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Female lineages anchored Pacific islands for 2000 years

Biggest genomics study of the Pacific reveals many migrations populated Micronesia

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Archaeologists recovered hundreds of human remains during construction at the Naton Beach site on Guam. DAVID DEFANT

Some 3000 years ago, people sailed toward the sunrise—and the last swatch of our planet uninhabited by humans: remote islands of the Pacific. By 1200 C.E. societies flourished from the Marianas to Rapa Nui, more than 12,000 kilometers apart. How the Pacific gradually became home to these groups—and just where they came from—has long been a mystery.

Some answers and twists are emerging, thanks to a large genomic study published today. Data from nearly 300 ancient and modern individuals reveals that at least five distinct groups migrated to the islands across 3 millennia. Once an island was initially settled, women stayed, maintaining maternal lines generation after generation. In contrast, male partners came from afar.

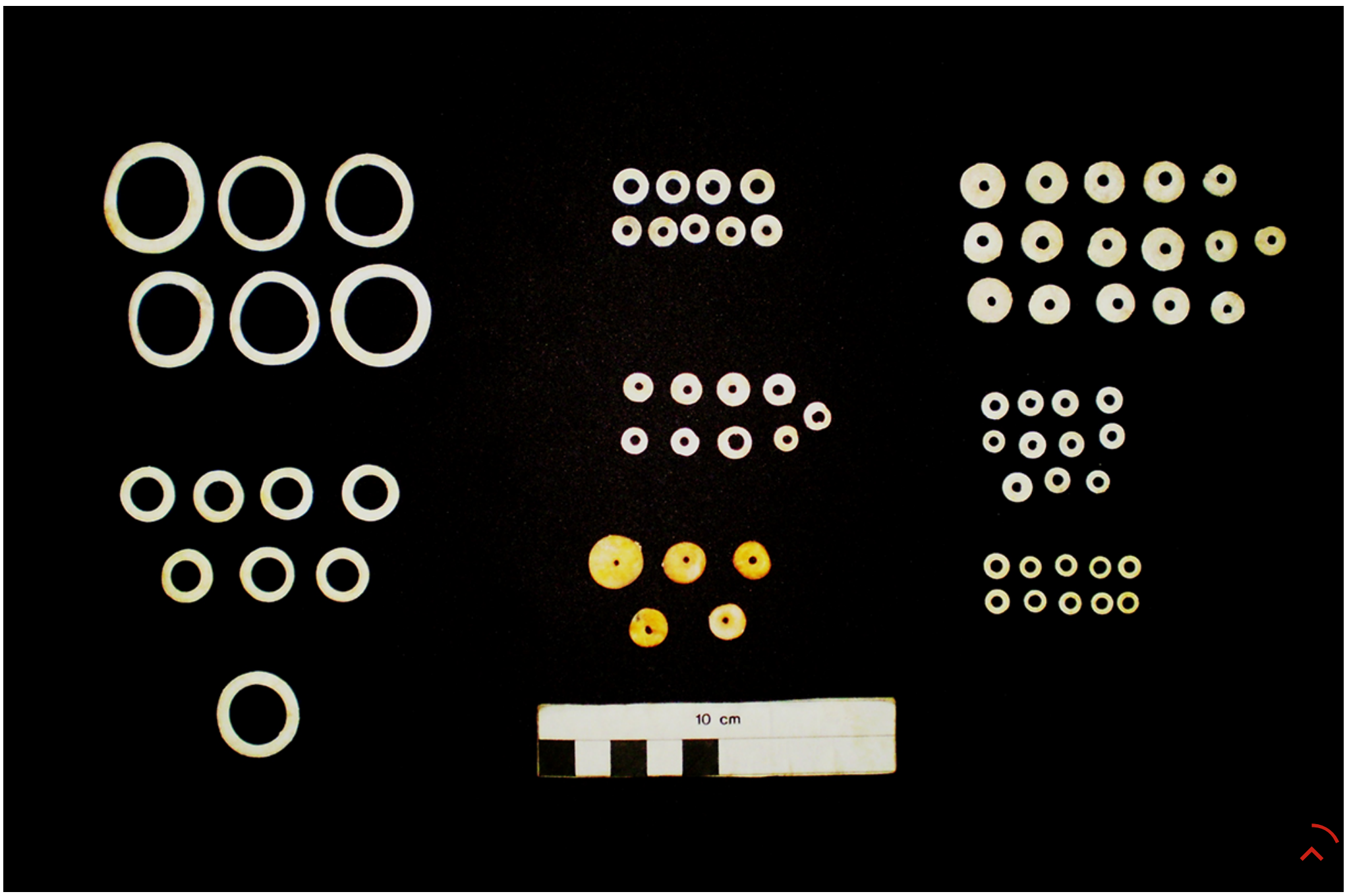
"It's a fascinating paper," says Christian Reepmeyer of the German Archaeological Institute, an expert on Pacific archaeology who was not involved in the study. "It shows the complexity of the human past," and "opens up a whole lot of new ideas about population movements."

The study focused on Micronesia, Oceania's northwest, which includes the Mariana and Marshall archipelagos. The region comprises an ocean expanse about the area of the continental United States, but its 2000-some islands, combined, could easily fit within the state of Delaware.

Micronesia also holds the earliest evidence of humans in a region known as Remote Oceania: 3500- to 3000-year-old campsites in the Marianas with shell beads, files made from sea urchins, and red pottery. Later inhabitants built pole-and-thatch dwellings and grew crops such as taro and breadfruit. About 1000 years ago, residents began to erect buildings on capped stone pillars, called latte, which stand today on islands such as Guam and Saipan.

From these changes in artifacts and lifestyles, archaeologists have tried to understand how many groups inhabited Micronesia, their connections with societies across Oceania, and their founders' origins. Genetics could help, but data only existed for about 50 ancient individuals from Remote Oceania, mostly from the Southwest Pacific and Polynesia to the east. Some scientists assumed the genetic history of those regions would hold true for Micronesia, which only had two ancient DNA profiles published.

To address this gap, Harvard University geneticists David Reich and Yue-Chen Lui teamed up with scientists who had worked with people in Micronesia for decades. With permission from Indigenous peoples of the islands and collaboration with other local stakeholders, the researchers extracted DNA from 164 individuals from sites between 2800 and 500 years old. Most of the remains were salvaged during construction projects on Guam and were analyzed after consultation with cultural leaders in that island's Indigenous CHamoru community. Some remains surfaced at more intimate spots, like a couple buried side-by-side near a cave entrance. A few were exhumed in the 1970s by Catholics who had searched an uninhabited, 2-mile-long island for the remains of a 17th-century priest. The study also analyzed the genetic profiles of 112 modern Micronesians through partnerships with local hospitals, universities, and the Pacific Basin Medical Officer Training Program.



Shell beads and bracelets were discovered with human burials in Guam. SWCA ENVIRONMENTAL CONSULTANTS, GUAM

Although DNA barely survived in the oldest specimens, the team managed to sequence enough segments to apply the lab's statistical methods designed to trace ancestry. The results quash the notion that Micronesia's genetic history mirrors other parts of the Pacific, and show the islands were populated by a series of founding events and mixtures with newcomers. At least two groups from islands of Southeast Asia likely settled in the Marianas, the DNA reveals. Later groups from more southern islands, New Guinea and New Britain, also migrated to parts of Micronesia. Other migrants likely came from the east, in Polynesia.

From the ancient to modern samples, female-inherited mitochondrial DNA remains consistent at sites, whereas male ancestry patterns change over time. The pattern suggests societies were matrilocal, with women staying in their home groups and men leaving to form families in new lands, the team reports today in *Science*. Pacific societies remained matrilocal into modern times.

"This research is very welcome," says Mike Carson, an archaeologist at the University of Guam who was not involved. The "impressive number" of ancient and modern DNA profiles adds to evidence from archaeology and linguistics, he says, which suggests past people gradually populated Pacific islands in successive migrations.

According to co-author Frank Camacho, a CHamoru biologist at the University of Guam, research like this can help people of the region better understand their past. "We're able to examine how we're related to other peoples, other islands, other communities in the Pacific."

The story remains incomplete, however, says Maile Arvin, a Native Hawaiian feminist scholar and professor of history and gender studies at the University of Utah. She wishes the article included more discussion about the history of colonialism and scientific research in the Pacific. The study "talks about prehistories of Indigenous people in the Pacific, but then it jumps to present-day, and it doesn't say anything about what happens in between," Arvin says.

Europe and the United States colonized most of Oceania and continue to occupy territories there. Nineteenth and early 20th century anthropologists, who were mostly white men, tried to use scientific measurements to classify Pacific peoples into racist categories, Arvin notes. Given that past, ethical research today requires more than Indigenous co-authorship or consent, she says. Genomic studies should address this legacy of colonial science. Otherwise, beyond the authors' intentions, she says, the work "can add fuel to some of these very problematic ideas about the racial divisions between different Pacific islanders."

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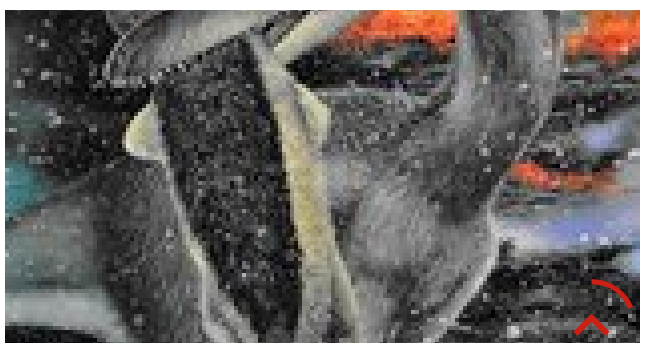

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