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USFSP News

USFSP Faculty Discover Remains With Complete Ancient African DNA

USF St. Petersburg anthropologists Drs. Kathryn and John Arthur have made a once-in-a-lifetime discovery in Mota Cave in the Ethiopian Gamo highlands: the first complete ancient African genome. DNA extracted from a skeleton in the cave provides the first human genome sequenced from the African continent. The discovery was published today in the prestigious journal Science.

“This is an extraordinary discovery, a contribution to the fields of anthropology and archaeology that will be recognized by scientists around the world,” said USFSP Regional Chancellor Sophia Wisniewska. “I could not be more proud of the Arthurs’ research, of their time and dedication to their field and to USF St. Petersburg.”

Dated to be around 4,500 years old, the skeletal remains, named Bayira—meaning “first born” in the Gamo language in honor of the ethnic group that lives in the area today—is an anthropological find of historical significance.

“Bayira allows us to piece together the population history of southwestern Ethiopia,” said Kathryn Arthur, who was led to Mota Cave by Gamo elders in 2011. “His genome is important for understanding later population movements between Africa and Eurasia.”

The Arthurs began their anthropological field research in Ethiopia 20 years ago and have focused much of their work in the Gamo Highlands in 2005. They began their current project in 2005, funded by the University of South Florida St. Petersburg and USF, the National Endowment for the Humanities (NEH), and the National Science Foundation (NSF).

The discovery of Mota Cave provides a wealth of information, including evidence that it had served as a hiding place for the Gamo during wars in previous centuries. A unique feature of the cave is that it had a dirt floor; caves in the area commonly have rock floors. The Arthurs began partial excavation and uncovered numerous artifacts—stone tools, pottery, and other similar items—that dated back between 6,000 years ago and the historic period.

It was in the following year that John Arthur—along with Drs. Matthew Curtis of Ventura College, and Mauro Coltorti and Pierluigi Pieruccini of the University of Sienna—discovered Bayira. The team realized Bayira could be a significant discovery and asked Dr. Jay Stock at the University of Cambridge to analyze the morphology of the skeleton. This analysis indicated
that *Bayira* was 30-50 years old when he died and that, given the cave’s environment, there may be a good chance for the preservation of his DNA.

With the permission of the Ethiopian Ministry of Culture, the team exported the skeleton’s ear bone to the University of Cambridge in the United Kingdom to undergo in-depth DNA analysis. The following period of research on the remains involved the collaboration of an international team of scientists, including Dr. Andrea Manica of the University of Cambridge, and Dr. Ron Pinhasi of Trinity College in Dublin, who led a team responsible for his DNA sequencing and analysis. They compared *Bayira*’s genomes to all living genomes in Africa.

What they discovered was that besides being the first human remains discovered with ancient African genome sequences, *Bayira* predates a migration of humans from West Eurasia into the Horn of African around 3,000 years ago.

“*Bayira*’s genetic sequence does not contain any West Eurasia genes, supporting the idea that more recent population movements are responsible for Eurasian admixture into modern African populations,” said John Arthur. “Thus, his genome is important for understanding the out-of-Africa expansion of *Homo sapiens* and later population movements between Africa and Eurasia.”

The fact that *Bayira*, likely a hunter and gatherer, was found in the highlands also is significant. His DNA contains three genetic variants, common among modern highland people, which indicate that he was adaptive and capable of living in the low oxygen conditions of high altitude.

“The significance of what John and Kathryn Arthur have discovered cannot be overstated,” said V. Mark Durand, Interim Regional Vice Chancellor of Academic Affairs. “Research findings like theirs may come along just once in a lifetime.”

“Our identities are tied to our heritage,” said Kathryn Arthur. “It is important to us that everyone can understand our work because of it’s relevance to everyone’s past or personal history.”

Learn more about the Arthurs’ work and their discovery in articles by the *Tampa Bay Times*, *New York Times* and *The Christian Science Monitor*, and a Q&A session with the *The National Science Foundation*. 
From left: USFSP Drs. John Arthur, Kathryn Arthur and Dr. Matthew Curtis, Ventura College.

Dr. John Arthur excavates in Mola Cave.
A shot of the entrance to Mota Cave. Photograph courtesy of Dr. Matthew Curtis, Ventura College.

A photograph of the Gamo Highlands. Photo courtesy of Dr. Matthew Curtis, Ventura College.