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First on the Scene in Europe

Over 42,000 years ago, the Aurignacians were already migrating across large areas of Europe. Some of the oldest and best finds come from an archaeological site in Russia, Kostenki, which lies 400 kilometres (250 miles) south of Moscow, on the River Don. Researchers have analysed DNA from the skeleton of a young man found here. Known as Kostenki-14, he lived about 38,000 years ago. He died in his twenties and was buried in a foetal position, with generous amounts of red ochre scattered over his body.

His mitochondrial DNA belongs to group U2, which is closely related to my own haplogroup, U5. Although U2 is very unusual today, it still crops up throughout Europe, as well as in central Asia and India. More exhaustive analysis of his mitochondrial DNA shows he was related to contemporary Europeans. He confirms the view that a group of people from Africa arrived in the Middle East about 55,000 years ago. They intermingled with a small number of Neanderthals, and shortly after this interbreeding the group split up. Some of them went further east, becoming South-east Asians and Australians in the fullness of time. Some remained in the Middle East and the Caucasus, while others began to migrate towards Europe. The man from Kostenki clearly belonged to the European group.

His grave, containing a well-preserved skeleton, was discovered back in the 1950s. Russian researchers tried to reconstruct his appearance on the basis of his bones. There are several copies of the reconstruction at museums in Moscow, Saint Petersburg and the rural locality of Kostenki.

These models show a slender young man with a broad but straight nose, unusually pronounced eyebrow arches and full lips. He was just 1.6 metres (5¼ feet) in height, with a strikingly small cranium. His teeth are broad and somewhat

worn, though otherwise healthy and in good condition, with a narrow gap between the front teeth in his upper jaw. The models depict him as dark-skinned, with dark, curly hair. Although that is certainly a reasonable assumption, researchers have not yet published any such details in the DNA analyses that are publicly available.

Nearby finds from the same period show that wild horses were the most common prey of the Kostenki man and his contemporaries. Archaeologists also found some hare and mammoth bones in his grave. At that time, clumps of trees, mainly willows, were beginning to grow in the steppes again, as the climate had recently become warmer after one of the Ice Age's colder periods. Life had become easier again after the worst catastrophe that Europe had experienced in 100,000 years.

The waxing and waning of ice ages is mainly the result of cyclical changes in the earth's orbit around the sun. The earth's axis can be tilted to a greater or lesser degree, it can be tilted in different directions, and the elliptical shape of the earth's orbit can vary. In certain positions, when the northern latitudes receive particularly little sunlight, a new global ice age can be triggered. These shifts are known as Milankovitch cycles, after the Serbian physicist who first described the pattern.

But there are other factors that can affect the climate at both global and regional level. Volcanoes, for instance, can discharge ash that filters out the sun's rays, thereby causing the earth to cool down.

Some 39,000 years ago there was a really 'Big Bang' – a volcanic eruption in the area around Naples, Italy. Magma poured out in quantities about 80 times greater than at the better-known eruption that buried the Roman town of Pompeii in AD 79. The plume from the magma rose 40 kilometres (25 miles) into the atmosphere. The ash spread mainly eastwards, over Greece and Bulgaria, the Black Sea and Russia. In Kostenki, archaeologists can clearly distinguish a thick layer composed mainly of dust, which helps them to date their finds. It seems likely that the sky was darkened for

a number of years, that the climate grew considerably colder, and that the ground was covered in decimetre-thick layers of ash – so thick in many places that it was impossible for animals to graze.

Some researchers believe that this volcanic eruption sounded the death knell for the Neanderthals. The Neanderthals left many traces that go back beyond 39,000 years, but there are scarcely any more recent ones that can definitely be attributed to them. The hypothesis is that at least some of us modern humans, unlike the Neanderthals, managed to adapt to the newer, harsher conditions after the ‘Big Bang’. Some researchers believe, for instance, that we began to use bone needles in this very period. This revolutionary new technology, the claim goes, enabled us to make warm, weatherproof clothes out of animal hides, and thereby to survive the most bitterly cold years.

The oldest known finds of eyed needles come from Kostenki and two other archaeological sites in Russia: Mezmaiskaya, in the northern Caucasus, and a location in the Altai Mountains of southern Siberia. They are estimated to be between 35,000 and 40,000 years old.

Clearly, needles and warm, well-made clothes may have helped us to survive. But they are probably not the whole explanation for why we survived while the Neanderthals died out. We need to remember that the Neanderthals had lived through many harsh periods of cold in the course of several ice ages. They recovered each time. It was not until we modern humans came on the scene that they were doomed to perish. The pattern is recognisable in many places in the Middle East, the Caucasus, Siberia and Europe. The Neanderthals lived there for thousands of years, then we arrived and the Neanderthals disappeared. In some places they had already vanished before our arrival. That can be seen, for instance, in the layers excavated at Hohle Fels. Excavations at other sites bear witness to an overlap of several thousand years, during which both groups may have coincided – albeit at a decent distance from each other. There are also sites where all traces of Neanderthals

stop abruptly, followed immediately by remains left by modern humans.

Very close to the grave of the Kostenki-14 man, in layers dating back to the same period, archaeologists have found needles along with a number of objects typical of the Aurignacian culture. There are tools made of bone and antler, and stones taken from rocky outcrops 1,500 kilometres (930 miles) away.

In addition, the Aurignacians of Kostenki made jewellery using the canine teeth of Arctic foxes and shells all the way from the Black Sea, 500 kilometres (310 miles) to the south. They also fashioned tubular beads with grooved spiral patterns out of the bones of foxes and birds.

Similar beads have been found throughout the region that has yielded Aurignacian finds. The site excavated at Abri Castanet in the French Dordogne was nothing less than a factory, where people mass-produced beads from mammoth tusks, reindeer antlers – and soapstone. Since that type of stone did not occur locally, they must have brought it from the Pyrenees, several dozen kilometres further south. The people in the hills of the Dordogne also adorned themselves with shells from both the Mediterranean and the Atlantic seaboard. Either they covered the whole distance on foot – up to 200 kilometres (125 miles) – or else they had extensive networks enabling them to barter goods with other groups.

The Aurignacians probably travelled from the Middle East through the region that is now Turkey. In any event, they travelled westward along the Danube just over 43,000 years ago. We can set aside the question of whether they had flutes and art objects made of ivory among their scant possessions, though I believe that to be the case. It is clear that their garments were embellished with various adornments.

Yet there were also anatomically modern humans – people like us – in Europe at an even earlier period. The very oldest

remains at Kostenki are assumed to be of Neanderthal origin. But the objects dating from 45,000 years ago – and earlier – appear to come from modern humans. In other words, those layers are significantly older than both the Kostenki-14 man and all the finds ascribed to the Aurignacian culture.

Stone tools of at least equal antiquity – apparently produced by modern humans – have been discovered at a number of sites in Hungary and the Czech Republic. It would seem that small groups of our type of humans made incursions into Europe at a very early stage, perhaps starting even earlier than 50,000 years ago. But these early pioneers did not survive. It was not until the Aurignacians that Europe acquired a viable population of modern humans.

There are also a number of finds from Italy and Greece that are now generally attributed to modern humans. The culture to which they belong, known as the Uluzzian, was discovered in the 1960s. For many years the view prevailed that these tools and adornments belonged to a group of unusually sophisticated Neanderthals. The stone tools appear to show a curious blend of the Neanderthals' production methods and those of modern humans. These finds also include shells and teeth perforated for use as pendants, remnants of red ochre, and tools made of bone. Just a few years ago, Italian researchers analysed two milk teeth from Italy's Grotta del Cavallo. The shape of these teeth has now convinced many – though not all – experts that they in fact belonged to an anatomically modern human. The debate continues; there are no DNA analyses.

All traces of the Uluzzians came to an end around 39,300 years ago. There is most probably a connection with the major volcanic eruption that took place at that time, very close by. But before the Uluzzians disappeared, they managed to have a decisive impact on their surroundings. They – or other pioneering groups of modern humans – introduced new customs into Europe.

The Neanderthals were not slow to copy them. There was another noteworthy culture in western Europe that appears to be a hybrid between the respective cultures of

the Neanderthals and modern humans. Known as the Châtelperronian, it has been identified in northern Spain and south-west France. The people belonging to this culture seem to have buried their dead on occasion, if only in a simple way, and they seem to have used personal adornments, arrows and, to some extent, coloured pigments.

Researchers have argued a great deal about who lay behind the Châtelperronian culture, but now, thanks to new and more sophisticated methods of radiocarbon dating, a picture is finally beginning to emerge. Everything suggests that the Châtelperronians were Neanderthals who imitated modern humans. Inspired by new arrivals in the region, they began to use personal adornments, make-up and spears.

The new and more precise radiocarbon dating was carried out at Oxford University under the leadership of Tom Higham. It suggests that all the Neanderthals of Europe disappeared at least 39,000 years ago; at any rate, there is no definite evidence of Neanderthals that is any more recent than that. But the new results of dating also show that Neanderthals and modern humans must have coexisted in Europe for thousands of years. That means there was ample time for the Neanderthals to acquire innovations from modern humans.

As we have seen, Jean-Jacques Hublin, the palaeontologist from Leipzig, is convinced that the two groups were suspicious of one another and that they kept their distance as much as possible. But he also suggests that they would sometimes have observed each other at arm's length. This would have enabled the Neanderthals to see that the modern humans used spears, which they threw at their quarry – a brilliant invention that made hunting both safer and more effective. The older method was to run after your prey and spear it directly, a technique that Neanderthals had used for several hundreds of thousands of years. It meant risking your life, of course, but they had no better method.

The Châtelperronian finds show that they suddenly started to produce spears at the very time when modern human beings first arrived in Europe. Neanderthals' spears were very

similar to those of modern humans and could be used in exactly the same way, but the two groups made their stone tools in slightly different ways. This fact strengthens Hublin in his conviction that the Neanderthals copied modern humans at a distance. In his view, there was no question of the two groups fraternising with each other. He may, however, be able to concede that they bartered with each other on rare occasions. That would explain why the layers with Neanderthal artefacts contain beads similar to those of modern humans.

The new ways adopted by the Neanderthals may have enabled them to survive for slightly longer; nonetheless, their downfall was a foregone conclusion once humans of our type began to take over Europe.

One of many attempts to account for the fact that we survived and they died out is based on the claim that we modern humans were supposedly less finicky about food. It was claimed that we were better at eating vegetables, such as roots rich in starch. But new research, including that of Amanda Henry at the Max Planck Institute in Leipzig, puts paid to that explanation. Having studied microscopic deposits on fossil teeth, she can bear witness to the fact that the Neanderthals also consumed a great deal of plant starch – so it is false to claim that they were very one-sided carnivores and died out for that reason.

On the other hand, we may have been better at catching fish and small, fast-moving animals such as hares and birds. It is conceivable that we were more skilled at making fishing nets out of plant fibres. Being able to fish and hunt using such nets was a major advantage. Firstly, it meant there was a more varied basis for people's diet, which was thus more reliable. If there were no big animals to hunt, they could always go down to the river and catch a few fish. Secondly, it meant more members of the group could contribute their labour. Hunting large mammals could often be dangerous and physically demanding; only strong, healthy people could

manage it. But laying and emptying fishing nets and traps was feasible even for weaker, older and disabled people. The art of fishing and hunting hares and birds may well have played a decisive role in securing our survival in Europe.

Maybe we outcompeted the Neanderthals by having more effective hunting methods. Maybe we simply killed them whenever the opportunity presented itself. I think Hublin is right in ascribing limited significance to climate change and sewing needles, but all the more to language, art, music and more extensive social networks.

However, the fact that the Neanderthals were already subject to severe pressures in the late Ice Age, before we arrived, must have simplified matters. A number of DNA studies show that some of them were very inbred towards the end. A Neanderthal boy in the Denisova cave in southern Siberia had so little genetic variation that his parents must have been half-siblings or the equivalent, while their parents were themselves the result of many generations of inbreeding within a small, restricted group. A Swedish study shows that towards the end there can only have been a few thousand Neanderthals in the whole of Europe. Their population dwindled rapidly about 50,000 years ago, as can be seen from the fact that their DNA became less and less varied.

The arrival of modern humans, the period of cold and the volcanic eruption in Italy would thus have sounded the death knell for a group that was already extremely vulnerable.

In the past, some researchers insisted that the Neanderthals had ample intellectual capacity to develop their new culture in a wholly independent way. But such arguments are heard less and less these days. It is abundantly clear that the Neanderthals lived in Europe in very much the same way for several hundred millennia, but then suddenly changed their way of life as soon as humans like us turned up.

In her bestselling novels, Jean M. Auel describes how Ayla, a Stone Age girl belonging to a group of modern humans, grows up among Neanderthals. We cannot rule out the possibility that something like that may have happened in real

life. There may have been individuals who moved between the two groups, bringing knowledge and traditions with them. After all, the genetic evidence shows that Neanderthals and modern humans interbred in the Middle East.

They also had hybrid offspring in Europe. For a long time, a number of anthropologists have claimed that certain excavated skeletons show clear anatomical features from both Neanderthals and modern humans. For instance, there are the two finds from the Peștera cu Oase cave in Romania: the cranium of a 15-year-old and the lower jaw of an adult. The latter specimen has been radiocarbon-dated, and its owner is estimated to have lived about 40,000 years ago.

In the spring of 2015, Svante Pääbo and his colleagues managed to prove that the lower jaw really does have a significant proportion of Neanderthal DNA – between 5 and 11 per cent of the genetic material. And the Neanderthal input had clearly come a mere four or five generations ago, as the pieces of DNA are in such long, unmixed sequences. That implies that the great-great-grandfather of the individual from Peștera cu Oase – or a relative at a similar distance in the ascending line – was a Neanderthal.

But people living in present-day Europe have no trace of this in our genetic material. In other words, when modern humans in Europe interbred with Neanderthals, their descendants must have died out. Researchers can only see definite traces of interbreeding somewhere in the Middle East about 54,000 years ago, and further east in Asia.

Neanderthals had bigger brains than ours, and they were by no means stupid. They were skilled hunters, and as regards dexterity they could give us a run for our money in many respects. Their stone tools were symmetrical and functional, and I have heard many archaeologists say how very difficult it is to learn how to make such tools. Clearly the Neanderthals also had the capacity to develop their technology, even if they did so by copying us.

But there is no credible evidence today to suggest that they made any use of art or musical instruments. They were probably unable to think in symbols to the same extent as we

can. It is very clear that they had a feeling for symmetry, but not for what we consider to be aesthetics and art.

I had a eureka moment when I heard Jean-Jacques Hublin mention the difference between symmetry and aesthetics. I thought of the time when I used to work in a cake shop as a teenager and learned how to decorate cakes and gateaux. Nearly all beginners make the same mistake: they try to make the patterns completely symmetrical. Once I had plucked up the courage to get away from symmetry, the gateaux I decorated looked a lot more attractive. Defying symmetry – just suppose that is one of the keys to what is uniquely human?

Like Hublin, I believe we modern humans bore some of the responsibility for the demise of the Neanderthals. We can reflect on the moral guilt that that might imply, even if it has – hopefully – passed the statute of limitations by now. After all, the Neanderthals were a kind of human being, even if they were not quite like us. Is their disappearance comparable with driving a species of animal to extinction? Or would it be more accurate to regard it as genocide?

Whatever the conclusion, we should be very careful not to look down on the Neanderthals. They managed to inhabit Europe for much longer than we have done so far. They were here for at least a few hundred millennia; indeed, if you also count their forerunners – sometimes called *Homo heidelbergensis* – for over 400,000 years.

The Aurignacian culture dominated Europe for about 10,000 years. It, too, lasted for much longer than any realm we know of from historical time. But then a new wave of migrants arrived on the scene.