



Owen Noome

The Theory of Evolution

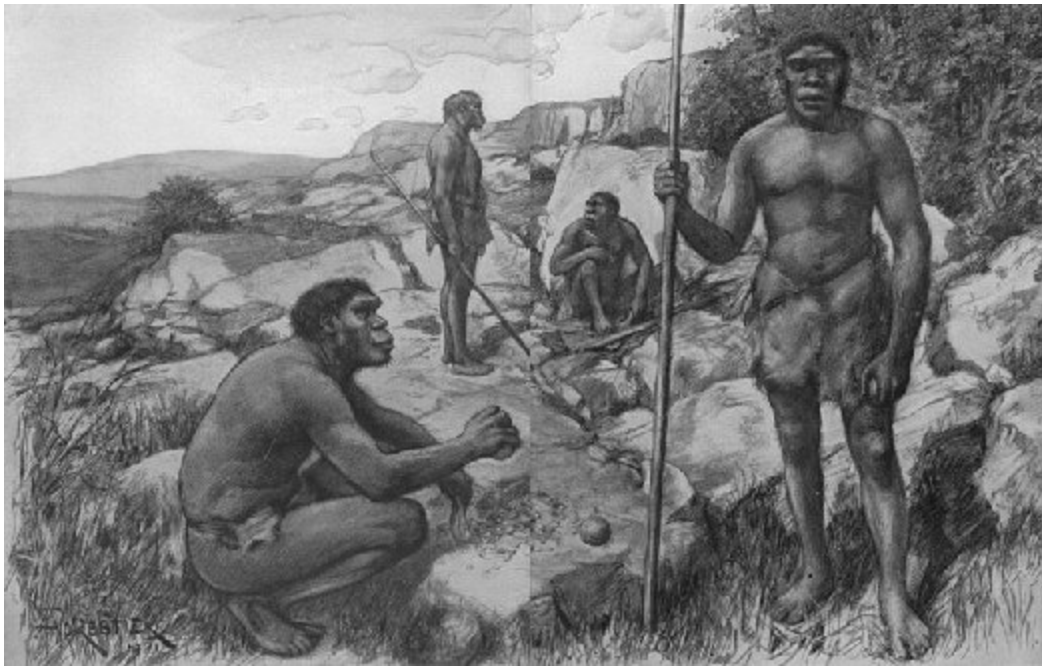
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The Theory of Evolution

The origin and evolution of humankind and the origin of Human Civilisation. From the Evolutionist point of view



RESTORATION BY A. FORESTIER OF THE RHODESIAN MAN WHOSE SKULL WAS DISCOVERED IN 1921 Attention may be drawn to the beetling eyebrow ridges, the projecting upper lip, the large eye-sockets, the wellpoised head, the strong shoulders.

The squatting figure is crushing seeds with a stone, and a crusher is lying on the rock to his right. The figure in the foreground, holding a staff, shows the erect attitude and the straight legs. His left hand holds a flint implement.

On the left, behind the sitting figure, is seen the entrance to the cave. This new Rhodesian cave-man may be regarded as a southern representative of a Neanderthal race, or as an extinct type intermediate between the Neanderthal Men and the Modern Man type.

(See also: A Brief Look At Evolution - Darwin's notes of evolution)

In biology, the continual process by which one form of life changes or evolves into another form. The theory of evolution suggests that all plants and animals descended from one or several kinds of simple organisms. It also explains why there are so many different kinds of plants and animals. The inherent characteristics of nearly all living things change from generation to generation. Eventually the accumulating changes may become so great that the descendant bears little likeness to it's remote ancestor and may belong to a different species.

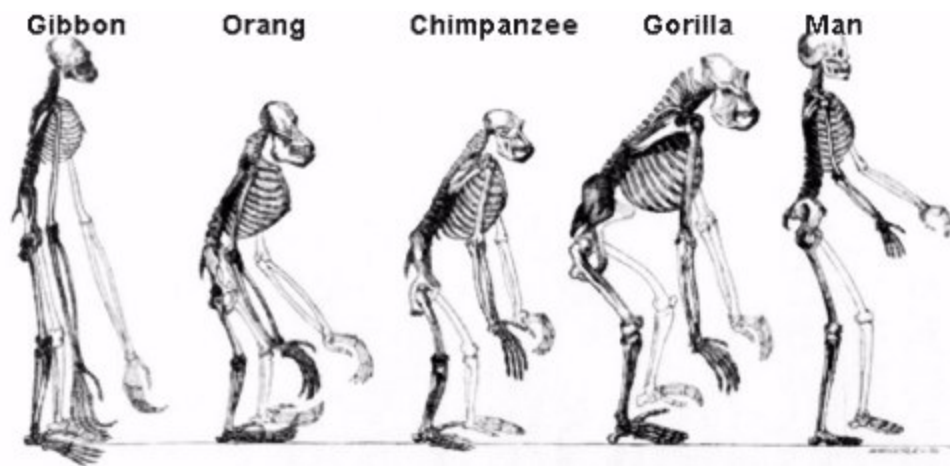
Evolution takes place by means of natural selection, mutation and sexual recombination.

Darwinism may be defined as the doctrine of natural selection or the survival of the fittest as put forward by Charles Darwin in *The Origin of Species*, published in 1859. Popularly it is usually regarded as equivalent to the theory of evolution, often considered only in it's application to one organism - man.

When the theory of evolution first came to public attention in 1859 it was met with a storm of protest and ridicule. Some people, misinterpreting the theory, thought it claimed that man was descended from apes. Actually, the theory states that man and apes had a common ancestor that was neither man nor ape.)

Approximately 5 million years ago, the human line and the ape line shared a common ancestor having more or less of a monkey-like nature from which the apes went on their separate way, leading to modern gorillas, chimps and orang-utans, and the hominid line (refers to the human family) went on in another direction, producing the Australopithecus - line diverges into sub-lines, one of which will eventually give rise to Homo sapiens (modern man)

Man in virtue of his faculty of speech is the highest member of the anthropoids, his nearest of kin being the gorilla, chimpanzee, orang and gibbon. From a zoological standpoint man differs from the anthropoid apes in 1) his adaptation to the erect position and the terrestrial habitat, in 2) his greater brain development and in 3) the very fully developed social instinct.



Human line of evolution - Beginning with:

The oldest living things were simple, one-celled organisms living in the sea.

Started about 600 million years - Life in the oceans originates.No life on earth.

Started about 550 million years ago - Life exists only in the oceans. Invertebrates evolve. Seaweeds the only plants - provide food for worms, jellyfish, sponges,....

Started about 500 million years ago - Life exists only in the oceans. Vertebrates evolve. Volcanic eruptions on the floor of the oceans.

Started about 430 million years ago - Life in the oceans develop and the first plants appear on land. New species of vertebrates develop in the oceans. Level of the oceans rise and new mountain ranges beginning to form.

Started about 400 million years ago - More plants with leaves and roots appear and evolve on earth. Rapid evolution of vertebrate animals. Ancestors of all fish evolve. Invertebrates - mites, spiders, wingless insects - leave the oceans.

Started about 350 million years ago - Amphibious creatures continue to develop. More plants and trees appear.

Reptiles become the first creatures to breed on land.

Between 40 - 300 million years ago - Life in the oceans and on earth evolving. Development of the oceans, land, continents, rivers, lakes, mountain ranges and deltas continue, as well as changes in climate conditions. Animal life is predominantly reptilian. Over time the first mammals evolve from the reptiles. The first dinosaurs appear. In the following periods reptiles increase in size and variety. Dinosaurs and pterosaurs dominate life on land and in the air.

Marine life continues to be dominated by reptiles - at a later stage become extinct while many varieties of modern mammals come into existence - ancestors of the elephant, the rhinoceros, the horse, the pig and cattle. Giant reptiles disappear.

Primitive monkeys and gibbons

They appear and began to evolve into the main groups about 38 - 60 million years ago. And then in the Oligocene period (26 - 40 million years ago) a tail-less primitive ape appears. In the Miocene period (8 - 27 million years ago) the Proconsul, a primitive anthropoid ape living in central africa migrates to Asia and Europe.

In the same period a gibbon-like ape was common in the open plains and less dense forests of Eurasia. This group is believed to hold the common ancestry of the chimpanzee, gorilla, and humans. In the Pliocene period (started 7 million years ago) man-like apes continue to develop. They included the species known as the Australopithecus. See: Genus Australopithecus.

A large number of fossil bones and teeth have been found at various places throughout Africa, Europe, and Asia. Tools of stone, bone, and wood, as well as fire hearths, campsites, and burials, also have been discovered and excavated. As a result of these discoveries, a picture of human evolution during the past 4 to 5 million years has emerged.

Ardipithecus ramidus....

First known hominid (proto-human) from fossil remains. This species is the oldest known hominid, dated at 4.4 million years ago.

About 2 - 4 million years ago:

Genus Australopithecus;

Australopithecus anamensis

Australopithecus afarensis

Possibly the best-known specimen of *afarensis* is Lucy, a 3.2 million year old partial skeleton found in November 1974 at Hadar, Ethiopia.

Australopithecus africanus

South Africa - A remarkable find was made in 1947 by Dr Robert Broom, who discovered a perfectly preserved adult *Australopithecus africanus* cranium, belonging to the 2, 5-million-year-old "Mrs Ples", at Sterkfontein. Several hundred discoveries followed, some dating back 3, 5 million years. Some of the cradles findings include 500 skull, jaw, teeth and skeletal fossils of early hominids, thousands of other animal fossils, over 300 fragments of fossils wood, and over 9,000 stone tools.

Limpopo, South Africa

The Makapans Cave and nearby archaeological and fossil sites are situated on the farm Makapansgat, 19 km north of Mokopane. It was here in 1948 that the fossil remains of *Australopithecus africanus*, a 3, 5 million-year-old ape-man, were found by Raymond Dart. In more recent years South Africa has once again captured the worlds attention with the discoveries of human remains at the Klasies River Caves along the Eastern Cape coast. Human remains with anatomically modern features have been found, dating well over 100 000 years old. If these dates are correct, then it is in Southern Africa that the world's oldest remains of our own species, *Homo sapiens*, have been found - some 60 000 years before their arrival in Europe and Asia.

Australopithecus aethiopicus

Australopithecus bozei

Australopithecus robustus



Paranthropus are a group of hominids that existed at the same time as the Australopithecines.

About 2 million years ago:

Ape-like creatures develop enough intelligence to make stone implements.

Probably living in Africa. Primitive man spreads to Asia and Europe. The more recent Homo Genus is thought to arise about two million years ago and contains sequentially such representatives as Homo habilis, Homo erectus, archaic Homo sapiens, the Neanderthals, the Cro-Magnons, and finally modern man, sometimes designated as Homo sapiens.

About 1.5 - 2 million years ago:



Homo habilis....it is believed that Homo erectus itself developed from Homo habilis. The H.habilis is believed to be the first "true humans". Evolution of Homo habilis into the "erectines," a range of human species often collectively referred to as Homo erectus".

About 28 000 – 1.8 million years ago:



Homo erectus....the immediate evolutionary predecessors of Homo sapiens are known as Homo erectus, whose skeletal remains have been found on several continents and are known by several different popular names such as "Java Man" and "Peking Man". Although Homo erectus walked upright like humans, used fire, and made crude stone tools, its brain capacity was somewhat smaller than that of a modern human. The more "primitive" Australopithecus had finally become extinct.

About 20 000 – 800 000 years ago:

Homo Sapiens (Archaic)....man's immediate predecessor. Archaic H. sapiens seems to have succeeded at the expense of its ancestor, H. erectus.

Homo antecessor

Homo heidelbergensis



Homo Neanderthal....It's mostly accepted that the Neanderthals did not evolve directly into later Europeans or any other living people, but were replaced by the dispersing moderns, who nonetheless interbred and mixed culturally with the Cro-Magnon



As the homo species like homo erectus, homo neanderthalis, homo heidelbergensis and ancient homo sapiens made further advances in creativity and productivity, they all felt a natural need to pen down their thoughts. This led to the cave paintings and carvings. All of those paintings can be interpreted as diary entries as you may see that the paintings and carvings simply depict what the early men "did" i.e. hunting, using tools etc.

Homo sapiens (Modern)

"The 'Recent African Origin' theory rests on a more scientific basis according to which all non-African populations descended from a Homo sapiens ancestor that evolved in Africa from Homo erectus 100,000 to 200,000 years ago. These ancestors then spread throughout the world, replacing the archaic Homo-populations, the Neanderthals and the Homo erectus. The viewpoint is that all genetic lineages derive from a recent common African ancestor and that non-African populations should carry a subset of the genetic variations present in modern African populations. But a more fascinating theory to me was the one of hybridization. It proposes some gene flow between modern humans that migrated from Africa with the archaic populations of the Neanderthals and the Homo erectus outside Africa. So, the evolution of modern humans could have been due to a blending of modern characters derived from the recent African populations with local characteristics of the archaic populations. From Homo erectus to Homo sapiens in Africa, the humans spread across a broad geographical region and rapidly increased in population in the past 50,000-100,000 years." (An Exploration into Early Human Migration)

Speculative Human line of evolution



Ardipithecus ramidus

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Australopithecus anamensis

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Australopithecus afarensis

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Australopithecus africanus

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Homo habilis

|

Homo erectus

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Homo Sapiens (Archaic)

|

Homo sapiens (Modern)

The "down-side" of Evolution

Reconstructions of our presumed ancestors rely more on artistic license than facts. Complete skeletons of hominids are rarer than fossils themselves. The famous Lucy, an example of *Australopithecus*, bequeathed to us only 40% of her skeleton. The skeletons generally turn up in shattered bits spread out over a wide swathe of ground.

Cradle of Humankind

S.E. Asia, The Cradle of Humankind ?

Strong evidence that it lay in S.E. Asia is supplied by the human remains (a skull, femur and two molars) found in 1892 by Dr. E. Dubois in certain Pliocene beds in E. Java. The skull of *Pithecanthropus erectus*, shows a cranial capacity of over 900 cubic centimetres - i.e. about midway between the highest living ape (gorilla. nearly 500 c.c) and the highest living man (Caucasian. 1,500 c.c). The distinctly human femur shows that this Pliocene ancestor could walk erect.

Africa, The Cradle of Humankind ?

Before the ancient civilizations like Inka, Mesopotamia, Egyptian etc. even came into existence, the early hominids led a nomadic life. According to the "Out of Africa Hypothesis", all the modern humans "*Homo Sapiens*" originated from Africa.



Africa originally was a much larger continent known as "Gondwanaland." About 130 million years ago, parts of it broke off and became South America, Australia, and India in a geological phenomenon known as "continental drift," a phenomenon that relies on an understanding of the theory of "plate tectonics." The earth's surface is broken up into "plates." These plates pull apart or smash together, creating such geological processes as earthquakes or, in this case, continental drift.

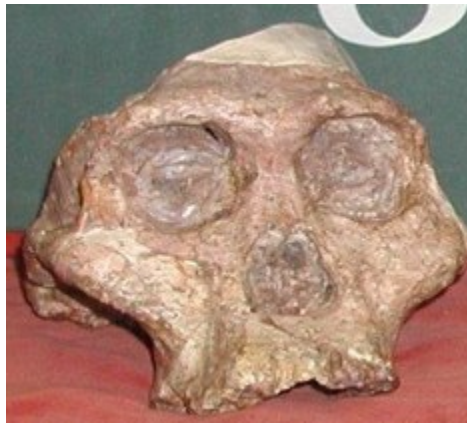
When Charles Darwin first published his theory that Africa was the "cradle of humankind," it provoked outrage. Part of this was simply religious opposition to the idea of evolution. The knowledge that relationships existed between Early Stone Age cultures in Europe and those of Northern Africa became strong presumptive evidence for a connection between the races of Europe and Africa. This, of course, was more and more strengthened as discoveries in Africa proved that not only were the relations of European culture with Northern African demonstrable, but also with those of Kenya, Rhodesia and even South Africa.

"PROFESSOR Sir ARTHUR KEITH states, 'the evidence to my mind is now conclusive that Europe was colonized by Caucasians at a comparatively late date when reckoned according to the calendar used by geologists.' This statement is the more welcome since there has been a very strong tendency in recent years to overthrow the Asiatic for an African or African- cum-European hypothesis.

The outcome of these discoveries developed a great school of thought which looked upon Africa as the primitive homeland, not only of the great apes, but also of early man. From little known Africa, men streamed northwards to settle in Europe at the close of the glacial period. Some of these peoples fixed their homes on the shores of the northern seas and underwent a process of bleaching which gave rise to the fair-skinned, light-eyed and yellow-haired peoples of Britain, Scandinavia and Germany. Such is the viewpoint which we may term the African hypothesis and one accepted in parte, or in toto, by many leading anthropologists and archaeologists. The theory of the independence of Europe from Asia, however, has in the past received strong support from well-known philologists. In fact, it is perhaps to the philologist that this outlook is very largely due...."

In Kenya, the earliest remains of human bones were discovered by Dr Richard Leakey. Evidence of the earliest, man were discovered at Koobi Fora on the shores of L. Turkana, formerly L. Rudolf.

In South Africa about 50 kilometres northwest of Johannesburg in the Gauteng province, one finds a site containing a complex of limestone caves, including the Sterkfontein Caves, where the 2.3-million year-old fossil *Australopithecus africanus* (nicknamed "Mrs. Ples") was found in 1947 by Dr Robert Broom and John Robinson, as well as the Wonder Cave. The find helped corroborate the 1924 discovery of the juvenile *Australopithecus africanus* skull, "Taung Child", by Raymond Dart, at Taung in the North West Province of South Africa, where excavations still continue.



Mrs. Ples

Races of men

The several divisions (Caucasic, Mongolic,...) of mankind are not distinct species but only marked varieties of a single species of genus homo. In other words, these varieties with their numerous diverging and converging sub-forms - their origin, antiquity and early migrations, their distinctive physical and mental characters and cultural developments are not viewed as separate units, but as interrelated groups and sub-groups of the human family.

Hence scarcely any pure races are now to be found. The characteristic racial qualities tabulated are seldom possessed exclusively by the members of the several divisions, and are therefore to be taken merely as general averages.

Classification of man is based upon certain characteristics:

Decree of pigmentation of skin.

Colour and texture of the hair.

Shape of the jaw, cheekbone, nose and eyes.

The shape of the skull and the form of the bones.

Speech.

Temperament.

Apart from physical characteristics there are social and cultural characteristics.



Homo erectus lived from an estimated 2,000,000 down to 100,000 years ago. Java and Peking man are included among Homo erectus.

Locations: Europe, India, China, Southeastern Asia, and Africa. Height: 5 feet 2 inches to 6 feet; Weight: 100 to 150 pounds. Fossils: Jaws, teeth, and an occasional skull cap and thighbone have been uncovered. In 1984, a well- preserved almost complete erectus was discovered in Kenya. Remarkably similar erectus bones and tools have surfaced in Africa, Asia, and Europe.

Brain Capacity: Donald Johanson says 850 cubic centimeters to 900 c.c. Richard Leakey claims 900 c.c. to 1100 c.c.. compared to 350 - 400 c.c. for australopithecines, 650 c.c. for Homo habilis and 1400 c.c for humans. It is thought that erectus' brain weighed around seven ounces at birth. It would mature at thirty-two ounces compared to forty-five ounces for an adult human.

Johanson describes Homo erectus as "tall, thin, and barrel-chested." Their weight and height would place them in the top 17 percent of modern human males. Based on reconstructed skeleton of a twelve-year-old male, Johanson believes erectus had a body shaped like many African groups today. But there were differences.

Their bones were considerably heavier and more massive than those of modern man. And their facial features included low sloping foreheads and heavy curved brow ridges. Like the australopithecines, erectus displays noticeably large thigh bones and a small pelvis.

Those qualities combined to make this species more athletic than we are today. They were designed for mobility. Walking and running came naturally for them; however, such dexterity came at a price. Erectus' narrow pelvis severely limited the size of its brain at birth. And the brain remained proportionally smaller than sapiens'. In contrast to Johanson's view, Richard Leakey believes Homo erectus was a little stockier than the average human today.

The head and face were "primitive" with the forehead sloping backwards and prominent brow ridges. His face protrudes less than Homo habilis, but not as flat as Homo sapiens. The chin was present but poorly developed. Erectus made and used tools. Large potato-shaped hand axes, along with picks, and long-edged cleavers are the basic utensils of Old Stone Age technology, otherwise known as the Acheulian tool industry. These stone tools were probably used for chopping, cutting, piercing, and pounding meat. Meat was evidently an important part of erectus' diet.

We find evidence that they were using their hand axes for cutting and carving wood and meat. Richard Leakey tells us that twenty thousand stone tools have been found associated with erectus. That's a lot of tools. But hunting weapons are not among them. No spear, dart, or arrowhead has surfaced. How they got their meat remains a mystery. Possibly they were scavengers.

The Acheulian technology was a stagnate technology. It didn't improve over time. It didn't even adapt to local conditions. Incredibly enough, we find the same hand axes, picks, and cleavers in Africa, Europe, and Asia. Leakey believes their tool craft may have actually declined, during the erectus period. He comments, "Some of the later examples of the technology appear simple and crude compared with some earlier material."

From Africa and China, we find solid evidence that erectus was using fire. Whether they could make it is still questionable. One million years ago at Swartkran, erectus was probably cooking food and/or using fire to keep predators away. At Zhoukoudian, a Peking site in China around 500,000 years ago, a series of ash layers leads anthropologists to believe erectus was responsible for these ancient hearths.

Did Homo erectus talk? Probably not, concludes anthropologist Ann MacLarnon. There's a major difference between erectus and sapiens in the thoracic region. The vertebral canal in Homo sapiens is twice as wide as it is in erectus. In this respect, Homo erectus is physically closer to an ape than it is to modern humans. And that is a distinction of considerable importance.

According to Ms. MacLarnon, erectus probably lacked the number of cell bodies which we have in our spinal chord. That means erectus had less muscle control in his rib section. Those muscles along with their supporting nerves control breathing. Finely controlled breathing is an essential requirement for speech. Apparently, erectus could not talk. Apart from this anatomical evidence, we have another common sense reason for doubting erectus' ability to speak. If they were discussing and comparing their stone techniques, that should be enough to spark an occasional improvement over a million years or so. But we don't find any.

In many ways erectus seems almost like us. But something is missing. The cultural traits of language, funerary rites, and art are all absent. And as Johanson points out, "There is the troubling matter of a tool industry that didn't change for a million years. That's a long, long time without improvement. Contrast that to the accomplishments humans have made in the last two hundred years.

Where should we place Homo erectus in the scheme of things? The experts disagree. The same argument that arose earlier with Australopithecus afarensis and Homo habilis surfaces again with Homo erectus. Paleontologists question whether erectus is one or more species. Those early fossils from Africa may need to be reclassified in a separate category from the later ones from Asia. Others believe erectus is an early form of sapiens. They say he is human.

Ancient Hominids

Life, skills and customs of the Ancient Hominids

No one knows for certain how the ancient hominids looked much less what they ate, how they hunted, how they treated one another, what they thought, or how they viewed their world and themselves. Artifacts left behind by the ancient hominids can provide hints.

The earliest examples of stone tools date from 2.3 million years ago. Hominids from this epoch are usually depicted as very apelike, lacking the dexterity and intelligence to fashion complex tools. Recently, though, evidence has emerged that contradicts this long-held belief.

The earliest stone tools consist of stones reshaped by the user to form a simple blade. The user hits a larger stone with a smaller one to knock off pieces, called flakes, in a process known as "flaking." Until the 1990s, few anthropologists would've considered the idea that the earliest hominids used their intellect to craft more complicated tools, or that their flaking techniques exhibited planning, analysis, and precision. But the tools unearthed in Kenya during the 1990s illustrated just these traits. The toolmaker removed as many as 30 flakes from a single stone to achieve the perfect shape.

Examining other examples from the same region showed that the toolmakers worked according to a defined process, rather than randomly flaking off bits until they happened upon the right shape. Having discovered the ideal angle for striking the stone, the toolmakers also duplicated the angle each time, resulting in a remarkable similarity between the tools. These "ape-men" clearly had the forethought and analytical skills to recognize the best angle, reproduce it with multiple stones, repeat the flaking process until they got it right, and teach their skills to their brethren.

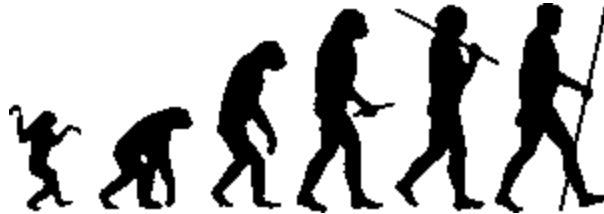
Evidence from Tanzania hints that early hominids did more than scavenge whatever carcasses they stumbled over in their wanderings. At one site, hominids traveled some distance to find a meal, which they then brought back to their home territory as evidenced by the animal bones found there. Hominids must've searched for carcasses, or even hunted the animals themselves, then transported the carcasses to another location where the flesh was removed using stone tools. The hominids didn't live where they de-fleshed their carcasses. Instead, they seem to have chosen one site as their butcher shop, and another for the living quarters.

Other evidence implies ancient hominids had culture and ritual. A number of sites preserve Neanderthals burials individuals purposely interred, rather than covered by sediment from flood waters or crushed under falling stones. At Kebara Cave in Israel and La Chapelle-aux-Saints in France we find simple pits in which Neanderthals buried the deceased; at Le Moustier in France, we discover a teenage boy buried with care on a bed of flint flakes, his head placed on one arm; at La Ferrassie in France, we encounter a cemetery where two adults and four children were laid to rest.

Then we have *Homo heidelbergensis*, an *erectus* successor who migrated into northern Europe around 600,000 years ago. At Boxgrove in England, scientists have uncovered a hammer carefully sculpted from the antler of an extinct giant deer. Fragments of flint on the hammer's surface demonstrate that *heidelbergensis* used such hammers to shape stone tools. To create a hammer for repeated uses implies *heidelbergensis* had the ability to plan ahead, as well as to recognize the value of making one tool to aid in the manufacture of others. By 400,000 years ago, *heidelbergensis* had begun to craft wood spears. They apparently realized which trees offered the hardest wood and therefore made the best weapons. Controversial evidence from Indonesia suggests ancient hominids sailed the ocean. Stone tools found on the island of Flores were originally attributed to *Homo erectus*. Since the discovery of *Homo floresiensis*, the dwarf hominid, anthropologists have argued about whether the tools belong to *erectus* or *floresiensis*. The only remains of *floresiensis* found so far date to between 18,000 and 12,000 years ago. At least one site containing stone tools dates to around 800,000 years ago. Unless older *floresiensis* bones are found, the dwarf hominids cannot have created the tools. *Homo erectus* seems the most likely suspect.

But how did *erectus* get to Flores 800,000 years ago? Although land bridges connected other archipelagos at the time, nobody has found evidence of a land bridge joining Flores to mainland Asia. *Homo erectus* had one way of reaching the island. They must've sailed there on boats. The evidence suggests ancient hominids possessed intelligence and sophistication on a par with our own. We should stop looking at them as apish brutes, and begin to see them for the clever creatures they were.

A Brief Look At Evolution – Darwin's notes of evolution



In a world dominated by religious dogma, where people turned to the Church both for moral guidance and rational inquiries, two Englishmen offered a theory that challenged the old ways and unified the study of biology. Though history has credited Charles Darwin as the source of both natural selection and evolution, his lesser known colleague, Alfred Russel Wallace (A.R Wallace) had independently arrived at the conclusion. The experiences that formulated both versions of evolution were independent in time and location, illustrating that the phenomena was not unique to any one temporal or geographic location.

The concept of natural selection (as understood today) began with the HMS Beagle, a 235 tonne brig sloop, on which Charles Darwin travelled for five years. Though the ship was not commissioned to radically alter the face of biology, it inevitably helped its now famous passenger to do just that. Joining Captain Robert FitzRoy as an unpaid gentleman, Charles Darwin looked forward to the opportunity to pursue his love for geology in South America. During the five year journey, Darwin had the opportunity to visit a group of small islands off the coast of present day Ecuador called the Galapagos. Darwin, a budding naturalist, spent a great deal of time collecting samples for later study and taking meticulous notes on rock formations and geological trends. As an after thought he embellished in the crews custom of collecting various species of birds from the locations visited. This tradition would set Darwin on the road to discover natural selection.

Though the birds played little role in his writings subsequent to his voyage, they ultimately gave him a reference to which he could ground his theory of natural selection. Darwin eventually returned to the birds after John Gould, an ornithologist, revealed that what Darwin thought were a series of different species of birds were in fact, all varying species of Finch. Intrigued, he began to pore over his notes quickly discovering, or re-discovering, that each species of finch had a distinctive bill, unique to a particular food source that was abundant to the island it was obtained.

Reading the ideas of economist Thomas Malthus, Darwin began to formulate the foundations for evolution. Malthus argued that a human population growing unchecked would double every 25 years. Because no environment can sustain infinite growth, there was intense competition for the finite resources available. Building on Malthus's idea, Darwin was able to apply the concept of competition for finite resources to the observations made during his journey to the Galapagos.

Variation between individuals of a species exists when combined with limited resources leads to competition. Darwin theorized that if the preceding statement was true, that species with advantageous variations would more likely survive than those without. This idea would explain the variation in the bills of finches he saw across the Galapagos, and explain why each bill was specialized to a specific resource abundant in the area that species of finch was found. Darwin coined the term natural selection to describe the process by which only favorable variations survive. Though Darwin's roots as a geologist and his study of Charles Lyell's, *Principles of Geology*, planted the seed for belief that great changes were the outcome of gradual processes over huge periods of time, Darwin did not apply this idea to biology until his study of fossils.

In 1837 Darwin began making detailed notes of evolution. Studying homologous structures, vestigial organs and embryological development of living species gave him ample evidence that evolution was occurring. Once natural selection became the avenue for explaining why evolution occurred, Darwin had amassed a huge amount of evidence for his theory. His facts eventually took the form of a 230 page essay written over two years, titled *The Origin of Species*. Though he arrived at the same conclusion as Charles Darwin, A.R Wallace did so at a later date, taking a different route. Unlike his famous counterpart, Wallace was not interested in geology or rock formations; his goal was to solve the riddle of the origin of species. Like Darwin, Wallace chose South America as his destination to find an answer to the riddle. He found both evidence and bad luck. Concluding his voyage two years later due to an illness, A.R. Wallace decided to return to England and begin cataloging the large collection he had amassed. On his voyage home his ship caught fire and sank, taking with it a substantial portion of his samples. Determined not to let a little bad luck inhibit his thirst for knowledge, Wallace left for Indonesia two years later. It was during the eight years A.R. Wallace spent in Indonesia where he came up with his theory of speciation via survival of the fittest.

Unlike Darwin, Wallace did not study finches to formulate his theory, rather, Wallace observed a slew of organisms including the *Rhacophorus Nigropalmatus*, or the flying frog. Like Darwin, Wallace observed how geographic separation seemed to cause speciation amongst similar individuals. He too eventually connected these observations back to Thomas Malthus, eventually authoring a mechanism to how such change occurred. He called what Darwin referred to as natural selection, "survival of the fittest". The "survival of the fittest" concept used by Wallace was similar to Darwin's but not identical.

Both agreed that some sort of selection occurred, but while Wallace described it as a natural phenomena, Darwin used selective breeding as a means to explain and understand the mechanism. In essence, A.R Wallace arrived at the same conclusions that Darwin had some twenty years before. When he sent Darwin an early manuscript of his findings, Darwin realized that he could no longer hold back his results. Darwin himself described Wallaces manuscript as an excellent summary of his original findings. After discussing the awkward situation with fellow scientists, Darwin published his paper and gave special mention to A.R Wallace and his work. Though Darwin received credit for the work they both arrived at the same conclusions. This final destination of sorts laid the foundation for future generations to regard the "Theory of Evolution" as more than just theory, but fact.

The affect of the publication was immediate, yet both viewed it in different contexts. Being a devout Christian, Darwin did not see evolution as contradictory to the world view as according to the Bible. He credited God for evolution and its mechanism, natural selection implying God may have created life, but natural selection is the mechanism for which life evolved. Wallace on the other hand horrified Darwin with his turn to "spiritualism".

The debate over the social and cultural implications was immediate. Evolution and natural selection were deemed heresy by the church and condemned as unchristian beliefs. Though scientists had a better understanding of what Darwin and Wallace were trying to convey, the general public were manipulated into thinking evolution was a theory of how they were a monkeys uncle. The misinformation and misinterpretation of exactly what evolution theorizes continues to this day.

The most recent incarnation of the debate comes in the form of evolution versus Intelligent Design. The debate is based on a core misunderstanding of not only what the theory of evolution expresses, but also the definition of a theory. A theory is a systematic and formalized expression of all previous observations made that is predictive, logical, testable and has never been falsified. Evolution is a scientific theory because it meets these criteria. Though Intelligent Design and alternative explanations offer critiques of evolution, they do not propose testable, predictive alternatives. Critiques do not qualify as scientific theories, yet many mask themselves as such.

Intelligent design for example offers two main critiques of evolution; the concept of specified complexity (also known as the "Watchmaker Hypothesis") and the Fine Tuned Universe argument. The prior makes the following claim; if a person is walking across a beach and comes across a pebble, they think nothing of it believing that it has been there by chance. If however, that person comes across a Rolex watch, it is obvious that someone must have placed it there. The minute intricacies of the watch leads one to the obvious conclusion that it must have been designed. Similarly, the minute intricacies of the human cell leads one to the obvious conclusion that a greater intelligence had a hand in its existence. This argument works only in the narrowest of context. When taken further, the watchmaker argument poses a significant philosophical problem. If the watch had a watchmaker, who designed the watchmaker? Intelligent Design advocates offer the idea of an "uncaused causer", or a God like figure to solve this problem. This in itself is a contradiction to the original argument that complexity requires design. In essence, we begin reasoning in circles.

The Fine Tuned Universe is another attempt at a critique of evolution. The argument states that the emergence of life as we know it is dependent on variables so finely tuned that it must have been designed. Proponents of Darwinian Evolution dismiss this argument as one based on ignorance and lack of imagination. If variables including the charge of an electron were slightly different, life as we know it may not exist - but that does not mean life will not exist at all. More than likely, if given enough time life would exist, just in a different form. Bacteria living in thermal vents offer evidence to support proponents of Darwinian Evolution. Rather than using carbon as the building block of life, these bacteria evolved using sulfur as their major organic component.

It is blatantly clear that critiques of Evolution are religiously motivated and based on misinterpretation of what evolution claims. It should be noted that evolution makes no claim of the existence of a "designer", rather evolution offers us a vehicle to explain the changes that have led to the variety of species seen today. Though both Darwin and Wallace may not have known it at the time, their research has led to one of the most controversial theories in science as well as one that has unified the study of biology.



Homo sapiens Neanderthal lived between 130,000 and 35,000 years ago. Europe was the center of their range. Some have been found as far south as Gibraltar, even down to Israel and the Near East. They were bordered on the north by glaciers, on the south by the Mediterranean Sea, and on the west by the Atlantic Ocean. Height: Average around 5 foot 8 inches.

Fossils: Part of a skeleton - a thick skull cap and a number of arm and leg bones were uncovered in the Neander Valley near Düsseldorf, Germany. Two more skeletons were found in a cave in Spy, Belgium. Brain capacity: Neanderthal's brain on average was slightly larger than our own. However, everything about them was big. Proportionally, their brain was roughly equivalent to modern humans.

During the 19th century, authorities commonly dismissed neanderthal as a "primitive brute," much too odd to be an ancestor of mankind. Over the years conventional wisdom changed. The popular cliché became: Dress a Neanderthal in a suit and he could go unnoticed through the streets of New York City. Perhaps he would be a bit shorter than average; maybe his features would be a little on the heavy side. Squatter? Yes. More muscular than most? Yes, indeed. But on the whole, he would blend in nicely.

Opinions have changed again on this sub-species. Paleontologists now believe Neanderthal was a very distinct group designed for cold weather with their stout, pear-shaped bodies which reduced the loss of heat. Their physique is completely opposite that of the rather slender Homo Erectus, who was much more at home in the warmer climates. Surprisingly enough, Neanderthal is also strikingly different from early modern Homo sapien sapiens who lived during the same period.

Artists have had a field day with Neanderthals. At times, they have been presented as primitive ape types; other times they resembled modern humans. It depended on the whim of the artist and the audience he wished to please. The truth is no one knows what neanderthals looked like; nor for that matter, what Homo erectus looked like; nor Homo habilis; nor the australopithecines either. Fleshy parts have not been preserved. Leaving portraits aside, however, we do know quite a few facts about neanderthal.

They were a formidable sub-species. We find sizable skeletons with thick arm and leg bones and good evidence of the muscle power which moved them. Their limbs and joints were bigger, thicker, and more durable than Homo sapien bones. Granted, those features might not draw much attention in a crowd today, but they had other characteristics which would stand out as -- different. The hip sockets face sideways rather than forward. That feature suggests neanderthal neither walked nor stood like a modern sapien.

It's hard to confuse a neanderthal face with a sapien, erectus, habilis or anything else. Their jaws and nose protrude, and the noses are huge. Don Johanson tells us that the nose stuck out almost perpendicular to the rest of the face. Their heads are long and narrow with a bulge in the occipital region, commonly called a "bun"; prominent brow ridges over high, round eye sockets (Cro-Magnon's sockets were low and square); swept back cheekbones; and no bony chin. Those are distinctions with a difference, but here is an oddity. We use our molars for crushing food, but evidently neanderthal didn't chew like us. His front teeth are the ones with larger crowns and roots compared to his other teeth. These front teeth are often eroded down to the roots in adult neanderthals. Researchers conclude neanderthal used his front teeth for chewing.

Paleontologists have listed quite a few interesting facts about Homo sapien neanderthal. Their tool production, which paleontologists label the Mousterian or Middle Stone Age, remained unchanged for their entire 100,000 year life span. It is seen as a technological advancement over Homo erectus' Acheulian industry.

Johanson points out that neanderthal produced different flint tools for different purposes: "such as meat cutting, hide scraping, and woodworking." Authorities think that they, like erectus, consumed quite a bit of meat. Some stone points may have been fitted onto a wooden shaft and used as a spear. Impact fractures suggest their use as projectiles. Judging by the numerous hearths in their caves, apparently, Neanderthal had learned the art of making fire. Fire pits were found where they had roasted meat and wild peas. Paleontologists see signs of long term illnesses and injury in a number of Neanderthal skeletons. That, they say, is ample proof this sub-species took care of each other when the need arose. And neanderthals buried their dead. Inside of several of their caves, we have uncovered neanderthal skeletons buried in flexed positions.

Did they speak? In Israel at a cave called Kebara, a 60,000 year old almost complete skeleton was uncovered. Among the bones was found a U-shaped hyoid bone which is very much like our own hyoid. That finding may indicate Neanderthals were capable of speech.

The hyoid bone anchors muscles that connect to both the larynx and the tongue. The hyoid is an important part of our physical anatomy which allows speech. Still, it's a matter of debate among the experts whether Neanderthal had a language.

The question remains: Who were the ancestors of neanderthal? And was this sub-species one of the direct ancestors of Homo sapien sapiens? Or were they merely another dead end species? As for the first question, the fossil record has no answer.

It is a puzzle. Homo erectus was around before them, but they were dramatically at odds in physique. The "handy man" Homo habilis supposedly was extinct hundreds of thousands of years before Neanderthal arrived on the scene. Besides, physically, habilis was even more distant from neanderthal than erectus. Consequently, neanderthals have no clear predecessors.

What about their descendents? Therein lies a deep split among the prehistory scholars. The ones who argue against neanderthal's inclusion in our ancestry seem to have the upper hand in the dispute. Modern people do not share neanderthal's distinctive traits of a narrow-shaped head with protruding jaws and a perpendicular nose, no chin, and a bun on the back of the skull. We don't chew with our incisor teeth, and our hip sockets face forward rather than veering toward the side.

Since people today don't have those traits, we suspect they died along with Neanderthal. Moreover, since perfectly normal-looking sapiens were already present during neanderthal's period, it's reasonable to conclude - they, not Neanderthal, were our ancestors.

The degree of anatomical differences between modern humans and neanderthal has prompted some to question Neanderthal's classification as a sub-species with sapiens. Paleontologist Yoel Rak believes neanderthal is a separate species. Rak claims that the differences between Neanderthal and sapiens are greater than those found in chimpanzees, which are divided into separate species, and in hyenas which are even given separate genera. Species is commonly defined as groups of interbreeding natural populations that are reproductively isolated from other such groups. Considering that neanderthals' unique traits are no longer with us, evidently sapiens were not interbreeding with neanderthals. Rak and others conclude we are looking at a separate species.

Then what can we make of neanderthal? Here we find a creature with a brain as large or larger than our own, walking around on two feet. We find evidence that they hunted, knew the art of starting a fire, cooked meat and vegetables, helped their sick and invalid, and buried their dead. Sounds very human, doesn't it? But yet, something is missing. A major piece of the puzzle doesn't quite fit.

Homo sapien Neanderthal, we find, is an enigma, just as Homo erectus was before it. Both were stuck in a rut. Although erectus lived over one, perhaps two million years and spread over three continents, his Acheulian stone culture remained what it was. It varied little from place to place and didn't improve at all over time. From this and some speculation about lack of breath control, paleontologists decided erectus couldn't speak. If they were exchanging ideas on their stone techniques, we should expect some improvement over a couple of million years.

While it is true neanderthal wasn't around nearly as long as erectus, still 100,000 years is a very long time to go without advances in their Mousterian stone kit. If Neanderthal's hyoid allowed him speech, his lack of progress becomes all the more difficult to explain.

Unlike erectus with its mere 850 to 900 c.c brain capacity, we cannot dismiss Neanderthal's lack of innovation due to a small brain. Evidently, there is more to being a human than just quantity of brains. How does Neanderthal fit into evolution? It doesn't; it's another dead end. This group appears suddenly without any known ancestors and leaves no obvious descendants. The experts don't even agree on how they should classify Neanderthal.



| The End

