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Homo heidelbergensis: The Tool to Our Success

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By Alexander Burkard

Homo heidelbergensis, a physiological variant of the species *Homo sapien*, is an extinct species that existed in both Europe and parts of Asia from 700,000 years ago to roughly 300,000 years ago (carbon dating). This "subspecies" of *Homo sapien*s, as it is formally classified, is a direct ancestor of anatomically modern humans, and is understood to have many of the same physiological characteristics as those of anatomically modern humans while still expressing many of the same physiological attributes of *Homo erectus*, an earlier human ancestor. Since *Homo heidelbergensis* represents attributes of both species, it has therefore earned the classification as a subspecies of *Homo sapien*s and *Homo erectus*. *Homo heidelbergensis*, like anatomically modern humans, is the byproduct of millions of years of natural selection and genetic variation. It is understood through current scientific theory that roughly 200,000 years ago (carbon dating), archaic *Homo sapien*s and *Homo erectus* left Africa in pursuit of the small and large animal game that were migrating north into Europe and Asia. As they migrated north with their food source, the climates that these individuals faced were completely opposite to the environment that they were subjected to in Africa.

Unfortunately, *Homo erectus* did not survive very long in this climate because it did not hold the intellectual whit and adaptive strategies that archaic *Homo sapien*s had. Over time, the *Homo erectus* population began to decrease as limited resources, and lack of environmental knowledge began to take over and consume the remaining numbers of this dying breed. *Homo sapien*s, a more intellectually advanced and environmentally adaptable species were left as the only surviving ancestor to *Homo erectus*. As the archaic *Homo sapien* population spent prolonged periods of time in this environment, many physiological changes began to take place in response to the many harsh, unforgiving environments it lived in. The anatomical aftermath was a human that had a defined brow ridge, broad nose, a stocky and robust build to say the least, and was immensely hairy. It represented characteristics of both species and would eventually be known as *Homo heidelbergensis*: the elder to the Neanderthals, and the child of archaic *Homo sapien*s. However, beyond the stereotypical "caveman" appearance this new subspecies expressed, there was something different about this new product: something resilient and innovative. It was something genotypic that was found deep in the depths of its cranium that can speak for itself though the archaeological record. *Homo heidelbergensis* remains are found in a variety of climates, each of which express a unique variety of faunal remains that attribute to the diversity in organic life during this subspecies span on Earth. Since this new subspecies was much more intellectually advanced than those before, it held invaluable knowledge about the environment which allowed it to succeed in a variety of settings and situations it was placed before, and ushered in new forms of tool development, hunting techniques, as well as unforeseen intellectual expansion.

Since the early nineteenth century, archaeologists have unearthed multiple heidelbergensis specimens from the soils of Western Europe and Eastern Asia, each of which offered unique glimpses into human prehistory. One of which in particular is the popular and controversial "Mauer" jaw, which was a heidelbergensis mandible uncovered in Heidelberg, Germany by German Archaeologist Otto Schoetensack in 1907. This astonishing find was a powder keg to the archaeological and scientific community. This not only created a new "class" of human di-

versity, but it opened the door to many questions and possible answers to human origin. However, it was not until a century later that modern technology, which used structural and genetic analysis, was able to give a possible answer to some of these questions, as well as an accurate in depth view into the life history of this specimen. Here, modern day anthropologists spoke about their findings after extensive paleopathological examination of the mandible of the *Homo heidelbergensis* "Mauer" jaw. They specifically spoke about the fracture marks on the mandible as well as the dentition arrangement of the specimen. The fracture on the lower mandible was provocative of periodontal disease, also known as gingivitis, which not only infected his gums but the surrounding muscle tissue of his mouth as well. He also showed severe gaping between his teeth, which is indicative of incipient osteoporosis. Osteoporosis, a disease in which the bones contain a lack of density, is brought about by a lack of vitamin D, which can be attained naturally from UV exposure. Since this specific species lived in a multi climate environment, high levels of vitamin D exposure and absorption via ultraviolet rays was not always consistent, and this physical indicator on the mandible shows that this organism spent a major portion of its life in a very low resource, inhospitable environment. Additionally, there was major scarring where the capillary veins would be located along the jawline. This was supported through intensive investigation as Osteochondrosis dissecans. This disease is related to osteoporosis, but is brought about from a lack of blood flow to muscle and related connective tissue. Essentially, this is when the blood and cartilage that surrounds and supports joints deteriorates because the body has insufficient vitamin and protein supplies. As a result, the body absorbs these proteins from wherever it can, including the cartilage and blood that surrounds major joints. This lack of blood and cartilage causes severe pain in individuals and leaves very prominent scarring and damage. This traumatic scarring on the mandible and dentition illustrates the demanding living conditions endured by humans during the European Middle Pleistocene (500,000 years ago), as well as the many environments that this specific subspecies lived in. This individual is a textbook definition of what it means to struggle to survive. Dr. Czarnetzki, the anthropologist who studied this specimen, more eloquently stated, "This diagnosis strongly suggests that the depression observable in the mandibular condyle results from a fracture; a phenomenon which illustrates the demanding living conditions in middle Pleistocene periods of Europe" (493). A study conducted in 2009 on the same specimen ushered in a new aspect of the mandible that was not yet discovered. This discovery revealed groundbreaking information on the distinct lacerations located on the lower mandible and was conclusively supported to be indicative of specialized tool use. When closely examined under an optical microscope, the inside portion of the root of each tooth was exposed with a majority of the tooth visible to the root apex, or the root base. A quick microscopic check concluded that this was the work of gingivitis, but a series of prominent scratches and lacerations at the base of the tooth were signatures deposits of calculus, polishing, and scratching on the exposed surfaces. This pointed anthropologists to the conclusion that tool use had taken place. The specimen examined in this study held many of the basic characteristics of gingivitis, which will naturally lead to a recession in the gum line, however this was further increased due to cutting and scratching of the gums. Physical evidence of this can be found on the outward surfaces of the tooth where laceration marks are prominent. This study not only supported the theory that tool use was in effect during this point in human prehistory, but that specialized tools were in place, including specialized tool crafters. Dr. Hilson, who performed this cross examination of the "Mauer" jaw stated, "The incisors show substantial attrition associated with secondary dentine deposition in the pulp chamber… They also show extensive patterns of non-masticatory scratches on the labial surfaces of both crown and root" (493).

A major tool that led to the success of *Homo heidelbergensis* were the physical tools themselves. A tool, which is also defined as technology, is a medium that allows an organism to interact with its environment. When an organism interacts with its environment via technology, that organism is to an extent exercising control over its environment. Technology allows humans to manipulate and control its surroundings; therefore giving it superiority and independence in whichever aspect that piece of technology specializes in. Rudimentary stone tools, which are scientifically categorized as Oldowan tools, are the first recovered forms of human technology, many of which date back two million years. However, it was not until 400,000 years ago that prominent usage of stone tools in the archaeological record are found. What a stone tool is made of, how it is "manufactured," and what it is used for, are all subtle yet outward signatures of higher thinking. Technology identifies how neurologically advanced an organism is, as well as the potential it holds to control its environment. Interestingly, Anthropologists and Biologists conducted on a study on a number of early tools used by archaic *Homo sapien*s, specifically hand axes that are believed to be associated with *Homo heidelbergensis* as well. Here, the scientists examined various tool designs from a number of sites in the Atapuerca Mountains in Southern Europe. After careful analysis they noticed that many of the tool designs used in the development of the axe heads uncovered, represent unprecedented levels of precision and attention to detail. Many of the methods that were used in the development of the axe head, as well as animal tissue residue on the axe blade from past use, were surprisingly similar to *Homo heidelbergensis*. Radiometric dating of fragments of the axe head supported that this artifact was of at least 400,000 years of age. The scientists finally projected the age of these tools to the same period as *Homo heidelbergensis*. Dr. Arenas, the leading scientist and anthropologist in this study concluded in her published results of her study that, "However, the evidence currently available indicates that Acheulean hand axes spread in the fluvial basins of Western Europe during MIS 11, about 400,000 years ago, associated with *Homo heidelbergensis* that *Homo heidelbergensis* was capable and did in fact produce stone hand axes" (3340).

Something else which quite literally brought "light" to the technology *Homo heidelbergensis* had available was that of fire. To support this, a study was conducted in 2009 by a group of archaeologists whom uncovered what they believed to be remnants of fire produced by early man. Coincidentally, these fire pits were discovered in the same geographic region as those of the earlier mentioned hand axes. Scientific theory states that the advent of fire did not occur until archaic *Homo erectus* (700,000 years ago), but *Homo heidelbergensis* and archaic *Homo erectus* did overlap for a small portion of Earth's prehistory. Evidence to support this can be found in the fossil record through geographically distributed fire pits with tool remains and carbon deposits from the fire itself. Many of these fire pits were dated to the same period as *Homo heidelbergensis*, while others left tool remains that were dated to the same period, but exhibited much more primitive design, therefore dating to an older period than heidelbergensis. However, something that was not strongly supported was the coexistence of *Homo erectus* and *Homo heidelbergensis*. No two specimens were ever found together at the same site, but the skeletal remains as well as the tools that were found with each individual dated to the same period, therefore supporting the theory that each species existed at the same point in time. Even though it is not definitive proof of coexistence, it is enough however, to support that *Homo heidelbergensis* lived in a period of when man was able to, and did control fire.

A fundamental aspect that was key to the independence of *Homo heidelbergensis* was its intellectual capacity. This is the single most important and influential piece to its success on Earth. Over the course of human prehistory and history, the expanse of knowledge that man has attained has grown considerably as humans have spent more and more time on Earth gath-

ering information from their environment. This can be reflected through the advanced literature, art, and technology that recent human society has produced, but a more fundamental and primitive basis of intelligence can be seen in simple interactions between man and environment. Tool usage is something of which that is exclusive to humans, and recently Chimpanzees. Object specialization represents high levels intellectual capacity and specialized dexterity. An example of this can be seen from a study conducted in 2006, where Anthropologists and Biologists tested the relation of right-handedness to its ties with brain specialization and higher thinking in hominoids, a superfamily of Apes and Humans. This study focused specifically on hand laterality of a sample of extinct hominids from the site Sima de los Huesos. These specimens dated via carbon dating to 500,000 years old and the results were compared with dental micro wear analysis in other fossil samples in Croatia and even modern day societies. This was a comparative study that was designed to also give a holistic view with the hopes for a most accurate result. Overall, the study concluded that European Middle Pleistocene *Homo heidelbergensis* was already as right-handed as modern populations, and that the enamel wear on the dentition of specific regions of the mouth from excavated hominid remains showed signs of chewing preferentiality and tooth picking, all of which are associated with high levels of thinking and intellect. This study was also conducted on Chimpanzees, all of which showed signs of hand laterality (hand preferentiality) seventy percent of the time. This strengthened the idea of hand preferentiality in *Homo heidelbergensis* because it showed that Chimpanzees, whom have a smaller neurological capacity than heidelbergensis were capable of performing tasks that through comparative archaeological evidence and testing with live species, heidelbergensis was capable of performing as well. If chimpanzees, whom have a much more simple neurological structure than *Homo heidelbergensis* can show statistically significant signs of hand laterality, *Homo heidelbergensis* must be able to as well. Dr. Lozano, an archaeologist and biologist who studies primatology and genetics stated, "Handedness in living humans is well established and shows the highest degree of manual specialization" (369). "Our results indicate that European Middle Pleistocene *Homo heidelbergensis* was already as right-handed as modern populations" (369).

Human origin is something that may never be fully explained or understood. However, *Homo heidelbergensis* fills in a missing chapter in the lost book of the human lineage, and serves to further the understanding of human origin. Many of the advancements that are made by modern humans can be attributed in part to the success and failures of *Homo heidelbergensis*. This subspecies represented the first of a new age of humans. It was intelligent, adaptable, and above all, developed and retained the tools which enabled it to become at last no longer confined and defined by the environment in which it lived in. The physical evidence that it has left behind in the archaeological record serves as a relic to the sheer ingenuity and resiliency of the common man.

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