing the lighthouse to the sea "clearly outweighs the risks of loss during a relocation effort."



DAVID ALAN HARVEY

A Protected Status for Pygmy Pine Trees

Tiny pine trees. A dozen species of moths. The broom crowberry. This exotic combination can be found in the Bass River State Forest in New Jersey's Pine Barrens (GEOGRAPHIC, January 1974) and helps explain why a 3,800-acre tract has been made part of the state's Natural Areas System. New Jersey's Department of Environmental Protection now must make preservation of natural resources the key factor in deciding how the area is to be managed.

The tract, known as the West Pine Plains, is part of the pygmy forest, a notable feature of the Pine Barrens. In the 12,000 to 13,000 acres of sandy soil grow the same species of pine and oak trees found elsewhere in the Pine Barrens. But the plains trees, for reasons that defy definitive explanation, stand only three to ten feet high.

"The ecosystem of the plains is globally rare," says Robert Cartica, supervising planner in the state's Office of Natural Lands Management. For example, it contains a dozen moth species and a low-growing shrub called the broom crowberry, normally found farther north in the state.

The goal of the Natural Areas System is to preserve lands that support rare or endangered species, significant ecosystems, and wildlife habitats. The addition of the West Pine Plains brings the number of state natural areas to 42, totaling almost 30,000 acres.

Changing Patterns at Chaco Canyon

For centuries the passage of sunlight through a series of rock slabs in New Mexico's Chaco Canyon created an unusual effect on the longest day of the year: Rays of light formed a dagger shape that seemed to "pierce" the center of a spiral carved into the soft sandstone of Fajada Butte by the pre-Columbian Anasazi people (GEOGRAPHIC, November 1982). But

nature—and probably humans—have had their impact: The "sun dagger" will be seen no longer.

The spiral and the sunlight pattern were discovered in 1977 by Anna Sofaer, a Washington, D. C., artist. On the shortest day of the year, she found later, two vertical beams of light would bracket the spiral. The Anasazi, Sofaer believes, were demonstrating a sophisticated use of astronomy.

Last June Sofaer and her colleagues found that the old pattern had changed: The sunlight created different shapes because the center rock slab had shifted. The pattern was also altered during last December's winter solstice (below), Sofaer discovered.

A National Park Service study said erosion had caused the slab to move. But, the study added, visitors may have speeded up the process. Access to the "quite fragile" site should be limited, even to researchers, "unless promise of new and valuable information can be demonstrated," the report urged.



JIM RICKBROOK, WEST LIGHT

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



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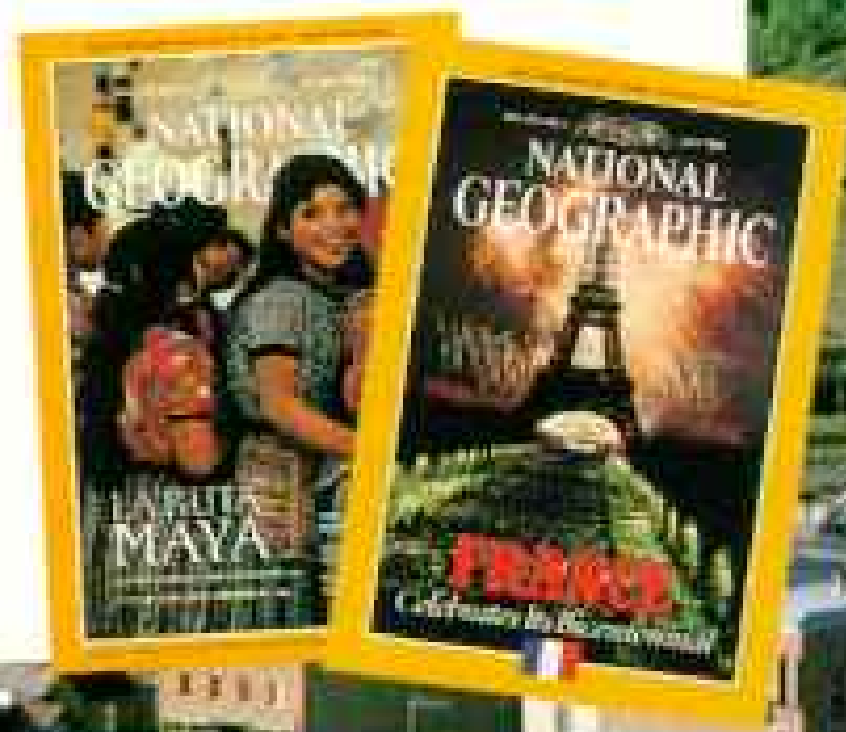
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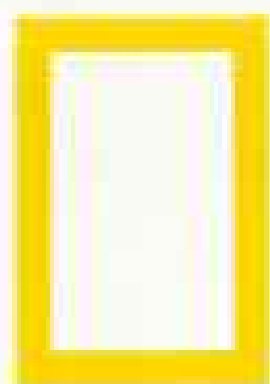
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Members Forum

U. S.-Canada Border

In "Common Ground, Different Dreams," a U. S. magazine has finally been able to capture the essence of the Canadian psyche (February 1990). Is Priit Vesilind an incognito Canadian? He describes with an insider's understanding the little twists and quirks that make up the Canadian identity. I would clarify one point. Handguns are restricted weapons in all Canada, not just Toronto.

MICHAEL BRASSARD
Etobicoke, Ontario

I found Vesilind's article disappointingly one-sided. We are represented as "fretting," "grousing," and even peeing spitefully over the border, not to mention streaming south to work, shop, drink, gamble, tan, and poach. Good grief. Where are the photos of the 13 million plus Americans who stream north every year? How about elaborating on what they come to see and do?

KAREN NELSON
*North Vancouver,
British Columbia*

Priit Vesilind points out that 20,000 Americans went to Canada during the Vietnam conflict, but he does not mention that more than 30,000 young Canadians came to the U. S. to serve in the armed forces during that conflict; I was one of them. The Vietnam Veterans Memorial in Washington, D. C., contains the names of at least 56 Canadians who died in the war.

LAWRENCE J. GAUGAN
Sterling Heights, Michigan

Your use of the phrase "Rambo and rap music" as symbols antithetical to Canadians was unfortunate, since the former was invented by a Canadian author, David Morrell.

GARY R. BRANNON
Waterloo, Ontario

How could anyone drive across North Dakota and not notice "Peace Garden State" on our license plate? That should have generated some curiosity about our International Peace Garden, on 2,339 acres given by Manitoba and North Dakota. In addition to beautiful formal gardens exhibiting 100,000 plants, the facilities are used for an international music camp that has been attended by 65,000 students so far. We are

indeed proud of our cooperation with Manitoba and the exceptional growth of the garden in the past 57 years.

ELDA HERMANSON
Minot, North Dakota

Many Canadians ignore the fact that the history of Canada is divided into three parts, each lasting roughly a century. Before independence and British domination Canada was a French colony. All those who get mad hearing *bonjour* should get mad at themselves for sharing the historical and geographical ignorance of so many North Americans.

PEDRO VERGARA
Benalmádena, Spain

I am quite certain that we Canadians know exactly who we are and where we are going. We are a very conservative people, and we do not have to resort to wearing the flag to show our patriotism. We celebrate Canada Day in our own way. We study American history in our schools, which is why we know more about Americans than they know of their neighbors to the north. Americans do not even know the names of our provinces, let alone cities.

A. A. KOHUT
Calgary, Alberta

Aral Sea

Your February article on the Aral Sea provided excellent coverage of one of the most unfortunate legacies of the old thinking in the Soviet Union, an attitude that was often expressed in the Stalin era as "declaring war on nature." The U.S.S.R. itself has emerged as the chief casualty.

PHILIP R. PRYDE
*Department of Geography
San Diego State University,
California*

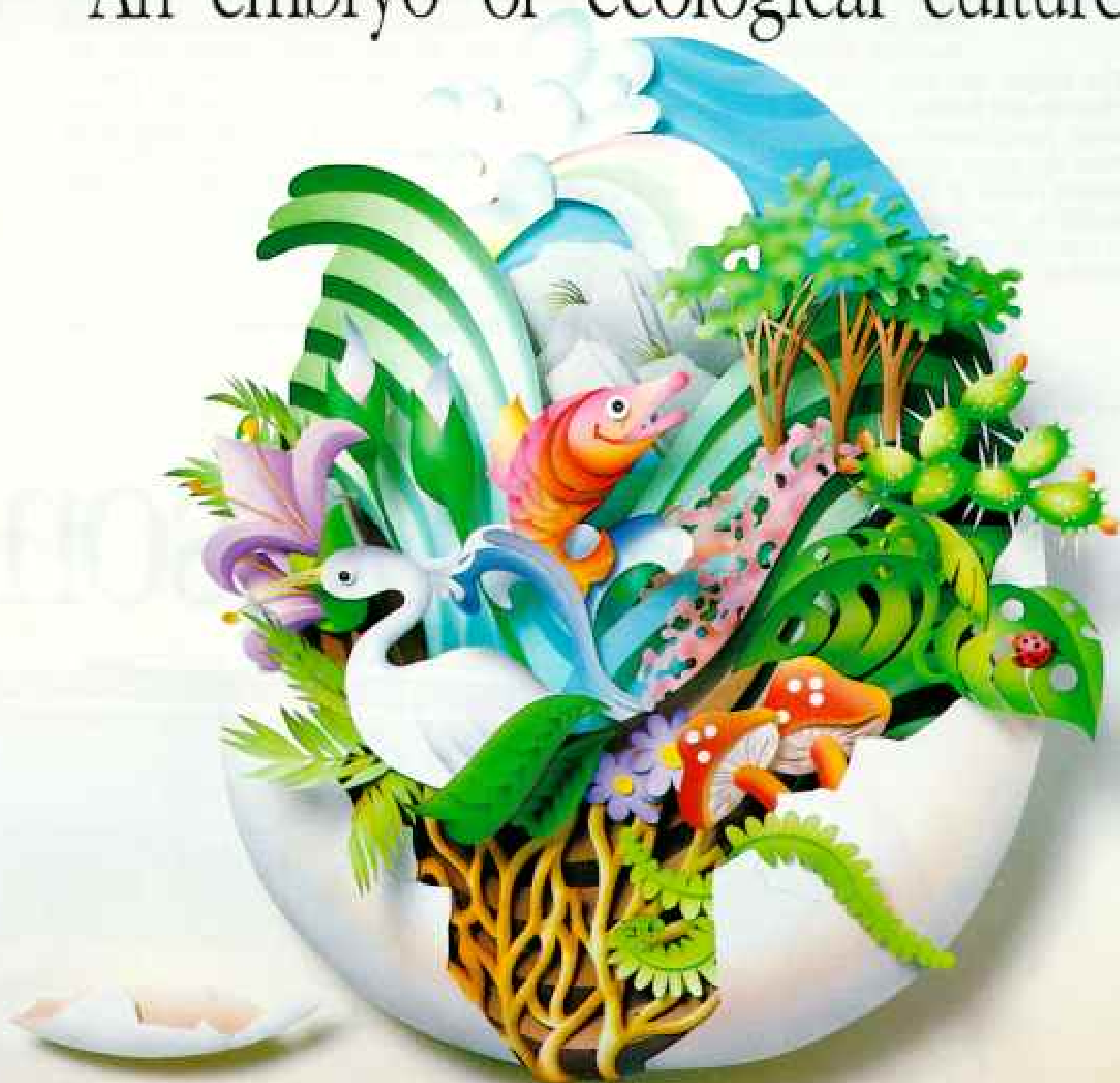
The future of the Aral Sea may have been prefigured in the demise of California's Owens Lake. In the late 19th century, steamboats laden with ore crossed it. Water diversions to Los Angeles dried up the Owens River and its terminal lake — one of the Great Basin's largest bodies of water — within a generation. For more than 50 years Owens Lake Bed has been a desert of salt and sand, occasionally generating intense salt storms like those seen near the Aral Sea.

THOMAS A. CAHILL
THOMAS E. GILL
*Crocker Nuclear Laboratory
University of California, Davis*

A similar situation happened in western Utah. Cram's atlas from 1917 shows Sevier Lake with water. Later maps show the lake as dry. It died due to diversion of water from the Sevier River.

LARRY DEMING
Cadillac, Michigan

An embryo of ecological culture



To all members of the human race

It is time to put aside the less important aspects of our existences and finally take on our responsibility as co-inhabitants of this indivisible, finite, and fragile, yet resilient environment we call Earth.

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Let us build "a better planet for children."

Sincerely yours,

México



A better planet
for children

WORLD ENVIRONMENT DAY

June 5, 1990, México

Beautiful Lake Chapala in Mexico has also lost much of its water to a metropolis, Guadalajara. Isn't there a solution?

JOHN U. NATTKEMPER
Martinez, California

The author cites lines from Matthew Arnold's "Sohrab and Rustum," terming it Arnold's epic work. Arnold merely took one dramatic episode from the great national epic of Persia, *Shah-nameh (Book of Kings)*—written by Firdawsi mostly in the tenth century (and nine volumes in translation)—reworked it, and published the result as "Sohrab and Rustum."

NOLAN FOWLER
Cookeville, Tennessee

I was disturbed to read the caption on page 84: "Another anemic child nurses, despite repeated warnings that even mother's milk . . . is contaminated." This mother deserves to be commended for making the best possible choice under extremely difficult conditions. Any animal milk in the area will be at least as contaminated. Expensive commercial formula generally needs to be mixed with water that is questionable. There is no adequate substitute for the perfect nutrition and lifesaving immunities of breast milk.

JAYE GULLICKSON
Barons, Alberta

Monterey Bay

While the article and marvelous photographs

Ask the person



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"Sure, I'm your typical 90's mother all right. Full time job. Full time mom. And a Caravan in the garage. Too much to do. Too little me.

"Get the kids to school, our two plus three more from down the street. With volleyball afterwards. Not to mention groceries. Pick up a load of furniture down in Ohio. And my husband's carting an exhibit to Wisconsin.

"Then skiing in Colorado at Christmas. With our

captured the breathtaking beauty and productivity of Monterey Bay, no mention was made of its pending designation as a national marine sanctuary. This remarkable area is one of ten sites being considered for the protective program run by the National Oceanic and Atmospheric Administration; eight marine sanctuaries now exist.

RACHEL T. SAUNDERS
*Center for Marine Conservation
San Francisco, California*

NOAA's Marine and Estuarine Management Division will hold public hearings this spring and summer to consider major protective regulations.

You would have done well to talk to local residents. Many of us feel the aquarium is one of the worst things to happen to Monterey and the bay. Traffic jams are now routine. The added noise, pollution, and water shortages have made a noticeable impact on the quality of life. Parklands have borne the brunt of the weekend population explosion. The grand tide pool in Pacific Grove suffers the visits of uncounted shell collectors, most of whom don't seem to mind that the animal hasn't finished using the shell yet. It's disheartening to see a busload of schoolchildren wading in with empty milk jugs collecting everything in sight. In short, although the aquarium

who drives one.



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Lyndsay over who sits in the wayback!

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And our research
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in the sun.



733 Third Ave., New York, NY 10017

was conceived with the best intentions, little thought was given to the problems created.

DALE GALAROWICZ
Monterey, California

Athapaskans

The outstanding photographs by Don Doll in the February issue illustrate the beauty that only the simplicity of black and white can bring forth. It presents a marvelous balance with the color.

GEORGE R. CAMPBELL
Marietta, Georgia

The reality, beauty, and color of the north have been lost in these photographs. One could assume that they are old and not representative of the 1980s. I do not feel this pictorial treatment does justice to the Athapaskans.

SHEILA MCMORRAN
Halifax, Nova Scotia

The article triggered fond memories. I spent the winter of 1938-39 in Nulato, one of the most interesting times in my life. Names in the article belong to children and grandchildren of people I knew. Given the mess we have made of our civilization, we didn't know how good it was then.

MAURICE SMITH
Anacortes, Washington

Chestnuts

We appreciated the refreshing optimism and fine photographs in "Chestnuts—Back From the Brink." Perhaps readers would be interested to learn the reasons for grafting American chestnut scions into Chinese chestnut stumps. The grafted scions grow and mature twice as rapidly as trees grown from seeds, and graft unions near ground level are easily protected when new shoots grow up. Some grafts of resistant American intercrosses made in 1986 were 18 feet tall at the end of the 1989 season and produced 56 seed nuts.

LUCILLE GRIFFIN
*American Chestnut
Cooperators' Foundation
Newport, Virginia*

A caution to enthusiasts who would assist in the preservation of this woodland marvel. You must have the proper soil—acidic, sandy loam—or the trees just will not grow. I know. I've tried.

TOM ATKINSON
*President, Canadian
Wildflower Society
Islington, Ontario*

.....
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A RESEARCH PSYCHOLOGIST discovered that systematically increasing the number of rats in an enclosed space eventually drives these normally socially responsible animals to unsocial, destructive behavior.

Our own species is not immune to such ills, and you can confirm the parallel by looking at the deteriorating health standards and shocking increase in violence and killing as our inner cities grow more crowded, ugly, and dilapidated.

Five years ago—in an act that might seem unrelated—President Reagan established a commission of 15 distinguished and concerned Americans to make recommendations on use of our outdoors. Tennessee Governor Lamar Alexander was chairman and National Geographic Society President Gilbert Grosvenor served as vice chairman of the President's Commission on Americans Outdoors.

Traveling the nation and listening to thousands of Americans, the commission became increasingly concerned. It urged lighting a "prairie fire" of community action to protect the environment and provide more green spaces and better protection of those we have. This fiscally conservative group called for the federal government to create an outdoor trust from sale of nonrenewable mineral rights that would ultimately yield a billion dollars a year for environmental enhancement. Shocking! As if the group had betrayed a trust, the report was quashed. An injunction barred its release. The President never saw the full text. It was bureaucratically gutted; only selected points were incorporated in a White House report. The administration took no action on any key point.

But die aborning it did not. Governor Alexander's dream of a prairie fire of action was not totally extinguished. Paul Pritchard, adviser to the commission and president of the National Parks and Conservation Association, released his copy of the report to the press, and Gilbert Grosvenor produced and distributed a beautifully illustrated executive summary. Citizen groups and local governments began to act. Both President Bush and Michael Dukakis praised the report during the 1988 campaign. The number of private land trusts has risen 30 percent since it was released.

As environment editor Noel Grove reports in this issue, a key proposal—to create networks of greenways—has caught on and is already changing the appearance and attitude of dozens of communities. Fears that urban trails would channel violence beyond the inner city seem unfounded.

If converting blighted and unused spaces into parks and trails can relieve explosive pressures in our ghettos, the seemingly high cost of the commission's recommendations will prove to be, rather than a tax dollar drain, a wise and critically needed investment in our quality of life.

Wilbur E. Garrett
EDITOR



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America's 112 nuclear electric plants already have cut foreign oil dependence by 4 billion barrels since the oil embargo of 1973, saving us \$115 billion in foreign oil payments.

But 112 nuclear plants will not be enough to meet our rapidly growing demand for electricity. We need more plants,

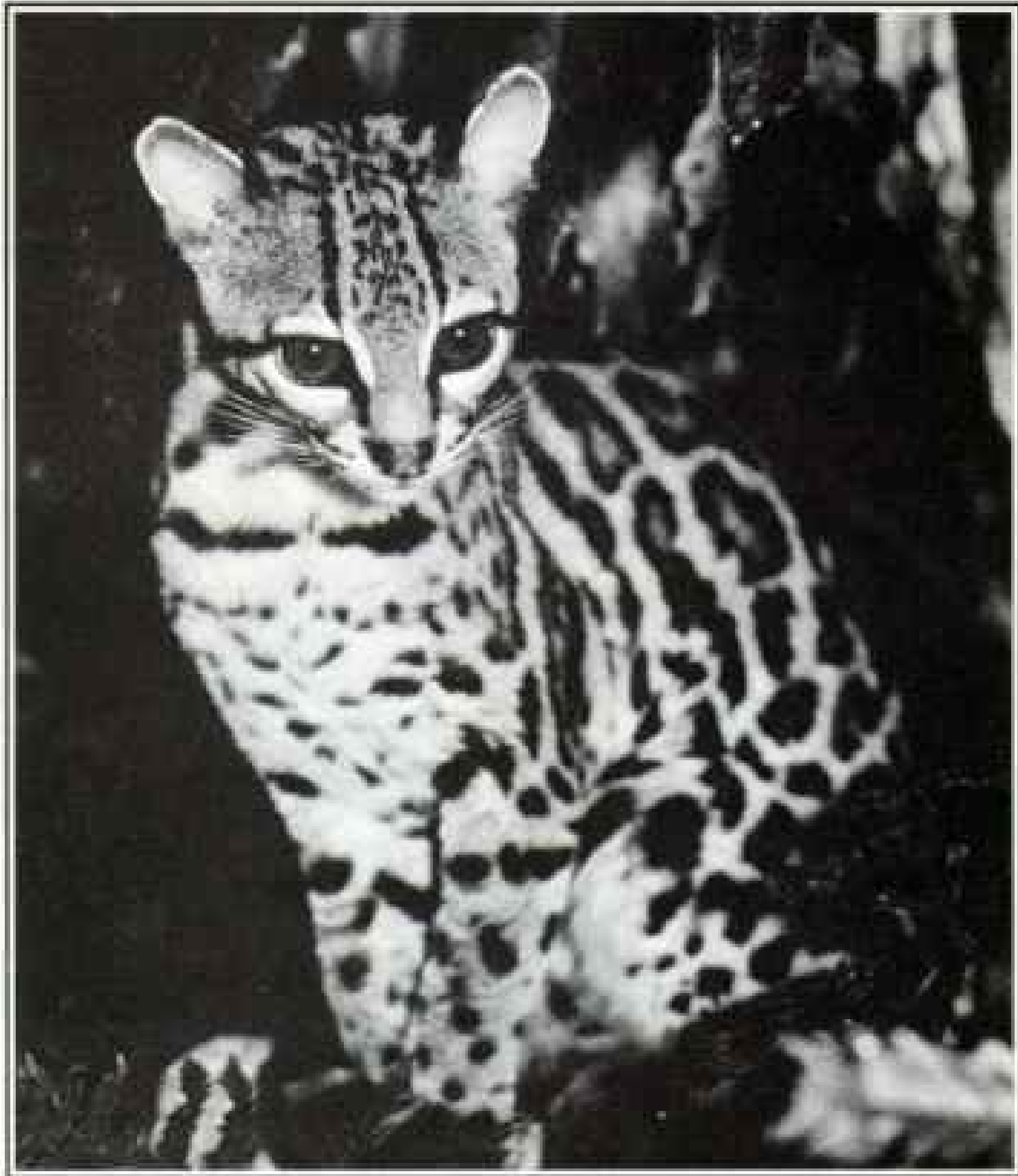
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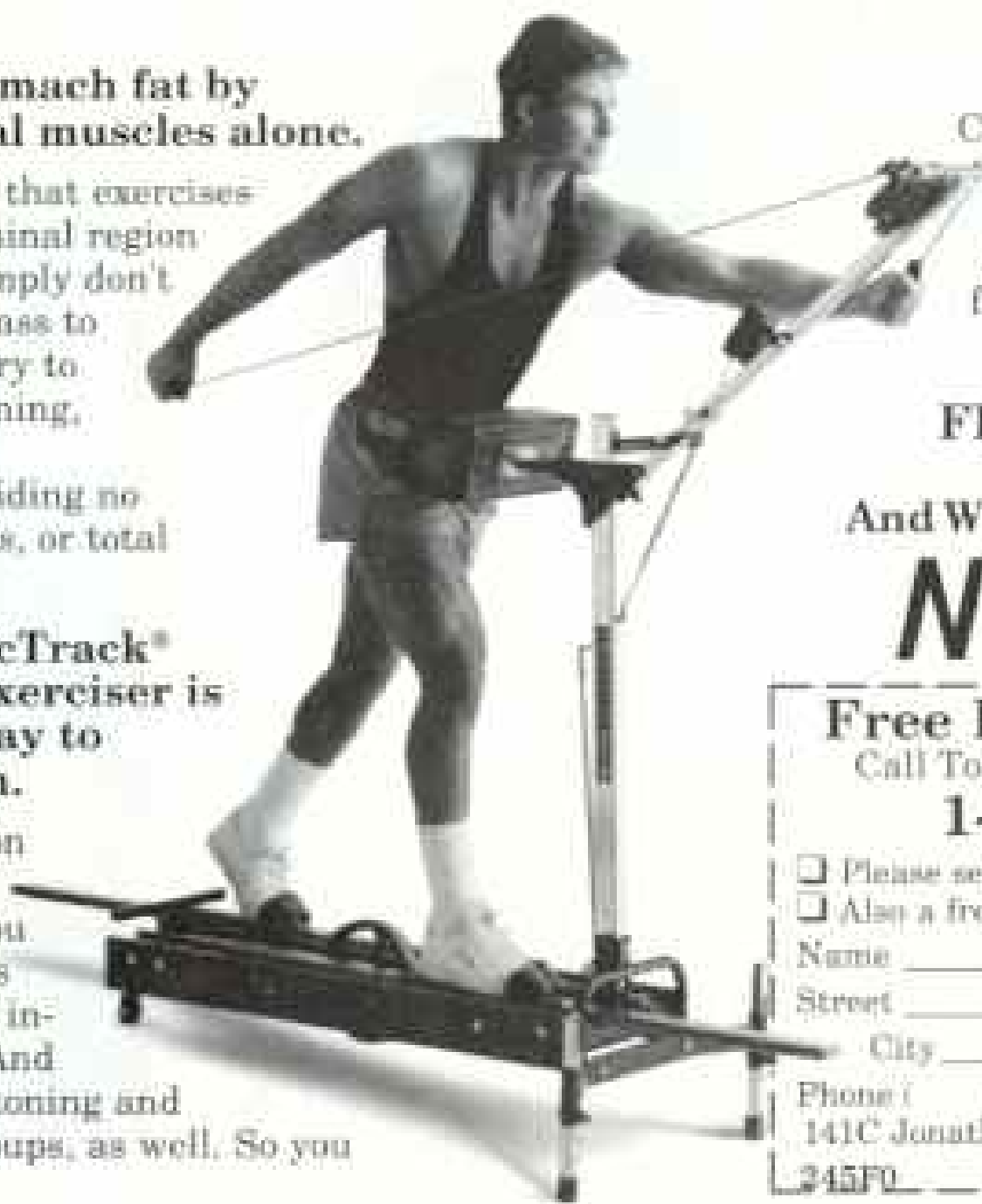
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On Assignment



the place, and she left with a new pair of cowboy boots, a taste for barbecued-chicken enchiladas, and warm feelings for a city with a heart as big as all Texas.

Bob's career at the magazine began 16 years ago, after graduation from American University and a short run as a shopping mall Santa Claus. Hired as an intern in *Legends*, he was promoted to issue editor 18 months later.

The father of a five-year-old, Bob was charmed by Dominica's children, who rush off to school each day in crisp, clean uniforms. "Even the mother who sells mangoes in the street makes sure her child looks great."

Staff photographer BRUCE DALE, whose pictures accompany Bob's text, was similarly captivated—and literally so by two youngsters who sneaked a peek through his camera (below). When his wife, Joyce, who visited the island with him, learned that textbooks were in short supply and years out of date, she rounded up and sent 7,000 used math, science, and reading textbooks from the Arlington, Virginia, school system. And more are on the way.

VICTOR R. BOGUELL, JR., (TOP LEFT); JEFFREY DALE



HAVE YOU SEEN the circus act in which a juggler spins dozens of plates on poles, then runs from pole to pole trying to keep everything in the air? Editors BETSY MOTZE and BOB BOOTH, here checking page proofs for the cover story on Austin, replayed that performance in helping to produce this month's issue.

Betsy, author of the Austin story, put the finishing touches on her text, then switched to her role as *Legends* Editor to oversee picture captions in the issue.

Likewise, Bob, whose coverage

of Dominica begins on page 100, did double duty as the issue editor for Betsy's story and the greenways article. An issue editor shepherds a story through production, balancing the interests of author, researcher, and others.

For Betsy, a 31-year veteran of the *Geographic* and *Legends* Editor since 1986, the Austin assignment meant returning to a city she hadn't visited for 37 years.

"I'd lived in Dallas as a young girl but had never been to Austin except on a high school trip," she says. This time she stayed to savor



WILDLIFE AS CANON SEES IT



Whooping Crane

Genus: *Grus*

Species: *americana*

Adult size: Stands about 1.5m; wingspan, 2.1m

Adult weight: 6-8kg

Habitat: Wetlands and grasslands; winters in Texas, U.S.A.; breeds in Northwest Territories, Canada

Surviving number: Estimated at 200 (150 in the wild)

Photographed by Tom Bean

Gusty winds ruffle the feathers of a whooping crane fishing the rich tidal flats on Texas' Gulf coast. By the 1940s the total number of cranes had dropped to 20, a result of habitat loss and hunting. Through management and protection, whooping cranes now number nearly 200. Captive breeding to reestablish populations in the wild offers further hope for this elegant bird. To save endangered species, it is essential to protect their habitats and understand the vital role of each species within the earth's ecosystem. Photography, both as a scientific research tool and as a means of communication, can help promote a greater awareness and understanding of the whooping crane and our entire wildlife heritage.



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