

Exploring the Origins of Today's Humans

Glossary

Acheulean (Mode 2): A stone tool type characterized by oval or pear-shaped bi-faced "hand axes" and are typically associated with *Homo erectus*. ~1.76 mya - 130 kya.

Admixture: Breeding between isolated populations.

Allele: Alternative DNA sequence at the same locus (location on the chromosome). *i.e.* alternate forms of a gene.

Anatomically "Modern" Humans: Humans dating to roughly 300 kya that are within range of the skeletal features of modern *Homo sapiens*.

Ancient DNA: DNA that is extracted from ancient specimens (skeletons, mummified tissues, frozen specimens, archeological material, archival collections, sediments, and dirt). The current upper age limit for ancient DNA extraction and sequencing is 0.4-1.5 mya.

Archaic Admixture: DNA from ancient, divergent, and now extinct populations found in current people.

"Archaic" *Homo sapiens*: Earlier forms of *Homo sapiens* who were anatomically and behaviorally distinct from modern humans.

Aurignacian (Mode 4): A stone tool type characterized by long, fine blades produced from a prepared core (Levallois Technique). Tools of this mode also include worked bone and antler points. ~43 kya - 28 kya.

Behavior: The way in which one acts or conducts oneself, especially toward others.

Behaviorally Modern Humans: Current *Homo sapiens*, a population of hominins who evolved in Africa 200-100 kya, developed a suite of behavioral and cognitive traits that distinguished them from other hominins in and outside Africa, which likely allowed them to replace all other related hominins across the planet, with some interbreeding but no surviving hybrid species.

Birch Tar (or pitch): A material produced through the dry distillation of birch bark and used as an adhesive for hafting. Neanderthals produced birch tar as early as 200 kya. Compare with *Bitumen*.

Bitumen (asphaltum or tar): A form of petroleum, a naturally-occurring organic by-product of decomposed plants, that is waterproof and flammable. Prehistoric humans used bitumen as an adhesive for hafting points to spears and for many other tasks and tools. Compare with *Birch Tar*.

Chromatin: A complex of DNA and proteins (histone and adaptor proteins) forming chromosomes.

Chromosomes: Discrete strands of tightly packaged chromatin.

Continuity (aka Phyletic Gradualism): An evolutionary model in which change occurs gradually over time. Compare with *Punctuated Equilibrium*.

Culture: Behavior and norms that are shared, learned, and socially transmitted.

Denisovans: An extinct hominin population contemporary with Neanderthals that hybridized with ancient humans and Neanderthals. Knowledge of Denisovan morphology is limited to two small fossils found in Siberia and a jaw in Tibet.

de Novo: A Latin adverb meaning "from the new." A new genetic variant that is the result of a mutation in a germ cell (egg or sperm) of one of the parents, or a variant that arises in the fertilized egg during embryogenesis.

Diploid: Two sets of each chromosome except for XY in male mammals.

Divergence: Change in genetic content or phenotype between isolated populations or species.

DNA: Deoxyribonucleic acid. The molecule of inheritance and consists of sequences of the four nucleotide bases: **A**denine, **T**hymine, **G**uanine, and **C**ytosine.

DNA Sequence: The order of nucleotide bases (**A**denine, **T**hymine, **G**uanine, and **C**ytosine).

Fitness (Darwinian): The relative likelihood that an allele will be represented in future generations (relative to other alleles in the same population). Compare with *Reproductive Success*.

Foraging: Searching for wild food or provisions as opposed to cultivating food crops.

Gene: DNA whose information encodes a function.

Gene-Culture Co-Evolution Theory: A branch of theoretical population genetics that models the transmission of genes and cultural traits from one generation to the next, exploring how they interact.

Gene Flow: Movement of alleles between populations.

Genetic Drift: Loss of alleles by chance.

Genome: All DNA in a cell. Also refers to the DNA sequence that typifies an individual or species.

Genomics: The study of genome structure/function.

Genotype: The two alleles at one or more diploid loci.

Genus: A taxonomic rank used in biological classification of living and fossil organisms to group closely related species. In binomial nomenclature, the genus name plus species name forms the binomial species name (e.g. *Homo sapiens*).

Great Apes: A taxonomic family that was once incorrectly used to denote chimpanzees, bonobos, gorillas and orangutans, but not humans.

Handaxe: A prehistoric stone tool with two faces and is usually made from flint, basalt, sandstone, quartzite, or chert.

Haplogroup: A genetic group of people who share a similar set of haplotypes via a distant common ancestor.

Haplotype: A set of alleles at distinct positions in the genome that are inherited together.

Hominid: A classification comprising all living and extinct "Great Apes" and humans.

Hominin: A classification of species comprising humans and our extinct relatives following the split with the common ancestor with chimpanzees.

Homo: The genus that comprises the species *Homo sapiens*, as well as several extinct species classified as ancestral to, or closely related to, humans.

Homo erectus: An extinct hominin species with fossil evidence from at least 1.9 million years to 70 thousand years ago and found from Africa to Indonesia. May have been the first hominin to leave Africa. *H. erectus* DNA may be retrievable from other species due to archaic admixture.

Homo naledi: An extinct hominin species whose fossil evidence dates to 335-236 kya. An assemblage of 15 *H. naledi* skeletons were first found in the Dinaledi Chamber of the Rising Star cave system in 2013 (since then, a second chamber has been found with *H. naledi* skeletons). The fossils possess a mix of "archaic" traits similar to genus *Australopithecus* (e.g. cranial and pelvic morphology) and "modern" traits characteristic of genus *Homo* (e.g. hand morphology). *H. naledi* lived contemporaneously with anatomically modern humans, Neanderthals, and Denisovans but is not likely a direct ancestor of humans living today.

Homo sapiens: The hominin species comprising all living humans. Meaning "wise man" in Latin, the name was introduced by Carl Linnaeus in 1758. The earliest fossil evidence of *Homo sapiens* appears in Africa around 300 kya (see *Jebel Irhoud Hominins*).

Howiesons Poort: A lithic technology cultural period in the Middle Stone Age in Africa named after the Howieson's Poort Shelter archeological site near Grahamstown, South Africa. Dates range from ~65.8 kya to 59.5 kya. Examples include composite weapons hafted with ochre and gum compound glue and microlith blades, bone arrows, and needles.

Hunter-Gatherer: A human living in a society in which most or all food is obtained by foraging (collecting wild plants and pursuing wild animals), in contrast to agricultural societies, which rely mainly on domesticated species.

Hybridization: Breeding among recognized species.

Introgression: Transfer of alleles between species.

Jebel Irhoud Hominins: The oldest known "early" human fossils discovered, dating to roughly 300 kya from an archaeological site in Morocco. The location of this discovery suggests a "pan-African" origin of humans, with a dispersed

interbreeding population, likely aided by climactic factors.

Levallois Technique (prepared core): A method of creating stone tools by first striking flakes off the stone, or core, along the edges to create the prepared core and then striking the prepared core in such a way that the intended tool is flaked off with all of its edges pre-sharpened.

Lomekwian Technology: The oldest known stone tools consisting of 150 artifacts found in Lomekwi, Kenya, close to Lake Turkana. ~3.3 mya.

Microlithic (Mode 5): A stone tool type consisting of small blades or points, called microliths, that were typically used in composite tools, such as an arrow point fastened to a haft. ~35 - 3 kya.

Mitochondrial DNA: Maternally inherited DNA found only in the mitochondria, the energy producing organelles of eukaryotic cells. Maternally inherited DNA found only in the mitochondria.

Morphology (Biology): Shape or form (outward appearance) of an organism. The branch of biology interested in the form and structure of organisms and their specific structural features.

Mousterian (Mode 3): A stone tool type characterized by hand-axes, scrapers, triangle points, and denticulates (a stone tool with edges of multiple notched shapes, or teeth) produced using a prepared core (i.e. Levallois Technique) and is most associated with Neanderthals. ~315 - 30 kya.

Mutation: Change in a DNA sequence.

Neanderthals: An extinct Eurasian hominin species that existed from 500-30 kya and interbred with ancient humans and Denisovans.

Obligate Tool User: Tool use is a necessity for survival. Tool use is an essential part of being human and we are the only known obligate tool users.

Oldowan (Mode 1): A stone tool type characterized by simple "choppers" for pounding, breaking, and bashing. ~2.6 - 1.7 mya.

Out of Africa: A hypothesis proposing the geographic origins of the genus *Homo* in Africa and migration of anatomically modern humans. These anatomically modern humans would have completely replaced the archaic human populations (Neanderthals, Denisovans, etc.) that had previously left Africa. This hypothesis emphasizes the African origin of our species but allows for the possibility of minor local contributions from archaic populations.

Paleolithic: A broad prehistoric period during which stone was used to make tools and weapons and is synonymous with Stone Age. Subdivisions:

- **Lower Paleolithic:** ~3.4 mya - 300 kya.
- **Middle Paleolithic:** Consists of use of prepared cores (i.e. Levallois Technique) and hafted tools and weapons. ~300 - 30 kya.

- **Upper Paleolithic:** Coincides with behavioral modernity and predates the advent of agriculture. Artifacts include finely crafted stone blades and bone and antler tools, such as harpoons and needles. ~50 - 10 kya.

Phenotype: Observable traits of an organism that result from interactions between genes and environment.

Phylogenetic Tree: A branching diagram showing the evolutionary relationships among biological species, or other entities, based on their physical or genetic characteristics.

Pleistocene: A geological epoch from ~2.5 mya to 11.7 kya characterized by a period of repeated glaciations. The end of the Pleistocene corresponds with the end of the last glacial period and also with the end of the Paleolithic age used in archeology. Subdivisions:

- **Early (Lower) Pleistocene:** ~2.58 mya - 781 kya.
- **Middle Pleistocene:** Emergence of *Homo sapiens*. 781 - 126 kya.
- **Late (Upper) Pleistocene:** 126 - 11.7 kya.

Polygenic: Relating to or determined by two or more genes.

Punctuated Equilibrium: An evolutionary model in which pronounced change takes place in short bursts followed by periods of evolutionary continuity. Compare with *Continuity*.

Reproductive Success: An individual's production of offspring per breeding event or lifetime (also includes the reproductive success of the offspring). Compare with *Fitness (Darwinian)*.

Rising Star Cave System: A system of caves in the Malmani dolomites of South Africa (and a part of the Cradle of Humankind World Heritage Site) where fossils of a previously unknown, extinct species of hominin, *Homo naledi*, were first discovered in 2013.

Saltation (Leap): Discontinuous evolution marked by a sudden mutational change from one generation to the next, and may result in a single-step speciation event.

San People: Members of various Khoisan-speaking indigenous hunter-gatherer groups that are the first nations of Southern Africa, and whose territories span Botswana, Namibia, Angola, Zambia, Zimbabwe, Lesotho and South Africa. mtDNA and Y chromosome studies show that the San carry some of the most divergent (oldest) human haplogroups.

Scavengers: Organisms that search for and feed on carrion, dead plant material, or refuse.

Single Nucleotide Polymorphisms (SNPs): Single nucleotide differences (e.g. Adenine, Thymine).

Species: A biological population whose individuals can mate with one another to produce viable and fertile offspring. *This is a debated definition.*

Stone Age: The prehistoric period during which stone was used to make tools and weapons and is synonymous with the paleolithic. ~3.4 mya - 10 kya. In African archaeology, stone age chronology is divided into Early Stone Age (ESA): ~2.6 mya to ~300 kya; Middle Stone Age (MSA): ~300 kya to ~50 kya; and Later Stone Age (LSA): ~ 50 kya to ~39 kya.

- **Early Stone Age** is characterized by the development of the first African stone tools, such as the Oldowan technology used by Australopithecines, and the later Acheulean technology, used by *Homo erectus*.
- **Middle Stone Age** is characterized by a transition from Acheulean to Levallois technology and the earliest known modern human behavior.
- **Later Stone Age** is characterized by microlithic industries and punch-struck blades, revealing fully modern human behavior.

Y-Chromosome DNA: In mammals, paternally inherited DNA. The Y-chromosome is one of two sex chromosomes (allosomes), and is the sex-determining chromosome. The Y-chromosome is passed paternally to sons only and it is one of the fastest-evolving (read: mutation rate) parts of the human genome.

Stone Tool Technology Types:



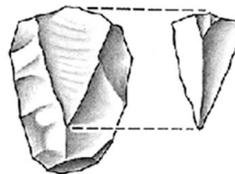
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(Mode 1)**

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