



Human Evolution: Insignificant Ape to Intelligent Designer

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Abstract

Modern genetics has confirmed that all the organisms on earth have evolved through time. From single-cell bacteria to blue whale all have the same origin. Humans are no exception to this. Humans are higher primates and our closest cousins are Chimpanzees. Nearly 6 million years ago chimpanzee family and our ancestors had the same origin. *Sahelanthropus tchadensis* is the oldest known hominid for now discovered from Chad which is at least 6 million years old. *Australopithecus afarensis* is an extinct hominin that lived between 3.9 and 2.9 million years ago in Africa. *Australopithecus africanus* is the descendent of *A. afarensis*. After that robust *Australopithecus* was evolved and their descendants true humans *Homo erectus*. *Homo erectus* migrated beyond Africa. Modern humans also evolved in Africa, they migrated outside Africa for more than once but all the anatomically modern human live today have born from a woman 200,000 years ago and that population left Africa 60,000 years ago and dominates the whole world by terminating other human species.

Keywords: Mammal, primate, evolution, *Australopithecus*, Neanderthals, *Homo erectus*

Introduction

Earth, the only known planet which harbor life and it does so in great quantity. The total number of variety of animals and plants is astonishing. The estimated number of different species varies from six million to a hundred million. Wherever you look there is life even we are carrying more bacteria in our cell rather than our total cell. There are often a multitude of variation on a single pattern. For example, nearly ten thousand species of bird, 6495 species of mammal, the total number of bat species in the world is presently cited at more than 1300, 10793 reptile species, 7924 species of amphibian, nearly 34000 fish species, and snake almost 3400 species. 350 thousand beetle species, 315 hummingbird, not to mention 400 thousand different kinds of flowering plants, etc. The variety is astounding. Why should there be such

a dazzling variety? Everyone locked in their life long fight for survival. Many animals and plants go to extremes to give themselves a chance.

How First Life Was Formed on Primitive Earth

The gradual process of origin of life according to recent studies has discussed in brief.

Amino acids are called the building blocks of life. In the Miller-Urey experiment, they used very simple molecules that were present on the early earth. They used water (H₂O), methane (CH₄), hydrogen (H₂) ammonia (NH₃). Miller found five amino acids in the solution (glycine, alanine while aspartic acid and aminobutyric acid were not certain (Miller, Urey, &

Oró, 1976). But after his death in 2007, after examining the sealed vials from the original experiment scientists were surprised to see that there were well over 20 different amino acid molecules are present. This experiment sheds light on the Origin of life on earth. CH₄, hydrogen, ammonia, and water were present at that primitive earth atmosphere and there was lightning too which maybe the source of the energy because the sun was not so bright. Proteins are polymer of amino acids, Volcanoes were very active at the beginning of earth life. So, there should be volcanic gas carbonyl sulfide.

An experiment was run by Jason Greenwald, Micheal P. Friedmann, and Ronald Riek to show that amyloid aggregates can arise from amino acid condensations under prebiotic conditions. First, they used alanine because it is the simplest of all the chiral amino acids, so it could be the most abundant amino acid in the prebiotic world. By using other amino acids – glycine, alanine, aspartic acid, and valine they showed that amyloid can pose many important properties that are necessary for the formation of the first replicative elements in the origin of life process. (Greenwald, Friedmann, & Riek, 2016)

It maybe concluded that first amino acids and then protein was formed by getting favourable condition in primitive earth. If we think it is true then we can assume that after the events somehow RNA was arisen and then DNA and at last first form of life developed.

In the 1980s it was discovered that RNA can catalyze several chemical reactions including the polymerization of nucleotide. Further studies showed that RNA molecules can direct the synthesis of a new RNA from the RNA template. So, RNA can both serve as a template and to catalyze its replication. By the evolutionary process RNA and amino acids then evolved into the modern-day genetic code DNA. DNA eventually becomes the most used genetic material in living forms.

First cells may have self-replicating RNA in a phospholipid membrane and were capable of encoding protein (Alberts et al., 2014).

Central Dogma of life

Mutation

Mutation is the change in the nucleotide sequence of the genome. It can occur in DNA or RNA.

Mechanisms responsible for the diversity in life forms:

The sequence of a gene can be altered in various ways and can have different health effects, depending on the site they occur.

Mutation can be three types according to their action.

- Neutral Mutation- no effect on survival
- Beneficial Mutation-increase the chance of survival
- Harmful Mutation-decrease the chance of survival

Natural Selection

Many more individuals are born in nature than can survive. Individuals having an advantage over others survive and reproduce in nature. This phenomenon of retaining adaptable species is called Natural Selection. Mutations that do not affect survival would not be affected by natural selection only left a fluctuating element in the species called polymorphic. (Darwin, 1859, p. 80)

Human Evolution

Examples of human development can best be comprehended in their paleoecological setting. Understanding the ecology of the earliest hominins requires breaking down-proof for the paleobiology and societies of the wiped-out species with regards to recreations of the conditions in which they lived, looking for proof of communications between the hominins and their living spaces to construe environmental connections.

Since the fossil record is deficient and safeguarding is biased, information on the variety and overlap in populaces of various hominin species and the creature and plant networks in which they lived is exceptionally restricted. Regardless, the fossil and archaeological record enables us to perceive biological contrasts between sympatric types of early hominin, and possibly to clarify longer-term, macroevolutionary-scale examples of speciation, heredity enhancement, and elimination in connection to wide climatic and paleoenvironmental patterns. While any causal impacts of paleoenvironmental conditions on the roots of our ancestry and the rise of bipedalism stay uncertain, it seems clear that early

hominins were biologically summed up and ready to make due in a wide scope of living spaces. Through time, as environmental change made living spaces patchier and less predictable, hominins expanded, either getting adjusted to increasingly specific diet or growing progressively flexible, omnivorous diets founded on specialized tool use. (Muehlenbein, 2015, p. 85)

The Early Hominin Record

Fossil and hereditary proof demonstrates that our human progenitors separated from a typical genealogy with apes at some point somewhere in the range of 5 and 7 million years back (mya) in Africa.

From that underlying split, the new genealogy kept on developing and expand. While scientists can contrast in their orders of individual fossil hominin taxa, there is no doubt that, in general, a significant number of the large examples of early hominin advancement created through a progression of versatile radiations—nature's paleoecological explores in endurance and extinction. Our own family, Homofirst rose out of a different cluster of African hominin taxa. Early *Homo* was at first not unreasonably unique to other early hominin species, yet just after 2 mya, *Homo* populaces turned into the first hominins to colonize Eurasia—extending out of Africa into a biological range phenomenal in some other warm-blooded animal (Zhu et al., 2018). Other hominin taxa made due for a period in Africa, yet by 1 mya *Homo erectus* was the main enduring hominin, the author of our genealogy. With *H. erectus* we can surmise that a novel parity had coevolved between biological adjustments and socio-social answers for natural issues, a conduct change that at last gave the human ancestry the innovative aptitudes to populate the planet. To comprehend the job that condition may have played in moulding the advancement of early hominin science and culture, it audits how huge scale examples of topography and atmosphere surrounded the ecological setting of hominin development, before outlining the difficulties of recreating the paleoecology of explicit early hominin species utilized similarly for translating the chemical marks and diet of early hominins themselves.

The Habitats of the Earliest Biped

We realize that bipedalism, the establishing adjustment of the hominin ancestry, first developed during the Late Miocene. Globally, the Late Miocene was described by cooler climate than in past periods,

and just before 6 mya, bone-dry conditions caused a huge drop in tree spread over the African tropics, as prove in pollen from remote ocean centres off both the western and the eastern coasts. The Messinian Salinity Crisis from 6 to 5.3 mya presumably intensified these climatic impacts in Africa through a perplexing loop (Imbrie et al., 1993), both through the impacts of expanded neighbourhood able do and through salt sequestration in the basin that affected ocean chemistry and influenced the quality of circulation patterns.

These ecological movements would have moulded selection pressures for Late Miocene ape populaces: splintered wooded living spaces diminished the abundance and expanded the unpredictability of plant foods, sleeping trees, and different forest resources; intensified seasonality expanded the unusualness of plant foods and drinking water; and trophic level movements included diversified mighty land carnivores adjusted to going after more noteworthy numbers and varieties of open-nation antelope. Without a doubt, it appears that Eurasian and African ape either advanced biological specializations or went terminated during this period when the hominin lineage split from that of chimpanzees.

Therefore, numerous researchers have thought about whether hominin bipedalism was additionally an adjustment to the spreading of savannas. Surely, an upstanding stance and effective walk could have been worthwhile to early hominins in open environments, in the case of going between patchy resources or keeping away from predation dangers. But such fundamental versatile situations are misrepresentations. As new paleoenvironmental proof is orchestrated, it has become evident that climatic fluctuations made complex examples of vegetation change across Africa, both continentally and local; (Bonnefille, 2010; Cerling et al., 2010; Kingston, 2007).

Thus, such a summed up "savanna hypothesis" isn't anything but difficult to test.

Savannahs or Woodlands?

The earliest recommended hominin is as of now *Sahelanthropus tchadensis*, recouped from Chad in a district right now covered by dunes, however, the site formed during a humid stage 7 mya that saw significant forest improvement in West Africa, and the region was arranged near a lake presumably

encompassed by groundwater forest (Lebatard et al., 2008), yet also near a sandy desert. After 7 mya, a sensational increment in aridity altogether decreased the degree of tropical woods across Africa, and it is obvious from the fossil faunal, botanical, and isotopic records somewhere in the range of 7 and 6 mya in the Tugen Hills that at any rate portions of the Rift Valley kept on supporting patches of lowland rainforest just as the open environment.

Two early bipeds that lived around 6mya, *Orrorin tugenensis* in Kenya, and *Ardipithecus kadabba* in Ethiopia, were found with fossils that recommend they occupied humid wooded areas. While these woody early biped territories were likely riparian passing destinations as opposed to living locales, despite everything they offer no help for the savanna biped theory.

Of the earliest hominin taxa, *A. ramidus* is related with the broadest paleoecological proof, however, the interpretation of this information stays dubious. The Aramis site, at 4.4 mya, falls inside a period between 4.5 and 4.0 mya when pollen proof reports a development of forested living spaces in both western and eastern Africa (Bonnefille, 2010), possibly enabling arboreally adjusted creature networks to spread.

The Aramis research group has incorporated proof from an assortment of sources including topography and paleosol geochemistry, paleobotanical remains, and a wide scope of cautiously contextualized animal fossils, and concluded that these early hominins lived and died in living spaces that extended from patches of closed forest to woodlands, yet didn't exploit more open grassy natural surroundings that were also present in the area. They bolster this understanding with paleo biologic proof from the hominin fossils themselves, for example, the obvious climbing capacity of these hominins, and isotopic values proposing a diet-dependent on woodland foods near the frugivorous diets of living chimpanzees.

Hence, the Aramis analysts dismissed the savanna speculation as a clarification for the sources of bipedalism. Nonetheless, different researchers have contended that as a result of sampling biases and taphonomic issues, similar information (especially paleosol isotopic data) are reliable with an understanding that the hominins lived in a wooded savanna mosaic habitat surroundings extending from riparian forest to open wooded grasslands (Cerling et

al., 2010). Indeed, even chimpanzees that live in semiarid savanna mosaic situations today still get the vast majority of their food from C3 plants—they should just range more generally to get them than forest chimps do (Sponheimer et al., 2006). The little cheek teeth, thin enamel, and gracile masticatory cranial design of *A. ramidus* are steady with isotopic estimations of the tooth polish that recommend an eating routine of leafy foods C3 plant assets from trees and bushes. Thinking about the total of the proof (Cerling et al., 2010), it appears to be sensible to presume that these early hominins most likely favoured searching in lush natural surroundings for nourishment, shade, and predator evasion, whatever the thickness of trees in fields they may have some of the time crossed.

Late Pliocene Adaptive Radiations

By the Late Pliocene, hominin taxa had expanded. While there is still no agreement about the exact patterns of the phylogenetic affiliations of these distinctive taxa, individual species had advanced in different environments, proposing adaptive radiations connected to diet. These species lived in South Africa and East Africa during a time of worldwide climatic weakening after 2.5 mya, when African woodlands were contracting and fossil species adjusted to exploiting dry, open prairies, (for example, antelope eating on C4 grasses) were getting incredibly normal.

Later "Robust" Hominins

An interesting story has developed as of late, contrasting two types of hominin that offer numerous adjustments to an intensely chewed diet including extremely powerful skulls, enormous biting muscles, and huge, heavily worn cheek teeth.

Numerous analysts allocate these species to the family Paranthropus, recommending that they speak to one vigorous heredity that spread and broadened between southern (*Paranthropus robustus*) and eastern (*Paranthropus boisei*) Africa (both Hunt and Ward in the present volume hold these robust specimens inside the genus Australopithecus). Different analysts would contend, notwithstanding, that the vigorous masticatory adjustments of these two taxa developed autonomously: parallel East African and South African ancestries reacting to Plio-Pleistocene environmental changes.

In either case, specialists expected for a long time that the eating regimens of these "robust" taxa were comparable, and discussed whether they lived in open or closed natural surroundings around the continent (Wood & Constantino, 2007). As talked about before, a significant trouble in deciding the favoured natural surroundings of such species is that their fossils are rarely preserved in living habitats, and more frequently found in areas where their remaining parts were moved after death, regardless of whether via carnivores or by river waters (Behrensmeyer, A.K., Reed, 2013).

Estimating the isotopic marks and dental microwear patterns of these fossil taxa has made this taphonomic issue less problematic, however, because the two sorts of dental proof archive parts of the diets of these people while they were alive. These behavioural marks furnish a significant examination with an interpretation of the masticatory morphology of the samples, specifically since the anatomical adjusted hominin was brought into the world with may both have been influenced by developmental processes and give proof of capacity, while not demonstrating a biological role (Daegling et al., 2013).

Despite their anatomical similarities, the robust taxa were adjusted to various diets. In South Africa, *P. (Au.) robustus* had tooth wear patterns and isotopic marks that proposed it usually ate a wide variety of genuinely delicate C3 foods, as had prior australopithecines in the area, yet enhanced these seasonally with critical amounts of little, hard, or tough foods, for example, C4 grass seeds, roots, nuts, or even grass-eating termites or little vertebrates (Sponheimer et al., 2006; Ungar & Sponheimer, 2011).

There are also proposals, based on strontium isotopes for ranging pattern of *P. (Au.) robustus* people, that a few people had travelled across ecological/geographical zones during their lifetimes, maybe giving proof of a relatively small area sizes just as potential patterns of social scattering (Copeland et al., 2011). Finger bones allocated to *P. (Au.) robustus* show dexterity, and they likely could have utilized tools to procure various kinds of foods; for instance, sharp long-bone parts found at a portion of the cave sites with *P. (Au.) robustus* fossils appear to have been utilized as digging instruments either to burrow up grassroots or to tear open termite mounds.

In East Africa, hominins, for example, *P. (Au.) boisei* were hyper robust, proposing an intensely chewed diet (Wood & Constantino, 2007). However, what were they chewing for significant stretches? Their isotopic marks recommend a diet intensely ruled by C4 foods, which could hypothetically incorporate anything from grass blades, to the shallow roots of grasses and sedges, to the meat of antelopes. Itemized investigations of the multifaceted nature of their tooth microwear designs recommend that they were not eating grasses, however, they were likely eating delicate foods with fine coarse surfaces, for example, shallow roots (Ungar, Grine, & Teaford, 2008). These sorts of plant foods would have been generally plentiful close to waterways and shallow lakes, so maybe as opposed to the summed up diets of southern African robusts, the East African robusts endure the undeniably challenging Rift Valley conditions by turning out to be profoundly specific foragers in perpetual wetland habitats (Lee-Thorp, Sponheimer, Passey, De Ruiter, & Cerling, 2010).

Early Homo: Ecological Entrepreneurs

The exact phylogenetic starting points of our variety, Homo, are yet uncertain (Anton & Josh Snodgrass, 2012). A few fossils of relatively gracile hominins have been found in both the Rift Valley and South African caverns. In East Africa, one or maybe two early species of (*Homo habilis*, *Homo rudolfensis*) have less vigorous appearances and smaller cheek teeth and offer moderately bigger brains, than found in contemporary "robust" hominins. Bigger brain sizes would have put metabolic and developmental demand on early Homo not faced by their contemporary hominins (Leonard, W. R., Snodgrass, J. J., & Robertson, 2009). Fossils of their postcranial skeletons are inadequately sampled, however, their walking and climbing capacities appear to have been like those of australopithecines.

These fossil taxa show up first in Africa around 2.3 mya, and some survived in Africa until at least 1.5 mya. One of these species is the feasible direct ancestor of *H. erectus* and our ancestry. Fossils of *H. erectus* have been discovered both in Africa and outside of Africa in Eurasia, at sites near 2.1 million years of old (Zhu et al., 2018). This species appears to have been profoundly variable in body size and cranial limit, however bigger than prior Homo, with body extents that may have been exceptional adjusted to long-separate walking or running.

H. erectus populaces appear to have shared prehistoric lands for hundreds of years with both robust hominins and surviving populaces of gracile species, and more likely had different examples of resource use (Wood & Strait, 2004). One of these, a particular gracile australopithecine species (*Australopithecus sediba*), has been recently found at a two million-year-old South African site; albeit *A. sediba* had australopithecine-sized brains, a few analysts have discovered their little teeth, gracile skulls, and derived manual dexterity and locomotor patterns to be suggestive of early Homo, their contemporary. So, an assortment of gracile hominin populaces, maybe including a few species, existed together somewhere in the range of 2.5 and 1.5 mya, a period of noteworthy natural change related to expanded aridity and fluctuating worldwide temperatures. In any case, just *H. erectus* endured and kept on spreading far and wide.

What environmental procedures prompted the accomplishment of early Homo?

Luckily for paleo scientists, as well as fossilized skeletal proof at death sites, proof of movement destinations has been preserved beginning at 2.6 mya. Buried in primary sites close to lakes and on-stream floodplains, archaeological deposits have preserved stone apparatuses regularly connected with fossil animal remains. These sites report that some early hominins had figured out how to choose and convey stones to use a hammer to pound materials and break apart weak rocks; the subsequent sharp fragments of stone were utilized as crude blades and chopping devices, and fossil bones related with some of these early stone apparatuses had been cut or crushed with stones, giving proof of cadaver butchery and the eating of meat and marrow (Blasco et al., 2019).

While no immediate proof excludes the likelihood that robust australopithecines could have made and utilized such apparatuses, most archaeologists accept that Homo had the adroitness and psychological capacity for tool making just as strong incentive to utilize tools to get to calorie-rich foods, given their little teeth and metabolically exorbitant brains. Animal remains butchered at the early sites incorporate everything from catfish and turtles at sites close to wetlands, to haunches of little antelope, warthog, zebra, and other bigger savanna and bushland creatures more than once conveyed to sites on floodplains or close to gallery forests of rivers and lakes (Hlubik et al., 2019). There is no immediate proof of plant foods preserved at such

locales, and considerable debate about whether hominins lived or camped at these places (Hlubik et al., 2019).

In any case, the way that numerous sites were visited more than once, over decades, recommends that early Homo was developing strategies for gaining foods and different resources that were dissipated broadly across landscapes, and that their omnivorous diet, locomotor, and planning capabilities, and maybe social collaboration, enabled them to exploit bigger regions, and maybe increasingly diverse, hostile habitats, than was feasible for their contemporary hominin species. Isotopic proof from fossil teeth proposes that early Homo kept up a blended eating regimen of C3/C4 food sources. C3 foods could incorporate everything from fish and little game to nuts, deep tubers, or even nectar, while meat or marrow from grazing warm-blooded creatures would add to the C4 balance (Ungar & Sponheimer, 2011).

Tooth microwear is by all accounts profoundly factor with no reasonable examples, however, some early *H. erectus* people had profoundly worn teeth, proposing noteworthy coarseness in their eating routine, maybe from digging roots. Overall, they appear to have been fit for an adaptively flexible eating habitat (Ungar, Grine, & Teaford, 2006). One recommendation, advanced as of late by primatologist Richard Wrangham (2003, 2009), is that significant moves in *H. erectus* anatomy compared with those of earlier hominins (expanded stature and brain size, with smaller teeth and a less extensive torso/gut size) could be clarified if *H. erectus* had controlled the utilization of fire and started to cook foods, which would diminish the potential poisons and increase the energetic quantity and palatability of those food sources.

Fire additionally could have protected *H. erectus* from predators in ways not possible for prior hominins (Hlubik et al., 2019).

While this cooking hypothesis is conceivable, and there are tempting proposals that some early stone tools were related with patches of scorched earth that had been burnt in prehistoric times, the most established generally acknowledged archaeological proof of cooking is more like one million years of age, instead of 2,000,000 years prior when *H. erectus* first evolved (Hlubik et al., 2019). Finally, early *H. erectus* fossils and archaeological sites have been found in more fluctuated and unique ecological settings than those of any early hominin.

First hominin outside Africa

So, *Homo erectus* had the capability to in different ecological conditions. According to stone tools discovery loess plateau, China in 2018 confirmed that the tools belong early Hominins-*Homo erectus* and it was dated to 2.12-million-year-old (Zhu et al., 2018). So, they were the first hominin species that explored beyond Africa for now. *Homo erectus* disappeared from earth 117,000-108000 years ago (Rizal et al., 2019).

Origin of *Homo sapiens*

The oldest known *Homo sapiens* specimens are around 315,000 years old. It was confirmed by the bones recovered from Morocco's Jebel Irhoud region in 2017 (Hublin et al., 2017). A study published in October 2019 suggested that all the anatomically modern human live today have descended from a woman 200,000 years ago in the south of the Zambezi basin, in northern Botswana by analyzing maternal L0 mitochondrial DNA branch. They left Africa 60,000 years ago and colonize every habitat on earth. But fossil remains of *Homo sapiens* are also found outside Africa before 60,000 years ago. If we consider the genetic analysis is true then we can conclude that those early migrants didn't survive long to create marks on our genome(Chan et al., 2019).

One hypothesis recommends that *Homo heidelbergensis*—a kind of transitional human species between the antiquated and the advanced—emigrated out of Africa 300,000 years prior and split. Those that would become Neanderthals went to what is presently Europe and parts of western Asia, while those to be Denisovans—who were just found as a species in 2008—made a beeline for eastern Asia. (The ones who remained behind became us, *Homo sapiens*, and left Africa 60,000 years prior, the hypothesis goes.)

There is increasingly more proof that the different types of humankind blended in manners we hadn't recently envisioned.

A report in *Nature* shows that, around 50,000 years prior, a Neanderthal and a Denisovan had a little girl. The young lady, who was at any rate 13 years of age, is one of less than 20 antiquated people who have had their entire genomes sequenced—hers from a solitary bone found in a collapse the Altai Mountains of Siberia. She is the principal revelation of an age-old human half breed (Slon et al., 2018).

A sequencing of cutting-edge human DNA against Neanderthal DNA in 2010 indicated that Neanderthal DNA is 99.7% indistinguishable from current human DNA. (For differentiate, present-day people and current chimps are 98.8% indistinguishable.) It is imagined that *Homo sapiens* and Denisovans may likewise have reproduced with one another.

Denisovan DNA still shows up in individuals in East Asia, for example, the (incidentally blonde-hair, blue-eyed) Melanesians of Papua New Guinea and the Solomon Islands in the Pacific. And all non-African people have DNA from Neanderthals.

The lineage of the Neanderthal-Denisovan youngster demonstrates exactly how complex the familial connections were between all these early types of people.

Conclusion

The origin of the *Homo* genus is now much more clear than previous years because of finding various fossils and using new technologies to extract and analyze data from these important fossils. Once nearly a dozen human species roamed the earth nowhere, we are the sole survivor species. According to studies, *Homo erectus* is the first member of the genus *Homo* and first human species to migrated outside Africa. *Homo sapiens* is the direct descendant of *Homo erectus*. New studies have justified that *Homo sapiens* mated with other human species, especially with *Homo neanderthalensis* and Denisovans. All the living members of our modern human population have originated from a woman who lived 200,000 years ago. In this review article, I have tried to represent our present knowledge on Human evolution. I hope in next years our family tree will be much more clear.

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