

ARCHAEOLOGY  
**GIZMODO** VIDEO REVIEW SCIENCE IO9 FIELD GUIDE EARTHER DESIGN PALEOFUTURE  
**Pre-Columbian Studies Are Shaking Up the History**  
**of Humans in the Americas** FIELD GUIDE EARTHER DESIGN PALEOFUTURE



George Dvorsky  
Yesterday 2:16pm •

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Skulls and other human remains from P.W. Lund's collection from Lagoa Santa, Brazil, kept in the Natural History Museum of Denmark.  
Image: Natural History Museum of Denmark

It's a huge day for archaeologists and anyone interested in the history of America's first settlers. Findings from three new genetics studies—all released today—are presenting a fascinating, yet complex, picture of the first people in North and South America, and how they spread and diversified across two continents.

Our understanding of how the Americas were first settled used to be simple. Today, it's not.

North America's first migrants, we've been told, spilled into the continent at the tail end of the last Ice Age some 15,000 years ago, either by trekking along the West Coast and/or through an interior land route. Eventually, this population found itself south of a massive ice sheet covering North America from coast to coast. From here, scientists assumed that, as populations moved southward, some groups split off, never to meet again. Gradually, this pattern of southward migration and dispersal resulted in the peopling of the Americas.

But as the new research released today suggests, it's considerably more complicated than that. Humans, as we're all too aware, aren't so predictable.

The exterior of the rock shelter site of Lapa do Santo in Brazil.  
Image: André Strauss

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A pair of closely related genetics papers, one published in *Science* and one in *Cell*, chronicles the movement of the first humans as they spread across the Americas, venturing both southward and northward and sometimes mixing in with the local populations. The third paper, published in *Science Advances*, shows what happened to one group of migrants who decided to make the high-altitude Andes their home—a decision that sent them down a unique evolutionary path.

The *Science* paper, led by David Meltzer from the Department of Anthropology at Southern Methodist University in Dallas and archaeologist Eske Willerslev, who holds positions at the University of Cambridge and the University of Copenhagen, tracks the spread of humans from the top of Alaska to the tip of South America, a region known as Patagonia. Their analysis presents a complex picture of expansion and diversification across the two continents.

By sequencing and analyzing 15 ancient genomes found throughout the Americas—six of which were older than 10,000 years—these researchers determined that, around 8,000 years ago, the ancestors of Native Americans were still on the move, migrating away from Mesoamerica (what is today Mexico and Central America) toward both North and South America. These groups moved rapidly and unevenly, sometimes interbreeding with local populations, complicating the genetic—and historical—picture even further.

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The close genetic similarity observed between some of the groups studied suggests rapid migratory speed through North and South America.

“That’s something we’ve suspected due to the archaeological findings, but it’s fascinating to have it confirmed by the genetics,” said Meltzer in a statement. “These findings imply that the first peoples were highly skilled at moving rapidly across an utterly unfamiliar and empty landscape. They had a whole continent to themselves and they were travelling great distances at breathtaking speed.”

The Meltzer and Willerslev team, which included dozens of researchers from institutions around the globe, also identified a previously unknown population with a distinctly Australasian genetic marker—a very surprising discovery. Found at the Lagoa Santa archaeological site, this individual lived around 10,400 years ago in what is now Brazil. The researchers were not able to detect the Australasian genetic marker in any of the other samples studied, including those found in North America.

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It's highly unlikely that this population sailed from Australia or Indonesia to South America. Rather, this group likely trekked northward from their point of origin, venturing through China and Siberia. This population likely didn't spend too much time in North America, eventually finding their way into South America, while leaving no genetic trace of their journey—aside from this lone specimen in Lagoa Santa. Meltzer and Willerslev don't know if this population arrived before or after the ancestors of Native Americans. This discovery now presents a very intriguing mystery, because this group could conceivably be the first humans to reach South America.

“If we assume that the migratory route that brought this Australasian ancestry to South America went through North America, either the carriers of the genetic signal came in as a structured population and went straight to South America where they later mixed with new incoming groups, or they entered later,” said Peter de Barros Damgaard, a geneticist from the University of Copenhagen, in a statement. “At the moment we cannot resolve which of these might be correct, leaving us facing extraordinary evidence of an extraordinary chapter in human history! But we will solve this puzzle.”

Archaeologist Eske Willerslev (middle) with Donna and Joey, two members of the Fallon Paiute-Shoshone tribe.  
Image: Linus Mørk, Magus Film

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Another intriguing result came from an analysis of the Spirit Cave Mummy—a 10,600-year-old skeleton involved in a legal dispute and a scientific controversy.

This natural mummy was discovered in 1940 in Nevada’s Great Basin Desert, and scientists have struggled to understand its origin. The Fallon Paiute-Shoshone Tribe, a group of Native Americans living in Nevada near Spirit Cave, said the remains belong to their ancestors; accordingly, they asked for possession of the specimen under the Native American Graves Protection and Repatriation Act. This request was denied as the origin of the Spirit Cave Mummy was disputed, leading to a 20-year legal battle. The situation changed two years ago when the tribe allowed Willerslev to conduct a DNA analysis on the specimen. His analysis showed that the skeleton is indeed related to the Fallon Paiute-Shoshone Tribe, quashing a longstanding theory that a group of Paleoamericans existed in North America prior to Native Americans.

Called the Paleoamerican Hypothesis, this theory first appeared in the 19th century. Danish explorer Peter W. Lund theorized in the 19th century that the remains he studied were not Native American, but the members of some other population, dubbed the Paleoamericans. He reached this conclusion by analyzing the shape of the ancient skulls.

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“Our study proves that Spirit Cave and Lagoa Santa were actually genetically closer to contemporary Native Americans than to any other ancient or contemporary group sequenced to date,” Willerslev said in a statement. “Looking at the bumps and shapes of a head does not help you understand the true genetic ancestry of a population—we have proved that you can have people who look very different but are closely related.”

Willerslev’s analysis was performed two years ago, at which time the specimen was returned to the Fallon Paiute-Shoshone Tribe. A private burial ceremony was held earlier this year, with Willerslev in attendance. The tribe released this statement today:

The Tribe has had a lot of experience with members of the scientific community, mostly negative. However, there are a handful of scientists that seemed to understand the Tribe’s perspective and Eske Willerslev was one of them. He took the time to acquaint himself with the Tribe, kept us well-informed of the process, and was available to answer our questions. His new study confirms what we have always known from our oral tradition and other evidence—that the man taken from his final resting place in Spirit Cave is our Native American ancestor.

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Migrations into North and South America, weren't as straightforward as we thought. This graphic shows possible migration routes, as posited by the new Cell study.  
Image: Posth et al./Cell

The Cell study, led by David Reich, a geneticist at Harvard Medical School and the Howard Hughes Medical Institute, and Cosimo Posth, an archaeogeneticist at the Max Planck Institute for the Science of Human History, used high-quality DNA to identify two previously unknown migrations from North to South America.

“The vast majority of genetic studies has proposed that a single [group of closely related people] spread into all Central and South America,” Posth told Gizmodo. “Analyzing the DNA of 49 ancient human remains across Central and South America spanning between 11,000 and 3,000 years ago, we learned that multiple population movements are necessary to explain ancient as well as present-day Central and South America gene pool.” To which he added: “It tells us that the peopling of Central and South America not only was fast but also it was accompanied by multiple waves, some of which disappeared and some others which left a strong genetic impact all the way until today.”

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The first of these two previously unknown migrations shows that the Clovis people, who lived in North America around 11,000 years ago, had a bigger impact on areas to the south than previously appreciated. This migration links the oldest individuals from Chile, Brazil, and Belize, dated to between 11,000 to 9,000 years ago, to the Clovis culture.

“This suggests that, surprisingly, the genetic ancestry of people who produced the Clovis culture expanded further south,” said Posth.

However, this ancestry was fully replaced around 9,000 years ago by another ancestral group, which left a long-lasting population that exists to this day in multiple South American regions. As to how or why this Clovis-related group got replaced so thoroughly is a complete mystery.

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The second previously unknown population migration is associated with the arrival in Southern Peru and Northern Chile of a genetic lineage linked to ancient individuals from the California Channel Islands. This population expansion happened at least 4,200 years ago, but it may have taken place much earlier than that.

“It could be that this ancestry arrived in South America thousands of years before and we simply don’t have earlier individuals showing it,” said Nathan Nakatsuka, a research assistant in the Reich lab at Harvard Medical School and co-lead author of the study, in a statement. “There is archaeological evidence that the population in the Central Andes area greatly expanded after around 5,000 years ago. Spreads of particular subgroups during these events may be why we detect this ancestry afterward.”

Ideally, the researchers would like to find DNA older than 11,000 years, and also acquire DNA from regions in northern South America and the Caribbean, which is absent in this study. The researchers aren’t sure how individuals in these regions are related to the ones analyzed in the new study.

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The location of ancient samples near Lake Titicaca, elevation 3812 meters, in what is now Peru and Bolivia.  
Image: J. Lindo et al., 2018/Science Advances

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The Science Advances study, led by anthropologist John Lindo from Emory University, analyzed the genetic prehistory of people living in the Andean Highlands, from about 7,000 years ago through to European contact.

Lindo's team studied seven human remains found in the Lake Titicaca region of the Andean Highlands of Peru dating back to between 6,800 to 1,400 years ago. These genomes were then compared to the genomes of individuals who lived in both the lowland and highland areas during prehistoric and modern times, allowing the team to identify any physical adaptations that happened prior to the arrival of the Europeans some 500 years ago.

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Archaeological evidence suggests this group began to occupy the Andean Highlands around 12,000 years ago. The new genetic evidence shows what happened as a result. Similar to the ancient inhabitants of the Tibetan Plateau, this group quickly adapted to the high altitude extremes, gaining resistance to cold temperatures, low oxygen, and UV radiation.

Fascinatingly, the Andean highlanders also acquired the ability to digest potatoes, a domesticated crop derived from wild tubers.

“We see a different configuration of a gene associated with starch digestion in the small intestine—MGAM—in the agricultural ancient Andean genome samples, but not in hunter-gatherers down the coast,” said Lindo in a statement. “It suggests a sort of co-evolution between an agricultural crop and human beings.”

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The researchers also documented a smaller-than-expected population decline following the arrival of Europeans and their attendant diseases. Elsewhere, in both North and South America, indigenous populations experienced population declines up to 90 percent. The death rate among the Andean highlanders, however, was closer to 30 percent. To explain this, the researchers point to a fortuitous mutation among the highlanders—an

immune gene correlated with smallpox, which may have conferred a protective effect. Another very likely factor, however, was the remote location of this population. The harsh mountain environment may have buffered this group from the Europeans and their attendant diseases, the researchers say.

“Genetics is showing that the early population history of the Americas is more complicated than earlier genetic models,” Ben Potter, a professor of anthropology at the University of Alaska Fairbanks who is not affiliated with the new studies, told Gizmodo. “It’s something we concluded from the complex archaeological record, but for which we couldn’t directly link with the genetic populations.”

Potter said genetic data is wonderful, but it doesn’t tell us the whole story. Unlike genetics, archaeology can secure timelines and geographic locations, while also showing continuity and changes to technology, adaptive strategies, and material and cultural connections across time and space. Potter said the new studies will allow “much more complex and realistic models to be developed,” but this process will “require collaboration with archaeologists and geneticists.”

The new studies are truly fascinating, but they seem to pose more questions than answers. No doubt, more archaeological evidence will be required to solve some lingering and newly introduced mysteries—but there’s no question that genetics will play an important role.

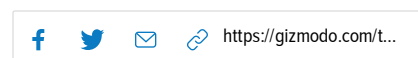
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[Science, Science Advances, Cell]

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