



Bones of Contention

Interactive Activity: Background Essay

In this activity, you will explore challenges scientists face in classifying fossils by attempting to classify 10 “mystery fossils.” Examine the data associated with each fossil to decide on the genus and species to which it belongs. Interpret the facts associated with each fossil to explain how each classification helps define a stage in human evolution. Assemble your own theories about the stages of human evolution, using data to support our claims. In the process, we will see where the fossil record tells a clear story, and what gaps remain.

In the 150 years since Darwin described the origin of species, scientists have gathered extensive fossil evidence in support of his theory. This evidence helps us understand the stages through which humans have evolved from a common ancestry with apes.

Key Characteristics of Hominin Evolution

Many scientists focus on bipedalism, diet, and cranial capacity as key characteristics to understand human evolution. For example, bipedalism (i.e., walking on two legs) is used to separate the earliest human ancestors from the ancestors of early apes. In bipeds, the foramen magnum—where the spinal cord enters the skull—is located near the middle of the skull, whereas in quadrupeds it is located toward the back of the skull. Likewise, the shape and position of the pelvis (hip), femur (leg), and tibia (shinbone) distinguish bipeds from quadrupeds, as does the relative lengths of their lower limbs (legs) and upper limbs (arms) and, to some extent, phalanx (finger bone) curvature.

Skull characteristics give clues about diet that help anthropologists classify species of human ancestors. For instance, the larger crests, longer faces, and extreme post-orbital constriction of modern Apes and early hominins help support the powerful jaw muscles required to consume hard diets. Scientists think that the reduction in these features that came with softer diets may have allowed for the development of larger brains in more modern hominins. In this manner, characteristics identified in fossils of human ancestors are understood through comparative evidence with apes and modern humans.

Classification of Species

Scientists often interpret such facts by classifying similar fossils into groups with similar characteristics, thus defining genera and species that represent key stages in the evolution of human ancestors. By doing this, they give structure and meaning to fossils.

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Species classification, however, can be difficult. Many gaps in the fossil record remain and new fossil discoveries challenge scientists to revise their classifications. To complicate the process further, dates of fossils reveal when these human ancestors existed but determining when they first appeared and when they go extinct or evolve into other species is not possible. For example, there is no clear date to define the transition from *Homo erectus* to *Homo sapiens* or whether *H. erectus* even gave rise to *H. sapiens*.

Therefore, while defining species is essential for understanding evolutionary trends, classifying fossils involves constant reorganizing of data as new techniques and findings emerge. Many questions about our human evolutionary tree remain unanswered. Although facts associated with each fossil may be clear and general facts of human evolution are well-established, the process of classifying fossils based on those facts is one of scientific interpretation and scientists continue to debate specifics of our evolutionary story.