[Template:Other uses](/wiki/Template:Other_uses" \o "Template:Other uses) [Template:Redirect](/wiki/Template:Redirect) [Template:Speciesbox](/wiki/Template:Speciesbox) **Neanderthals** or **Neandertals** [Template:IPAc-en](/wiki/Template:IPAc-en), [Template:Smallcaps](/wiki/Template:Smallcaps) also [Template:IPAc-en](/wiki/Template:IPAc-en)-, -[Template:IPAc-en](/wiki/Template:IPAc-en)-, -[Template:IPAc-en](/wiki/Template:IPAc-en), -[Template:IPAc-en](/wiki/Template:IPAc-en))[[1]](#cite_note-1)[[2]](#cite_note-2) (named for the [Neandertal](/wiki/Neandertal) in Germany) were a [species](/wiki/Species) or [subspecies](/wiki/Subspecies) of [human](/wiki/Archaic_humans) in the [genus](/wiki/Genus) [*Homo*](/wiki/Homo_(genus)) which became extinct between 40,000 and 28,000 years ago. They were closely related to [modern humans](/wiki/Human),[[3]](#cite_note-3)[[4]](#cite_note-4) having [DNA](/wiki/DNA) over 99.5% the same.<ref name=lbnl2006/> Remains left by Neanderthals include bone and stone tools, which are found in [Eurasia](/wiki/Eurasia), from [Western Europe](/wiki/Western_Europe) to [Central](/wiki/Central_Asia), [Northern](/wiki/Northern_Asia), and [Western Asia](/wiki/Western_Asia). Neanderthals are generally classified by paleontologists as the species *Homo neanderthalensis*, having separated from the [*Homo sapiens*](/wiki/Homo_sapiens) lineage 600,000 years ago, or alternatively as a [subspecies](/wiki/Subspecies) of *Homo sapiens* (*Homo sapiens neanderthalensis*).[[5]](#cite_note-5)[[6]](#cite_note-6)[[7]](#cite_note-7) Several cultural [assemblages](/wiki/Assemblage_(archaeology)) have been linked to the Neanderthals in Europe. The earliest, the [Mousterian stone tool culture](/wiki/Mousterian_culture), dates to about 300,000 years ago.[[8]](#cite_note-8) Late Mousterian [artifacts](/wiki/Artifact_(archaeology)) were found in [Gorham's Cave](/wiki/Gorham's_Cave) on the south-facing coast of Gibraltar.[[9]](#cite_note-9)[[10]](#cite_note-10) Nevertheless, King's name had priority over the proposal put forward in 1866 by [Ernst Haeckel](/wiki/Ernst_Haeckel), *Homo stupidus*.[[22]](#cite_note-22) The practice of referring to "the Neanderthals" and "a Neanderthal" emerged in the popular literature of the 1920s.[[25]](#cite_note-25) The German pronunciation of *Neanderthaler* or *Neandertaler* is [Template:IPA](/wiki/Template:IPA) in the [International Phonetic Alphabet](/wiki/International_Phonetic_Alphabet). In British English, "Neanderthal" is pronounced with the /t/ as in German, but different vowels (IPA: [Template:IPA](/wiki/Template:IPA)).[[26]](#cite_note-26)[[27]](#cite_note-27)[[28]](#cite_note-28) In layman's [American English](/wiki/American_English), "Neanderthal" is pronounced with a /θ/ (the voiceless *th* as in *thin*) and /ɔ/ instead of the longer British /aː/ (IPA: [Template:IPA](/wiki/Template:IPA)),[[29]](#cite_note-29) although scientists typically use the /t/ as in German.[[30]](#cite_note-30)[[31]](#cite_note-31)

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## Classification[[edit](/index.php?title=(none)&action=edit&section=2)]

For some time, scientists have debated whether Neanderthals should be classified as *Homo neanderthalensis* or *Homo sapiens neanderthalensis*, the latter placing Neanderthals as a [subspecies](/wiki/Subspecies) of *H. sapiens*.[[32]](#cite_note-32)[[33]](#cite_note-33) Some morphological studies support the view that *H. neanderthalensis* is a separate [species](/wiki/Species) and not a subspecies.[[34]](#cite_note-34)[[35]](#cite_note-35) Evidence from [mitochondrial DNA](/wiki/Mitochondrial_DNA) studies has been interpreted as evidence [Neanderthals](/wiki/Human_evolution#Neanderthalensis) were not a subspecies of *H. sapiens*.[[36]](#cite_note-36) Others, for example [University of Cambridge](/wiki/University_of_Cambridge) Professor [Paul Mellars](/wiki/Paul_Mellars), say "no evidence has been found of cultural interaction".[[37]](#cite_note-37)

## Origin[[edit](/index.php?title=(none)&action=edit&section=3)]

The first humans with [proto-Neanderthal](/wiki/Homo_heidelbergensis)[[38]](#cite_note-38) [traits](/wiki/Trait_(biology)) are believed to have existed in [Eurasia](/wiki/Eurasia) as early as 350,000–600,000 years ago[[39]](#cite_note-39) with the first "true Neanderthals" appearing between 200,000 and 250,000 years ago.<ref name=neanderrediscovered/> The exact date of their extinction had been disputed but in 2014, a team led by Thomas Higham of the [University of Oxford](/wiki/University_of_Oxford) used an improved radiocarbon dating technique on material from 40 archaeological sites to show that Neanderthals died out in Europe between 41,000 and 39,000 years ago, with the last group disappearing from southern Spain 28,000 years ago. Radiocarbon dating performed on charcoal in Gorham's Cave in Gibraltar in 2006 suggests that Neanderthals lived there 24,000 to 28,000 years ago. This coincides with the start of a very cold period in Europe and is 5,000 - 18,000 years after *Homo sapiens* reached the continent.[[40]](#cite_note-40) Comparison of the DNA of Neanderthals and *Homo sapiens* suggests that they diverged from a common ancestor between 350,000 and 400,000 years ago. This ancestor was probably [*Homo heidelbergensis*](/wiki/Homo_heidelbergensis). Heidelbergensis originated between 800,000 and 1,300,000 years ago, and continued until about 200,000 years ago. It ranged over Eastern and South Africa, Europe and Western Asia. Between 350,000 and 400,000 years ago the African branch is thought to have started evolving towards modern humans and the Eurasian branch towards Neanderthals. Scientists do not agree when Neanderthals can first be recognised in the fossil record, with dates ranging between 200,000 and 300,000 years BP.[[41]](#cite_note-41)[[42]](#cite_note-42)[[43]](#cite_note-43)[[44]](#cite_note-44)

## Discovery[[edit](/index.php?title=(none)&action=edit&section=4)]

[Template:Multiple image](/wiki/Template:Multiple_image) Neanderthal skulls were [first discovered](/wiki/Engis_2) in the [Engis](/wiki/Engis) ([Engis 2](/wiki/Engis_2)) Caves ([fr](/wiki/Fr:Grottes_Schmerling)), in what is now Belgium (1829) by [Philippe-Charles Schmerling](/wiki/Philippe-Charles_Schmerling) and in [Forbes' Quarry](/wiki/Forbes'_Quarry), Gibraltar, dubbed [Gibraltar 1](/wiki/Gibraltar_1) (1848), both prior to the type specimen discovery in a [limestone](/wiki/Limestone) quarry of the [Neander Valley](/wiki/Neanderthal,_Germany) in [Erkrath](/wiki/Erkrath) near Düsseldorf in August 1856, three years before [Charles Darwin's](/wiki/Charles_Darwin) [*On the Origin of Species*](/wiki/On_the_Origin_of_Species) was published.[[45]](#cite_note-45) The [type specimen](/wiki/Type_specimen), dubbed [Neanderthal 1](/wiki/Neanderthal_1), consisted of a skull cap, two [femora](/wiki/Femur), three bones from the right arm, two from the left arm, part of the left [ilium](/wiki/Pelvis), fragments of a [scapula](/wiki/Scapula), and ribs. The workers who recovered this material originally thought it to be the remains of a bear. They gave the material to amateur naturalist [Johann Carl Fuhlrott](/wiki/Johann_Carl_Fuhlrott), who turned the fossils over to anatomist [Hermann Schaaffhausen](/wiki/Hermann_Schaaffhausen).

To date, the bones of over 400 Neanderthals have been found.[[46]](#cite_note-46)

### Timeline of research[[edit](/index.php?title=(none)&action=edit&section=5)]

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* 1829: The [Engis 2](/wiki/Engis_2) Neanderthal skulls were discovered in [Engis](/wiki/Engis), in present-day Belgium.
* 1848: Neanderthal skull [Gibraltar 1](/wiki/Gibraltar_1) found in [Forbes' Quarry](/wiki/Forbes'_Quarry), Gibraltar. Called "an ancient human" at the time.
* 1856: [Johann Karl Fuhlrott](/wiki/Johann_Karl_Fuhlrott) first recognized the fossil called "Neanderthal man", discovered in [Neanderthal](/wiki/Neanderthal,_Germany), a valley near [Mettmann](/wiki/Mettmann) in what is now North Rhine-Westphalia, Germany.
* 1864: [William King](/wiki/William_King_(geologist)) proposed the name *Homo neanderthalensis* at a meeting of the [British Association for the Advancement of Science](/wiki/British_Association_for_the_Advancement_of_Science), but then changed his mind and argued that Neanderthals were different enough from humans to warrant a separate genus, under the assumption that they were likely "incapable of moral and theositic conceptions."[[47]](#cite_note-47)\* 1880: The mandible of a Neanderthal child [was found](/wiki/Šipka_(cave)) in a secure context and associated with cultural debris, including hearths, [Mousterian](/wiki/Mousterian) tools, and bones of extinct animals.
* 1886: Two nearly perfect skeletons of a man and woman were found at [Spy, Belgium](/wiki/Spy,_Belgium) at the depth of 16 ft with numerous [Mousterian](/wiki/Mousterian)-type implements.
* 1899: Hundreds of Neanderthal bones were described in stratigraphic position in association with cultural remains and extinct animal bones.
* 1899: Sand excavation workers found bone fragments on a hill in [Krapina](/wiki/Krapina), Croatia called *Hušnjakovo brdo*. Local Franciscan friar Dominik Antolković requested [Dragutin Gorjanović-Kramberger](/wiki/Dragutin_Gorjanović-Kramberger) to study the remains of bones and teeth that were found there.
* 1905: During the excavation in Krapina more than 5 000 items were found, of which 874 residue of human origin, including bones of prehistoric man and animals, artifacts.
* 1908: A nearly complete Neanderthal skeleton was discovered in association with [Mousterian](/wiki/Mousterian) tools and bones of extinct animals.[Template:Clarify](/wiki/Template:Clarify)
* 1925: [Francis Turville-Petre](/wiki/Francis_Turville-Petre) finds the '[Galilee Man'](/wiki/Galilee_Man) or 'Galilee Skull' in the [Zuttiyeh Cave](/wiki/Zuttiyeh_Cave) in Wadi Amud in [The British Mandate of Palestine](/wiki/The_British_Mandate_of_Palestine) (now [Israel](/wiki/Israel)).
* 1926: Skull fragments of [Gibraltar 2](/wiki/Gibraltar_2), a four-year-old Neanderthal girl, discovered by [Dorothy Garrod](/wiki/Dorothy_Garrod).
* 1953–1957: [Ralph Solecki](/wiki/Ralph_Solecki) uncovered nine Neanderthal skeletons in [Shanidar](/wiki/Shanidar) Cave in the [Kurdistan](/wiki/Kurdistan) region of northern Iraq.
* 1975: [Erik Trinkaus'](/wiki/Erik_Trinkaus) study of Neanderthal feet confirmed they walked like modern humans.
* 1981: The [Bontnewydd Palaeolithic site](/wiki/Bontnewydd_Palaeolithic_site), [Wales](/wiki/Wales) yields the most north-western site in Eurasia.
* 1987: [Thermoluminescence](/wiki/Thermoluminescence) results from Israeli fossils date Neanderthals at [Kebara](/wiki/Kebara_Cave) to 60,000 BP and humans at [Qafzeh](/wiki/Qafzeh) to 90,000 BP. These dates were confirmed by [electron spin resonance](/wiki/Electron_spin_resonance) (ESR) dates for Qafzeh (90,000 BP) and [Es Skhul](/wiki/Es_Skhul) (80,000 BP).
* 1991: [ESR](/wiki/Electron_Spin_Resonance) dates showed the [Tabun Neanderthal](/wiki/Tabun,_Israel) was contemporaneous with modern humans from Skhul and Qafzeh.
* 1993: 127,000-year-old DNA is found on the child of Sclayn, found in [Scladina](/wiki/Scladina) ([fr](/wiki/Fr:Scladina)), Belgium.
* 1994: Neanderthal remains inadvertently uncovered inside the [Sidrón Cave](/wiki/Sidrón_Cave) in [Piloña](/wiki/Piloña) municipality, [Asturias](/wiki/Asturias), northwestern [Spain](/wiki/Spain). Since then the remains of at least 12 individuals: three men, three adolescent boys, three women, and three infants have been found. In 2009 Neanderthal ancient [mtDNA](/wiki/MtDNA) was partially sequenced in HVR region for three distinct Neanderthals there.[[48]](#cite_note-48)[[49]](#cite_note-49)\* 1997: Matthias Krings *et al.* are the first to amplify Neanderthal mitochondrial DNA ([mtDNA](/wiki/MtDNA)) using a specimen from Feldhofer grotto in the Neander valley.<ref name=Krings>[Template:Cite journal](/wiki/Template:Cite_journal)</ref>
* 1997–2000: During new excavations in the Neandertal, additional bone fragments are found, some of which fit the fragments found in 1856, thus pinpointing the exact location of the original find. The exact location had previously been unknown, as the site of the find (the „Kleine Feldhofer Grotte“) was destroyed by limestone mining.[[50]](#cite_note-50)\* 1998: A team led by pre-history archeologist João Zilhão discovered an early [Upper Paleolithic](/wiki/Upper_Paleolithic) human burial in Portugal, at [Abrigo do Lagar Velho](/wiki/Abrigo_do_Lagar_Velho), which provided evidence of early modern humans from the west of the [Iberian Peninsula](/wiki/Iberian_Peninsula). The remains, a largely complete skeleton of an approximately 4-year-old child, buried with pierced shell and red [ochre](/wiki/Ochre), is dated to *ca.* 24,500 years [BP](/wiki/Before_Present).[[51]](#cite_note-51) The [cranium](/wiki/Human_cranium), [mandible](/wiki/Human_mandible), [dentition](/wiki/Dentition), and [postcrania](/wiki/Postcrania) present a mosaic of European early [modern human](/wiki/Modern_human) and Neanderthal features.[[51]](#cite_note-51)\* 2000: Igor Ovchinnikov *et al.* retrieved mitochondrial DNA of a Neanderthal infant from [Mezmaiskaya Cave](/wiki/Mezmaiskaya_Cave) in the Caucasus.[[52]](#cite_note-52)\* 2005: The [Max Planck Institute for Evolutionary Anthropology](/wiki/Max_Planck_Institute_for_Evolutionary_Anthropology) launched a project to reconstruct the Neanderthal genome, working with Connecticut-based [454 Life Sciences](/wiki/454_Life_Sciences).[Template:Citation needed](/wiki/Template:Citation_needed) In 2009, the Max Planck Institute announced the "first draft" of a complete Neanderthal genome is completed.[[53]](#cite_note-53)\* 2010: Comparison of Neanderthal genome with modern humans from Africa and Eurasia shows that 1–4% of modern non-African human genome might come from the Neanderthals.[[14]](#cite_note-14)[[54]](#cite_note-54)\* 2010: Discovery of Neanderthal tools far away from the influence of *H. sapiens* indicate that the species might have been able to create and evolve tools on its own, and therefore be more intelligent than previously thought. Furthermore, it was proposed that the Neanderthals might be more closely related to *Homo sapiens* than previously thought and that may in fact be a subspecies of it.[[55]](#cite_note-55) Evidence has more recently emerged that these artifacts are probably of *H. sapiens sapiens* origin.<ref name=Benazzi2011>[Template:Cite journal](/wiki/Template:Cite_journal)</ref>
* 2012: Charcoal found next to six paintings of seals in Nerja caves, Malaga, Spain, has been dated to between 42,300 and 43,500 years old. The paintings themselves will be dated in 2013, and if their pigment matches the date of the charcoal, they would be the oldest known cave paintings. José Luis Sanchidrián at the University of Cordoba, Spain believes the paintings are more likely to have been painted by Neanderthals than early modern humans.[[56]](#cite_note-56)\* 2013: A jawbone found in Italy had features intermediate between Neanderthals and *Homo sapiens* suggesting it could be a hybrid. The mitochondrial DNA is Neanderthal.[[57]](#cite_note-57)\* 2013: An international team of researchers reported evidence that Neanderthals practiced [burial behavior](/wiki/Burial) and intentionally buried their dead.[[19]](#cite_note-19)\* 2014: Researchers at the University of Colorado Museum in Boulder report that Neanderthals were not less intelligent than modern humans and "that single-factor explanations for the disappearance of the Neandertals are not warranted any more."[[58]](#cite_note-58)\* 2014: Prof Thomas Higham of the University of Oxford performed the most comprehensive dating of Neanderthal bones and tools ever carried out, which demonstrated that Neanderthals died out in Europe between 41,000 and 39,000 years ago—this coincides with the start of a very cold period in Europe and is 5,000 years after *Homo sapiens* reached the continent.[[59]](#cite_note-59)[[60]](#cite_note-60)

## Habitat and range[[edit](/index.php?title=(none)&action=edit&section=6)]

[Template:Further](/wiki/Template:Further) [thumb|Sites where typical Neanderthal fossils have been found](/wiki/File:Carte_Neandertaliens.jpg) Early Neanderthals lived in the [last glacial period](/wiki/Last_glacial_period) for a span of about 100,000 years. Because of the damaging effects the glacial period had on the Neanderthal sites, not much is known about the early species. Countries where their remains are known include most of Europe south of the line of glaciation, roughly along the [50th parallel north](/wiki/50th_parallel_north). This includes most of Western Europe, Central Europe, the Carpathians, and the Balkans,[[61]](#cite_note-61) some sites in Ukraine and in western Russia, Central and Northern Asia up to the [Altai Mountains](/wiki/Altai_Mountains), and Western Asia from the [Levant](/wiki/Levant) up to the [Indus River](/wiki/Indus_River). The [Bontnewydd Palaeolithic site](/wiki/Bontnewydd_Palaeolithic_site) at [Denbighshire](/wiki/Denbighshire), [North Wales](/wiki/Wales) is the most north-western site of Neanderthal remains and one of the oldest remains in Britain (230,000 years ago). It is estimated that the total Neanderthal population across this habitat range numbered at around 70,000 at its peak.[[62]](#cite_note-62) Neanderthal fossils have not been found to date in Africa, but there have been finds close to North Africa, both on Gibraltar and in the Levant. At some Levantine sites, Neanderthal remains date from after the same sites were vacated by modern humans. Mammal fossils of the same time period show cold-adapted animals were present alongside these Neanderthals in this region of the Eastern Mediterranean. This implies Neanderthals were better adapted biologically to cold weather than modern humans and at times displaced them in parts of the Middle East when the climate got cold enough. However this has been disputed recently through studies of their cranial morphology and sinuses. Some scholars have also posited that Neanderthals could be an Asian species which expanded into Europe, making Neanderthals a tropical species rather than cold adaptive.[[63]](#cite_note-63)[[64]](#cite_note-64) *Homo sapiens* appears to have been the only human type in the Nile River Valley during these periods, and Neanderthals are not known to have ever lived south-west of present-day Israel. When climate change caused warmer temperatures, the Neanderthal range likewise retreated to the north, along with the cold-adapted species of mammals. Apparently these weather-induced population shifts took place before modern people secured competitive advantages over the Neanderthal, as these shifts in range took place well over ten thousand years before modern people totally replaced the Neanderthal, despite the recent evidence of some successful interbreeding.[[63]](#cite_note-63) Separate developments in the human line, in other regions such as Southern Africa, somewhat resembled the Eurasian Neanderthals, but these people were not Neanderthals. One such example is [Rhodesian Man](/wiki/Kabwe_skull) ([*Homo rhodesiensis*](/wiki/Homo_rhodesiensis)), who existed long before any classic Eurasian Neanderthals, but had a more modern set of teeth. Some *H. rhodesiensis* populations appeared to be on the road to modern *H. sapiens sapiens*. At any rate, the populations in Eurasia underwent increasing "Neanderthalization" over time. Some have suggested that *H. rhodesiensis* in general was ancestral to both modern humans and Neanderthals, and that at some point the two populations went their separate ways, but this argument presupposes that *H. rhodesiensis* existed around 600,000 years ago.

To date, no intimate connection has been found between these similar archaic people and the Eurasian Neanderthals, at least during the same time as *H. rhodesiensis* seems to have lived about 600,000 years ago, long before the time of classic Neanderthals. This said, some researchers think that *H. rhodesiensis* may have lived much later than this period, depending on the method used to date the fossils, so this question remains open to debate. Some *H. rhodesiensis* features, like the large brow ridge, may have been caused by [convergent evolution](/wiki/Convergent_evolution).

It appears incorrect, based on present research and known fossil finds, to refer to any fossils outside Eurasia as true Neanderthals. They had a known range that possibly extended as far east as the [Altai Mountains](/wiki/Altai_Mountains), but not farther to the east or south, and apparently not into Africa. At any rate, in North-East Africa the land immediately south of the Neanderthal range was possessed by modern humans [*Homo sapiens idaltu*](/wiki/Homo_sapiens_idaltu) or [*Homo sapiens*](/wiki/Homo_sapiens), since at least 160,000 years before the present. 160,000-year-old hominid fossils at [Jebel Irhoud](/wiki/Jebel_Irhoud) in Morocco were previously thought to be Neanderthal, but it is now clear that they are early modern humans.<ref name=Planck>[Template:Cite web](/wiki/Template:Cite_web)</ref>

Classic Neanderthal fossils have been found over a large area, from northern Germany to Israel and Mediterranean countries like Spain<ref name=ArsuagaEtal>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> and Italy<ref name=MallegniPiperno&Segre1987>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> in the south and from England and Portugal in the west to Uzbekistan in the east. This area probably was not occupied all at the same time. The northern border of their range, in particular, would have contracted frequently with the onset of cold periods. On the other hand, the northern border of their range as represented by fossils may not be the real northern border of the area they occupied, since Middle Palaeolithic-looking artifacts have been found even farther north, up to 60° N, on the Russian plain.[[65]](#cite_note-65) Recent evidence has extended the Neanderthal range by about [Template:Convert](/wiki/Template:Convert) east into southern [Siberia's](/wiki/Siberia) Altai Mountains.[[66]](#cite_note-66)[[67]](#cite_note-67)

## Anatomy[[edit](/index.php?title=(none)&action=edit&section=7)]

[Template:Main article](/wiki/Template:Main_article) [thumb|Reconstruction of the head of the](/wiki/File:Homo_neanderthalensis_adult_male_-_head_model_-_Smithsonian_Museum_of_Natural_History_-_2012-05-17.jpg) [Shanidar 1](/wiki/Shanidar_1) fossil, a Neanderthal male who lived c. 70,000 years ago ([John Gurche](/wiki/John_Gurche) 2010) Neanderthal anatomy differed from modern humans in that they had a more [robust](/wiki/Robustness_(morphology)) build and distinctive [morphological](/wiki/Comparative_anatomy) features, especially on the [cranium](/wiki/Human_skull), which gradually accumulated more derived aspects as it was described by Marcellin Boule,[[68]](#cite_note-68) Neanderthals are known for their large [cranial capacity](/wiki/Cranial_capacity), which at 1600 cm3 is larger on average than that of modern humans. One study has found that Neanderthal brains were more asymmetric than other hominid brains.[[73]](#cite_note-73) In 2008, a group of scientists produced a study using three-dimensional computer-assisted reconstructions of Neanderthal infants based on fossils found in Russia and Syria. It indicated that Neanderthal and modern human brains were the same size at birth, but that by adulthood, the Neanderthal brain was larger than the modern human brain.[[74]](#cite_note-74) They had almost the same degree of [encephalization](/wiki/Encephalization) (i.e. brain to body size ratio) as modern humans.[[75]](#cite_note-75)[[76]](#cite_note-76)

## Behavior[[edit](/index.php?title=(none)&action=edit&section=8)]

[Template:Main article](/wiki/Template:Main_article) Neanderthals made advanced tools,[[77]](#cite_note-77) probably had a language (the nature of which is debated and likely unknowable) and lived in complex social groups[Template:Citation needed](/wiki/Template:Citation_needed). The Molodova I archaeological site in eastern Ukraine suggests some Neanderthals built dwellings using animal bones. A building was made of [mammoth](/wiki/Mammoth) skulls, jaws, tusks and leg bones, and had 25 hearths inside.[[78]](#cite_note-78)[[79]](#cite_note-79)[thumb|250px|left|](/wiki/File:Pointe_levallois_Beuzeville_MHNT_PRE.2009.0.203.2.fond.jpg)[Levallois](/wiki/Levallois_technique) point—[Beuzeville](/wiki/Beuzeville), [France](/wiki/France) Circumstantial evidence suggests Neanderthals may have been building some form of [watercraft](/wiki/Watercraft) since the [Middle Paleolithic](/wiki/Middle_Paleolithic).[[80]](#cite_note-80)[[81]](#cite_note-81) Scientists have speculated that these watercraft may have been similar to [dugout](/wiki/Dugout_(boat)) canoes, which are among the oldest known boats in the archaeological record.[[81]](#cite_note-81) [Mousterian stone tools](/wiki/Mousterian) discovered on the southern [Ionian Islands](/wiki/Ionian_Islands) suggests that Neanderthals were sailing the [Mediterranean Sea](/wiki/Mediterranean_Sea) as early as 110,000 years ago.[[82]](#cite_note-82) Quartz [hand-axes](/wiki/Hand-axe), three-sided picks, and stone cleavers from [Crete](/wiki/Crete) have also been recovered that date back about 170,000 years ago.[[83]](#cite_note-83) It was once thought that Neanderthals lacked the sophistication for hunting, perhaps scavenging meat from carcasses,<ref name=neanderrediscovered/> but increasing evidence suggests they were [apex predators](/wiki/Apex_predator),[[84]](#cite_note-84)[[85]](#cite_note-85) capable of bringing down a wide range of prey from [red deer](/wiki/Red_deer), [reindeer](/wiki/Reindeer), [ibex](/wiki/Capra_(genus)) and [wild boar](/wiki/Wild_boar), to larger animals such as [aurochs](/wiki/Aurochs) and even, on occasion, [mammoth](/wiki/Mammoth), [straight-tusked elephant](/wiki/Straight-tusked_elephant) and [rhinoceros](/wiki/Rhinoceros).<ref name=neanderrediscovered/>[[86]](#cite_note-86) However, while they were largely [carnivorous](/wiki/Carnivore),[[87]](#cite_note-87)[[88]](#cite_note-88) new studies indicate Neanderthals also had cooked vegetables in their diet.[[85]](#cite_note-85)[[89]](#cite_note-89) In 2010, an [isotope analysis](/wiki/Isotope_analysis) of Neanderthal teeth found traces of cooked vegetable matter, and more recently a 2014 study of Neanderthal [coprolites](/wiki/Coprolite) (fossilized feces) found substantial amounts of plant matter, contradicting the earlier belief they were exclusively (or almost exclusively) carnivorous.[[87]](#cite_note-87)[[90]](#cite_note-90) The size and distribution of Neanderthal sites, along with genetic evidence, suggests Neanderthals lived in much smaller and more sparsely distributed groups than their *Homo sapiens* contemporaries.<ref name=sheernumbers>[Template:Cite web](/wiki/Template:Cite_web)</ref><ref name=geneticdiversity>[Template:Cite web](/wiki/Template:Cite_web)</ref> Some experts suggest that this disparity alone was a major contributing factor to their ultimate replacement by *Homo sapiens*, which may have outnumbered them by as much as 9 to 1 according to some estimates.[[91]](#cite_note-91) Their lower population density may have also increased Neanderthal susceptibility to mutations caused by [inbreeding](/wiki/Inbreeding).[[92]](#cite_note-92) The bones of twelve Neanderthals were discovered at [El Sidrón](/wiki/El_Sidrón) cave in the [Atapuerca Mountains](/wiki/Atapuerca_Mountains) of Spain. They are believed to be a social group which was massacred about 50,000 years ago, and analysis of the mtDNA shows that the three adult males belonged to the same maternal lineage, while the three adult females belonged to different ones. This suggests a social structure where males remained in the same social group and females "married" out.<ref name=tattersall202>[Template:Cite book](/wiki/Template:Cite_book)</ref>

The bones of the El Sidron group show signs of defleshing, suggesting that they were victims of cannibalism, and as their bones also show signs that they suffered from food shortage, they may have been victims of "survival cannibalism" by another Neanderthal group.<ref name=tattersall202/> The St. Césaire 1 skeleton discovered in 1979 at La Roche à Pierrot, France, showed a healed fracture on top of the skull apparently caused by a deep blade wound. Researchers have taken this as evidence of the presence of interpersonal violence among the Neanderthals.[[93]](#cite_note-93)

## Genome[[edit](/index.php?title=(none)&action=edit&section=9)]

[Template:Further](/wiki/Template:Further)

### Background[[edit](/index.php?title=(none)&action=edit&section=10)]

Early investigations concentrated on mitochondrial DNA (mtDNA), which, owing to strictly matrilineal inheritance and subsequent vulnerability to [genetic drift](/wiki/Genetic_drift), is of limited value in evaluating the possibility of interbreeding of Neanderthals with [Cro-Magnon](/wiki/Cro-Magnon) people.

In 1997, geneticists were able to extract a short sequence of DNA from Neanderthal bones.[[94]](#cite_note-94) The extraction of mtDNA from a second specimen was reported in 2000, and showed no sign of modern human descent from Neanderthals.[[52]](#cite_note-52) In July 2006, the [Max Planck Institute for Evolutionary Anthropology](/wiki/Max_Planck_Institute_for_Evolutionary_Anthropology) and [454 Life Sciences](/wiki/454_Life_Sciences) announced that they would [sequence](/wiki/Sequencing) the [Neanderthal genome](/wiki/Neanderthal_genome) over the next two years. This [genome](/wiki/Genome) was expected to be roughly the size of the [human genome](/wiki/Human_genome), three-billion base pairs, and share most of its [genes](/wiki/Genes). It was hoped the comparison would expand understanding of Neanderthals, as well as the evolution of humans and human brains.[[95]](#cite_note-95) [Svante Pääbo](/wiki/Svante_Pääbo) has tested more than 70 Neanderthal specimens. The Neanderthal genome is almost the same size as the human genome and is identical to ours to a level of 99.7% by comparing the accurate order of the nitrogenous bases in the double nucleotide chain.[Template:Sfn](/wiki/Template:Sfn) From mtDNA analysis estimates, the two species shared a common ancestor about 500,000 years ago. An article[[96]](#cite_note-96) appearing in the journal [*Nature*](/wiki/Nature_(journal)) has calculated the species diverged about 516,000 years ago, whereas fossil records show a time of about 400,000 years ago.[[97]](#cite_note-97) A 2007 study pushes the point of divergence back to around 800,000 years ago.[[98]](#cite_note-98) [Edward Rubin](/wiki/Edward_Rubin) of the [Lawrence Berkeley National Laboratory](/wiki/Lawrence_Berkeley_National_Laboratory) states recent genome testing of Neanderthals suggests human and Neanderthal DNA are some 99.5% to nearly 99.9% identical.[[99]](#cite_note-99)[[100]](#cite_note-100)

### Interbreeding with modern humans[[edit](/index.php?title=(none)&action=edit&section=11)]

On 16 November 2006, [Lawrence Berkeley National Laboratory](/wiki/Lawrence_Berkeley_National_Laboratory) issued a press release suggesting Neanderthals and ancient humans probably did not interbreed.<ref name=lbnl2006>[Template:Cite press release](/wiki/Template:Cite_press_release)</ref> Edward M. Rubin, director of the U.S. Department of Energy's Lawrence Berkeley National Laboratory and the Joint Genome Institute (JGI), sequenced a fraction (0.00002) of genomic [nuclear DNA](/wiki/Nuclear_DNA) (nDNA) from a 38,000-year-old Vindia Neanderthal femur. They calculated the common ancestor to be about 353,000 years ago, and a complete separation of the ancestors of the species about 188,000 years ago.[[101]](#cite_note-101) Their results show the genomes of modern humans and Neanderthals are at least 99.5% identical, but despite this genetic similarity, and despite the two species having coexisted in the same geographic region for thousands of years, Rubin and his team did not find any evidence of any significant interbreeding between the two. Rubin said, "While unable to definitively conclude that interbreeding between the two species of humans did not occur, analysis of the nuclear DNA from the Neanderthal suggests the low likelihood of it having occurred at any appreciable level."[[101]](#cite_note-101) In 2008 Richard E. Green et al. from [Max Planck Institute](/wiki/Max_Planck_Institute) for Evolutionary Anthropology in Leipzig, Germany, published the full sequence of Neanderthal [mitochondrial DNA](/wiki/Mitochondrial_DNA) (mtDNA) and suggested "Neanderthals had a long-term effective population size smaller than that of modern humans."[[102]](#cite_note-102) In the same publication, it was disclosed by Svante Pääbo that in the previous work at the Max Planck Institute, "Contamination was indeed an issue," and they eventually realized that 11% of their sample was modern human DNA.[[103]](#cite_note-103)[[104]](#cite_note-104) Since then, more of the preparation work has been done in clean areas and 4-base pair 'tags' have been added to the DNA as soon as it is extracted so the Neanderthal DNA can be identified. [thumb|left|150px|Scientist at the](/wiki/File:Neanderthal_DNA_extraction.jpg) [Max Planck Institute for Evolutionary Anthropology](/wiki/Max_Planck_Institute_for_Evolutionary_Anthropology) extracting the DNA With 3 billion nucleotides sequenced, analysis of about ⅓ showed no sign of admixture between modern humans and Neanderthals, according to Pääbo. This concurred with the work of Noonan from two years earlier. The variant of [microcephalin](/wiki/Microcephalin) common outside Africa, which was suggested to be of Neanderthal origin and responsible for rapid brain growth in humans, was not found in Neanderthals. Nor was the [MAPT](/wiki/MAPT) variant, a very old variant found primarily in Europeans.[[103]](#cite_note-103) However, an analysis of a first draft of the Neanderthal genome by the same team released in May 2010 indicates interbreeding may have occurred.[[14]](#cite_note-14)[[54]](#cite_note-54)"Those of us who live outside Africa carry a little Neanderthal DNA in us," said Pääbo, who led the study. "The proportion of Neanderthal-inherited genetic material is about 1 to 4 percent. It is a small but very real proportion of ancestry in non-Africans today," says Dr. [David Reich](/wiki/David_Reich_(geneticist)) of [Harvard Medical School](/wiki/Harvard_Medical_School), who worked on the study. This research compared the genome of the Neanderthals to five modern humans from China, France, sub-Saharan Africa, and Papua New Guinea. The finding is that about 1 to 4 percent of the genes of the humans outside Sub-Saharan Africa came from Neanderthals, compared to the baseline defined by the two Sub-Saharan Africans.[[54]](#cite_note-54) This indicates a gene flow from Neanderthals to modern humans, i.e., interbreeding between the two populations. Since the three non-African genomes show a similar proportion of Neanderthal sequences, the interbreeding must have occurred early in the [migration of modern humans out of Africa](/wiki/Early_human_migrations), perhaps in the Middle East. No evidence for [gene flow](/wiki/Gene_flow) in the direction from modern humans to Neanderthals was found. Gene flow from modern humans to Neanderthals would not be expected if contact occurred between a small colonizing population of modern humans and a much larger resident population of Neanderthals. A very limited amount of interbreeding could explain the findings, if it occurred early enough in the colonization process.[[54]](#cite_note-54) While interbreeding is viewed as the most [parsimonious](/wiki/Parsimony) interpretation of the genetic discoveries, the authors point out they cannot conclusively rule out an alternative scenario, in which the source population of non-African modern humans was already more closely related to Neanderthals than other Africans were, because of ancient genetic divisions within Africa.[[54]](#cite_note-54) Other studies carried out since the sequencing of the Neanderthal genome have cast doubt on the level of admixture between Neanderthals and modern humans, or even as to whether the species interbred at all. One study has asserted that the presence of Neanderthal or other archaic human genetic markers can be attributed to shared ancestral traits between the species originating from a 500,000-year-old common ancestor.[[105]](#cite_note-105)[[106]](#cite_note-106)[[107]](#cite_note-107)[[108]](#cite_note-108) Among the genes shown to differ between present-day humans and Neanderthals were [*RPTN*](/wiki/RPTN), [*SPAG17*](/wiki/SPAG17), [*CAN15*](/wiki/CAN15), [*TTF1*](/wiki/TTF1), [*FOXP2*](/wiki/FOXP2) and [*PCD16*](/wiki/PCD16).[[54]](#cite_note-54) More recent research suggests that Neanderthal-*Homo sapiens* interbreeding appears to have occurred asymmetrically among the ancestors of modern-day humans, and that this is a possible rationale for differing frequencies of Neanderthal-specific DNA in the genomes of modern humans. In 2015, researchers Benjamin Vernot and Joshua Akey at the University of Washington conclude in a paper in the [American Journal of Human Genetics](/wiki/American_Journal_of_Human_Genetics) that the relatively greater quantity of Neanderthal-specific DNA in the genomes of individuals of East Asian descent (than those of European descent) cannot be explained by differences in selection.[[109]](#cite_note-109) They further suggest that " two additional demographic models, involving either a second pulse of Neandertal gene flow into the ancestors of East Asians or a dilution of Neandertal lineages in Europeans by admixture with an unknown ancestral population" are parsimonious with their data.[[109]](#cite_note-109) Similar conclusions were reached in a paper published in the same publication by researchers Bernard Kim and Kirk Lohmueller at UCLA: "Using simulations of a broad range of models of selection and demography, we have shown that this hypothesis [that the greater proportion of Neandertal ancestry in East Asians than in Europeans is due to the fact that purifying selection is less effective at removing weakly deleterious Neandertal alleles from East Asian populations] cannot account for the higher proportion of Neandertal ancestry in East Asians than in Europeans. Instead, more complex demographic scenarios, most likely involving multiple pulses of Neandertal admixture, are required to explain the data."[[110]](#cite_note-110) In a subsequent interview, Dr. Lohmueller did note that these findings go against the commonly-held perception that Neanderthals were mostly localized to modern-day Europe and western Asia: "It’s very hard to put these findings into spatial context. The key idea is that there would have to have been some additional interbreeding events involving East Asians, but not Europeans. These interbreeding events could have been directly between Neanderthals and East Asians, maybe in some other indirect way."[[111]](#cite_note-111) Vernot also noted that "[H]umans have been constantly migrating throughout their history - this makes it hard to say exactly where interactions with Neanderthals occurred. It's possible, for example, that all of the interbreeding with Neanderthals occurred in the Middle East, before the ancestors of modern non-Africans spread out across Eurasia. In the model from the paper, the ancestors of all non-Africans interbred with Neanderthals, and then split up into multiple groups that would later become Europeans, East Asians. Shortly after they split up, the ancestors of East Asians interbred with Neanderthals just a little bit more."[[111]](#cite_note-111) Studies published in March 2016 suggest that modern humans bred with hominins, including Neanderthals, on multiple occasions.[[112]](#cite_note-112) Another study in April 2016 found differences between *Homo sapiens* and Neanderthal Y chromosomes that, they postulated, could cause female *Homo Sapiens* to miscarry male babies that had Neanderthal fathers.[[113]](#cite_note-113) This could explain why no modern man had to date been found with a Neanderthal Y chromosome.[[114]](#cite_note-114) Melanesians and Australoid populations show evidence of only one interbreeding event, possibly ~100,000 years ago, occurring in the Middle East, Europeans show a second event, which may also be of Middle Eastern origin, occurring possibly 50,000 years ago, while East Asians show an additional third interbreeding event possibly 30,000 years ago occurring in Siberia. Evidence that Neanderthal genomic material is often found amongst genes of the immune system suggests that some of the interbreeding may have secured resistance to diseases that Neanderthal populations had bred resistance to.[[112]](#cite_note-112) In 2016 researchers reported that they had found Human DNA in the genome of a female Neanderthal from the Altai mountains region near the border between Mongolia and Russia. They calculated that the mating must have taken place about 100,000 years ago.<ref name = Guardian2016>[Template:Cite web](/wiki/Template:Cite_web)</ref>

### Epigenetics[[edit](/index.php?title=(none)&action=edit&section=12)]

In April 2014, a first glimpse into the [epigenetics](/wiki/Epigenetics) of the Neanderthal was obtained with the publication of the full [DNA methylation](/wiki/DNA_methylation) of the Neanderthal and the [Denisovan](/wiki/Denisovan).[[115]](#cite_note-115)[[116]](#cite_note-116) The reconstructed [DNA methylation](/wiki/DNA_methylation) map allowed researchers to assess gene activity levels throughout the Neanderthal genome and compare them to modern humans. One of the major findings focused on the limb morphology of Neanderthals. Gokhman et al. found that changes in the activity levels of the [HOX cluster](/wiki/HOX_cluster) of genes were behind many of the morphological differences between Neanderthals and modern humans, including shorter limbs, curved bones and more.[[116]](#cite_note-116)

## Extinction hypotheses[[edit](/index.php?title=(none)&action=edit&section=13)]

[Template:Main article](/wiki/Template:Main_article) According to a 2014 study by Thomas Higham and colleagues of organic samples from European sites, Neanderthals died out in Europe between 41,000 and 39,000 years ago,[Template:Efn](/wiki/Template:Efn) and *Homo sapiens* arrived in Mediterranean Europe between 45,000 and 43,000 years ago, so the two different human populations shared Europe for several thousand years.<ref name=higham2014>[Template:Cite journal](/wiki/Template:Cite_journal)[Template:Paywall](/wiki/Template:Paywall)</ref>[[117]](#cite_note-117) The exact nature of biological and cultural interaction between Neanderthals and other human groups has been contested.[[118]](#cite_note-118) Possible scenarios for the extinction of the Neanderthals are:

1. Neanderthals were a separate species from modern humans, and became extinct (because of climate change or interaction with modern humans) and were replaced by modern humans moving into their habitat between 45,000 and 40,000 years ago.[[119]](#cite_note-119) [Jared Diamond](/wiki/Jared_Diamond) has suggested a scenario of violent conflict and displacement.[[120]](#cite_note-120)# Neanderthals were a contemporary subspecies that bred with modern humans and disappeared through absorption ([interbreeding theory](/wiki/Neanderthal_admixture)).

[thumb|350px|mtDNA-based simulation of modern human expansion in Europe starting 1600 generations ago. Neanderthal range in light grey](/wiki/File:CurratExcoffierNeandethalmtDNA.png)[[121]](#cite_note-121)

As Paul Jordan notes: "A natural sympathy for the underdog and the disadvantaged lends a sad poignancy to the fate of the Neanderthal folk, however it came about." Jordan, though, does say that there was perhaps interbreeding to some extent, but that populations that remained totally Neanderthal were probably out-competed and marginalized to extinction by the [Aurignacians](/wiki/Aurignacian).[[63]](#cite_note-63)

### Climate change[[edit](/index.php?title=(none)&action=edit&section=14)]

About 55,000 years ago, the weather began to fluctuate wildly from extreme cold conditions to mild cold and back in a matter of a few decades. Neanderthal bodies were well suited for survival in a cold climate—their barrel chests and stocky limbs stored body heat better than the Cro-Magnons. However, the rapid fluctuations of weather caused ecological changes to which the Neanderthals could not adapt; familiar plants and animals would be replaced by completely different ones within a lifetime. Neanderthals' ambush techniques would have failed as grasslands replaced trees. Neanderthals died out in Europe between 41,000 and 39,000 years ago which coincides with the start of a very cold period.[[59]](#cite_note-59)[[122]](#cite_note-122) Raw material sourcing and the examination of faunal remains by Adler et al. (2006) in the southern Caucasus region suggest that modern humans may have had a survival advantage during this period, being able to use social networks to acquire resources from a greater area. They found that in both the Late Middle Palaeolithic and Early Upper Palaeolithic more than 95% of stone artifacts were drawn from local material, suggesting Neanderthals were restricted to more local resources. Furthermore, excavations at Ortvale Klde Rockshelter discovered that there was a clear break between the Late Middle Paleolithic and the Early Upper Paleolithic lithic assemblages, which were attributed to Neanderthals and modern humans respectively. This would suggest that modern humans came in and replaced Neanderthals, rather than a slow shift or integration occurring in this region. [[123]](#cite_note-123) Studies on Neanderthal body structures have shown that they needed more energy to survive than any other species of hominid. Their energy needs were up to [Template:Convert](/wiki/Template:Convert) more per day comparing to projected anatomically modern human males weighing [Template:Convert](/wiki/Template:Convert) and females [Template:Convert](/wiki/Template:Convert).[[124]](#cite_note-124) When food became scarce, this difference may have played a major role in the Neanderthals' extinction.[[122]](#cite_note-122)

### Coexistence with ''Homo sapiens''[[edit](/index.php?title=(none)&action=edit&section=15)]

[thumb|250px|Skeleton and reconstruction of the](/wiki/File:Skeleton_and_restoration_model_of_Neanderthal_La_Ferrassie_1.jpg) [La Ferrassie 1](/wiki/La_Ferrassie_1) Neanderthal man from the [National Museum of Nature and Science](/wiki/National_Museum_of_Nature_and_Science) In November 2011 tests conducted at the Oxford Radiocarbon Accelerator Unit in England on what were previously thought to be Neanderthal baby teeth, which had been unearthed in 1964 from the Grotta del Cavallo in Italy, were identified as the oldest modern human remains discovered anywhere in Europe, dating from between 43,000 and 45,000 years ago.[[125]](#cite_note-125) Given that the 2014 study by Thomas Higham of Neanderthal bones and tools indicates that Neanderthals died out in Europe between 41,000 and 39,000 years ago, the two different human populations shared Europe for as long as 5,000 years.[[59]](#cite_note-59) The exact nature of biological and cultural interaction between Neanderthals and other human groups has been contested.[[118]](#cite_note-118) Modern humans co-existed with them in Europe starting around 45,000 years ago and perhaps even earlier. Neanderthals inhabited that continent for a long period of time before the arrival of modern humans. H. sapiens may have introduced a disease that contributed to the extinction of Neanderthals, and that may be added to other recent explanations for their extinction. When Neanderthal ancestors left Africa roughly 100,000 years earlier they adapted to the pathogens in their European environment, unlike modern humans who adapted to African pathogens. This transcontinental movement is known as the [Out of Africa model](/wiki/Recent_African_origin_of_modern_humans). If contact between humans and Neanderthals occurred in Europe and Asia the first contact may have been devastating to the Neanderthal population, because they would have little if any immunity to the African pathogens. More recent historical events in Eurasia and the Americas show a similar pattern, where the unintentional introduction of viral, or bacterial pathogens to unprepared populations has led to mass mortality and local population extinction.[[126]](#cite_note-126) The most well known example of this is the arrival of [Christopher Columbus](/wiki/Christopher_Columbus) to the New World, which brought and introduced foreign diseases when he and his crew arrived to a native population who had no immunity.

Anthropologist Pat Shipman, of Pennsylvania State University, suggested that [domestication of the dog](/wiki/Domestication_of_the_dog) could have played a role in Neanderthals' extinction.[[127]](#cite_note-127)

## Interbreeding hypotheses[[edit](/index.php?title=(none)&action=edit&section=16)]

[Template:Main article](/wiki/Template:Main_article) [300px|thumb|right|](/wiki/File:Homo-Stammbaum,_Version_Stringer-en.svg)[Chris Stringer's](/wiki/Chris_Stringer) [hypothesis](/wiki/Hypothesis) of the [family tree](/wiki/Family_tree) of [genus](/wiki/Genus) [*Homo*](/wiki/Homo), published 2012 in [*Nature*](/wiki/Nature_(journal)). The horizontal axis represents geographic location; the vertical axis represents time in millions of years ago. [*Homo floresiensis*](/wiki/Homo_floresiensis) originated in an unknown location from unknown ancestors and reached remote parts of [Indonesia](/wiki/Indonesia). [*Homo erectus*](/wiki/Homo_erectus) spread from Africa to western Asia, then east Asia and Indonesia; its presence in Europe is uncertain, but it gave rise to [*Homo antecessor*](/wiki/Homo_antecessor), found in [Spain](/wiki/Spain). [*Homo heidelbergensis*](/wiki/Homo_heidelbergensis) originated from *Homo erectus* in an unknown location and dispersed across Africa, southern Asia and southern Europe (other scientists interpret fossils, here named *heidelbergensis*, as late *erectus*). [*Homo sapiens*](/wiki/Human) spread from Africa to western Asia and then to Europe and southern Asia, eventually reaching Australia and the Americas. In addition to [Neanderthals](/wiki/Neanderthals) and [Denisovans](/wiki/Denisovans), a third [gene flow](/wiki/Gene_flow) of archaic Africa origin is indicated at the right.[[128]](#cite_note-128) An alternative to extinction is that Neanderthals were absorbed into the [Cro-Magnon](/wiki/Cro-Magnon) population by [interbreeding](/wiki/Hybrid_(biology)). This would be counter to strict versions of the [Recent African Origin](/wiki/Recent_African_Origin), since it would imply that at least part of the genome of [Europeans](/wiki/Ethnic_groups_in_Europe) would descend from Neanderthals.

Hans Peder Steensby, while strongly emphasising that all modern humans are of mixed origins, proposed the interbreeding hypothesis in 1907, in the article *Race studies in Denmark*.[[129]](#cite_note-129) He held that this would best fit current observations, and attacked the widespread idea that Neanderthals were ape-like or inferior.

The most vocal proponent of the hybridization hypothesis is [Erik Trinkaus](/wiki/Erik_Trinkaus) of [Washington University](/wiki/Washington_University).[[130]](#cite_note-130) Trinkaus claims various fossils as products of hybridized populations, including the [child of Lagar Velho](/wiki/Lapedo_child), a skeleton found at [Lagar Velho](/wiki/Lagar_Velho) in [Portugal](/wiki/Portugal).[[131]](#cite_note-131)[[132]](#cite_note-132) In a 2006 publication co-authored by Trinkaus, the fossils found in 1952 in the cave of [Peștera Muierii](/wiki/Peștera_Muierii), [Romania](/wiki/Romania), are likewise claimed as descendants of previously hybridized populations.[[133]](#cite_note-133) Genetic research has asserted that some admixture took place.[[134]](#cite_note-134) The genomes of all non-Africans include portions that are of Neanderthal origin,[[135]](#cite_note-135)[[136]](#cite_note-136) due to interbreeding between Neanderthals and the ancestors of Eurasians in Northern Africa or the Middle East prior to their spread. Rather than absorption of the Neanderthal population, this gene flow appears to have been of limited duration and limited extent. An estimated 1 to 4 percent of the DNA in Europeans and Asians (French, Chinese and [Papua](/wiki/Papuan_people) probands) is non-modern, and shared with ancient Neanderthal DNA rather than with Sub-Saharan Africans ([Yoruba people](/wiki/Yoruba_people) and [San](/wiki/San_people) probands).[[54]](#cite_note-54) [Ötzi the iceman](/wiki/Ötzi), Europe's oldest preserved mummy, was found to possess an even higher percentage of Neanderthal ancestry.[[137]](#cite_note-137) Recent findings suggest there may be even more Neanderthal genes in non-African humans than previously expected: approximately 20% of the Neanderthal gene pool was present in a broad sampling of non-African individuals, though each individual's genome was on average only 2% Neanderthal.[[138]](#cite_note-138) More recent [genetic studies](/wiki/Genetics) seem to suggest that [modern humans](/wiki/Modern_humans) may have mated with "at least two groups" of [ancient humans](/wiki/Ancient_humans): Neanderthals and [Denisovans](/wiki/Denisovans).[[139]](#cite_note-139) Some researchers suggest admixture of 3.4–7.9% in modern humans of non-African ancestry, rejecting the hypothesis of ancestral population structure.<ref name=KLLF>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> Detractors have argued and continue to argue that the signal of Neanderthal interbreeding may be due to ancient African substructure, meaning that the similarity is only a remnant of a common ancestor of both Neanderthals and modern humans and not the result of interbreeding.[[107]](#cite_note-107)[[140]](#cite_note-140) [John D. Hawks](/wiki/John_D._Hawks) has argued that the genetic similarity to Neanderthals may indeed be the result of both structure and interbreeding, as opposed to just one or the other.[[141]](#cite_note-141) While modern humans share some [nuclear DNA](/wiki/Nuclear_DNA) with the extinct Neanderthals, the two species do not share any [mitochondrial DNA](/wiki/Mitochondrial_DNA),<ref name=Krings/> which in primates is always maternally transmitted. This observation has prompted the hypothesis that whereas female humans interbreeding with male Neanderthals were able to generate fertile offspring, the progeny of female Neanderthals who mated with male humans were either rare, absent or sterile.[[142]](#cite_note-142) However, some researchers have argued that there is evidence of possible interbreeding between female Neanderthals and male modern humans.<ref name = Guardian2016/>[[143]](#cite_note-143)[[144]](#cite_note-144)

## Specimens[[edit](/index.php?title=(none)&action=edit&section=17)]

[Template:Main article](/wiki/Template:Main_article)

### Notable specimens[[edit](/index.php?title=(none)&action=edit&section=18)]

[thumb|right|Type Specimen, Neanderthal 1](/wiki/File:Neandertal_1856.jpg)

* [Neanderthal 1](/wiki/Neanderthal_1): The first Neanderthal specimen found during mining in August 1856. It was discovered in a limestone quarry at the Feldhofer grotto in Neanderthal, Germany. The find consisted of a skull cap, two femora, three right arm bones, two left arm bones, ilium, and fragments of a scapula and ribs.
* [La Chapelle-aux-Saints 1](/wiki/La_Chapelle-aux-Saints_1): Called the Old Man, a fossilized skull discovered in [La Chapelle-aux-Saints](/wiki/La_Chapelle-aux-Saints), France, by A. and J. Bouyssonie, and L. Bardon in 1908. Characteristics include a low vaulted cranium and large browridge typical of Neanderthals. Estimated to be about 60,000 years old, the specimen was severely arthritic and had lost all his teeth, with evidence of healing. For him to have lived on would have required that someone process his food for him, one of the earliest examples of Neanderthal altruism (similar to Shanidar I.)

[thumb|250px|The](/wiki/File:Ferrassie_skull.jpg) [Ferrassie skull](/wiki/La_Ferrassie_1)

* [La Ferrassie 1](/wiki/La_Ferrassie_1): A fossilized skull discovered in La Ferrassie, France, by R. Capitan in 1909. It is estimated to be 70,000 years old. Its characteristics include a large occipital bun, low-vaulted cranium and heavily worn teeth.
* [Le Moustier](/wiki/Le_Moustier): A fossilized skull, discovered in 1909, at the archaeological site in Peyzac-le-Moustier, Dordogne, France. The Mousterian tool culture is named after Le Moustier. The skull, estimated to be less than 45,000 years old, includes a large nasal cavity and a somewhat less developed brow ridge and occipital bun as might be expected in a juvenile.
* [Shanidar Cave](/wiki/Shanidar_Cave): Found in the [Zagros Mountains](/wiki/Zagros_Mountains) in ([Iraqi Kurdistan](/wiki/Iraqi_Kurdistan)); a total of nine skeletons found believed to have lived in the [Middle Paleolithic](/wiki/Middle_Paleolithic). One of the nine remains was missing part of its right arm, which is theorized to have been broken off or [amputated](/wiki/Amputation). The find is also significant because it shows that stone tools were present among this tribe's culture. One of the skeletons was originally thought to have been buried with flowers, signifying that some type of burial ceremony may have occurred. This is no longer considered to be the case, and [Paul B. Pettitt](/wiki/Paul_B._Pettitt) has stated that the "deliberate placement of flowers has now been convincingly eliminated", noting that "A recent examination of the microfauna from the strata into which the grave was cut suggests that the pollen was deposited by the burrowing rodent Meriones tersicus, which is common in the Shanidar microfauna and whose burrowing activity can be observed today".[[145]](#cite_note-145)\* Amud 1: Fossilized remains of an adult Neanderthal, dated to roughly 45,000 years ago, and one of several found in a cave at [Nahal Amud](/wiki/Nahal_Amud), [Israel](/wiki/Israel), at least some of which may have been deliberately buried. A particularly notable feature of this find is its cranial capacity, which, at 1,740 cm3, is among the largest known for any hominid, living or extinct.<ref name=neanderrediscovered>[Template:Cite book](/wiki/Template:Cite_book)</ref>[[146]](#cite_note-146)

### Chronology[[edit](/index.php?title=(none)&action=edit&section=19)]

This section describes bones with Neanderthal [traits](/wiki/Phenotypic_trait) in [chronological](/wiki/Chronology) order.

#### Mixed with ''H. heidelbergensis'' traits[[edit](/index.php?title=(none)&action=edit&section=20)]

* > 350 ka: [Sima de los Huesos](/wiki/Atapuerca_Mountains#Sima_de_los_Huesos_(1983–)) c. 500:350 [ka](/wiki/Annum) ago[[147]](#cite_note-147)[[148]](#cite_note-148)\* 350–200 ka: [Pontnewydd](/wiki/Pontnewydd_(Bontnewydd-Llanelwy)_Paleaolithic_site) 225 ka ago.
* 200–135 ka: [Atapuerca](/wiki/Atapuerca_Mountains),[[149]](#cite_note-149) Vértesszőlős, Ehringsdorf, Casal de'Pazzi, Biache, La Chaise, Montmaurin, Prince, Lazaret, Fontéchevade

#### Typical ''H. neanderthalensis'' traits[[edit](/index.php?title=(none)&action=edit&section=21)]

* 135–45 ka: [Krapina](/wiki/Krapina), [Saccopastore skulls](/wiki/Saccopastore_skulls), Malarnaud, Altamura, Gánovce, [Denisova](/wiki/Denisova_Cave), Okladnikov, [Altai Mountains](/wiki/Altai_Mountains), Pech de l'Azé, [Tabun](/wiki/Tabun_Cave) 120–[Template:Val](/wiki/Template:Val) ka,[[150]](#cite_note-150) [Qafzeh](/wiki/Qafzeh)9 100, [Shanidar 1 to 9](/wiki/Shanidar) 80–60 ka, [La Ferrassie 1](/wiki/La_Ferrassie_1) 70 ka, [Kebara](/wiki/Kebara_Cave) 60 ka, Régourdou, Mt. Circeo, Combe Grenal, [Erd](/wiki/Érd) 50 ka, [La Chapelle-aux Saints 1](/wiki/La_Chapelle-aux_Saints_1) 60 ka, Amud I [Template:Val](/wiki/Template:Val) ka,[[151]](#cite_note-151)[[152]](#cite_note-152) [Teshik-Tash](/wiki/Teshik-Tash).
* 45–35 ka: [Le Moustier](/wiki/Le_Moustier) 45 ka, [Feldhofer](/wiki/Neanderthal_1) 42 ka, La Quina, l'Horus, Hortus, Kulna, Šipka, Saint Césaire, Bacho Kiro, El Castillo, Bañolas, [Arcy-sur-Cure](/wiki/Arcy-sur-Cure).[[153]](#cite_note-153)\* < 35 ka: Châtelperron, Figueira Brava, Zafarraya 30 ka,[[153]](#cite_note-153) Vogelherd 3?,[Template:Vs](/wiki/Template:Vs)[[154]](#cite_note-154) [Vindija](/wiki/Vindija_Cave) [Template:Val](/wiki/Template:Val) 14C B.P.[[155]](#cite_note-155) (Vi-208 [Template:Val](/wiki/Template:Val), Vi-207 [Template:Val](/wiki/Template:Val) 14C B.P.),[[155]](#cite_note-155) Velika Pećina,

#### ''Homo sapiens'' with some neanderthal-like archaic traits[[edit](/index.php?title=(none)&action=edit&section=22)]

* < 35 [Pestera cu Oase](/wiki/Pestera_cu_Oase) 35 ka, [Mladeč](/wiki/Mladeč) 31 ka, Pestera Muierii 30 ka (n/s),[[156]](#cite_note-156) [Lapedo Child](/wiki/Lapedo_Child) 24.5 ka.

## Popular culture[[edit](/index.php?title=(none)&action=edit&section=23)]

[Template:Main article](/wiki/Template:Main_article) Neanderthals have been portrayed in popular culture including appearances in literature, visual media and comedy, often in an unflattering and inaccurate light.

Early artistic reconstructions mostly presented Neanderthals as beastly creatures, emphasizing hairiness and rough, dark complexion.[[157]](#cite_note-157) More recent reconstructions acknowledge that because of the lineage evolution in European latitude there is reason to believe that Neanderthals were fair-skinned and probably with no more facial hair than modern man. Archaeological evidence exists indicating that they probably communicated by speech and used tools. Artist renderings and reconstructions of Neanderthals have become much more intelligent-looking[Template:Clarification needed](/wiki/Template:Clarification_needed) and closely resembling modern humans.[[158]](#cite_note-158)[[159]](#cite_note-159)

## See also[[edit](/index.php?title=(none)&action=edit&section=24)]

[Template:Div col](/wiki/Template:Div_col)

* [Abrigo do Lagar Velho](/wiki/Abrigo_do_Lagar_Velho)—More about "the Lapedo child"
* [Almas: wild man of Mongolia](/wiki/Almas_(cryptozoology))
* [Altamura Man](/wiki/Altamura_Man)
* [Basajaun](/wiki/Basajaun)
* [Biological anthropology](/wiki/Biological_anthropology)
* [Bruniquel Cave](/wiki/Bruniquel_Cave)
* [Caveman](/wiki/Caveman)
* [*Dawn of Humanity* (2015 PBS film)](/wiki/Dawn_of_Humanity_(film))
* [Denisova hominin](/wiki/Denisova_hominin) another *Homo* species that may have interbred with Neanderthals
* [Early human migrations](/wiki/Early_human_migrations)
* [Engis 2](/wiki/Engis_2)
* [Life timeline](/wiki/Template:Life_timeline)
* [Max Planck Institute for Evolutionary Anthropology](/wiki/Max_Planck_Institute_for_Evolutionary_Anthropology)
* [Neanderthal 1](/wiki/Neanderthal_1)
* [Neanderthal genome project](/wiki/Neanderthal_genome_project)
* [Neanderthal Museum](/wiki/Neanderthal_Museum)
* [Neanderthals of Gibraltar](/wiki/Neanderthals_of_Gibraltar)
* [Pleistocene megafauna](/wiki/Pleistocene_megafauna)
* [Roca dels Bous (archaeological site)](/wiki/Roca_dels_Bous_(archaeological_site))
* [Species problem](/wiki/Species_problem)

[Template:Div col end](/wiki/Template:Div_col_end) **Lists:**

* [List of fossil sites](/wiki/List_of_fossil_sites) *(with link directory)*
* [List of human evolution fossils](/wiki/List_of_human_evolution_fossils) *(with images)*
* [List of Neanderthal sites](/wiki/List_of_Neanderthal_sites)

## Notes[[edit](/index.php?title=(none)&action=edit&section=25)]

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## References[[edit](/index.php?title=(none)&action=edit&section=26)]

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**Journals**

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## Further reading[[edit](/index.php?title=(none)&action=edit&section=27)]

* [Template:Cite journal](/wiki/Template:Cite_journal)
* [Template:Cite journal](/wiki/Template:Cite_journal)

## External links[[edit](/index.php?title=(none)&action=edit&section=28)]

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* [Template:Cite web](/wiki/Template:Cite_web)
* [Template:Cite web](/wiki/Template:Cite_web)
* [Template:Cite web](/wiki/Template:Cite_web)
* [Template:Cite web](/wiki/Template:Cite_web): Includes Neanderthal mtDNA sequences
* [Panoramio](http://www.panoramio.com/photo/322489)—'IMG\_6922 The Neandertal foot prints' (photo of ~25K years old fossilized footprints discovered in 1970 on volcanic layers near [Demirkopru Dam](/wiki/Demirkopru_Dam) Reservoir, [Manisa](/wiki/Manisa), [Turkey](/wiki/Turkey))
* [Did better mothering defeat the Neanderthals?](http://cosmosmagazine.com/features/better-mothering-defeat-neanderthals/)
* [My Great-great-great Grandfather's a Neanderthal](http://cosmosmagazine.com/features/my-great-great-great-grandfathers-a-neanderthal/)
* [Ancient tryst fortified human immune system](http://cosmosmagazine.com/news/ancient-boost-fortifies-human-immune-systems/)
* [Neanderthal-human hybridisation hypothesis](http://hypothesisjournal.com/index.php/main/article/view/215)
* [Neanderthal hybridization and Haldane's rule](http://blogs.discovermagazine.com/gnxp/2011/04/neandertal-hybridization-haldanes-rule/)

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