Relationship between neanderthals and modern humans

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The Neanderthal was discovered in Feldhofer Grotto, in the Neander Valley, Germany in August 1856. The existing material was revealed in a limestone excavation near the city of Dusseldorf. The findings were comprised of a skull cap, two femora, the three right arm bones, two of the left arm bones, part of the left ilium and fragments of a scapula and ribs. Neanderthals are classified as the prehistoric humans who lived in Europe, the Middle East and Western Asia. Since the discovery of their remains, the relationship between modern humans and Neanderthals has been argued by many scholars. As the middle Pleistocene arose, a new species by the name of Homo sapiens migrated into Europe which caused various scholars to argue against the relationship between the two hominins. There have been a wide range of debates that argue the discovery of the modern human and the Neanderthal. One side of the debate suggests that the Neanderthal is a similar but different form of Homo sapiens with a few different characteristics. As a result, they argue that the Neanderthal had the ability to breed with the Homo sapiens. The opposing side of the debate suggests that the two hominids were different from one another and therefore, they were unable to breed with one another due to their genetic variations. They also argue that both species lived in one environment at the same particular time period. Scholars who conclude that modern humans have evolved from Neanderthals due to the similarity of their anatomical structure classify these species as Homo sapiens. In contrast, other scholars who conclude that Neanderthals were distinct species and did not mate with Homo sapiens classify these species as the Homo Neanderthalensis. Ian Tattersall, a paleoanthropologist at the American Museum of Natural History believes that Neanderthals should be classified as Homo Neanderthalensis because they

are distinguishable from modern humans based on their anatomical structure. Tattersall argues that more than one lineage of hominids simultaneously occupied Europe during the middle Pleistocene. This paper examines the many false arguments which state that Neanderthals are a similar but different form of Homo sapiens with a few different characteristics, and whether or not they had the ability to breed with Homo sapiens. The opposing side of the debate suggests that the two hominids were significantly different due to the differences within their genetics, their habitat and adaptation, and their morphology. In summary, this paper will argue that although Neanderthals are closely related to modern humans, they are scientifically classified as a separate species known as Homo neanderthalensis.

In 1987, scientists came across a common ancestor to modern humans, known as Eve. This finding was of a female specimen who lived in Africa approximately 200 000 years ago and was the most recent common ancestor through matrilineal descent of all modern humans to the present day. This suggests that all the individuals within the present day have the ability to trace some of their genetic inheritance through their mothers. In order to trace the evolution of various human species, scientists use mitochondrial DNA. To better understand the concept of genetic variation among modern humans and Neanderthals, amino acid from the bones were examined to determine whether or not DNA might be preserved in a given sample. Scientists were able to describe 27 differences between the Neanderthal DNA and a modern human DNA. Svante Paabo is an evolutionary biologist currently specializing in genetics. Paabo is recognized

as one of the founders of paleogenetics, a discipline that establishes methods of genetics in order to better understand the study of early humans. In 2006, Paabo stated a plan in order to reconstruct the entire genome of Neanderthals. Paabo and his team members worked very hard to be able to extract the DNA from a right humerus which is the upper arm bone of the Neanderthal. The humerus, top of a cranium, two femurs which is the upper leg bone, the right radius and ulna which are the lower arm bones, part of the left ilium which is also known as the pelvis, and some fragments of a shoulder blade and ribs were discovered by individuals in the Feldhofer Cave, near Dusseldorf, Germany, in 1856. These findings help scholars to better understand and to better distinguish the relationship between modern humans and Neanderthals.

The various findings of the Neanderthal mitochondrial DNA demonstrate that Neanderthals had the ability to interbreed with modern humans. However, the lack of diversity in Neanderthal mitochondrial DNA sequences, combined with the large differences between Neanderthal and modern human mitochondrial DNA strongly suggests that Neanderthals and modern humans developed separately and did not interbreed with one another. To better support this concept Neanderthal mitochondrial DNA studies are used to reinforce the arguments of those scientists who claim that Neanderthals should be considered a separate species who did not significantly contribute to the modern gene pool. Due to the fact that mitochondrial DNA is only spread from the mother, changes amongst generations are caused by mutations alone and not due to the recombination of the mother’s and father’s DNA. The amount of difference between Neanderthal and modern

human DNA suggests that our common ancestor existed about 550, 000 to 690, 000 years ago (Krings, 1999). In summary, if Neanderthals had made a significant genetic contribution to modern humans, similarities between the two sets of DNAs would have been observed. To conclude the overall comparison between Neanderthals and modern humans it has been concluded that the Neanderthal genetic contribution to the modern gene pool is significantly small.

One specific distinction between H. sapiens and H. neanderthalensis was a climatic adaptation. During the past decades, the climate began to change from extreme cold conditions to mild cold in a significantly short period of time. There were several glaciations which occurred during the existence of Neanderthals. Neanderthals adapted to severe cold climates and survived as a species for many years longer than the existence of modern humans. The body of the Neanderthal was able to function within cold climates. Their short limbs and thick bodies tended to minimize heat loss from the head which suggests an adaptation to the extreme cold. The reason why Neanderthals were unable to adapt to the mild cold climate was because the changes in the various weather conditions caused ecological changes to which the Neanderthals were not able to adapt and function accordingly. The climate changes were vigorously rapid and thus created replacements for various organisms, and because of these changes it was difficult for Neanderthals to adapt and function within this rapid change of climate. Studies on Neanderthal body structures have demonstrated that Neanderthals needed more energy to survive than any other species.

In comparison to the modern human the Neanderthal energy needs were approximately 100 to 350 calories more in a given day (Schwartz, 1999). When food became rare or unavailable, this difference in calorie intake may have played a major role in the Neanderthals' extinction. Neanderthals had a short period of dental growth which was an excellent indicator of somatic development, indicating that they developed even faster than their immediate ancestor, the Homo heidelbergensis (Ramirez Rozzi & De Castro, 2004). Jeffery Laitman, an American anatomist and physical anthropologist has studied the specific details of the Neanderthal anatomy. Laitman points out that the bony structures along the nose of the Neanderthal skeleton helped the Neanderthals to breathe in the cold air of the Ice Age in Europe. Laitman illustrates that the longer projection of their nose provided more surface area on which help to cover and to create a warm, and dry air before it reached the throat and lungs. Due to this, Laitman suggests that Neanderthals had the ability to breathe more through their noses than modern humans. Tattersall and Schwartz suggest that the Neanderthal nasal anatomy not only sets Neanderthals apart from other humans but is unique among all primates. Tattersall and Schwartz believe that their discovery of yet another basic difference in the Neanderthal anatomy supports the view that Neanderthals and modern humans are separate species.

Neanderthals and Homo sapiens are very similar anatomically. The comparison of the two species illustrate that they are very similar to one another. During the 1960's it had been believed that Neanderthals were not a separate species from modern humans. However, this popular belief is currently being argued with significant references which point out that this

was a false conclusion. Neanderthals represent a very close evolutionary relative of modern humans. Neanderthals were built on exactly the same basic body plan as modern humans, however their skulls and skeletons reveal some significant differences. The various major differences between the two species are with regards to their anatomical structure. Ian Tattersall stresses the issue that there is a significant difference between the two particular species, and he suggests that much evidence has been shown to better prove this hypothesis.

Neanderthals' cranium is different in shape and in size in comparison to the cranium of an average modern human. Neanderthals' cranium was longer from the front to the back, which resulted in relatively low, sloping foreheads. At the back of their skulls, they had a prominent projection called an occipital bun. Neanderthals also had very robust faces with large noses and prominent brow ridges which extended between their eyes. In comparison, modern humans have the pointed chin, which is not a recognizable feature in the Neanderthals. These traits give the Neanderthal face and head an appearance more resembling that of the late Homo erectus and Homo heidelbergensis than of modern humans. The characteristics of the Neanderthal brain are very similar to the modern human brain, and the structural organization of their brain was similar as well. The average Neanderthal brain was larger than the brain of most individuals in the present day. Their large brains were shaped in long horizontal skulls with low foreheads and bulging posteriors, in contrast to the short skulls and high foreheads of modern humans. These heavily built and muscled individuals had a brain volume of approximately 1200 to 1800 cubic centimetres, equal

to and even larger than modern human brains. Female Neanderthal brains were about 200 cm3 smaller than those of males. The size of the brain signifies that Neanderthals were much more muscular than modern humans, bulking about 30 percent more in weight, therefore brain size increased because they had a larger anatomical structure.

Neanderthal skeletons illustrate various differences from those of modern humans, particularly in the pelvis and limb joints, which were larger and more robust in Neanderthals than in modern humans. Their short limbs and thick bodies tended to minimize heat loss from the head and extremities which suggest adaptation to the extreme cold. The limb bones of Neanderthals were rather thick in comparison to the modern Homo sapiens, and their joint surfaces were larger in comparison to the modern Homo sapiens. Many characteristics of the Neanderthal skeleton appear to be related to cold climate adaptations. These particular features included limb bone proportions and muscle attachments indicating broad, slightly short and strong body, a large rounded nasal opening, and a suite of anatomical traits of the skull. Thus the fossil record for Neanderthals is significantly better than for earlier human species. One reason for this is that Neanderthal fossils are relatively young compared to other early human species, and fossils decay over time. Although the Homo neanderthalensis skeleton has many skeletal features which are very similar to the Homo sapiens' skeletal structure, Tattersall focused on the various differences between the two hominids. There is a significant difference between the length of the pelvis, and also the thorax which was significantly short in length in the Neanderthal body structure. Tattersall explains that the rib cage of the Neanderthal is

shaped like a barrel when it is viewed from the front. This therefore suggests that the sides are more or less parallel and both the bottom and the top of the thorax taper modestly inward (Tattersall, 2006). It has been argued that the differences in the two species' appearances have affected not just the external appearance of the two hominids, but also the way in which their locomotion is perceived. One example used to better understand the importance of their locomotion suggests that the height of the waist of the Neanderthal may have restricted the amount of rotation their body was capable of. Tattersall suggests that because the Neanderthals had a different type of locomotion, it is clearer that the two species were able to distinguish each other from one another. In summary, Tattersall illustrates that because of the significant differences in the anatomical structure, it is more evident that when the Homo sapiens and the Neanderthal first came into contact with one another, they were most likely able to have recognized one another as a different species and had been able to distinguish that they could not be potential breeding partners.

In conclusion, Tattersall uses various examples to illustrate the distinctive differences between the Homo sapiens and the Neanderthals. This is significant because it helps us to compare the two hominids to better understand and identify the differences among the two species. Tattersall concludes that Neanderthals are an extinct group with various distinctive characteristics which only belong to the Homo neanderthalensis species and not the Homo sapiens species. This makes the understanding of human evolution a lot more clear because it illustrates that prior to modern humans there existed a distinctive species, and that modern humans evolved from a

different species. The objective of studies in human evolution is to understand our lineage, and this particular study argues that Neanderthals are not on that direct lineage. Tattersall argues strongly that there is no overlap between the range of variation of features in Homo sapiens and those in Neanderthals.

The existence of Neanderthals is still a much questioned issue, and vigorously debatable. It seems highly unlikely that the Neanderthals contributed absolutely nothing to the modern genome, but whether they left a large heritage in modern humans or an insignificant one is a question that might not be answered satisfactorily for a period of time. The Neanderthal genetics factor, the outcomes of the Neanderthal habitat and adaptation, and the Neanderthal morphology in comparison with modern humans have been illustrated to distinguish who these individuals were and how they became a great subject of study for many scientists, researchers, and scholars. Neanderthals and their relation to modern humans illustrate important assumptions of who these individuals were. By discussing their relation to modern humans, this paper created a more in depth analysis of the identity of the Neanderthals. Since many researches demonstrate that Neanderthals were of their own species, this paper recognizes that Neanderthals are a different species from modern Homo sapiens. Although there have been many scholars who argue against this fact, based on the research for this paper, one has seen many differences that appear between a modern human and the Neanderthals. Therefore one can conclude by identifying the Neanderthals as a Homo species that lived prior to the existence of the Homo sapiens.

Sources

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