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WHAT WOULD THE CHILD OF A HUMAN AND A NEANDERTHAL LOOK LIKE?

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YOUNG REVIEWER:

ALICE

AGE: 12

Long ago there were many different species (or kinds) of humans. These included our ancestors, as well as another group, called the Neanderthals, who went extinct and no longer exist. Neanderthals looked very different from us: big muscles, big brains, and no chins. In 2010, scientists managed to study the DNA (genetic code) from these ancient Neanderthals and found, with surprise, that our ancestors had children with them. Neanderthal DNA exists in many people alive today. But we still did not know what the children of humans and Neanderthals (known as hybrids) would look like. By looking at the hybrid children of different kinds of mice, scientists realized that hybrids look very strange indeed. Based on this research, scientists think that human-Neanderthal children would have large heads (even bigger than the Neanderthals) and that their faces would look a little more like humans than Neanderthals.

HUMANS AND NEANDERTHALS

SPECIES

A group or kind of organism with similarities either in their DNA, the way they look, or the way they act.

Today, there is only one **species** of humans around. Scientists call this species *Homo sapiens.* Individual *Homo sapiens* might all look a little different from each other, but there are far more ways in which we are similar, both in the way we look, and in our DNA. However, *Homo sapiens* were not always the only human species on the planet.

About two hundred thousand years ago (which is very long ago, but not nearly as far back as the dinosaurs), there were at least five different kinds of humans in the world. Some were smaller than us, with smaller heads, such as the "Hobbits" in Indonesia (*Homo floresiensis*) and *Homo naledi*, whose skeletons are found in caves in South Africa. The early ancestors of our species, *Homo sapiens,* were much like us in brain and body size and lived in Africa (*Homo sapiens sapiens*). There was also a group called the Denisovans from northern Asia, which we do not know very much about [1]. We called them *Homo sapiens denisova*. But it is the Neanderthals (*Homo sapiens neanderthalensis*), whose skeletons are mainly found in Europe, who are probably the most famous of these human cousins (Figure 1).

Figure 1

A map of the world where humans and our relatives lived between 300 and 100 thousand years ago, based on fossil evidence. During this time, Neanderthals lived in Europe, humans like us lived in northern Africa, the Denisovans are found in northern Asia, the Hobbits are in Indonesia, and *H. naledi* is in South Africa. (Source: Abrian Curington).

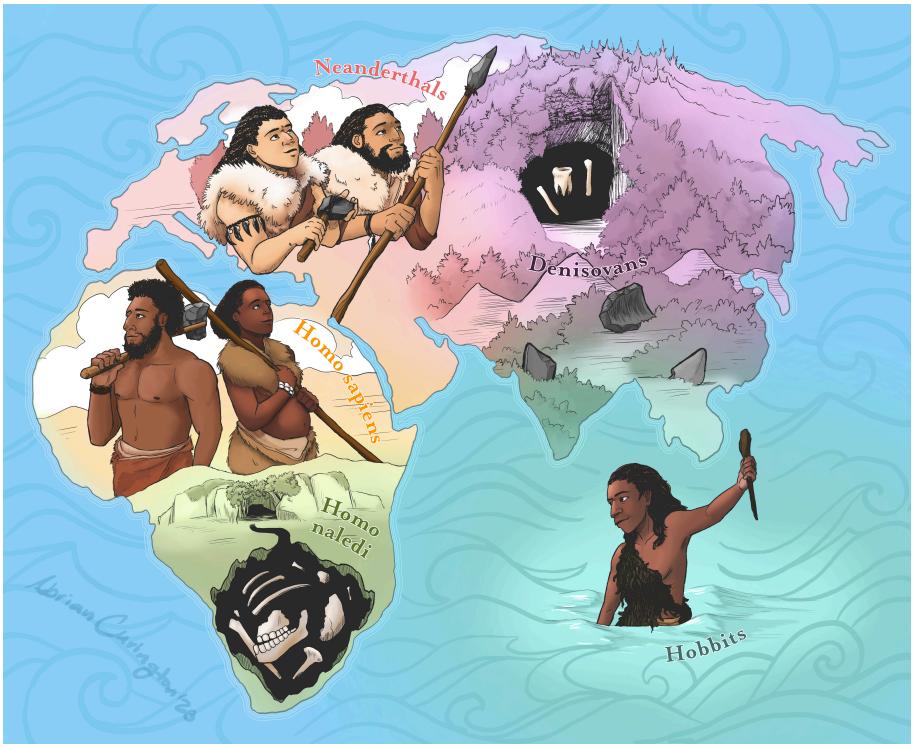

Figure 1

From their skeletons, scientists know that Neanderthals were a little shorter than us on average, but had very rugged, muscular bodies, and large heads, with brains even bigger than ours. Their heads and faces were also different from ours in shape: their faces puffed out around the nose, their heads had a clear bump in the back, they had

massive brow ridges above their eyes, and they had no forehead and no chin!

Neanderthals lived in Europe for hundreds of thousands of years, but around 40,000 years ago, they vanished. Around the same time, humans who were more like us started living in Europe. Scientists used to believe that these humans killed off the Neanderthals. Others argued that we were just more clever than the Neanderthals, or were better at working in groups, so we "outcompeted" them in other ways, such as eating the best foods before they could. Still others believed that the Neanderthals did not vanish at all, but instead, humans took them in and made them part of their societies.

This last opinion led to a heated debate. For some scientists, the Neanderthals seemed so different that they did not think Neanderthals could have lived well with humans. These scientists thought of Neanderthals as less clever than us and not as capable, in terms of working together or even in making art. They thought of Neanderthals as real brutes, and a completely different species from humans.

INFERTILE

Inability to have offspring (children).

Based on these ideas, some scientists insisted that Neanderthals and humans were so different that they would not have been able to have children together, or that any children they did have would be **infertile** (not able to have children themselves). For example, mules, which are the **hybrids** of donkeys and horses, are infertile and cannot breed. If Neanderthals and humans could have children, regardless of whether those children were infertile, the children would also be considered hybrids.

HYBRID

The offspring (children) of two different species. For example, a mule is the hybrid of a horse and a donkey.

Then, in 2010, scientists managed to get DNA out of very ancient Neanderthal skeletons [2]! This was an amazing feat, since DNA is very fragile and breaks down quickly. The wonderful thing about having this DNA was that we could finally know whether humans alive today have some Neanderthal DNA in them. If so, it would mean that these ancient humans *did* have hybrid children with Neanderthals, and that these hybrids form part of our ancestry.

The answer was yes! A very small bit of Neanderthal DNA exists in many people alive today. This discovery changed the way scientists think about the Neanderthals. And, since then, we have found DNA from several ancient skeletons, and this new evidence also proves that humans and Neanderthals had hybrid children.

Although the ability to analyse old DNA is very cool, it is not really as useful as we might like. Most skeletons of ancient humans no longer have any DNA within them. The DNA is too broken down, or often the skeleton has **fossilized** completely, turning into rock. This means that we might never know what the DNA of many skeletons was like. How, then, will we know if we find a skeleton from a hybrid? What would a human-Neanderthal hybrid look like? Will it have the rugged

FOSSILIZE

To become a fossil, which is the remains of a plant or animal that lived long ago.

features of the Neanderthal? Will it have a human chin? Will it have a mixture of Neanderthal and human features? Or will it look like neither species?

ANIMAL HYBRIDS

One way that scientists have tried to answer the question of what a human-Neanderthal hybrid would look like is through looking at hybrid animals [3]. Some animals have hybrids, too. As already mentioned, a mule is the hybrid offspring of a horse and a donkey. A zonkey is the hybrid of a zebra and a donkey. A liger is the hybrid of a male lion and a female tiger. These are all examples of hybrids, but they are not found in nature.

People used to think that the only way animals of different species could have hybrid babies is if humans interfered. We can do this by forcing animals that would not usually live together into the same areas. We sometimes put animals into captivity, in the same cage or garden. But we also force different species of animals to live together when we break up their homes, by cutting down trees or building houses and roads in their natural habitats. These actions force the animals to live elsewhere, with other animals they would not normally live with.

We now know that some animals *do* create hybrids in nature. Certain species of baboons and ducks naturally create hybrids, for instance. Using the DNA of ancient bear skeletons, scientists found that polar bears and brown bears also produced hybrid babies thousands of years ago! This new information tells us that hybrids are not just unusual monsters; they are a normal part of nature! In fact, hybrids can be very important. They can be good for animal species because they bring in new DNA that might help the species survive unusual changes in their environments.

THE HOUSE MOUSE

To find out what a human-Neanderthal hybrid might have looked like, scientists turned to the little house mouse. Why the house mouse? Well, first, just like there used to be many different humans, there are three different kinds of house mice—one kind is from Europe, another lives in Russia and another is from China. In nature, the Russian and European mice sometimes have hybrid offspring, and the Russian and Chinese mice also have hybrids. These hybrids are very different from each other. The Russian-European mouse hybrids are very sickly and do not survive very well, but the Russian-Chinese mouse hybrids are so healthy that they are even better off than their parents!

Despite these hybrid mice being so different, the scientists noticed something similar in the way the mice looked. Both kinds of hybrid mice had huge heads! In fact, the hybrids' heads were larger than the heads of any of the parent mice. When scientists looked closer, they also noticed that these mice looked more similar in their faces to the parent with the smaller head. It is interesting that, when we look at other animal hybrids, we see a very similar pattern in some of them. For example, the hybrid of a coyote and a wolf has a face that looks more like coyote. Scientists also noticed that some animal hybrids have other strange features, like extra teeth or unusual "gaps" in the bones that form the head and face.

SO, WHAT WOULD A HUMAN-NEANDERTHAL CHILD LOOK LIKE?

If we use what we know from mice and other animals, it is reasonable to think that hybrid humans in the past would have shown this same pattern (Figure 2). These human-Neanderthal children might have had large heads, even larger than those of Neanderthals. Or these hybrids may have had unusual features in their faces and teeth. We can use this information to help identify which human fossils are hybrids! For example, human fossils that have unusually large heads, possibly with small faces, or strange teeth and odd features on their faces, could, in fact, be hybrids. It turns out we can identify lots of human fossils that are probably hybrids! The ability to identify which fossils are hybrids based on the way they look will allow us to get some information even when DNA is too broken down to analyse.

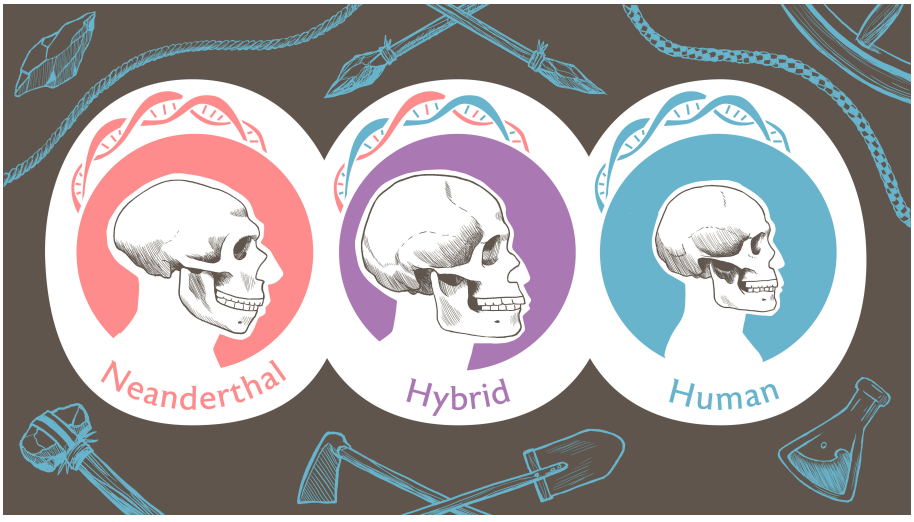

Figure 2

Figure 2

A representation of three skulls. The Neanderthal (left) has a big head, low forehead, and puffy face. The Human like us (right) has a rounded head, flat face and more prominent chin. Based on our study, the hybrid (middle) will possibly look more like the human, but have a bigger head, like the Neanderthal, with a slightly puffy face. (Source: Abrian Curington).

Even though the strange features of human-Neanderthal hybrids are very rare in humans today, the DNA we have from ancient humans and Neanderthals is clear: we all have a little bit of DNA from another

human species, from long ago. Therefore, when we ask, "What does a human-Neanderthal hybrid look like?," one answer might be, "Look in the mirror!"

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YOUNG REVIEWER

ALICE, AGE: 12

Hello, my name is Alice. I am 12 years old and my hobbies are art, listening to music, doing sports, and learning chemistry in school. When I grow up, I want to become a food chemist and advocate for problems like racism.

AUTHORS

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While Kerryn loves studying ancient humans, her passion is in talking about research and science with people of all ages and from all over the world! Her own research ranges from studying hybrid humans to studying how human evolution is taught in schools. She also coaches and tutors young scientists, helping them to plan and write their own research, in fields ranging from science to business studies. She hopes to help you fall in love with science too! *kerryn.warren@gmail.com

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Terry splits his time between teaching anatomy to medical students and doing research on human evolution. His research is about the evolution of the human skull, and he is particularly interested in how changes in the size and shape of the brain shaped the way the skull evolved. Terry has done fieldwork on human evolution in Africa, Asia, and Europe. He loves to share his unbridled enthusiasm for science with students of all ages!

REBECCA R. ACKERMANN

Professor Rebecca Ackermann studies humans and human evolution. She was the founding director of the Human Evolution Research Institute at UCT and is currently deputy director. She is also deputy dean of transformation in the Faculty of Science at the University. Her research focuses on how evolution happens, and how different kinds of evolutionary ways interact to produce the diversity in skeletons we see through time. She is particularly interested in how human evolution produces diversity in skeletons. Rebecca is also passionate about equality and justice, believing there should be no barriers to doing good science, no matter who you are!