

# Beyond *Kon-Tiki*: Did Polynesians Sail to South America?

**After decades of taboo and controversy, Pacific Rim archaeologists are finding new evidence that Polynesians reached South America before Europeans did, voyaging across the world's largest ocean around 1200 C.E.**



IT WAS LATE IN THE DAY IN DECEMBER 2007 when the curator pulled out a half-dozen ancient human skulls from dusty drawers in the museum in Concepción, Chile. The skulls, of varying ages, had been found during the past century by locals as well as scientists on the windswept island of Mocha, 30 kilometers off the southern Chilean coast. “I nearly dropped to the floor,” recalls Lisa Matisoo-Smith, a biological anthropologist at the University of Otago in New Zealand. She immediately noticed that some crania had characteristics hinting at a Polynesian origin, such as a pentagonal shape when viewed from behind.

## Online sciencemag.org

**S** Podcast  
interview  
with author  
Andrew Lawler.

Mocha is 3700 kilometers east of Easter Island, the closest known prehistoric Polynesian settlement. Matisoo-Smith was in Chile on a hunt for rat bones that might show Polynesian contact with South America; she hadn’t imagined stumbling on human remains that might bolster that case. She and Chilean colleague José-Miguel Ramírez-Aliaga of the Universidad de Valparaíso hope to win agreement from local peoples and the Chilean government for an excavation on Mocha to seek signs of Polynesian settlement, artifacts, and human and animal remains.

Their effort is one part of an ambitious

drive to settle a long-standing controversy among archaeologists and anthropologists. Considered the realm of crackpot theorists until recently, the idea of prehistoric contact between Polynesians and South Americans has gone mainstream. A new generation of researchers is using DNA analysis of varied organisms such as humans, chickens, and sweet potatoes to add compelling data to a case previously based on more nebulous linguistic and artifact similarities. Given current views of Polynesian expansion (see sidebar, p. 1346), many researchers now think it likely that Polynesians reached South America by about 1200 C.E., after the settlement of Easter Island, and several centuries before Europeans arrived around 1500 C.E.

“This is a watershed moment,” archaeologist James Bayman of the University of Hawaii, Manoa, told participants at a session on the topic at the meeting of the Society for American Archaeologists (SAA) in St. Louis, Missouri, in April. “New methods no longer give us an excuse to ignore the issue.” Some skeptics point out that there is still no incontrovertible evidence that Polynesians went to South America and then returned to Pacific islands, and contact with North America remains questionable (see sidebar, p. 1347). Bayman admits that the research “is still a work in progress.” But he and many colleagues agree that resistance to the idea of prehistoric contact is starting

to crumble, giving archaeologists a chance to rethink the way technology and innovations spread in prehistory.

## Heyerdahl’s ghost

The idea that Polynesians and South Americans were in touch more than 500 years ago is as old as archaeology itself. In 1837, a French writer noted that plank boats used by locals on the west coast of Chile were remarkably similar to those found in Tahiti. Two years later, a British sea captain pointed out that the Patagonian and Polynesian words for canoes—*kialu* and *kialoa*, respectively—were nearly the same, notes Kathryn Klar, a linguist at the University of California (UC), Berkeley. An archaeologist suggested in the 1930s that the sweet potato diffused from its home in the Andes to the Pacific before Columbus. And researchers at a 1968 conference concluded that the pre-Columbian presence in Polynesia of indigenous South American plants like the sweet potato were likely signs of prehistoric contact.

There is no question that the Polynesians were the great premodern seafarers, spreading east from Asia and Melanesia in outrigger canoes and arriving on the shores of Fiji by 1000 B.C.E. (*Science*, 2 March 2001, p. 1735). By 1200 C.E., using sails and sophisticated navigation techniques, they had peopled most South Pacific islands, including Hawaii and Easter Island on the



**Seaworthy.** The reach of Polynesians, shown here in this 18th century engraving, may have extended as far east as South America.

eastern edge of the Pacific. But did they go all the way to South America?

Scientists largely blame Thor Heyerdahl, the famous Norwegian writer and adventurer, for souring academia on that idea. In 1947, Heyerdahl and a crew of five sailed nearly 7000 kilometers from Peru to French Polynesia on a balsa-wood raft dubbed the *Kon-Tiki* to prove that ancient Americans could have sailed east to colonize the Pacific. The trip and resulting book made him a worldwide celebrity. Heyerdahl thought that the original seafarers came from the Middle East via South America, where they bestowed civilization on dark-skinned peoples before setting off across the world's largest ocean.

Such racist assumptions and a lack of scientific rigor horrified many anthropologists and tarred researchers who wanted to examine such prehistoric long-distance connections more thoroughly. "People asked me if I wanted to ruin my career and be considered a fool," recalls Terry Jones, now a professor at California Polytechnic State University in San Luis Obispo. The topic is still controversial, though no longer taboo. "We have to tiptoe back and reexamine just what the connections are," says archaeologist Terry Hunt of the University of Hawaii, Manoa.

The most compelling evidence, scholars say, centers on the humble sweet potato. That tuber is widely recognized to have been domesticated only once, about 6000 B.C.E.



**Stone age.** Ram3rez-Aliaga (right) notes that M3ori hand clubs (top row) resemble Mapuche versions from Chile.

in the uplands of Peru, where it became an important staple, according to Andrew Clarke, a molecular biologist at the University of Otago. Unlike the coconut or the gourd, which can naturally float from island to island, "the sweet potato needs people" to spread, he says. Some scholars in the past argued that the sweet potato was exported to Southeast Asia by the Spanish and Portuguese in post-Columbian times, then spread east across the Pacific. But the tuber, still a mainstay of the Polynesian diet, has shown up frequently in much earlier Pacific sites. Patrick Kirch of UC Berkeley, for example, dated a carbonized sample from the Cook Islands northeast of New Zealand at about 1000 C.E.

Such ancient samples have been known for decades but received little attention. Now

genetic tools are clinching the argument that sweet potatoes were brought to Pacific islands before the advent of Europeans. "It is easy to spot changes in the sweet potato genome over time," explains Clarke, who presented some of his data at the SAA meeting. That's because his team of researchers from New Zealand and Japan is using a high-resolution molecular marker technique to illuminate the large amount of genetic variation found in the plant. They examined 300 samples collected from around Oceania, South America, and Southeast Asia and found that the varieties common in Polynesia differ from those brought by Europeans to Southeast Asia; the Polynesian varieties are more directly related to the South American ones, Clarke says, strongly suggesting prehistoric contact.



### Chicken feed

Just how a highland Andes crop appeared in Polynesia in pre-Columbian times remains controversial. "The sweet potato shows movement from South America to Polynesia, but not how it happened or who was involved," says Atholl Anderson, an archaeologist at the Australian National University in Canberra. Given the crop's highland origin and the prevailing winds, he argues that it is more likely that Amerindians dispersed the tuber to Pacific islands, moving west as Heyerdahl had proposed.

But most researchers see few signs of Amerindian excursions into the Pacific. Cultural anthropologist Richard Scaglion of the University of Pittsburgh in Pennsylvania instead argues that Polynesians may have arrived at the southern coast of South America and sailed north using the prevailing current to the Ecua-

dorian port of Guayaquil, the only sheltered port in South America north of the rocky southern coast of Chile. The Canara people once lived from this area of the coast into the Andes highlands, making the sweet potato accessible to coastal visitors. And here the current veers sharply west. Computer simulations show that “the most successful return [westward] from the coast would be from Guayaquil to Polynesia,” Scaglione adds, making this area “a possible locus of trans-Pacific contact.”

Climate change may also have played a role in prehistoric contact. Heyerdahl argued that South Americans went west to colonize Polynesia in part because the winds at mid-latitudes blow from east to west. But paleoclimatic data from a 2002 study suggest that prolonged El Niño events reversed those winds around 1000 C.E., providing a window for Polynesians to voyage more easily to the South American coast. “The change in winds enabled them to go in new directions,” says Hunt.

Archaeological evidence for Polynesians in the area around Guayaquil—or anywhere else in South America—remains elusive. But researchers note intriguing similarities between objects found along the coast and those of a similar vintage common on distant Pacific islands. Some, such as stone fish weirs or fish hooks, could have evolved similar shapes independently, says Ramírez-Aliaga. But other artifacts from the Mapuche culture, centered on south-central Chile



**Land ho.** Mocha Island is drawing the interest of archaeologists seeking Polynesian remains in South America.

and including the area near Mocha Island, are strongly reminiscent of Polynesia. Polished stone hand clubs, wide at one end with a rounded short handle, look like wooden clubs used by the Māori people of New Zealand, who are of Polynesian descent. Stone clubs from the Chatham Islands off New Zealand's eastern coast also look similar to another Mapuche type; both resemble stylized birds. And a Mapuche stone ax called a *toki*—the same word is used in Polynesia—resembles adzes used in Polynesia.

Some cultural traditions are also surprisingly similar. Both the Mapuche and the

Polynesians celebrated the New Year with the rising of the Pleiades after the winter solstice and used a magic *toki* to cut trees. Both play a game similar to field hockey, *pai pai* in the Austral Islands and *palin* in Mapuche.

Despite the sweet potato's strong evidence, so far there is no evidence for other common Polynesian animals, like the dog and rat, in South America. But there are signs of pre-Columbian chickens. Domesticated in Southeast Asia, the chicken spread to Europe and was thought to have arrived in the Americas with Columbus. Then in 2007, a team

led by Alice Storey of the University of New England in Armidale, Australia, dated three chicken bones from El Arenal in Chile, about 100 kilometers from Mocha Island, to between 1300 C.E. and 1450 C.E. The claim grabbed headlines around the world.

But geneticist Jaime Gongora of the University of Sydney in Australia isn't convinced by those few bones, saying that “a large number of specimens” need to be found and dated in independent laboratories to ensure reliable radiocarbon results. Storey says that she has new data that will soon be ready for publication.

## Changing Time in the South Pacific

*“When this comes to be prov'd we Shall be no longer at a loss to know how the Islands lying in those seas came to be people'd ... so we may trace them from Island to Island quite to the East Indies.”*

—James Cook, 1769

Little did British explorer James Cook know that the question of when and how the Polynesians peopled the Pacific would still be a hot topic more than 2 centuries later. Most archaeologists now agree that Polynesians can trace their origins to the Lapita Culture, a fusion of Melanesian and Austronesian peoples that had spread as far east as Fiji by 1000 B.C.E. But archaeologists are deeply at odds over when Polynesians fanned out across the vast northern, central, and eastern Pacific Ocean.

One group favors a slower and earlier settlement that puts them on Hawaii as early as 500 C.E., while another argues that it wasn't until 1200 C.E. that most of the far-flung islands were colonized. For the moment, those who argue for a swift and late settlement seem to have the upper hand. “But this is going to be a hard issue to resolve,” says archaeologist Terry Jones of the California Polytechnic State University in San Luis Obispo.

Many of the early radiocarbon dating samples collected during the past 6 decades are suspect, says Terry Hunt of the University of Hawaii,

Manoa, and the reliable dates are all later. Hunt argues that a host of early dates depend on carbonized remains found in sediment cores that could be the result of natural rather than humanmade fires or were done on driftwood, which could be centuries earlier than the people who used it. After carefully examining more than 1000 radiocarbon dates, Hunt believes that Polynesians may have reached East Polynesia sometime after 1000 C.E., in “an explosive dispersal” that extended to Easter Island, Hawaii, and possibly the coast of South America (see main text, p. 1344). It was “the most rapid phase of human expansion in world prehistory,” he says.

Not everyone is willing to let go of the longer chronology. Marshall Weisler, an archaeologist at the University of Queensland in Brisbane, Australia, complains that “there are pre-1200 C.E. dates for several island groups that are routinely ignored or dismissed by the short-chronology folks.” Many scientists, however, seem to be drifting in Hunt's direction. “Increasingly, there is evidence for a rapid radiation around 1000 C.E.,” says Patrick Kirch of the University of California, Berkeley.

The key may lie in the Society Islands, which likely were an important point for Polynesian dispersal north to Hawaii and east as far as Easter Island and possibly South America. Two domesticated coconuts from the islands date to 600 C.E., but the earliest settlement appears to be centuries later. That ambiguity is a sign that archaeologists have more work to do before Cook's musing can be definitively answered.

—A.L.





**Contact clues.** This Araucana chicken and these New Zealand sweet potatoes (*below*) may be legacies of Polynesian contact with South America.



### Fiction to fact?

Sweet potato and chicken data will likely not be enough to convince skeptics. “We should be pursuing other lines of evidence,” such as Polynesian settlements in South America and ancient DNA, says Hawaii’s Hunt. “Human evidence would be the key.”

The skulls that Matisoo-Smith examined in Concepción provide intriguing hints of Polynesian ancestry. But DNA data would be more conclusive, and to date, few studies have sought Polynesian genetic markers in modern South Americans. Analyses of mitochondrial DNA in indigenous South Americans so far show no sign of a Polynesian incursion, says Matisoo-Smith. If contacts were minimal, those markers may be hard to find in living people. And because people of Polynesian ancestry settled in South America after Europeans arrived, researchers will need to look at DNA from ancient South Americans. Given that most prehistoric voyagers were likely male, scientists say they need uncontaminated nuclear DNA from an archaeological site in order to pinpoint the Y chromosomes of a Polynesian.

Mocha so far is the best candidate for such evidence and for signs of a Polynesian settlement on the continent. “A wider excavation will allow us to look for the settlement pattern, more burials, and of course more artifacts” from any Polynesian colony, says Hunt. But first the team is working with Mapuche leaders, the New Zealand embassy, and the Chilean government to take into account sensitivities among indigenous peoples in the Americas about archaeological digs.

## Northern Exposure in Doubt

In the 1930s, famed anthropologist Alfred Kroeber noted that the Chumash Indians of Southern California made sophisticated sewn-plank boats remarkably like those constructed in Hawaii more than 4000 kilometers to the west. He suggested prehistoric Polynesian contact as the source of the Chumash technique. Now an archaeologist and a linguist are seeking to prove that old theory. But while researchers are making strides in demonstrating a connection between South America and Polynesia (see main text, p. 1344), the idea that California Indians learned from Hawaiians faces an uphill struggle. Questions about timing make many archaeologists skeptical.

The sewn-plank boats built by the Chumash reached more than 8 meters in length and could carry a dozen people, shuttling between the California coast and the Channel Islands, 30 kilometers offshore. Although smaller than the oceangoing boats built by Polynesians, they surpassed the technology of all other natives along the North American coast prior to the arrival of Europeans. The first hard evidence for the Chumash vessels appears circa 700 C.E., around the time that some say Polynesians were settling the central and eastern Pacific.

Terry Jones, an archaeologist at California Polytechnic State University in San Luis Obispo, believes that the appearance of the boats as well as Polynesian-style fishhooks in the same era provides convincing evidence for contact. And some linguistic evidence backs up that view. His collaborator Kathryn Klar, a linguist at the University of California (UC), Berkeley, has cataloged several Chumash words, including *tomolo*—the word for canoe—that appear to be closely related to Polynesian languages. Woodworking terms are also similar.

But others aren’t yet convinced. For example, it’s possible those words are not ancient and arrived with Europeans who had traveled in the Pacific in the 18th and 19th centuries. “Corned beef in a can has an indigenous Polynesian name,” archaeologist Terry Hunt of the University of Hawaii, Manoa, points out. And an increasingly influential group argues that Polynesians didn’t arrive in the eastern Pacific until 1000 C.E. (see sidebar, p. 1346), which would make the earlier Chumash innovation necessarily indigenous. “If they don’t arrive by 700 A.D., then it doesn’t fit,” says Patrick Kirch of UC Berkeley. Jeanne Arnold of UC Los Angeles adds that there is “zero archaeology for a Polynesian incursion” in North America. Finding Polynesian artifacts “would be wonderful,” Arnold says. “But I want to see the evidence.”



**Tech transfer?** Researchers debate whether this ancient sewn-plank canoe design from California is the result of Polynesian influence.

—A.L.

The work by young researchers like Clarke, Storey, and Matisoo-Smith is a sign that the taboo put in place a half-century ago in the wake of *Kon-Tiki* has lost its power. Clarke, for example, is eager to push on to study the bottle gourd, the tomato, soapberry, the coconut, and other plants that may have moved across the Pacific before European ships arrived. But that work still holds little interest to most scholars who focus on the Americas. “There’s been a glass wall separating the two regions,” says Hawaii’s Bayman.

That is changing, says Ramírez-Aliaga, who experiences less resistance among his South American colleagues to the idea of contact than in the past. Trade clearly was a two-way street, “so this takes nothing

away from native American groups,” says Matisoo-Smith.

Skeptics like Anderson and Gongora insist that much more data is necessary before they will accept the idea of seafaring Polynesians trading with ancient South Americans, and that scenario remains for now absent from world-history textbooks. Bayman cautions that overthrowing entrenched views will require additional lines of decisive evidence. But many Pacific Rim scientists say it is only a matter of time before a once-heretical notion becomes accepted wisdom. “When you put all of it together, I don’t see how you can interpret this any other way,” says Jones. “This is moving from compelling to accepted truth.” —ANDREW LAWLER