

THE GOD PARTICLE: DEAD AND GONE FOREVER?

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HIGH SOCIETY

Why were the perfectly preserved bodies of three Inca children entombed on a frozen peak in the Andes? Kate Douglas investigates the hottest mummy find in years

CONSTANZA CERUTI had always thought of herself as a "Westerner", a descendant of Italian and Spanish immigrants to Argentina. She grew up on the plains of Buenos Aires and, as far as she knew, had no particular links with the Andes or their people. Yet from an early age Ceruti had a passion for the mountains and the Incas who lived and worshipped there. Something drew her there, though she had no idea what. "I decided to be a high-altitude archaeologist," she says. "That was the goal of my life."

Two years ago Ceruti helped lead a remarkable expedition. Lullillaco (pronounced yu-yi-yá-ko) is a volcano in the far north-west of Argentina, standing 6723 metres above sea level—so high that your body can't ever adapt to the thin air. Here Ceruti, working with renowned high-altitude archaeologist Johan Reinhard, discovered the highest Inca site yet known, and unearthed the most perfectly preserved mummies ever found—three beautiful Inca children who were taken there and ritually sacrificed around 500 years ago.

Who were these children, and why were they buried alive in their icy graves? It's a real mystery, because the Incas left no written records, despite their impressive technical and artistic capabilities. But Ceruti and others have been piecing together what went on during the Incas' mountain-top rituals using archaeological clues, documents from the 16th-century Spanish invaders, and ancient DNA preserved by the cold. "These mummies are like messengers," says Ceruti. "They were meant to be messengers when they were sacrificed to the gods to represent their communities in the other world." Now they are telling their stories to the scientists as well.

There's very little reference to the remote and mountainous north-west of Argentina in the chronicles of the Spanish conquistadors. The region was a late addition to the Inca empire, which stretched 3000 kilometres along the western coast of South America at its height in the 16th century. Ceruti set out to systematically survey the area. At 28, she's relatively new to this game—she began climbing just five years ago, after finishing her anthropology degree. But she has already scaled around 80 of the country's highest peaks.

"Most of the mountains have evidence of pre-Hispanic ritual use," Ceruti says. Usually it's just charcoal or low stone walls—the remnants of small shrines. But sometimes there are signs of more important sites, perhaps with roofed buildings and shelters, or even burial sites on the summit. Finding them is no mean feat, however. Ceruti routinely climbs for eight hours to reach the more remote sites. "I climb at night so that I can be on the summit in early morning," she says. "The first few hours of the day are less windy."

Why did the Incas and their forebears spend so much time and energy scaling these inhospitable peaks to build shrines and offer sacrifices? When Reinhard began working in the Andes two decades ago, the predominant view was



Mountain riches: the small crouched figure of the Boy, one of the exquisite Inca mummies discovered on Lullallaco. Insets: the view from the peak and carved figurines found with the body

that they were trying to get closer to the Sun, which they worshipped. But he suspected the Incas worshipped the mountains themselves—as protectors, controllers of weather and water providers. He began to search the peaks for patterns to support his theory.

Reinhard's work uncovered several sacred mountain-top sites, and he became convinced there was another on Lulluillaco. Ceruti had also set her sights on the volcano. It towers above everything within a vast area spanning the border between northern Argentina and Chile, and its summit is permanently swathed in ice. The name means "deceiving water" in Quechua, the Inca language, probably because despite the ice cap, no river flows from the mountain. Their shared interest inspired Ceruti and Reinhard to team up, and in early 1999 they got the go-ahead to start digging.

It was a tough expedition. Reinhard, Ceruti and a handful of helpers spent a total of 23 days on Lulluillaco, in conditions the human body is simply not designed to cope with. Above 5800 metres you can't adapt to the altitude. The lack of oxygen causes permanent cell damage, your immune system starts to fail, and fluid can build up in the brain and lungs. At best the conditions affect your rationality and judgement. At worst they can kill you. It's too cold and windy to remove your gloves, even when taking intricate measurements, and at altitude electric storms are common. The team spent an uninterrupted 13 days on the summit under these conditions—a record for high-altitude archaeology.

The most obvious remains are two stone

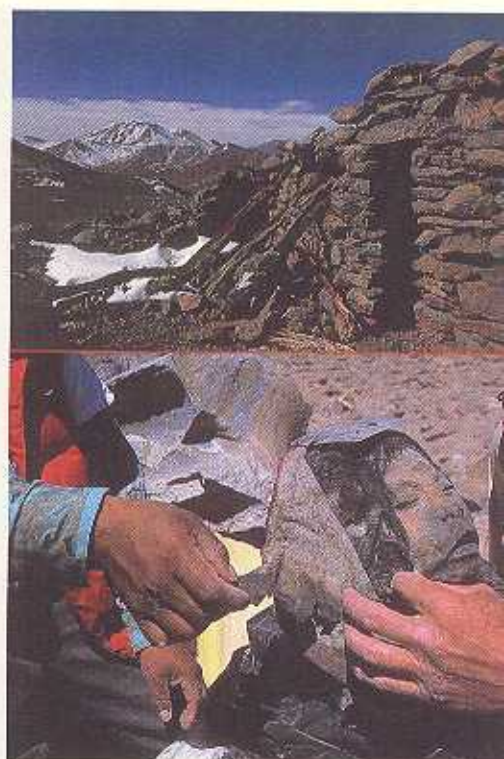
shelters near the top. Nearby, and less impressive at first sight, was a 10-by-6-metre area surrounded by a low stone wall, but here the team struck gold—a sacrificial platform. They began to excavate, and just two days later broke into a small chamber about 1.5 metres down. Inside was crouched the body of a small boy dressed in a bright red tunic, curled in the fetal position with his face hidden between his knees.

Reinhard and Ceruti's team soon found a second tomb, and another body hidden beneath a thick shroud. It turned out to be an adolescent girl with intricately braided hair, sitting cross-legged with feet tucked neatly in and her head lolling on her shoulder as if in frozen slumber. Finally they uncovered a third mummy. The body of this young girl had been struck by lightning at some point in the last 500 years, destroying some of her covering shroud. So the first thing Ceruti saw was a beautiful upturned face. "It was a very special moment," she recalls. "More than finding, it was like meeting someone."

Despite Lightning Girl's superficial burns, it was immediately apparent that these three little bodies were in remarkable condition. "It's so cold up there, the ground never froze and unfroze," says Reinhard. The children were deep-frozen for five centuries, never subject to the cell rupture and tissue damage caused by thawing. X-ray analysis has since revealed that their internal organs are among the best preserved in any mummy ever found. Their brains look much as they would have shortly after death, and their lungs are still inflated with air. You can even see blood in their hearts and blood vessels. What's more, there were no signs of injury or trauma on any of the bodies. The researchers estimated that Lightning Girl was just six years old when she died, the Boy was seven and the Maiden probably 15, based on their teeth and bones.

Why would the Incas let three children freeze to death on top of a mountain? The answer is recorded by the early Spanish chroniclers, say Reinhard and Ceruti. Inca communities sacrificed their most beautiful and unblemished children or adolescent girls as offerings to the gods in the "capacocha"—the most important of their religious rituals. Shortly before the ceremony the children would be taken to the capital Cuzco, where the emperor presided over a festival lasting several days. An entourage of officials, priests and family then set off for the provinces with the children, travelling on foot and taking as straight a line as was possible towards the mountaintop site.

Evidence from the 20 or so child sacrifices found so far suggests that their death was made as painless as possible. Some may have



been poisoned, others suffocated, strangled, struck with a single blow to the head, or—as seems likely on Lulluillaco—left to die from exposure. "I think that these children were just taken to the summit," Ceruti explains, "and while the priests were doing some other activities like lighting the fires or burying some offerings, they would be waiting for the children to slowly fall unconscious so that they were ready to place in the tombs."

Narcotic drugs probably made the children's death more comfortable. Once the mummies had been brought down from the mountain and taken to the nearest lab—more than 500 kilometres away at the Catholic University of Salta—Larry Cartmell from Valley View Regional Hospital in Oklahoma looked for traces of drugs in their hair. He found no sign of tobacco use, but there were high levels of cocaine. "This indicates that coca was used at least 10 days before death," says Cartmell, because it takes this long for chemicals circulating in the body to be deposited in hair. The Maiden's coca consumption was particularly high. Her hair contains three times as much cocaine as any sample Cartmell has seen from more than 350 modern Andean inhabitants. She also had small pieces of coca leaves around her lips. "In Inca times coca consumption was highly controlled by the state," says Ceruti. "The fact that these children were taking it means that they were under the control of the state."

Votive objects buried with the capacochas offer other information about the ritual. Such





Peak practice: clockwise from top left are the burial site atop Llullaillaco, figurines found with the bodies, the Maiden, and Lightning Girl. Far left, Lightning Girl's face revealed for the first time

artefacts are extremely rare because most sacrificial sites were destroyed by the Spaniards or have been looted more recently. Yet these three tombs contained more than 100 objects which, like the mummies, were remarkably well preserved. They include mysterious items such as a flamboyant headdress made from the huge white feathers of an unidentified species of bird, and little bags of hair, possibly that of the children themselves. Ceruti says that the Incas believed hair had magical qualities. They performed cutting rituals on a child's first locks and often tied long hair, like the Maiden's, into hundreds of braids to prevent strands from falling out.

Ceremonial riches

Other items found on the volcano underline the importance of the ceremony. There is a stunning necklace made of iridescent pink *Spondylus* shell found in the waters around Ecuador. This material was more precious to the Incas than gold because it was so rare. Finely worked textiles and decorated pots show that the people who made these offerings did not stint on their labour. And, Ceruti points out, the intricately inlaid metal objects could only have been made by several craftsmen working together—tangible evidence of the power of the capacocha rituals to unite the Inca people.

One of the most interesting finds for Ceruti is a series of figurines representing a caravan of llamas led by a herdsman, crafted from gold, silver and *Spondylus* shell. She believes it indicates that one purpose of the

capacocha was to increase the fertility of livestock. But these very complex ceremonies were symbolic on a lot of different levels says Ceruti. She thinks that capacochas were primarily to do with the succession of a new emperor, when they served to unite the empire, reinforce central authority and re-establish equilibrium between the people and their gods. She points out that "Qhapaq" means related to royalty, the emperor or power, and "hucha" means sin, guilt or cosmic disorder. But Reinhard argues that there were probably many events, such as natural disasters and social turmoil, that would have prompted the Incas to appease the mountains or seek their good fortune.

What is becoming apparent to the researchers is that mountain worship is deeply rooted in Andean culture, and continues even to this day. It seems that by tapping into these beliefs, the Inca leaders could persuade their subjects to invest huge amounts of time and energy—and even their children—in mountain-top ceremonies that reinforced the authority of the emperor and helped cement this unwieldy empire.

Recent DNA analysis of the mummies supports the idea that parents would happily offer their children for sacrifice. It turns out that the two girls may have been related. Their mitochondrial DNA—the genetic material which comes from the energy-releasing structures in the cells, and is inherited from the maternal side only—is sufficiently different to rule out a shared mother. But it was in such good condition

that Keith McKenney and his colleagues at George Mason University in Virginia decided to look for further clues among the more fragile chromosomes in the nucleus. They were in for a pleasant surprise. "[It] was the best preserved ancient DNA, bar none," says McKenney. What's more, the DNA of the girls was identical in seven out of the nine sequences they looked at. "We can't exclude the possibility that the Llullaillaco females had the same father," concludes McKenney.

He hopes that further studies will reveal more about the children's ancestry and origins, but for the moment DNA records from modern Andean people are too sparse to show the history of distinct genetic populations. Using what's already there, however, McKenney has managed to track down a living relative of the Maiden—a native Peruvian living in Washington DC, whose mitochondrial DNA has so far shown just one difference from the Maiden's.

The DNA studies have been a revelation for Ceruti in more personal ways too. McKenney needed to be sure that the DNA his team was studying wasn't contaminated, so he took samples from everyone who had been in contact with the mummies. It convinced them that the DNA was really ancient, but Ceruti's sample was more similar than most. To her surprise, it showed unmistakable signs that native South American blood runs in her veins. So perhaps her love of the mountains is no mystery after all. She has more in common than she ever imagined with the three Inca children frozen in time. □