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Evolution in humans beings through geological time scale and its changing trends through course of evolution

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ABSTRACT

Human evolution is the lengthy process of change by which people originated from apelike ancestors. Scientific evidence shows that the physical and behavioral traits shared by all people originated from apelike ancestors and evolved over a period of approximately six million years.

One of the earliest defining human traits, bipedalism -- the ability to walk on two legs -- evolved over 4 million years ago. Other important human characteristics -- such as a large and complex brain, the ability to make and use tools, and the capacity for language -- developed more recently. Many advanced traits -- including complex symbolic expression, art, and elaborate cultural diversity -- emerged mainly during the past 100,000 years.

Humans are primates. Physical and genetic similarities show that the modern human species, *Homo sapiens*, has a very close relationship to another group of primate species, the apes. Humans and the great apes (large apes) of Africa -- chimpanzees (including bonobos, or so-called "pygmy chimpanzees") and gorillas -- share a common ancestor that lived between 8 and 6 million years ago. Humans first evolved in Africa, and much of human evolution occurred on that continent. The fossils of early humans who lived between 6 and 2 million years ago come entirely from Africa.

Most scientists currently recognize some 15 to 20 different species of early humans. Scientists do not all agree, however, about how these species are related or which ones simply died out. Many early human species -- certainly the majority of them – left no living descendants. Scientists also debate over how to identify and classify particular species of early humans, and about what factors influenced the evolution and extinction of each species.

Early humans first migrated out of Africa into Asia probably between 2 million and 1.8 million years ago. They entered Europe somewhat later, between 1.5 million and 1 million years. Species of modern humans populated many parts of the world much later. For instance, people first came to Australia probably within the past 60,000 years and to the Americas within the past 30,000 years or so. The beginnings of agriculture and the rise of the first civilizations occurred within the past 12,000 years.

Keywords **- Homo sapiens, *australopithecines, or australopith***

I.THE PROCESS OF EVOLUTION

The process of evolution involves a series of natural changes that cause species (populations of different organisms) to arise, adapt to the environment, and become extinct. All species or organisms have originated

through the process of biological evolution. In animals that reproduce sexually, including humans, the term species refers to a group whose adult members regularly interbreed, resulting in fertile offspring -- that is, offspring themselves capable of reproducing. Scientists classify each species with a unique, two-part scientific name. In this system, modern humans are classified as *Homo sapiens*.

Evolution occurs when there is change in the genetic material -- the chemical molecule, DNA -- which is inherited from the parents, and especially in the proportions of different genes in a population. Genes represent the segments of DNA that provide the chemical code for producing proteins. Information contained in the DNA can change by a process known as mutation. The way particular genes are expressed – that is, how they influence the body or behavior of an organism -- can also change. Genes affect how the body and behavior of an organism develop during its life, and this is why genetically inherited characteristics can influence the likelihood of an organism's survival and reproduction.

Evolution does not change any single individual. Instead, it changes the inherited means of growth and development that typify a population (a group of individuals of the same species living in a particular habitat). Parents pass adaptive genetic changes to their offspring, and ultimately these changes become common throughout a population. As a result, the offspring inherit those genetic characteristics that enhance their chances of survival and ability to give birth, which may work well until the environment changes. Over time, genetic change can alter a species' overall way of life, such as what it eats, how it grows, and where it can live. Human evolution took place as new genetic variations in early ancestor populations favored new abilities to adapt to environmental change and so altered the human way of life

II.EARLY LIFE IN AFRICA

The human story begins in one of the most geologically fascinating areas on Earth, the Great Rift Valley of Africa. It is an enormous split torn into Earth's crust that runs from the forests in Tanzania to the deserts of Ethiopia. In some places the rift is thousands of feet deep and exposes the last fifteen million years of the earth's history. Here, fossil remains of our earliest ancestors can be found. Humankind appears to have first evolved in Africa, and the fossils of early humans, or **hominids,** who lived between five million and two million years ago, come entirely from Africa.

III.EARLY HUMANS: EVOLUTION OF AUSTRALOPITHECINES

Nearly five million years ago in Africa, an apelike species evolved with two important traits that distinguished it from the apes. This species had small canine teeth (next to the four front teeth), and it was **bipedal** , meaning it could walk on two legs instead of four. Scientists refer to these earliest human species as australopithecines, or australopith for short. The **fossil record** shows that there is not an orderly sequence leading from one form to another. Several groups lived at the same time and characteristics developed at different rates; therefore the human family tree suggests a long and complex past.

Early Australopiths or Gracile Group

- *Ardipithecus ramidus.* Discovered in 1994 and estimated at 4.4 million years old. This ancient line suggests a close relationship with apes and chimps because of the enamel found on the teeth. Whether or not it walked upright is unknown.
- *Australopithecus anamensis.* Discovered in 1995 and estimated at four million years old. Jaws were apelike but the legs were humanlike; it may have walked upright.
- *Australopithecus afarensis.* Discovered in 1974 by Donald Johanson and known as "Lucy." Estimated at 3.9 to 3.1 million years old. Thought to walk upright and bipedal, these may have left footprints in volcanic ash in Laetoli 3.7 million years ago. Fossils show sexual differences, and suggest that they were adept at climbing trees.
- *Australopithecus africanus.* First found in 1924 by Raymond Dart, this was the first known australopith. Dating from 3 to 2.4 million years ago, it had forelimbs longer than legs and walked upright. Many feel this is the best candidate as ancestor to early *Homo* species

Homo erectus

Homo erectus was first discovered on the island of Java in Indonesia, in 1891. The discoverer, Eugene Dubois originally called it *Pithecanthropus erectus* based on its morphology that he considered to be intermediate between that of humans and apes.[Homo erectus lived from about 1.8 million to 70,000 years ago. The earlier specimens (from 1.8 to 1.2 million years ago) are sometimes seen as a different species, or a subspecies. called *Homo ergaster*, or *Homo erectus ergaster'*.

In the early Pleistocene, 1.5–1 mya, in Africa, Asia, and Europe, presumably, some populations of *Homo habilis* evolved larger brains and made more elaborate stone tools; these differences and others are sufficient for anthropologists to classify them as a new species, *H. erectus*. In addition *H. erectus* was the first human ancestor to walk truly upright. This was made possible by the evolution of locking knees and a different location of the foramen magnum (the hole in the skull where the spine enters). They may have used fire to cook their meat.

A famous example of *Homo erectus* is Peking Man; others were found in Asia (notably in Indonesia), Africa, and Europe. Many paleoanthropologists are now using the term *Homo ergaster* for the non-Asian forms of this group. They reserve *H. erectus* only for those fossils found in the Asian region that meet certain requirements (as to skeleton and skull) which differ slightly from ergaster.

Neanderthal Man

Homo neaderthalensis (usually called Neanderthal man) lived from about 250,000 to about 30,000 years ago. Also, less usual, as *Homo sapiens neanderthalensis*: there is still some discussion if it was a separate species *Homo neanderthalensis*, or a subspecies of *H. sapiens*. While the debate remains unsettled, evidence from mitochondrial DNA and Y-chromosomal DNA sequencing indicates that little or no gene flow occurred

between *H. neanderthalensis* and *H. sapiens*, and, therefore, the two were separate species.[1] In 1997, Dr. Mark Stoneking, then an associate professor of anthropology at Pennsylvania State University, stated:

"These results [based on mitochondrial DNA extracted from Neanderthal bone] indicate that Neanderthals did not contribute mitochondrial DNA to modern humans… Neanderthals are not our ancestors".

Homo floresiensis

Homo floresiensis, which lived about 100,000–12,000 years ago has been nicknamed *hobbit* for its small size. Its size may be a result of island dwarfism, the tendency for large mammals to evolve smaller forms on islands. *H. floresiensis* is intriguing both for its size and its age. It is a concrete example of a recent species of the genus *Homo* that shows derived traits not shared with modern humans. In other words, *H. floresiensis* share a common ancestor with modern humans, but split from the modern human lineage and followed a different evolutionary path. The main find was a skeleton believed to be a woman of about 30 years of age. Found in 2003 it has been dated to approximately 18,000 years old. The living woman was estimated to be one meter in height, with a brain volume of just 380 cm^3 This is small for a chimpanzee and less than a third of the *H. sapiens* average of 1400 cm^3.

There is an ongoing debate over whether *H. floresiensis* is indeed a separate species.Some scientists believe that *H. floresiensis* was a modern *H. sapiens* suffering from pathological dwarfism. Modern humans who live on Flores, the island where the skeleton was found, are pygmies. This fact is consistent with either theory. One line of attack on *H. floresiensis* is that it was found with tools only associated with *H. sapiens*.

Human arrival on Flores

Stone artefacts have now been found on Flores which can be dated to a million years ago. These artefacts are *proxies*; which means there were no skeletons of humans, but only a species of *Homo* could have made the artefacts. The artefacts are flakes and other implements, 48 in all, some of which show signs of being worked to produce a cutting edge. This means that humans were present on Flores by that date, but it does not tell us which species that was.

Homo sapiens

Homo sapiens has lived from about 250,000 years ago to the present. Between 400,000 years ago and the second warm period in the Middle Pleistocene, around 250,000 years ago, its skull grew and more sophisticated technologies based on stone tools developed. One possibility is that a transition between *H. erectus* to *H. sapiens* occurred. The evidence of Java Man suggests there was an initial migration of *H. erectus* out of Africa. Then, much later, a further development of *H. sapiens* from *H. erectus* in Africa. Then a subsequent migration within and out of Africa eventually replaced the earlier *H. erectus*.

Era	MYA	Epochs	Life Forms	
Cenozoic	2	Pleistocene	First Hominids	*Australopithecus africanus 3 mya*
	5	Pliocene		*Ardipithecus ramidus 4.4 mya*
	23	Miocene	First Hominoids Africa contacted Eurasia. Himalayas formed 17 mya. Drier climate, forests and grasslands.	*Aegyptopithecus 24 mya*
	34	Oligocene	First catarrhines and platyrrhines	*Catopithecus 37mya* *Eosimias 45mya*
	55	Eocene	Abrupt warming climate First prosimians	Omididae and Adapidae
	65	Paleocene	First Primates Tropical and subtropical climate worldwide	

Fossil Evidence

From skeletons to teeth, early human fossils have been found of more than 6,000 individuals. With the rapid pace of new discoveries every year, this impressive sample means that even though some early human species are only represented by one or a few fossils, others are represented by thousands of fossils. From them, we can understand things like:

- how well adapted an early human species was for walking upright
- how well adapted an early human species was for living in hot, tropical habitats or cold, temperate environments
- the difference between male and female body size, which correlates to aspects of social behavior
- how quickly or slowly children of early human species grew up.

While people used to think that there was a single line of human species, with one evolving after the other in an inevitable march towards modern humans, we now know this is not the case. Like most other mammals, we are part of a large and diverse family tree. Fossil discoveries show that the human family tree has many more branches and deeper roots than we knew about even a couple of decades ago. In fact, the number of branches our evolutionary tree, and also the length of time, has nearly doubled since the famed 'Lucy' fossil skeleton was discovered in 1974!

There were periods in the past when three or four early human species lived at the same time, even in the same place. We – *Homo sapiens* – are now the sole surviving species in this once diverse family tree. While the existence of a human evolutionary family tree is not in question, its size and shape - the number of branches representing different genera and species, and the connections among them – are much debated by researchers and further confounded by a fossil record that only offers fragmented look at the ancient past. The debates are sometimes perceived as uncertainty about evolution, but that is far from the case.