

The peoples of Lagoa Santa

Human burial sites in Minas Gerais
reveal a succession of customs from
10,000 to 8,000 years ago

Maria Guimarães

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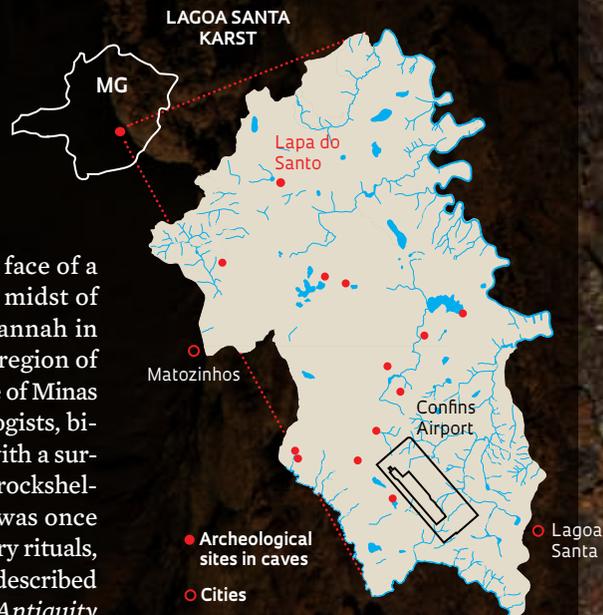
Lapa do Santo, a rockshelter in the midst of the Cerrado savannah, appears to have been an important center for rituals associated with death





An opening in the face of a steep cliff in the midst of the Cerrado savannah in the Lagoa Santa region of the Brazilian state of Minas Gerais has presented archeologists, biologists and anthropologists with a surprising revelation. The cave, a rockshelter known as Lapa do Santo, was once an important center for funerary rituals, as revealed by the excavations described in an article published in the *Antiquity* journal, one of the most prominent publications in that field. The cave housed complex burial patterns featuring dismembered corpses arranged according to precise rules, revealing a succession of very distinct cultures during a period—approximately 10,000 years ago—that had previously been considered to be homogeneous. “The greatest benefit was in discovering these cultural changes over time, which for some reason no one had noted before,” says André Strauss, a Brazilian archeologist and visiting professor at the University of Tübingen in Germany, a doctoral candidate at Germany’s Max Planck Institute, and the article’s lead author. The study goes beyond the deaths themselves and provides a glimpse of who these people were and how they lived.

Strauss felt that there was something special about this place during his first year in the geology program at the University of São Paulo (USP). He went on his first field expedition in 2005 as an intern for bioanthropologist Walter Neves of USP’s Biosciences Institute (IB-USP). “I was at the bottom of a two-meter-deep trench, digging and sifting through what I found.” It was from that vantage point that Strauss became fascinated with the potential discoveries to be made there and decided that he wanted to do something other than focus on skull measurements and search for signs of coexistence with large animals, known as megafauna. That was the focus of the research conducted in the 19th century, when Danish naturalist Peter Lund dis-



covered human bones alongside those of large animals in a cave in Lagoa Santa, setting in motion a tradition of excavation that made it one of the most long-lasting archeological regions in Brazil. Five years later, during his master’s research under Neves, Strauss observed some order in the apparent confusion at the site: what appeared to be a meaningless jumble of bones did, in fact, follow a pattern. “It’s difficult to perceive the subtleties. The burials are very complex.”

“This was made possible because Walter reversed the usual order of the field procedures,” Strauss notes. Brazilian archeology, he says, generally focuses on artifacts, and only calls in specialists in human fossils when bones are found. “Many skeletons are damaged in the process.” Neves has been analyzing human evolution in the Americas since 1988, conducting a case study in this region. In his projects, bioanthropologists coordinate the excavation, document everything they find, and rely on specialists to analyze the artifacts—in the case of Lapa do Santo, the stone fragments and tools made of bone, such as spatulas, chisels and, on rare occasions, fishhooks.

In the cave, the walls of which are decorated with relief drawings indicative of fertility rituals (phallic images), the findings were striking. Strauss, Neves and their colleagues identified three distinct periods of human occupation, the oldest from 12,700 to 11,700 years ago.

Between 2001 and 2009, they exhumed and analyzed 26 human burials dating back to approximately 10,500 and 8,000 years ago, which revealed a variety of funerary practices never before discovered in the lowlands of South America. These practices were described in an article in *Antiquity* and a second article of which André Strauss was the sole author, published in the January-April 2016 issue of *Boletim do Museu Paraense Emílio Goeldi*.

“There were highly sophisticated funerary practices in the Andes,” says Neves, “but the previously studied Chilean mummies are more recent than the material found in Lapa do Santo”. Another distinction is that the cave in Minas Gerais contains no funerary offerings, while the customary practice of hunter-gatherers was to bury the dead along with their belongings. “The complexity of the practices discovered at Lapa do Santo resides not in the objects, but in a high degree of manipulation of the body and the skeleton, in a very sophisticated manner,” says the USP professor.

FUNERARY RITUALS

The oldest burial pattern, dating back to between 10,600 and 9,700 years ago, included a man and a child who was approximately five years old — both buried intact. The child was placed in a seated position, with the legs folded and the knees close to the head. The open jaw, which causes the mouth to look agape, indicates that the pit was not completely filled in.

The removal of body parts after death is characteristic of the following period, between 9,600 and 9,400 years ago. This period is represented at seven burials, plus a few disarticulated bones, and is described as the second pattern. Some of the skeletons were articulated, but had missing parts. One striking case was that of a man whose head appeared to have been removed hours after his death and who was buried with his hands (also severed, as indicated by cut marks on the wrist bones) covering his face—one hand pointing upwards and the other hand downwards, as Strauss and colleagues described in 2015 in the *PLOS ONE* journal.

Other skeletons were completely dismembered and arranged in bundles, indicating that the bones were stored together, possibly wrapped up, and bur-

Successive cultures

Burial patterns have changed over time



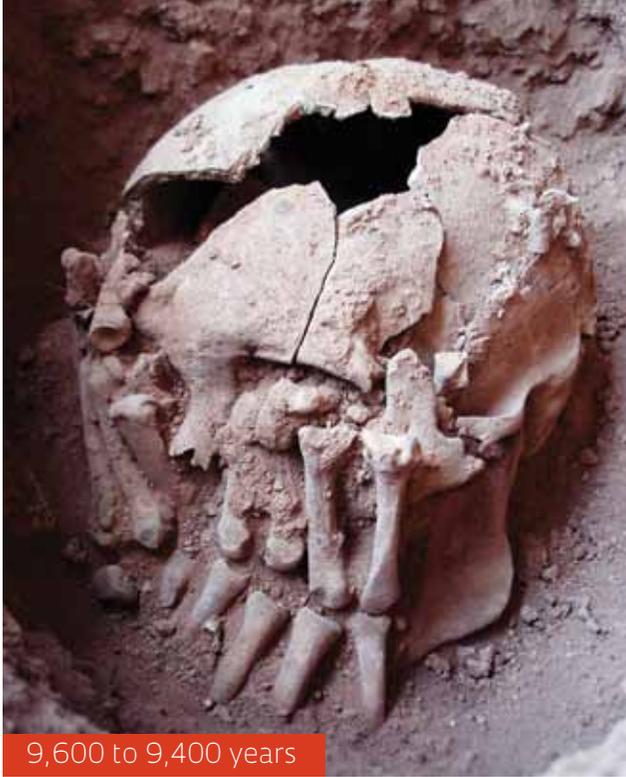
Simple graves with no signs of manipulation of body parts manipulation. The two skeletons pictured are of a man and a woman

The findings represent a paradigm shift in how we view human habitation in this area during that period

ied only removal of the flesh and going through a drying process. Many of the isolated bones had also undergone treatments such as burning, cutting, the application of red pigment and the removal of teeth. In some cases, the bones of one or two children were combined with the skull of an adult, or vice-versa, in a manner suggesting very precise rules for how the burial should be carried out. Teeth which had been removed were also buried with the remains of a different person.

The third burial pattern, dating from 8,600 to 8,200 years ago, involves nine heaps of completely disarticulated bones arranged in circular pits with diameters of 30 or 40 centimeters and a depth of 20 centimeters. Each pit was fully occupied by the remains of a single individual. In the case of adults, the longer bones were generally broken after death to allow their placement in these small tombs.

Despite so many recorded cases of dismemberment, there are no signs that violence in life was a common practice. “We read the bones; everything is recorded in them,” Strauss says. In addition, the bones show extremely low levels of healed fractures, which are indicative of injuries sustained while the subject was alive. Generally, Strauss believes that the findings represent a paradigm shift in how we view human habitation in the area during that period—the early Holocene. “For a long time, the big question was whether Luzia was the oldest skull in the Americas and whether it resembled Africans,” he says, referring to the 11,000-year-old skull described by Neves, which redefined the way human occupation in the region should be viewed (see the 50th Anniversary issue of FAPESP at bit.ly/AmLuzia). “We now



9,600 to 9,400 years

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Bodies were dismembered and might be buried along with parts from several people. A head arranged with its severed hands is the most striking example



8,600 to 8,200 years

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Shallow circular pits contained bones of a single person and were covered by stone blocks

know that there was not just one Luzia people in Lagoa Santa; it was actually a succession of peoples who inhabited the region, with clear cultural transformations.” In fact, the period was approximately 5,000 years long—a long enough period for occupation by very diverse populations, even if they were, to some extent, descended from one another.

DNA studies are soon expected to start yielding results and providing answers about how these groups succeeded one another and what the relationship between them was. “Cranial morphology shows that they had the same general architecture,” Walter Neves notes. There is continual variation in this large group, which he defines as Paleoamerican. According to his theory, which posits that two distinct migrations gave rise to the inhabitants of America, the first people with Asiatic features likely arrived at the area approximately 7,000 years ago—though there are no human remains in Lagoa Santa that date back to between 7,000 and 2,000 years. Nonetheless, the existing clues from the area and other sites are gradually refining the hypothesis. “I thought the second migratory group had replaced the Luzia people,” he admits. “But today we have very strong evidence that this morphology survived intact un-

til the 19th century.” Such is the case, for example, of the Botocudo Indians, who were decimated during the colonial period, according to skulls stored at the National Museum of Brazil, as maintained by Strauss, Neves and colleagues in a paper published in 2015 in the *American Journal of Physical Anthropology*.

LIFE PRACTICES

Since the beginning of his PhD studies in 2011, Strauss has coordinated the work at Lapa do Santo, with German funding. The archeological riches in the area sustain both countries’ interest in these collaborative efforts, which includes partnerships for genetic studies. The Brazilian counterpart for the project is Walter Neves, whose Laboratory for Human Evolutionary and Ecological Studies (LEEEH) receives the materials collected on the expeditions. No vestiges of ceramics have been found in recent years—a strong indication that these were hunter-gatherers who lived there part-time, rather than farmers, thus corroborating the established theories. They hunted for fish, lizards, rodents, armadillos, wild pigs and small deer, all of which they carried back to the cave intact. There is no evidence of larger animals such as tapirs or the enor-

mous mammals that were believed to have been associated with the humans of Lagoa Santa ever since Peter Lund found proof of association in a different cave in the region, between 1835 and 1844. This is not always the case, it would seem.

“They even ate rock cavy,” Neves exclaims, referring to a rodent slightly larger than a guinea pig. In his opinion, no diet is more precarious than one consisting of these animals, indicating that better sources of protein were not available to the groups in Lagoa Santa, who apparently existed at a borderline subsistence levels. While this is only a theory, the scarcity of personal belongings at the burial sites may indicate that there was no room for waste, and tools—such as fishhooks, only seven of which were found at Lapa do Santo—were basic life necessities. “Their time was devoted to facilitating the existence of the group,” Neves speculates, and by his estimates, they were large groups.

Their way of life may now be more clearly delineated, but these conclusions also present an enigma. Chemical analyses that reveal diets by quantifying carbon and nitrogen isotopes, carried out by the Brazilian biologist Tiago Hermenegildo during his PhD studies at the University of Cambridge in the United Kingdom, have

shown that the inhabitants of the region consumed large amounts of vegetables and supplemented their diet by hunting. Such a high consumption of vegetables is unexpected for hunter-gatherers, especially with a diet rich in carbohydrates, as indicated by the high incidence of cavities in the teeth found in the area.

Rodrigo Elias de Oliveira, a dentist and researcher in Neves' group, has co-authored a paper with lead author Pedro Tótora da Glória, also of LEEEH, on dental health at Lapa do Santo. Their study will be published in the *Annals of the Brazilian Academy of Sciences* journal. Elias, who has partnered with Strauss since 2006 in the excavations at Lapa do Santo, explains that the discrepancies between the incidence of cavities they have observed and those of other documented hunter-gatherer populations, are derived from the fact that Lagoa Santa has a tropical climate with Cerrado vegetation. "The other examples we have are from temperate climates," he says. "Here food which is naturally available—various types of fruit and tubers—can cause more cavities." He is focusing on the fruit of the Brazilian pequi and cherry trees, still widely used in the region, as a possible source of food at that time. These fruits are rich in carbohydrates, and carbonized fragments have been found at the Lagoa Santa sites.

Oliveira, who conducted his PhD research under Walter Neves and is now a postdoctoral researcher in periodontics at the USP School of Dentistry, brings to the project a detailed knowledge of teeth—which are abundant at archaeological sites because they are made of stronger material than bone. "A tooth is like a time capsule, it is packed with information," he says. He explains that bones renew themselves continuously,

Skull with teeth removed (right), fishhooks made of bone (opposite page) and scenes from the field and laboratory



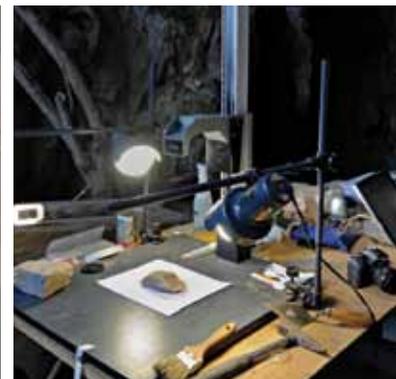
so one could say that a person replaces his skeleton every 10 years. An adult's teeth, however, are evidence of the period in one's life when teeth take their permanent form. Oliveira hopes that the isotopic studies currently underway, conducted in collaboration with Hermenegildo, will help them to delve deeper into such detailed dietary aspects of these people, such as the types of plants they consumed, the migratory movements during their lifetimes, and how long children were breastfed. The dentist adds that the presence of strontium isotopes, as well as the shape of the femur, which responds to muscle activation, indicate that the people found at Lapa do Santo were natives of Lagoa Santa. "They had mobility, but they were not nomadic."

A FLOOR OF ASHES

The inference of intense human occupation arises from the confirmation that many bonfires were lit at Lapa do Santo. "They used fire all the time; they knew what they were doing," says archeologist

Ximena Villagran of USP's Museum of Archeology and Ethnology (MAE). Her microscopic analyses of the cave sediment revealed a large quantity of ashes, up to a depth of 1 meter, as published in a paper published in the *Journal of Archaeological Science* website in July 2016. The inhabitants of the region not only controlled fire, they apparently planned its use by storing decomposing wood. This detailed understanding is made possible by organic petrology analysis, a technique that has recently come into use in archeology and to which Villagran had access through her partnership with the French geologist Bertrand Ligouis during a postdoctoral fellowship at the University of Tübingen, where he heads the Laboratory for Applied Organic Petrology.

Another cutting-edge technique used by Villagran was the Fourier transform infrared spectroscopy (FTIR), normally used in the analysis of loose sediment. Villagran placed her samples on glass slides, which enabled her to investigate exactly why the sediment is composed





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of aggregates of several shades of yellow, orange and red. During her classification of the sediments inside and around the cave, it became clear that the ashes had been produced inside the rockshelter. She also identified termite mound fragments, indicating that the material was brought inside the cave for a reason. “Perhaps they used these fragments as hot stones for cooking or as outdoor ovens, like the ones used by the Xavante Indians to bake maize cakes,” she speculates. Following this microscopic-scale revelation, it became apparent that the grasslands of Lagoa Santa were replete with termite mounds.

An enigma presented itself when Villagran confirmed that the dark red color she had observed in certain parts of the sediment would have required temperatures of over 600 degrees Celsius (°C), to be formed. Through experiments in which she lit fires and inserted a long-stem thermometer into the flames, Villagran verified that the soil beneath the fire was not subjected to such high temperatures. The explanation literally fell upon her during her second visit to the archeological site: “I realized that sediment rains down from the rock wall above the cave’s entrance,” she said. If this sediment were to fall directly into

the fire, the particles would be subjected to temperatures of 800°C to 1000°C.

During her analysis of the microstructure of the sediment surrounding the burial sites, Villagran noted a continuity that had been disturbed at certain points, as if someone had been digging a grave. She intends to continue conducting analyses in order to produce a detailed description of how the burials were made. Strauss also wants to know whether the sophisticated funerary practices existed exclusively in Lapa do Santo. He supports the hypothesis that these burials were part of a more disseminated culture. “I looked through past publications, and the signs are there; they just needed an analysis of this kind,” says the archeologist, who wants to expand the study to other regions of Brazil.

One limitation is the fact that that what has already been excavated cannot be recovered, unless it has been documented with extreme meticulousness. Until recently, the records kept were flawed, possibly due to a lack of resources. “Excavating is like reading a book and then burning the pages,” says Strauss, who specialized in archeological documentation. He says that removing the contents of a grave takes 20 to 25 days, as the sediment is gradually removed while a three-dimensional model of the finding is generated, and everything photographed and filmed. An archeologist’s logbook, he says, should convey the information and observations in detail and should be made public, not written like a personal diary. “This perception is still growing within Brazilian archeology.”

Since 2011, another 11 burial sites were exhumed, corroborating the patterns described earlier, and they are now being studied. The excavations continue at Lapa do Santo and promise to reveal even

more layers of time and human customs. According to the American archeologist Kurt Rademaker, a professor at Northern Illinois University and an expert on hunter-gatherers, the work at Lagoa Santa, combined with the work being done in the Andes region, is revealing considerable cultural diversity. “Strauss and his interdisciplinary team are doing cutting-edge archeological science and enriching our knowledge about the physical appearance, ancestry and ways of life of ancient South Americans, particularly their highly interesting ritual practices,” he says. It is impossible to know what was going on in the minds of these ancient inhabitants of what is now called Minas Gerais, but the team involved in the research is committed to painting an approximate picture. ■

Project

Origins and microevolution of man in the Americas: a paleoanthropological approach (III) (No. 2004/01321-6); **Grant Mechanism:** Research Grant – Thematic Project; **Principal Investigator:** Walter Alves Neves (IB-USP); **Investment:** R\$2,032,930.19.

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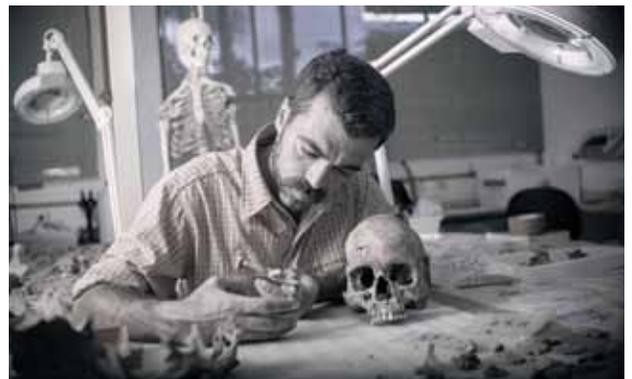
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