HUMAN EVOLUTION

Oldest *Homo sapiens* bones found in Europe

Pendants of cave bear teeth spark debate about cultural links to Neanderthals

By **Ann Gibbons**

During a warm spell about 47,000 years ago, a small band of people took shelter in a cave on the northern slope of the Balkan Mountains in what is now Bulgaria. There, they butchered bison, wild horses, and cave bears, leaving the cave floor littered with bones and a wealth of artifacts—ivory beads, pendants made with cave bear teeth, and stone blades stained with red ochre.

This region had long been home to Neanderthals, who left stone tools in the same cave more than 50,000 years ago. But these cave dwellers were new to Europe, as an international team reports in *Nature* this week. Researchers re-excavated the cave and used a cutting-edge toolkit of their own to identify a molar and a handful of bone fragments as belonging to *Homo sapiens*, our own species. Precise new dates show these cave dwellers lived as early as 47,000 years ago, which makes them the earliest known members of our species in Europe.

The last Neanderthals didn't vanish from Western Europe until about 40,000 years ago, so the two kinds of humans must have overlapped on the continent for at least 5000 years; previous DNA studies have shown that they mated. The new work is reigniting a long-standing debate about how Neanderthals and moderns may have influenced each other's cultures, because it links moderns to a package of artifacts that resemble those made later by Neanderthals. "It's a wonderful example of pulling all these lines of evidence together to make a solid argument that *H. sapiens* were the authors" of some of those artifacts, says paleoanthropologist Katerina Harvati of the University of Tübingen.

Bones of early *H. sapiens* in Europe are scarce, so researchers try to identify them from tools and artifacts thought to be unique to modern humans. Those include sophisticated artifacts known as the Aurignacian, including bladelets, carved figurines, and musical instruments dating from 43,000 to 33,000 years ago. The reign of the Neanderthals, from about 400,000 to 40,000 years ago, is marked by less refined Mousterian tools. But researchers have puzzled over who crafted "transitional" artifacts—a grab bag of bone tools, beads, and jewelry immediately preceding the Aurignacian. One of these toolkits, called the Initial Upper Paleolithic (IUP), shows up in the Middle East about 47,000 years ago and later appears across Eurasia.

Partial fossils found with artifacts at one site in the United Kingdom and one in Italy suggested *H. sapiens* made some transitional assemblages, but questions persist about those dates at those sites. The Bulgarian cave, called Bacho Kiro, yielded human fossils in the 1970s, but those were lost.

In 2015, a team of researchers re-excavated Bacho Kiro cave in Bulgaria and found modern human bones and a tooth.

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Paleoanthropologist Jean-Jacques Hublin and colleagues at the Max Planck Institute for Evolutionary Anthropology joined forces with Bulgarian researchers to re-excavate Bacho Kiro in 2015. They uncovered thousands of bones, stone and bone tools, beads and pendants, and a human molar.

The shape of the molar marked it as a member of *H. sapiens*, but many of the bones were too fragmentary to tell whether they were animal or human. So, the Max Planck team scrutinized proteins in the bone. They extracted collagen from 1271 fragments and applied a new method called ZooMs to analyze them. Four fragments from the older layers were human. Researchers then extracted DNA from these bones and the tooth and found that the mitochondrial sequences—the most abundant DNA in many fossils—were those of *H. sapiens*. The team is now analyzing the fossils' nuclear DNA.

Meanwhile, Max Planck radiocarbon dating specialist Helen Fewlass and her colleagues directly dated collagen from 95 bones. They report in *Nature Ecology & Evolution* that the human bones and artifacts date from 43,650 to 45,820 years ago. The ages of animal bones modified by people suggest they were in the cave "probably beginning from 46,940" years ago, Fewlass says. At about this time, the climate of Europe had begun to warm, which may have enticed *H. sapiens* with IUP toolkits to venture north from the Middle East, into the Balkans and beyond, Hublin says. (The DNA of these early arrivals shows, however, that they left no descendants in Europe today.)

Hublin notes that pendants made from the teeth of cave bears at Bacho Kiro are similar to pendants thought to be the handiwork of later Neanderthals and crafted about 42,000 to 44,000 years ago—the so-called Châtelperronian industry, first found at the Grotte du Renne site in France. He argues that this supports his long-held contention that Neanderthals picked up this type of pendant from moderns.

Others say that extrapolation goes too far. "Transitional" technologies such as the IUP are so diverse and widespread that it's not clear that only one kind of human invented them, says archaeologist Nick Conard, also at the University of Tübingen. And archaeologist Francesco d'Errico of the University of Bordeaux, who has long debated Hublin over Neanderthals' abilities, points to earlier notched bone scrapers and beadlike objects as evidence that Neanderthals could create sophisticated art and technology well before they met modern humans.

Debate is sure to continue, but archaeologists welcome the "very significant" dates at Bacho Kiro, says Tom Higham, a radiocarbon specialist at the University of Oxford. "For the first time, we're able to pin the IUP as being made by anatomically modern humans in Europe." ■

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