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[BBC Homepage](#)

[Science & Nature Homepage](#)

In TV & Radio follow-up:

TV programmes
[Animal Hospital](#)
[Big Cat Diary](#)
[Bill Oddie Goes Wild](#)
[Britain Goes Wild](#)
[British Isles: A Natural History](#)
[Countryfile](#)
[Cousins](#)
[Dangerous Passions](#)
[Dragons Alive](#)
[Geronimo](#)
[Hawking](#)
[Horizon](#)
[Jungle](#)
[Leonardo](#)
[Life on Air](#)
[Nile](#)
[Should I Worry About...?](#)
[Robots](#)
[State of the Planet](#)
[Talking with Animals](#)
[Test Your Pet](#)
[What Am I Like?](#)
[Wild Africa](#)
[Wild Down Under](#)
 TV & radio listings
 Presenters

[Contact Us](#)



[Nature](#)

[Wildlife Finder](#)

[Science](#)

[Prehistoric Life](#)

[Human Body & Mind](#)

[Space](#)

You are here: [BBC](#) > [Science & Nature](#) > [TV & Radio Follow-up](#) > [Horizon](#)



First shown: **BBC Two, Thursday 20 February, 9pm**

[The Day We Learned To Think](#)

[Next on Horizon](#)

[Programme summary](#)
[Questions and answers](#)
[Transcript](#)
[Weblinks](#)

The successes and danger of gene therapy are assessed in [Trial & Error](#), 27 February, BBC Two

The Day We Learned To Think - programme transcript

NARRATOR (JOHN SHRAPNEL): It is one of the greatest whodunits of them all. When, in the course of our evolution from apes to modern humans, did we acquire the ability to talk, to give meaning to the world around us, to think? When did we really stop being animals and become truly human? Now one small stone may hold the answer. This piece of ochre could at last solve a 100,000 year old mystery, the mystery of the day we learned to think. Hidden on the wild coast of South Africa where the Indian Ocean joins the Atlantic, there is a cave. Today it's abandoned, but once it teemed with life. For here, tens of thousands of years ago, some of our earliest ancestors lived.

PROF CHRIS HENSHILWOOD (African Heritage Research Institute): I like to think of areas along this coast as being the original Gardens of Eden. You really had everything that you needed.

NARRATOR: For the last 10 years this cave has been anthropologist Chris Henshilwood's life. Every year he's dug further and further down back into time searching for clues about the people who lived here and one day he came across something he never expected to see, something that, according to all the textbooks, just shouldn't have been there at all.

CHRIS HENSHILWOOD: This absolutely incredible image appeared. There was enormous excitement as you can imagine. Everybody was jumping around the place. Here was a definitive image that nobody would argue with was deliberately created.

NARRATOR: Henshilwood's discovery is threatening to revolutionise our understanding of one of humanity's biggest puzzles. History books may have to be rewritten and long-held theories torn up. Because of what he found one of the great scientific detective stories may finally have been solved: when did our ancestors cease being brute animals and first become truly human? When did we learn to think? Thinking is the defining trait of humankind. It has given us machines, technology, power. No other animal has the ability to look at the world outside and transform it. Thinking makes us what we are - the most dominant species to have ever strode the earth. Where all other animals live from day to day we alone plan ahead, dream and create.

PROF RICHARD KLEIN (Stanford University): Well I suppose if I had to isolate one trait that I would say marks modern humans, its innovativeness, creativity, the ability to introduce and invent new things all the time. No other animal species is continually reinventing its own behaviour.

NARRATOR: But when did this crucial ability to be creative and to dominate the world around us actually happen? Find the day we learned to think and you would have identified perhaps the single most important moment in human history.

PROF ALISON BROOKS (George Washington University): We essentially live in a world that we create in our heads. If you look around us everything that you live in is created by humans. This is a fascinating development. How do we come to behave the way we did? When did this happen?

NARRATOR: The search for the answer to that question has become one of science's greatest missions, but it was not going to be simple. Thinking leaves no traces. There are no fossilised thoughts waiting to be dug out of the ground and dated. It was like investigating a murder scene without a body. So scientists had to look for indirect clues - not fossils, but other evidence for when thought began and then they realised that thought must have come hand-in-hand with something else.

MONTAGE MAN: Come on, four pound a pound banana... WOMAN: Oh yes, I tried to speak to her yesterday. WOMAN: Yes, did you not... WOMAN: No, I didn't know...

NARRATOR: Thinking also means talking.

MAN: Give me a few...

NARRATOR: For us to be able to transform the world our thoughts need communication.

WOMAN: Thanks very much, thank you...

NARRATOR: So scientists concluded thinking could only have happened when we developed language.

MONTAGE MAN: ...utterly vacuous. MAN: ...make a simple mistake. MAN: ...some day he discovered mobiles... GEORGE BUSH: Read my lips.

PROF RANDALL WHITE (New York University): Language, it's really a critical threshold to cross. The ability to have things stand for other things and to recognise and to agree within a culture or, or even within a species that a certain thing stands for something, something else.

NARRATOR: But then archaeologists ran into the same problem all over again. There are no ancient tape-recordings and writing was only invented recently.

ALISON BROOKS: What are we going to look for? First of all it's going to give us evidence that humans were behaving in a modern way.

MAN: ...the high esteem in which she's held.

ALISON BROOKS: We're very stumped for how we're going to get evidence of these kinds of things, so we look in a way for proxies. NARRATOR: But there was one kind of evidence archaeologists could look for, something that was proof of thought and as clear a form of language as you could ever hope to see.

RICHARD KLEIN: How do we detect creativity in the, in the archaeological record? One obvious line of evidence is art. When you get unquestionable art that's widespread and common I think you could say that you're dealing with people just like us.

NARRATOR: Only humans create, and can make sense of, art.

PROF TERRENCE DEACON (University of California, Berkeley): I'm sure that dozens of dogs have walked down this street in the past years and perhaps not one has glanced up in awe or wonder and thought to himself what does this mean? For a dog this is colour on a wall, perhaps even less than that.

NARRATOR: But to a human being a painting is far more than just a collection of colours. It is a language, an expression of thought.

TERRENCE DEACON: In a lot of ways this becomes a way of talking. This is a story. In fact many, many stories. The listener, the reader, the onlooker has to decode the story, so when you look at this mural and see all of these different images you don't look at these for the pictures, you don't look at these for the colour, you don't look at these for what they do to the building, you look through them to meaning.

NARRATOR: For archaeologists this realisation that art, language and thought were all the same thing was a huge breakthrough. Suddenly what they had to look for was clear. Discover the earliest forms of human art and you would have found the day we learned to think. So starting decades ago archaeologists went hunting for art. They looked in the obvious place: Africa, the cradle of human evolution itself, but they found nothing. They traced the path the early humans took out of Africa through the Middle East. Still nothing. So archaeologists turned to Europe and then a wonder- the first ever cave paintings, stunningly crafted and detailed.

RANDALL WHITE: This is their representation of the world around them, so when I walk into one of these caves it just, absolutely gives me chills to think that in some miniscule percentage I'm able to

actually peek into the way that they saw their world. We can walk into a cave like that and say I understand, I understand the mystery. A modern human would have done that, I would have done that.

NARRATOR: And they found far more: intricately worked statuettes; thousands of pieces of jewellery. Here at last in Europe was the evidence archaeologists had been searching for - symbolic art that could only have been made by people who could talk and think, like us, and it all dated from the same period - around 35,000 years ago. The European evidence was beyond doubt. It was as if a light bulb had gone on inside the human brain, a thinking Big Bang. For some reason we'd suddenly become truly modern humans.

RANDALL WHITE: All of the elements of the human mind were in place to create everything that exists subsequently - to go to the Moon, to create writing, to create agriculture, to do all of the things that we've done over the subsequent 35,000 years.

NARRATOR: And so, it seemed, the moment we'd learned to think had been found. This landmark moment in human history became known as the Human Revolution. Just how powerful this Human Revolution must have been was shown by something else, something more disturbing. For when our ancestors first arrived in Europe 35,000-40,000 years ago there were people already waiting for them, another species of human who'd been living in Europe for hundreds of thousands of years. They were called the Neanderthals.

PROF JEAN-JACQUES HUBLIN (University of Bordeaux): It's difficult for us to, to accept, even to understand this notion of different species of humans living in the same world. Very, very strange.

NARRATOR: The Neanderthals were as much a part of the human family as we are, closer to us than any living animal like chimpanzees, but because they'd come out of Africa long before our immediate ancestors they had evolved along very different lines.

JEAN-JACQUES HUBLIN: The face of a Neanderthal is a very long face and it's also very projecting in the middle portion of the face. It's very likely that Neanderthals had very big and very projecting nose. That was probably a very spectacular feature.

NARRATOR: The Europe the Neanderthals had made their home had been wracked by a succession of Ice Ages. It was a punishing environment and one which shaped their whole physical appearance.

JEAN-JACQUES HUBLIN: They have long trunk and rather short limbs which is something which allows to retain some warmth in the body. I would say they look a little bit like Eskimos. They were very well adapted to this very challenging and very changing environment, but about 40,000 years ago something happened to them that never happened before.

NARRATOR: What happened was the arrival of the modern humans. After 250,000 years of life the Neanderthal species was wiped out almost overnight. For scientists the arrival of the modern humans and the disappearance of the Neanderthals had to be more than a coincidence. The first clues to understanding what might have happened emerged when they studied Neanderthal tools.

RANDALL WHITE: When you're confronted with certain aspects of Neanderthal, of the Neanderthal archaeological record you scratch your head because you say I don't understand, I wouldn't have done it that way, why didn't they do it this way?

NARRATOR: Neanderthal tools were very different to ours in one crucial respect: everything was much simpler and above all, unlike the modern humans, there was no Neanderthal art and so no evidence these primitive humans could actually think.

RICHARD KLEIN: Neanderthals don't seem to have produced anything that we would really call art. They don't seem to have produced personal ornaments. They were in fact truly primitive people. Sure they were human, they just weren't modern human.

NARRATOR; And so archaeologists put together a theory to explain their disappearance. 40,000 years ago modern humans arrived in Europe and suddenly started to think. This gave them a unique advantage over the Neanderthals. In the battle for the scarce resources left by the Ice Age brains won out over brawn as our superior minds allowed us to defeat our physically tougher neighbours.

RANDALL WHITE: One population capable of communicating better, capable of inventing better, capable of organising better in the face of a population that had none of that in their 300,000 year tradition. It seems to me that the, the competition would not have lasted very long.

NARRATOR: Unable to think like us the apparently inferior Neanderthals were pushed to the brink of extinction until, finally, they vanished altogether. This then was the final proof of the power of the Human Revolution. That sudden dawning of thought had allowed us to surpass even our nearest

relatives. The Human Revolution had given us the power to take over the world. But then the mutterings started. A strange anomaly emerged that didn't quite fit with the Human Revolution story. It began when scientists started looking for the first traces of that other supposed proof of thinking, not art but language. It was Jeffrey Laitman who started the confusion. He's an expert in anatomy and in particular one small part of the human body, the part we use to speak: the throat.

PROF JEFFREY LAITMAN (Mount Sinai School of Medicine): The throat is arguably the most important region in all of human anatomy and physiology. As a native New Yorker I like to think of this as the Grand Central Station of the human body. (Background voice) These are really nice. This is a really clear picture...

NARRATOR: Laitman began studying the human voice box, or larynx. He discovered that in the course of evolution our larynx had moved to a very different position to that of all other mammals.

JEFFREY LAITMAN: Something has happened in you and me and what's happened has been rather remarkable. Our larynx has descended in the throat. One key gain, of course, is that by the larynx being lower in the throat you have space above it, so what we get in the deal is a mechanism which has turned us, sound-wise and turned us vocal-wise from being a, a bugle to being a trumpet. (Background voices) Around the... Which one am I following (TALKING TOGETHER) Beautifully here, beautifully...

NARRATOR: What the lower larynx gives us is the ability to speak.

(Background voice) ...the upper lip is over here. Right, you can see it clearly on the...

NARRATOR: So Laitman started to wonder: when did this lowering of the larynx actually happen, when did we acquire this ability to speak? His research revealed that over the course of millions of years of evolution the shape of our skulls had changed in a way that had caused the larynx to descend.

JEFFREY LAITMAN: The big difference is when you find adult humans. When you look at the bottom of their skulls you see a little valley, a gully, which is very different and the relationship we found were that skulls that are very bent bottom, like this, relate to a larynx not positioned high on up, but a larynx that has gone much further down.

NARRATOR: The gully-shaped skull went hand-in-hand with the ability to speak, so Laitman began to investigate. When had this key development needed for language actually happened? Looking at skulls from further and further back in time he found something deeply puzzling.

JEFFREY LAITMAN: By the time of early members of our own species, Homo sapiens, some 100,000-200,000 years before the present, we start to see features that are almost identical to living humans.

NARRATOR: The modern gully shape and so the ability to speak had been reached at least 200,000 years ago, long before the Human Revolution.

JEFFREY LAITMAN: So they had the anatomy for it. Were they speaking like us? Now we get into the world of hypothesising. I wasn't there. However, if you have a car that has a nice, big engine and all the tyres you assume that car is going to run and it's going to run pretty fast otherwise why does it have that big engine and why does it have all those nice tyres? That's what we're dealing with.

NARRATOR: And then in Israel something happened to thicken the plot even further. In 1989 an archaeological site yielded for the first time a tiny and precious piece of a Neanderthal skeleton called the hyoid bone.

DR MARGARET CLEGG (University College London): The hyoid bone is a bone in your vocal tract and it sits about here and if you press with your fingers you can actually feel the shape of the bone.

NARRATOR: Just as in modern humans the Neanderthal hyoid would have been crucial in forming the larynx. For the first time scientists could compare our ability to make sounds with the Neanderthals and they were in for a surprise. The hyoid bones were virtually identical.

MARGARET CLEGG: The relationship between the hyoid bone and the cranial base and the face and the skull is the same in the Neanderthals as it is in modern humans and the implication of that is that the hyoid bone is going to sit in the same place as it does in modern humans. It's going to be low in the throat.

NARRATOR: In other words, like modern humans the Neanderthals had a low larynx. It meant they too would have been physically capable of speech. In fact in some ways they might even have done it better.

MARGARET CLEGG: The thing about the Neanderthals is that although they would have had a similar sort of vocal tract to ours there were differences in the Neanderthals. They've got great big chests, they've got huge noses and massive sinuses. Now the big chest and large nose is going to give them a much bigger sound, much more in common, perhaps, with an opera singer than with an ordinary person.

NARRATOR: There was now a clear paradox. The Human Revolution theory said we only learned to think 40,000 years ago and the proof of that was the sudden appearance of art in Europe, but according to the fossils that other apparent proof of thought, speech, had emerged 160,000 years earlier. It just didn't make sense.

RANDALL WHITE: That raised a serious question for us archaeologists, it raised a serious question because it said OK, you can have anatomically modern humans in Africa 100,000 years ago, but why if they're anatomically modern aren't they doing all this good stuff that we see among the earliest moderns in Europe, why are, why aren't there painted caves, why aren't there all of these engraved objects etc?

NARRATOR: For supporters of the Human Revolution theory, like Richard Klein, there was now a real difficulty. How to reconcile the contradictory evidence of the art and the anatomy, so Klein proposed a radical theory. Even if humans had the anatomy for speech much earlier they didn't have the ability to use it. Then, in contrast to every other process in evolution, where change happens gradually, the human mind had been switched on suddenly through a single, freak genetic mutation. Only then did we start to think, to talk and to create art.

RICHARD KLEIN: I think that what happened 40,000 or 50,000 years ago was that there was a genetic mutation that allowed people to be very much more creative than they had been before, to think differently, to ask questions about what if I make my tools this way, what would be the result, in a way that no one had been able to do before.

NARRATOR: According to Klein thought had not emerged through gradual evolution, but in a sudden, dramatic leap forward. It was as if we'd been genetically touched by God. For Klein this sudden awakening was so powerful it was the only possible explanation for why we'd replaced the Neanderthals. We had the thinking genes and they didn't.

RICHARD KLEIN: My belief is yes, there were genes missing, if you like that made it impossible for them to behave in a fully modern way and that helps us to understand why when modern humans appeared in Europe beginning perhaps 40,000 or 45,000 years ago they were able to replace the Neanderthals so completely.

NARRATOR: It was a bold hypothesis and a compelling one. The Human Revolution theory remained the best explanation of the day we learned to think. But then, in the year 2000, on the other side of the world from Europe, in Africa, came something utterly unexpected. At Blombos, on the east coast of South Africa, anthropologist Chris Henshilwood had been quietly excavating his prehistoric cave for over a decade.

CHRIS HENSHILWOOD: This is Blombos cave, a very special find. We're really looking at what has been left here almost as if it was put down yesterday.

NARRATOR: As they dug down through the floor of the cave his team were going back to an ancient time of human habitation tens of thousands of years ago.

CHRIS HENSHILWOOD: We came down onto this layer you can see over here which really was quite remarkable. On the surface were lying the most beautifully made artefacts, bone points, spear points as well and immediately I realised we'd gone back a very, very long way in time.

NARRATOR: The beautifully crafted objects were dated to over 70,000 years ago, long before the Human Revolution, but there was still no proof the people in the cave were thinking people, like us.

CHRIS HENSHILWOOD: You always hope and think that perhaps one day you will find some really definitive evidence that'll tell you these people were modern. Are we going to find art in this environment, did these people even produce art? We didn't know that, we had no idea at all.

NARRATOR: Then one type of item started appearing over and over again.

CHRIS HENSHILWOOD: We noticed large numbers of pieces of ochre. Ochre is a soft stone, comes in reds and yellows. If you scrape it it'll produce a powder and that powder can be mixed with animal fat, for example, and used as a paint.

NARRATOR: At first no one could work out what the ochre was doing in the cave. It didn't occur there naturally. In fact, it could only have come from miles away. It must have been brought there

for a reason, but why?

CHRIS HENSHILWOOD: I think ochre is very important to these people and we can see that simply because of the great numbers. 8,000 pieces of ochre in the old levels alone. They have scraped these pieces of ochre to, first of all, obtain the powder and I think secondly, so they could use the ochre to apply colour directly to other surfaces.

NARRATOR: Then one day Henshilwood found a piece of ochre that was different from the rest.

CHRIS HENSHILWOOD: One afternoon we were excavating here we found another piece of ochre. We'd been recording all the pieces of ochre we'd taken out. We found this piece of ochre, brushed up the side and there was this absolutely remarkable pattern revealed. There was huge excitement you can imagine.

NARRATOR: The ochre piece appeared to have been marked with a clear image, what seemed like an abstract geometric pattern.

CHRIS HENSHILWOOD: This was a deliberate construction of a series of cross-hatchings in each direction, a line across the top, a line through the middle and a line down the bottom, so it actually circumscribed that engraving as if it was they'd made the crosses and they'd deliberately surrounded it with these other lines as well.

NARRATOR: Henshilwood believed he'd found what was possibly the world's oldest ever work of art, but he had to be sure. Was it really that old and was it really art? So first they dated the ochre. The cave layers it was found in showed it to be 77,000 years old, twice as old as the Human Revolution. Then was it art? Archaeologist Francesco d'Errico is a specialist in prehistoric markings. He had to verify whether the lines were deliberately created to form a work of art and were not accidental knife marks.

DR FRANCESCO D'ERRICO (University of Bordeaux): These lines were produced with a point rather than a knife or a cutting tool because there is movement, there is a certain wobbly character to the line, so the lines on the piece are the results of a deliberate series of actions by the engraver with a tool specially designed for that purpose.

NARRATOR: D'Errico's analysis showed the slab of ochre had been specially rubbed down before being carefully, and deliberately, engraved. It meant there could be no more doubt.

CHRIS HENSHILWOOD: Here is the first example of the ability of humans to store something outside the human brain. You are storing the message that somebody else, who's part of that same group, could pick up and they would understand what that meant. This is the beginning of things like art, writing and everything else that follows.

NARRATOR: And this was no one-off find. Henshilwood found a second slab of ochre with a similar, abstract pattern. His discoveries at Blombos spread like wildfire through the scientific community.

ALISON BROOKS: I was at a scientific meeting and Francesco, who was sitting in the fourth or fifth row, turned out to have a photograph of this thing sort of in his pocket. He pulled out this photograph and I, I really felt as if my hair stood on end. It was like a definitive moment to see it. It couldn't be anything but the product of a modern human brain and yet it was old.

NARRATOR: The evidence of Blombos pointed to one conclusion: modern human behaviour had not started in Europe 40,000 years ago, but in Africa at least 30,000 years earlier. The Human Revolution theory had to be wrong. In the wake of the Blombos finds suddenly a whole host of other puzzling discoveries in Africa made sense - sophisticated stone tools that dated from 80,000 years ago; intricate harpoon points from over 90,000 years ago; and Jeffrey Laitman's research on the evolution of speech - all had been dismissed as signs of thinking and modern behaviour, but now everything is being reconsidered.

CHRIS HENSHILWOOD: We've a period, a mosaic if you like, of the evolution of the human mind that is not just focussed on Blombos, but spread across Africa and different things are happening at different times.

ALISON BROOKS: There's a very gradual emergence of these behaviours rather than a sudden appearance of all of them. If you go back 130,000 years ago you don't find the whole suite, you only find part of it.

NARRATOR: So it seems there was no single day we learned to think. The art found in Europe was just the culmination of a long process that had taken hundreds of thousands, perhaps millions, of years. Human beings had not been genetically touched by God. Instead, like everything else in nature, thought and language had emerged gradually, just as the laws of evolution said they should,

but there was one final puzzle that still needed to be solved. If thought had emerged over hundreds of thousands of years then why hadn't the Neanderthals evolved it too and if they had, then why had they been wiped out? The cave of Pech de L'Aze in France was home to generations of Neanderthals before the arrival of the modern humans in Europe. Excavated in the 1960s everything found here seemed to fit the typical picture of the Neanderthals as a primitive species, incapable of thinking like the modern humans, but then Chris Henshilwood's colleague, Francesco d'Errico noticed a whole class of evidence had been overlooked.

FRANCESCO D'ERRICO: These pieces of manganese have remained in museum drawers for more than 30 years.

NARRATOR: 450 pieces of black manganese oxide had been found in the layers of the cave. It's a rock whose powder can be used as a pigment, just like ochre, and again it seemed to have been used for a very particular purpose.

FRANCESCO D'ERRICO: Some of the pieces, like this one, are in the shape of a pencil. The two sides have been worked to produce a point which has been worn down. The pigments were then rubbed on a soft surface and our microscopic examination of the pigments show this must have been done on either animal skin or on human skin.

NARRATOR: If d'Errico was right and the pigment was used as a pencil it meant the Neanderthals must have been capable of some form of symbolic expression, some form of art.

FRANCESCO D'ERRICO: Some of these pigments must have been used symbolically, but from a period when the Neanderthals were not in contact with modern humans, a period which was the same as when red ochre was being used by modern humans in Africa.

NARRATOR: And d'Errico examined other evidence, like these stunning pieces of Neanderthal jewellery that dated from the time they were living side-by-side with modern humans.

FRANCESCO D'ERRICO: These objects were made by the Neanderthals, polished by the Neanderthals and equally worn by the Neanderthals. For me this is the proof the last Neanderthals were capable of symbolic thought.

NARRATOR: In other words, the evidence suggested that the Neanderthals may have been thinking and speaking too and they might have been doing it even before they met our ancestors. These revelations have meant the traditional view of the Neanderthals as a brutish, primitive species is being discarded. It means their disappearance may not have been as simple as the extermination of an inferior species by a superior one. Instead, d'Errico suspects something else may have been at work, something more mundane and random, like disease.

FRANCESCO D'ERRICO: The disappearance of the Neanderthals is still today a mystery. It could well be for epidemiological reasons due to the arrival of new illnesses, as has often happened when people invaded new territories.

NARRATOR: It would not have been the first time in history one invading population had led to the accidental extinction of another. It was the fate of the North and South American native peoples, devastated by 'flu and smallpox, brought in by Westerners. Perhaps it was a similar end that befell our last human cousins tens of thousands of years earlier.

FRANCESCO D'ERRICO: I think that if the Neanderthals had not disappeared they would have no doubt developed their own kind of modern behaviour, perhaps of a kind not so different from our own.

NARRATOR: Our picture of the Neanderthals is still far from definite, but it does raise a fascinating possibility. Had history taken a different turn perhaps the Neanderthals would have survived to be living amongst us today. It's an extraordinary thought. The collapse of the Human Revolution theory means that modern humanity did not suddenly arise in Europe as the textbooks once said. It began to emerge slowly long ago in places like Blombos in South Africa. This is where the first truly modern humans grew up over 70,000 years ago.

CHRIS HENSHILWOOD: I like to think about what the people must have thought and done when they lived at this cave. We sit in the same place those people sat 70,000 years ago. What were they doing, what were they thinking? I believe very much the same as we're doing right now. They were capable of symbolic thought. In other words, they could talk about yesterday and today and tomorrow. That is a remarkable step forward.

[Back to top of page](#)

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[Return to Horizon homepage](#)

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