



Spirits in the Sand

The ancient Nazca lines of Peru shed their secrets

From the air, the lines etched in the floor of the desert were hard to see, like drawings left in the sun too long. As our pilot cut tight turns over a desert plateau in southern Peru, north of the town of Nasca, I could just make out a succession of beautifully crafted figures.

“Orca!” shouted Johny Isla, a Peruvian archaeologist, over the roar of the engine. He pointed down at the form of a killer whale. “*iMono!*” he said moments later, when the famous Nasca monkey came into view. “*iColibrí!*” The hummingbird.

Since they became widely known in the late 1920s, when commercial air travel was introduced between Lima and the southern Peruvian city of Arequipa, the mysterious desert drawings known as the Nasca lines have puzzled archaeologists, anthropologists, and anyone fascinated by ancient cultures in the Americas. For just as long, waves of scientists—and amateurs—have inflicted various interpretations on the lines, as if they were the world’s largest set of Rorschach inkblots. At one time or another, they have been explained as Inca roads, irrigation plans, images to be appreciated from primitive hot-air balloons, and, most laughably, landing strips for alien spacecraft.

After World War II a German-born teacher named Maria Reiche made the first formal surveys of the lines and figures—called geoglyphs—outside Nasca and the nearby town of Palpa. For half a century, until her death in 1998, Reiche played a critically important

role in conserving the geoglyphs. But her own preferred theory—that the lines represented settings on an astronomical calendar—has also been largely discredited. The ferocity with which she protected the lines from outsiders has been adopted by their caretakers today, so that even scientists have a hard time gaining access to the most famous animal figures on the plain, or pampa, immediately northwest of Nasca.

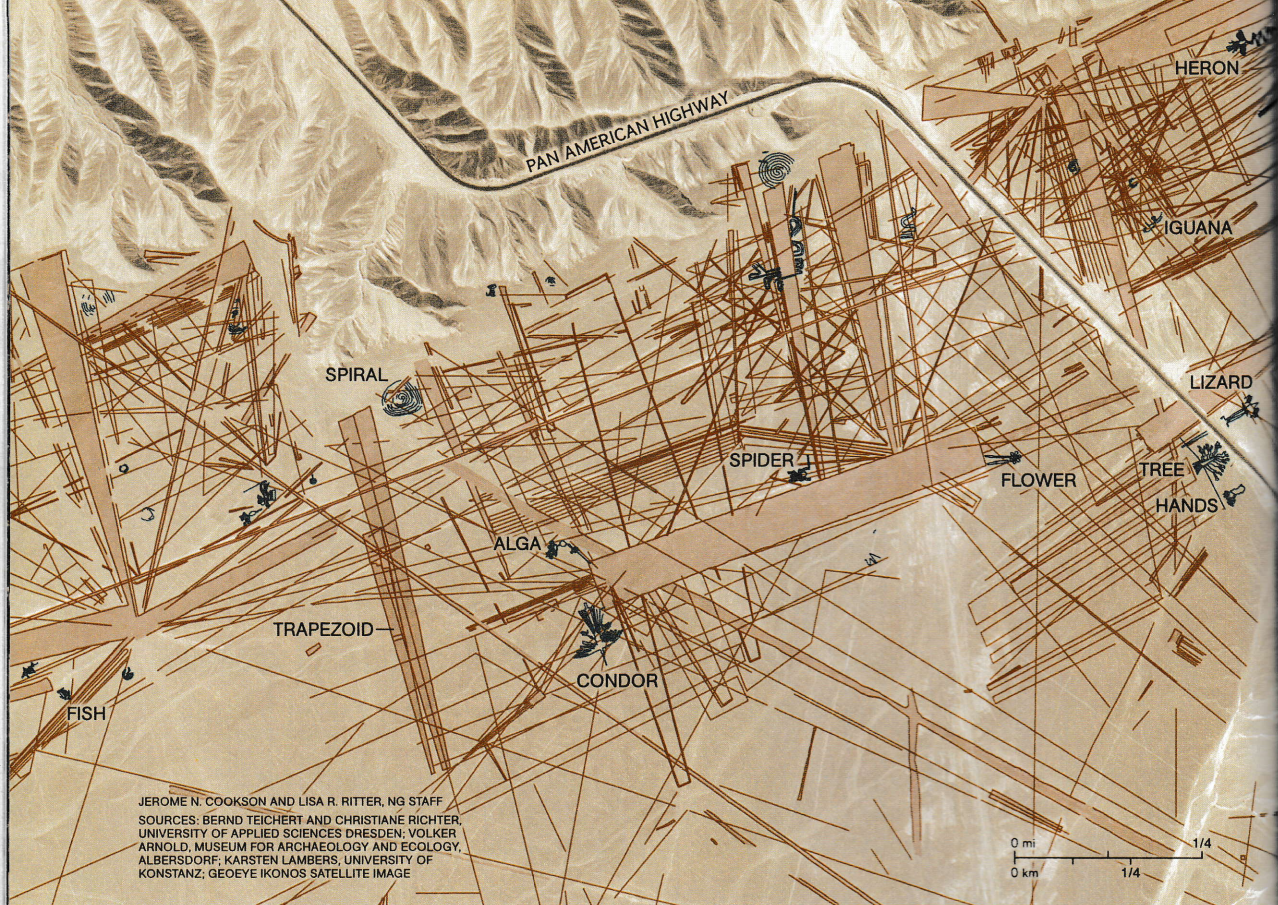
Since 1997, however, a large Peruvian-German research collaboration has been under way near the town of Palpa, farther to the north. Directed by Isla and Markus Reindel of the German Archaeological Institute, the Nasca-Palpa Project has mounted a systematic, multidisciplinary study of the ancient people of the region, starting with where and how the Nasca lived, why they disappeared, and what was the meaning of the strange designs they left behind in the desert sand.

As our plane banked into another turn, Isla, a native of the highlands who works at the Andean Institute of Archaeological Studies, kept his broad, high-cheeked face pressed to the window. “Trapezoid!” he shouted, pointing out a huge geometrical clearing looming into sight. “Platform!” he added, gesturing with his finger. “Platform!”

Platform? He was pointing at a small heap of stones at one end of the trapezoid. If Isla and his colleagues are right, such unprepossessing structures

This depiction of a giant bird, with a long, pointed beak and wings spanning 220 feet, may evoke tiny hummingbirds that flitted through irrigated fields.





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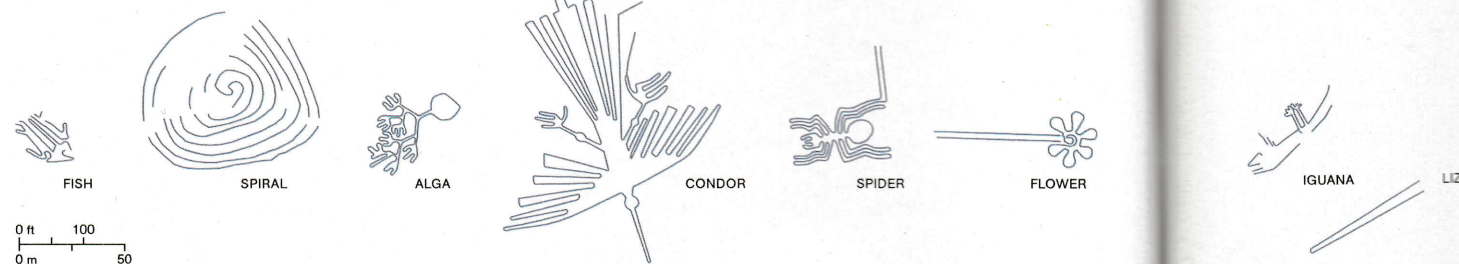
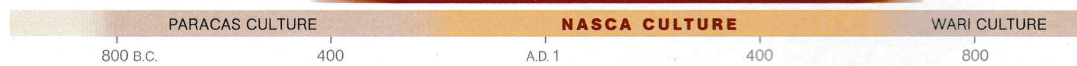
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Desert Mystery

Thousands of designs adorn some 1,500 square miles of desert in southern Peru (right). Created over more than a millennium (time line, below), they include dozens of naturalistic figures like those pictured at bottom. Lines and trapezoids were added later (above). No one knows for sure what the designs meant or why they changed over time, but they likely played a crucial part in the rituals of people who prayed for rain to fall in the Andes, to the east, and flow down to their fields.



GEOGLYPH CONSTRUCTION



may hold a key to understanding the true purpose of the Nasca lines. The story begins, and ends, with water.

THE COASTAL REGION of southern Peru and northern Chile is one of the driest places on Earth. In the small, protected basin where the Nasca culture arose, ten rivers descend from the Andes, to the east, most of them dry at least part of the year. These ten fragile ribbons of green, surrounded by a thousand shades of brown, offered a fertile hot spot for the emergence of an early civilization, much as the Nile Delta or the rivers of Mesopotamia did. "It was the perfect place for human settlement, because it had water," says geographer Bernhard Eitel, a member of the Nasca-Palpa Project. "But it was a high-risk environment—a very high-risk environment."

According to Eitel and his University of Heidelberg colleague Bertil Mächtle, the microclimate in the Nasca region has oscillated dramatically over the past 5,000 years. When a high-pressure system over central South America called the Bolivian High moves to the north, more rain falls on the western slopes of the Andes. When the high shifts southward, precipitation decreases, and the rivers in the Nasca valleys run dry.

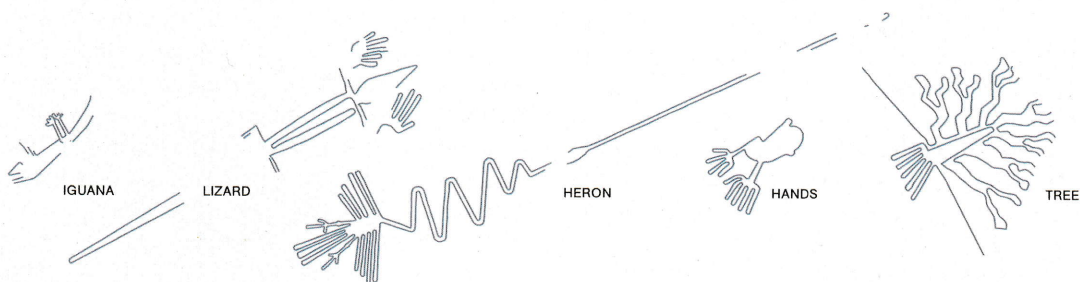
Despite the risky conditions, the Nasca flourished for eight centuries. Around 200 B.C., the Nasca people emerged out of a previous culture known as the Paracas, settling along the river valleys and cultivating crops such as cotton, beans, tubers, lucuma (a fruit), and a short-eared form of corn. Renowned for their distinctive pottery, they invented a new technique of mixing about a dozen different mineral pigments in a thin wash of clay so that colors could

be baked into the pottery. A famous ceramic tableau known as the Tello plaque—showing several Nasca strolling while blowing their panpipes, surrounded by dancing dogs—has been viewed as an iconic snapshot of a peaceful people whose rituals embraced music, dance, and sacred walks.

The theocratic capital of early Nasca times was a sand-swept mecca called Cahuachi. The site, first excavated in the 1950s by Columbia University archaeologist William Duncan Strong, is a vast, 370-acre complex featuring an imposing adobe pyramid, several large temples, broad plazas and platforms, and an intricate network of connecting staircases and corridors. In their 2003 book on Nasca irrigation systems, archaeologist Katharina Schreiber of the University of California, Santa Barbara, and Josué Llancho Rojas, a local schoolmaster and historian, point out that the Nasca River, which goes underground about nine miles to the east, resurfaces like a spring on the doorstep of Cahuachi. "The emergence of water at this point," they write, "was almost certainly regarded as sacred in prehistoric times."

"Cahuachi was a ceremonial center," says Giuseppe Orefici, an Italian archaeologist who has led the excavation for many years. "People came here from the mountains and from the coast, bringing offerings." Among the artifacts unearthed were dozens of severed heads, typically with a braided rope strung through a hole drilled in the forehead, perhaps to allow the skull to be worn around the waist.

Elsewhere in the Nasca realm, people moved east or west along the river valleys as rainfall patterns shifted. The Peru-German archaeological initiative has explored the region from the





Beneath the guiding hand of archaeologist Alberto Urbano, a snaking path traces an enigmatic figure that was meant to be walked on, as apparently were all the Nasca lines. At a distance (top right) Urbano paces the width of a trapezoid that cuts through the continuous swirls.

Pacific coast to altitudes of nearly 15,000 feet in the Andean highlands. Almost everywhere they have looked they have found evidence of Nasca villages—“like pearls in the valley margins,” says Reindel. “And near every settlement we find geoglyphs.”

THE PARCHED DESERT and hillsides made an inviting canvas: By simply removing a layer of dark stones cluttering the ground, exposing the lighter sand beneath, the Nasca created markings that have endured for centuries in the dry climate. Archaeologists believe both the construction and maintenance of the lines were communal activities—“like building a cathedral,” says Reindel.

In the hyperarid southern valleys, early Nasca engineers may have also devised a more practical way of coping with the scarcity of water. An ingenious system of horizontal wells, tapping

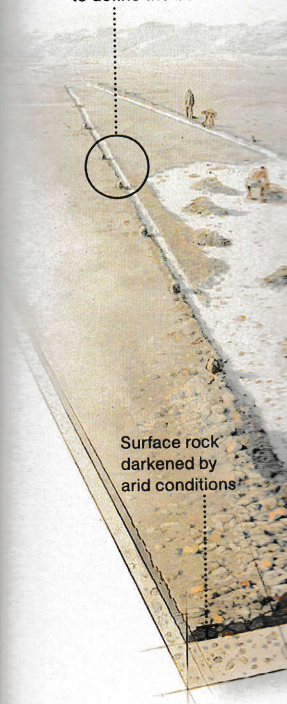
into the sloping water table as it descends from the Andean foothills, allowed settlements to bring subterranean water to the surface. Known as *puquios*, these irrigation systems still water the southern valleys.

Perhaps because of the adversity they faced, the Nasca people seem to have been remarkably “green.” The creation of the *puquios* displayed a sophisticated sense of water conservation, since the underground aqueducts minimized evaporation. The farmers planted seeds by making a single hole in the ground rather than plowing, thus preserving the substructure of the soil. During a visit to a Nasca site called La Muña, Isla pointed out layers of vegetative matter in the walls of buildings and terraces that marked the rocky hillside settlement. The Nasca, he said, recycled their garbage as building material. “It’s a society that managed its resources very well,” he said. “This is what Nasca is all about.”

Constructing the

LINEAR (Based on evidence)

1 The design is marked off with large stones. The surface layer of dark rock is removed to define the border.





Constructing the Geoglyphs

LINEAR (Based on evidence from unfinished geoglyphs)

1 The design is marked off with large stones. The surface layer of dark rock is removed to define the border.

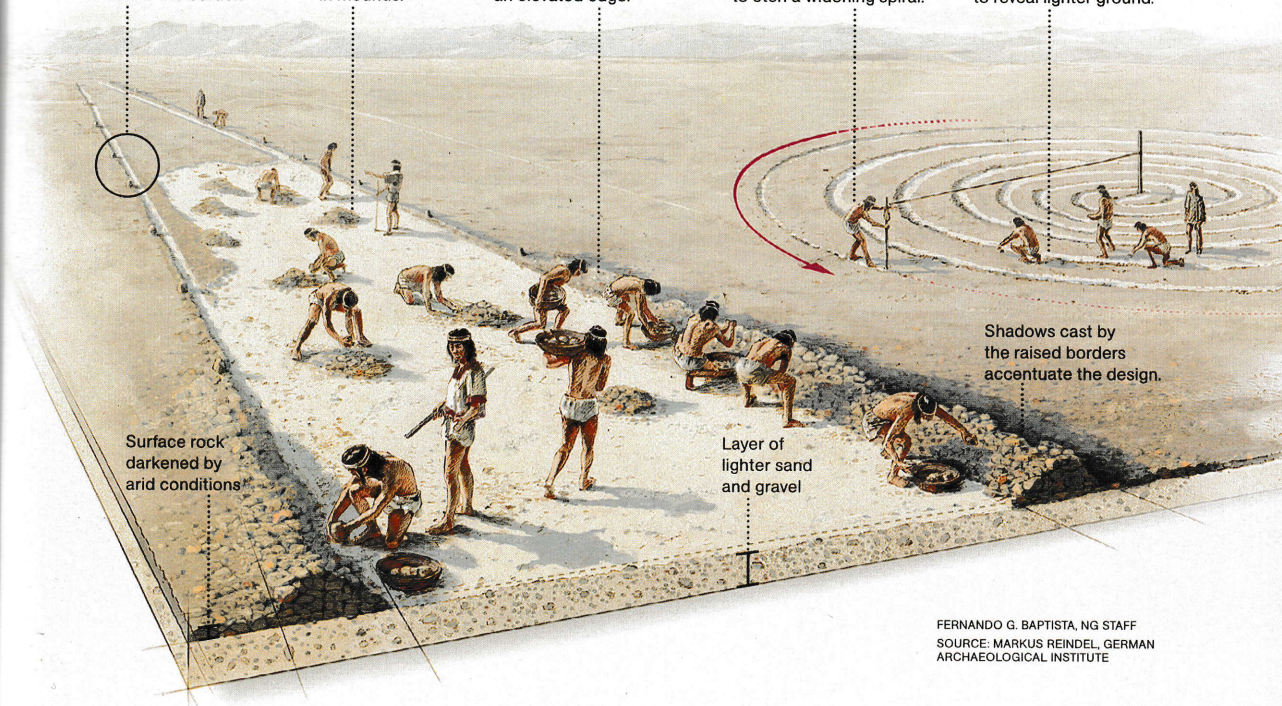
2 The interior is cleared of dark rocks, which are collected in mounds.

3 The mounds of surface rocks are distributed along the border to form an elevated edge.

SPIRAL (Archaeologists' theory)

1 A rope wrapped around a handheld stick and tied to a center pole is incrementally let out to etch a widening spiral.

2 A second spiral is traced within the first. Rocks on the edge of each track are cleared to reveal lighter ground.



FERNANDO G. BAPTISTA, NG STAFF
SOURCE: MARKUS REINDEL, GERMAN
ARCHAEOLOGICAL INSTITUTE



A revered *huarango* tree sprouts above a human face on this jar from La Tiza. Found in a tomb beside a decapitated body, the vessel may have served as a proxy for a head severed in a sacrifice. Near Cerro Blanco a desiccated *huarango* (right) stands as a reminder of the groves that once offered cooling shade. Some scientists now believe the Nasca made the land drier by clearing it for farming.



TO MOST PEOPLE TODAY, Nasca is all about the lines. But although the Nasca were certainly the most prolific makers of geoglyphs, they were not the first. On a hillside abutting a plateau south of Palpa sprawl three stylized human figures, with buggy eyes and bizarre rays of hair, that date to at least 2,400 years ago—earlier than almost any textbook date for the start of the Nasca civilization. Reindel's group has attributed no fewer than 75 groups of geoglyphs in the Palpa area to the earlier Paracas culture. These Paracas geoglyphs, which often depict stylized humanlike figures, in turn share distinct visual motifs with even earlier images carved in stone, known as petroglyphs. During a recent foot survey of a suspected Paracas site high in the Palpa River Valley, Isla came across a petroglyph of a monkey—a surprising, earlier incarnation of the famous Nasca geoglyph he had pointed out to me on the pampa below our plane.

Stephen Hall's latest book, Wisdom: From Philosophy to Neuroscience, is due out this month from Knopf. Robert Clark is a frequent contributor.

These new findings make an important point about the Nasca lines: They were not made at one time, in one place, for one purpose. Many have been superimposed on older ones, with erasures and overwritings complicating their interpretation; archaeologist Helaine Silverman once likened them to the scribbling on a blackboard at the end of a busy day at school. The popular notion that they can be seen only from the air is a modern myth. The early Paracas-era geoglyphs were placed on hillsides where they could be seen from the pampa. By early Nasca times the images—less anthropomorphic, more naturalistic—had migrated from the nearby slopes to the floor of the pampa. Almost all of these iconic animal figures, such as the spider and the hummingbird, were single-line drawings; a person could step into them at one point and exit at another without ever crossing a line, suggesting to archaeologists that at some point in early Nasca times the lines evolved from mere images to pathways for ceremonial processions. Later, possibly in response to explosive population growth documented by the German-Peruvian

team, more people performed these rituals, and the geometrical patterns stretched more than 100 miles. Reindel says, "is that they can no longer be seen anymore, but they were used for religious purposes."

Those ancient ancient traces in the ground were discovered in 2007 by Tomasz Górecki, a physicist at the Bartolomeo Observatory and the Earth's magnetic field. In Yunama, a village near the lines nearby. Subtle magnetic signal indicated the compacted by human platforms. Karsten Schreiber of the Nasca-Palpa collected positional data of sight lines and geoglyphs. The data showed other geometric shapes they would be visible



team, more people may have participated in these rituals, and the geoglyphs took on open, geometrical patterns, with some trapezoids stretching more than 2,000 feet. “Our idea,” Reindel says, “is that they weren’t meant as images to be seen anymore, but stages to be walked upon, to be used for religious ceremonies.”

Those ancient acts of worship have left their traces in the ground itself. Between 2003 and 2007 Tomasz Gorka and Jörg Fassbinder, geophysicists at the Bavarian State Department of Monuments and Sites, took measurements of the Earth’s magnetic field on a trapezoid near Yunama, a village outside Palpa, and on other lines nearby. Subtle perturbations in the magnetic signal indicated that the soil had been compacted by human activity, especially around the platforms. Karsten Lambers, another member of the Nasca-Palpa Project, had meanwhile collected positional data and precise measurements of sight lines across hundreds of geoglyphs. The data showed that the trapezoids and other geometric shapes were constructed where they would be visible from a number of vantage

points. The team concluded that they were places where “social groups acted and interacted, and spectators in the valleys and on other geoglyph sites were able to watch and observe.”

CERRO BLANCO, among the tallest sand dunes in the world, rises pale and stark out of the surrounding bowl of sere Andean foothills, dominating the physical and spiritual landscape of the southern Nasca valleys. For centuries the Andean people have worshipped deities embodied in mountains such as Cerro Blanco. According to Johan Reinhard, a National Geographic explorer-in-residence, the mountains have traditionally been associated—mythologically, if not geologically—with water sources. The Nasca potsherds littering the path to the summit of Cerro Blanco would suggest the connection runs deep into the past.

In 1986 Reinhard reported finding ruins of a ceremonial stone circle at the summit of Illakata, at over 14,000 feet one of the tallest mountains feeding runoff to the Nasca drainage system. Along with other traces of ritual activity



at the top of Nasca watersheds, the discovery led him to propose that one of the main purposes of the Nasca lines was related to the worship of mountain deities, including Cerro Blanco, because of their connection to water.

Recent research has bolstered the hypothesis. In the highlands farther north, where wild vicuñas wander near the headwaters of the Palpa River, I joined Reindel and his team on a scramble to the top of a sacred mountain known locally as Apu Llamoca. (In the indigenous language, *apu* is the word for “deity.”) At the summit of this dark volcanic dike, Reindel showed me a worship circle with ceramic potsherds the team had found in 2008 and nearby, a semicircular structure almost exactly like the one Reinhard had reported finding on Illakata.

For the Nasca-Palpa Project researchers, however, the real epiphany connecting Nasca sacred rituals to water worship occurred in 2000, on the trapezoid that dominates the desolate plateau

■ **Society Grant** Some of this research was funded by your National Geographic Society membership.

near the village of Yunama. The archaeologists had frequently noticed large, man-made mounds of stones at the end of such trapezoids, which they suspected were ceremonial altars. As Reindel excavated his way through one mound, uncovering smashed potsherds, crayfish shells, vegetable remains, and other relics that clearly represented ritual offerings, he came upon fragments of a large seashell of the genus *Spondylus*, distinctive for its creamy, coral-like hues and spiky outer surface. It appears in the coastal waters off northern Peru only during El Niño events and is thus associated with the arrival of rainfall and agricultural fertility.

“The *Spondylus* shell is one of the few items of Andean archaeology that has been well studied,” Reindel says. “It’s a very important religious symbol for water and fertility. Like incense in the Old World, it was brought from far away and is found in specific contexts, such as funerary objects and on these platforms. It was connected in certain activities to praying for water. And it’s clear,” he adds, “in this area, water was the key issue.”

Stones
painting
the Nasca

ULTIMATELY, ALL THE
went unanswered.

In 2004, at a site in the northern Nasca region, ornate archaeologist Christopher Chazotte discovered while excavating the first part of the skeleton was not the skull, but to see the vertebrae site. “The person was seen with legs crossed, and no

Cut marks on the body probably indicate a sharp obsidian point, a ceramic pot against the elbow, a typically decapitated which grew an eerie with eyes. According to expert on Nasca pot



Stones found in a ceremonial site at Cahuachi (above) were used to grind pigments for painting the great pyramid. After this religious center fell, for reasons still debated by experts, the Nasca began to build wells (left) to tap deep aquifers flush with mountain rainwater.

ULTIMATELY, ALL THOSE offerings and prayers went unanswered.

In 2004, at a site called La Tiza in the southern Nasca region, overlooking the dry Aja River, archaeologist Christina Conlee made a grim discovery while excavating a Nasca tomb. The first part of the skeleton to emerge from the dirt was not the skull, but the neck bones. “We could see the vertebrae sitting on top,” Conlee told me. “The person was seated, with arms crossed and legs crossed, and no head.”

Cut marks on the protruding neck bones probably indicate the head had been severed by a sharp obsidian knife. Underscoring the point, a ceramic pot known as a head jar rested against the elbow of the skeleton; it depicted a typically decapitated “trophy head,” out of which grew an eerie, Halloween-like tree trunk with eyes. According to Donald Proulx, an expert on Nasca pottery and professor emeritus

at the University of Massachusetts Amherst, the style of the jar suggests a tentative date of A.D. 325 to 450.

Everything about the burial—the posture of the skeleton, the head jar, and the posture of the body—indicates a deliberate, respectful interment. “You’re not going to do that with your enemy,” said Conlee, a researcher at Texas State University. Isotope analysis of the young man’s bones make clear that he had lived in the immediate vicinity and was thus a local person rather than a foreign enemy captured in war. Conlee suspects the skeleton represents a ritual sacrifice. “Although we find trophy heads spread throughout the Nasca period,” she said, “there are some indications that they became more common in the middle and late period, and also at times of great environmental stress, perhaps drought. If this was a sacrifice, it was made to appease the gods,

The sacred symbols of the Nasca reverberate through their material culture. Adorning the border of a ceremonial shawl from Cahuachi, long-haired heads mimic real sacrificial heads. Spiders on a pot, echoed in the geoglyph on page 56, may have been symbols of agricultural bounty. Emerging before a rain, such creatures would have been welcome harbingers of an event that was crucial to survival.



minutes of an odd tiptoeing hike, we found ourselves standing in the lanes of an ancient spiral—another common form of Nasca geoglyph.

As we walked around the path of the spiral, my feet naturally drew me face-to-face with every point in the compass of the surroundings: the Palpa Valley to the south, the coastal mountains to the west, the local “sacred mountain” (Cerro Pinchango) to the north, and to the east, the foothills of the Andes, with their godlike power to feed the fragile rivers that curl through the Nasca drainage, watering the seeds of civilization sown in this otherwise arid environment. If I had stepped into the vortex of this curving itinerary in ancient times, I would also have been compelled to face my fellow worshippers walking the same path. Such a Nasca prayer walk, I realized, would have reinforced both sacred and social relationships.

“Look!” Isla suddenly exclaimed. The sun had risen above the foothills, and the slanting morning light was projecting our long shadows across the geoglyph. The spiral fairly hovered above the landscape, its boundaries

of piled rock etched in sharp relief.

As my footsteps continued around the curves of the spiral, it occurred to me that one of the most important functions of the “mysterious” Nasca lines is no mystery at all. The geoglyphs surely provided a kinetic, ritualistic reminder to the Nasca people that their fate was tied to their environment—its natural beauty, its ephemeral abundance, and its life-threatening austerity. You can read their reverence for nature, in times of plenty and in times of desperate want, in every line and curve they scratched onto the desert floor. When your feet inhabit their sacred space, even for a brief and humbling moment, you *can* feel it. □



SOLVING THE ENIGMA

Severed human heads. Mysterious figures etched in the desert sand. Follow archaeologists as they probe the connection on the **National Geographic Channel, February 21 at 8 p.m. ET in the U.S.**

Bring the lines to life in an interactive map at ngm.com/nasca.