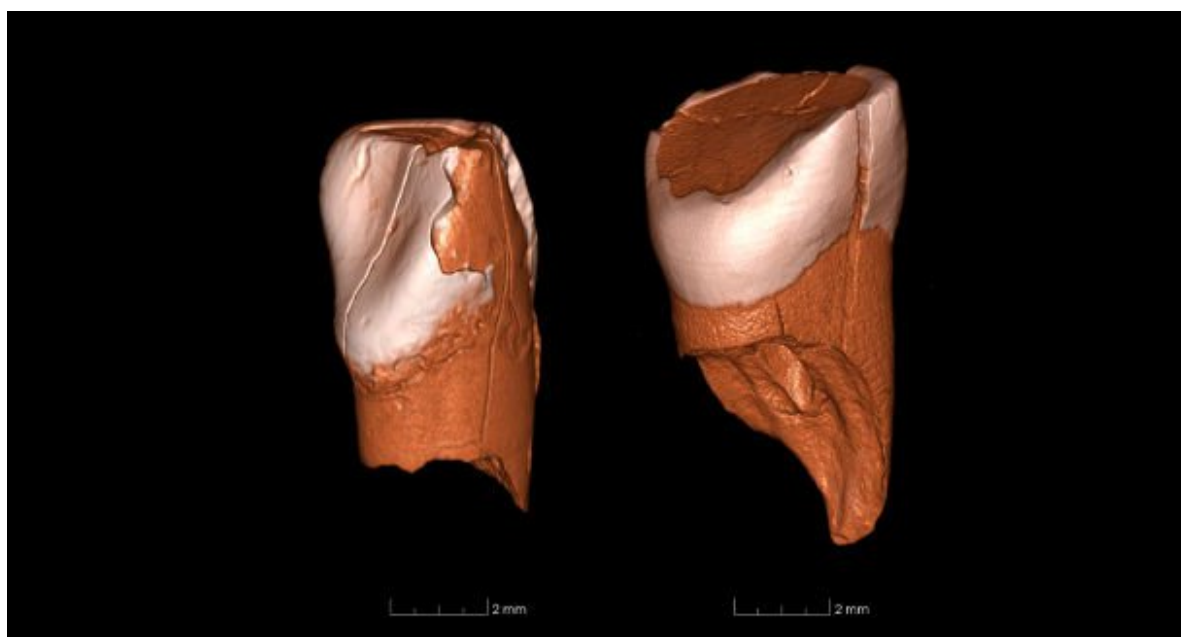


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3-D digital models of the mandibular primary incisor from Riparo Bombrini (left) and the maxillary primary incisor from Grotta di Fumane (right). (Image: Daniele Panetta/Institute of Clinical Physiology, National Research Council, Pisa, Italy)

05/mag/2015 | News Europe

Prehistoric teeth connect modern humans with Neanderthal demise

by Dental Tribune International

LEIPZIG, Germany/RAVENNA & PISA, Italy: An international team of researchers has analysed two primary teeth from the prehistoric sites of Grotta di Fumane and Riparo Bombrini in northern Italy. Their research results may have strong implications for our understanding of the interaction between modern humans and Neanderthals. The scientists attributed the teeth to an early culture of modern humans in southern Europe, thereby linking the emergence of *Homo sapiens* to the extinction of the Neanderthals.

A recent study from 2014 that analysed Neanderthal bones and tools found that the Neanderthal species, closely related to modern humans, died out in Europe between 41,000 and 39,000 years ago, while *Homo sapiens* arrived in Europe between 45,000 and 43,000 years ago. There are several hypotheses regarding the reason the Neanderthals went extinct, such as an inability to adapt to climate change, parasites and pathogens introduced by the modern human, and competitive exclusion owing to the arrival of modern humans.

The Proto-Aurignacian culture, which spread in south-west and south-central Europe around 42,000 years ago, was characterised by a remarkable set of technological innovations in stone knapping and bone tool industries, as well as by the great use of personal ornaments and the production of the earliest figurative art.

To date, it has not been clear whether the Proto-Aurignacian belonged to the species *Homo sapiens*, since both modern humans and Neanderthals populated Europe at that time. Therefore, it is pivotal to identify the group responsible for this culture to shed light on the demise of the Neanderthals, the researchers at the University of Bologna in Ravenna and the Max Planck Institute for Evolutionary Anthropology in Leipzig pointed out.

Unfortunately, according to them, only two sites have provided unambiguous human remains associated with the Proto-Aurignacian: Riparo Bombrini in the western Ligurian Alps in Italy, where a mandibular primary incisor was found in 1976, and Grotta di Fumane in the western Lessini Mountains in Italy, where a maxillary primary incisor was found in 1992.

Dr Stefano Benazzi from the University of Bologna and colleagues from the National Research Council's Institute of Clinical Physiology in Pisa compared digital models based on CT scans of the human tooth from Riparo Bombrini with those of modern human and Neanderthal dental samples. The researchers compared the internal features of the dental crown, namely the thickness of the enamel, and found that the specimen from Riparo Bombrini belonged to a modern human.

Viviane Slon and colleagues from the Max Planck Institute for Evolutionary Anthropology analysed the mitochondrial DNA from the Grotta di Fumane dental specimen and discovered that its mitochondrial genome falls within the variation of modern humans, specifically typical pre-agricultural mitochondrial DNA in Europe.

Moreover, Dr Sahra Talamo from the Max Planck Institute undertook a comprehensive programme of radiocarbon dating to establish a firm chronology for the tooth from Riparo Bombrini, and ascertained that it is about 40,000 years old.

According to the researchers, the results of their analyses showed that the two fossil teeth are the oldest human remains in an Aurignacian-related archaeological context, confirming that by 41,000 calendar years before the present, modern humans bearing Proto-Aurignacian culture had spread into southern Europe, living side by side with the Neanderthals.

“At the time of the replacement of Neanderthals by modern humans in Europe, the biological nature of several contemporaneous European populations remains unknown, and so far there has been no direct evidence that the earliest Aurignacian, a culture of many technical innovations, was actually produced by modern humans,” explained Prof. Jean-Jacques Hublin, Director of the Department of Human Evolution at the Max Planck Institute and co-author of the study. “The association of modern remains with the earliest Aurignacian-related archaeological context now provides physical evidence that the arrival of our species on the continent triggered the demise of Neanderthals, who disappeared a couple of millennia later.”

The study, titled “The makers of the Protoaurignacian and implications for Neandertal extinction”, was published online on 23 April in the *Science* journal ahead of print.