How Do We Study Human Evolution?

Disciplines

Anthropology and Biology, but they have many subdisciplines.

-Anthropology is the study of mankind in a holistic manner. It incorporates both biological and cultural sciences and other relevant disciplines. It is the belief of anthropologists that humans are the products of the combined influences of biology and culture.

- Physical Anthropology is the study of human biology within the framework of evolution. Emphasis on interaction between biology and culture, and is also known as biological anthropology. It concerns genetics, evolutionary biology, nutrition, physiological adaptation and growth and development.
- Palaeoanthropology is the study of human evolution.
- Anthropometry is the study of craniology and comparative anatomy.

-Molecular Anthropology/ Biology- DNA sequencing in humans and non-human primates. Between individuals, populations and species.

- Primatology is the study of primates.

-Archaeology is a body of methods designed to understand the human past through the examination and study of its material remains. Its primary data are the artefacts and other material culture, associations, and contextual information created by past peoples and preserved to the extent that they can be reliably identified and interpreted by modern researchers.

-Biology concerns itself with evolution, natural selection and Mendelian genetics. It uses the scientific method,

have grasping feet. Whereas apes use all four limbs to climb, hominins probably used their arms to pull the body upwards. He legs provided support and upward propulsion but no grip.

Early Hominid Hands

Until recently, the best example of a pre-human hominid hand was the hand of 'Lucy'. There is very little hand material. By the time of *A, afarensis,* the proportions of the hand are very different from that of a chimpanzee. They have a much shorter thumb that departs the hand much closer to the wrist and the fingers are similar to living humans in their relative size. Overall, recent evidence suggests that *A. afarensis* had manual proportions that were at least partially human and would have allowed a human-like precision grip capability. Specifically, the ratio of thumb to finger length, the joint surfaces at the base of the thumb, index and middle fingers, and the changes in the size and orientation of the joints of the wrist bones closest to the fingers mean the thumb side of Lucy's hand is close to that of modern man. These changes mean the thumb, index and middle fingers can form a three-jaw chuck, allowing the hand to conform to, and firmly grasp and manipulate, a wide range of irregular shapes. Finger control can be exerted over objects held between the thumb and the tips of the index and middle fingers. Rocks could have been used as primitive tools, as the wrist structure can absorb the shock of repeated hard strikes more effectively than the ape hands. Lucy, however, did not have full opposability and her fingers still show finger bones with a slight degree of curvature, similar to apes.

Also, neither apes nor Lucy could flex the fingers on the ulnar side of the hand- far side- towards the base of the thumb. We do this when we grasp anything. Additional changes to the wrist, etc., came after *A. afarensis.* These changes were in the configuration of the ulnar side of the wrist that allowed the hand to extend along the side of the arm. The opposition of the fourth and fifth fingers combined with ulnar deviation of the wrist and hand and are unique to modern humans. This allowed clubbing and the swinging radius of arm-plus-stick. This was not possible for apes and early hominins who could only hold a stick at a slight angle to the vertical and not wield it like a club.

A second effect of ulnar opposition is an improved precision grip, and improved use of the hands.

Other Early Hominins

Australopithecus robustus was claimed to show clear evidence of human-like manual dexterity. This included a well-developed capability for precision gripping and the potential for power grasping. It was a species that evolved from *A. afarensis* in parallel with the human, or *Homo,* line. The thumb resembles a human thumb and indentations revealed attachment points for the *flexor pollicis longus* muscle. Only humans and their early ancestors have this muscle, which functions to bring the tip of the thumb into contact with the index finger for precision grasping. There is, however, some questions as to whether the hand was from *robustus* or *habilis.* An *africanus* specimen was found with hand bones that seem to be like those of modern humans in having a short palm and fingers. The finger bones, however, are curved like those of the *A. afarensis* skeleton Lucy, indicating they were probably used in climbing.

What Drove the Evolution of the Hand?

One suggestion is that human-like proportions of the hand and the enhanced thumb/hand relationship, evolved as an adaptation to stone tool-making, proved by the humans hand well-adapted to tool making. However, since an *A. afarensis* effectively had human-like hand proportions and yet predates the appearance of stone tools in the archaeological record, many regard this as sufficient evidence that human-like hand proportions are not a specific adaptation to making tools. Also, its hands and other hominin hands lack important features that reflect a powerful grip useful for tool production. In particular, the distal finger bones lack the large fingertip surfaces that are found in living and fossil humans. These increase the surface area used for griping, allowing for the forceful grip necessary for tool production.

Hand anatomy may be an adaptation to ancestral practices in ancestral environments, which happened to provide a fortuitous preadaptation which humans then exploited for tool usage. Although some evidence suggests otherwise, it is thought that the human hand had not yet fully developed in 'Lucy'. However, tool use in these has been contested due to cut marks found on bones. If 'Lucy' did use tools, then it pushes back tool use by 800,000 years.

We know that sometime after Lucy, a more mobile joint developed at the base of the small finger, the origin of which is unknown. To date, no fossil specimens from this region of the hand of *H. erectus.* We also do not know whether a change in brain weight occurred before or after this joint change. The

1.6mya	Sangiran (Java)	First discovery of *H. erectus:* shows dispersal out of Africa by 1.6mya.

Key Asian Homo erectus Discoveries

Pleistocene

This epoch of the Cenozoic lasted from 1.8mya until 10,000ya. It is frequently referred to as the Ice Age, this epoch is associated with continental glaciations in northern latitudes.

Zhoukoudian *Homo erectus*

The fossil remains of *H. erectus* discovered in the 1920's and 30's, as well as recent excavations at this site, are the largest collection of *H. erectus* anywhere. The hominin remains belong to approximately 40 adults and children. More than 100,000 artifacts have been recovered from the site.

Asian and African *H. erectus* Comparison

Homo erectus remains from East Africa show several differences from the Javanese and Chinese fossils. Some African cranial specimens aren't as strongly buttressed by supraorbital and nuchal tori, and their cranial bone aren't as thick. Some researchers call for a separate species status for the African material to distinguish it from the Asian fossil material. Bernard Wood, the leading proponent of this view, suggests that the name *Homo ergaster* be used for the African and *H. erectus* be used for solely Asian material.

Dates (mya)	Site	Evolutionary Significance
.9 – .8	Ceprano (Italy)	Well-preserved cranium; best evidence of full *H. erectus* morphology from any site in Europe.
.85 – .78	Gran Dolina (Spain)	Oldest evidence of hominins in western Europe; likely not *H. erectus.*
1.75	Dmanisi (Georgia)	Oldest well-dated hominins outside of Africa; not like full *H. erectus* morphology, but are small-bodied and small-brained.

Acheulian

A lower Paleolithic stone tool industry that includes bifacially worked hand axes and cleavers and many kinds of flake tools. It began as early as 1.4mya in Africa, spread across many parts of the temperate to tropical parts of Europe and Asia, and ended roughly 200,000ya. It brought about stone