Our first sex with Neanderthals happened 100,000 years ago

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It was a two-way street. Many people carry ancient Neanderthal DNA in their genome as a result of cross-species liaisons around 50,000 years ago. Now it seems that some Neanderthals carried our DNA, too.

This particular group had, for example, a big chunk of modern human DNA right in the middle of a gene that may have a role in language development, called *FOXP2*. What's more, they got that DNA from us at least 100,000 years ago, somewhere in Eurasia. The finding challenges an idea central to our thinking about human evolution: that our species didn't properly leave Africa until about 60,000 years ago.

A team led by Sergi Castellano at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, compared 50,000-year-old DNA from four extinct human relatives: a Neanderthal and a Denisovan from Siberia, and two European Neanderthals. They also looked at 500 genomes from living Africans.

Neanderthals and Denisovans are more closely related to each other than they are to us, so their genomes should have more in common, too. But Castellano's team found that parts of the Siberian Neanderthal genome were more similar to the genomes of modern-day Africans than those of the Denisovans or the European Neanderthals. Statistical analyses ruled out the possibility that those similarities were the result of contamination.

"One chunk of modern DNA found in Neanderthals was inside a gene linked to language development"

The length of the modern-day DNA segments allowed the team to estimate when they entered the Siberian Neanderthal gene pool. Recently added DNA typically exists in long segments that become shorter down the generations. The team concluded that modern humans must have first interbred with Neanderthals at least 100,000 years ago (*Nature*, DOI: 10.1038/nature16544).

The researchers speculate that this might have happened in the Arabian peninsula or eastern Mediterranean, based on tentative archaeological evidence that modern humans were living in those regions by then. It could also

have happened further east – especially in light of the discovery last year of 47 modern human teeth in sediments in south-east China, dated to between 80,000 and 120,000 years old.

For many years, hypotheses that significant out-of-Africa migration could have happened that early were considered heretical, says archaeologist Michael Petraglia at the University of Oxford. The idea isn't so outlandish any more, it seems. "This study is an eye-opener," says María MartinÓn-Torres at University College London, who was involved in the Chinese finds. "A whole unknown episode is open now to investigate."

Some researchers were sceptical that modern humans had reached China so early, says MartinÓn-Torres. She thinks the new DNA evidence will help convince them. Chris Stringer at London's Natural History Museum agrees. "The search is now on for further traces of these mysterious early moderns, and their Neanderthal relatives in Asia," he says.

It's possible that Neanderthal DNA affects the health of modern humans (see "Should we fear our inner Neanderthal?"). Might Neanderthals have benefited from gaining modern human DNA, for example, in their version of the *FOXP2* gene? "We can't discount the possibility," says Mark Pagel at the University of Reading, UK, but figuring it out won't be easy because *FOXP2*'s effects may have been different in Neanderthals and may not have helped them acquire the basics of language.

"It is too early to tell," says Castellano, whose team is starting to tackle such questions. In other words, the jury is still out.

Should we fear our inner neanderthal?

Some of us have a secret in our genome: DNA that our forebears got from sex with Neanderthals. But does this DNA hold any sway over us?

A team led by Corinne Simonti at Vanderbilt University in Nashville, Tennessee, studied medical records and genetic data from more than 28,000 people of European descent. They found small but significant links between the presence of certain Neanderthal DNA segments and the incidence of medical conditions, including depression and addiction (*Science*, doi.org/bch3).

"The brain is incredibly complex, so it's reasonable to expect that introducing changes from a different evolutionary path might have negative consequences," says Simonti. However, many factors influence susceptibility to health issues, so people without this ancient DNA might still develop depression and those who do carry this DNA might never experience it.

In fact, plenty of "our" DNA has foreign origins – from extinct early humans to viruses – and can have both good and bad effects on health.