



Neanderthal

(Redirected from Neanderthals)

Neanderthals (/niˈændərtɑːl, neɪ-, -θɑːl/ *nee-AN-də(r)-TAHL*, *nay-*, *-THAHL*^[8] ***Homo neanderthalensis*** or ***H. sapiens neanderthalensis***) are an extinct group of archaic humans who inhabited Europe and Western and Central Asia during the Middle to Late Pleistocene. Neanderthal extinction occurred roughly 40,000 years ago with the immigration of modern humans (Cro-Magnons), but Neanderthals in Gibraltar may have persisted for thousands of years longer.

The first recognised Neanderthal fossil, Neanderthal 1, was discovered in 1856 in the Neander Valley, Germany. At first, Neanderthal 1 was considered to be one of the lower races in accord with historical race concepts. As more fossils were discovered through the early 20th century, Neanderthals became characterised most especially by Marcellin Boule as a unique species of underdeveloped human. By the mid-20th century, human evolution was described as progressing from an apelike ancestor, through a "Neanderthal phase", ending in modern humans. This gave way to the "Out of Africa" theory in the 1970s. With the sequencing of Neanderthal genetics first in 2010, it was discovered that Neanderthals interbred with modern humans.

Neanderthal anatomy is characterised by a long and low skull, a heavy and rounded brow ridge (supraorbital torus), an occipital bun at the back of the skull, strong teeth and jaws, a wide chest, and short limbs. These traits gradually became more frequent through the Middle Pleistocene of Europe, possibly due to natural selection in a cold climate, as well as genetic drift when populations collapsed during glacial periods. Neanderthals would have also been effective sprinters. Neanderthal specimens vary in height from 147.5 to 177 cm (4 ft 10 in to 5 ft 10 in), with average male dimensions of maybe 165 cm (5 ft 5 in) and 75 kg (165 lb). While Neanderthal brain volume averaged

Neanderthal

Temporal range: Middle–Late Pleistocene^[1]



An approximate reconstruction of a Neanderthal skeleton. The central ribcage (including the sternum) and parts of the pelvis are from modern humans.

Scientific classification

Domain:	<u>Eukaryota</u>
Kingdom:	<u>Animalia</u>
Phylum:	<u>Chordata</u>
Class:	<u>Mammalia</u>
Order:	<u>Primates</u>
Suborder:	<u>Haplorhini</u>
Infraorder:	<u>Simiiformes</u>
Family:	<u>Hominidae</u>

higher than any living population — 1,640 cc (100 cu in) for males and 1,460 cc (89 cu in) for females — their brain organisation differed from modern humans in areas related to cognition and language, which could explain the comparative simplicity of Neanderthal behaviour compared to Cro-Magnons in the archaeological record.

Neanderthals maintained a low population and suffered inbreeding depression, which may have impeded their ability to progress technologically. They produced Mousterian stone tools (a Middle Palaeolithic industry), maintained and maybe created fire, and possibly wore blankets and ponchos. They predominantly ate whatever was abundant close to home, usually big game as well as plants and mushrooms. Neanderthals were frequently victims of major physical traumas and animal attacks. Examples of Palaeolithic art have been inconclusively attributed to Neanderthals, namely possible ornaments made from bird claws and feathers; collections of unusual objects including crystals and fossils; and engravings. Neanderthals uncommonly buried their dead, but this is not indicative of a religious belief of an afterlife.

Taxonomy

Etymology

Neanderthals are named after the Neander Valley in which the first identified specimen was found. The valley was spelled *Neanderthal* and the species was spelled *Neanderthaler* in German until the spelling reform of 1901.^[b] The spelling *Neandertal* for the species is occasionally seen in English, even in scientific publications, but the scientific name, *H. neanderthalensis*, is always spelled with *th* according to the principle of priority. The vernacular name of the species in German is always *Neandertaler* ("inhabitant of the Neander Valley"), whereas *Neandertal* always refers to the valley.^{[c][10]} The valley itself was named after the late 17th century German theologian and hymn writer Joachim Neander, who often visited the area.^[9] His grandfather, a musician, had changed the family

Subfamily: Homininae

Tribe: Hominini

Genus: *Homo*

Species: †*H. neanderthalensis*

Binomial name

†*Homo neanderthalensis*

King, 1864

Synonyms^[7]

Homo

- *H. stupidus*
Haeckel, 1895^[2]
- *H. europaeus primigenius*
Wilser, 1898
- *H. primigenius*
Schwalbe, 1906^[3]
- *H. antiquus*
Adloff, 1908
- *H. transprimigenius mousteriensis*
Farrer, 1908
- *H. mousteriensis hauseri*
Klaatsch 1909^{[4][5]}
- *H. priscus*
Krause, 1909
- *H. chapellensis*
von Buttel-Reepen, 1911
- *H. calpicus*
Keith, 1911
- *H. acheulensis moustieri*
Wiegers, 1915
- *H. lemousteriensis*
Wiegers, 1915
- *H. naulettensis*
Baudouin, 1916
- *H. sapiens neanderthalensis*
Kleinshmidt, 1922

name from the original German *Neumann* ("new man") to the Graeco-Roman form *Neander*, following the fashion of the time.^[11]

Neanderthal can be pronounced using the /t/ (as in /ni'ændərtɑ:l/)^[12] or the standard English pronunciation of *th* with the fricative /θ/ (as /ni'ændərθɔ:l/).^{[13][14]} The latter pronunciation, nevertheless, has no basis in the original German word which is pronounced always with a *t* regardless of the historical spelling.^[15]

Neanderthal 1, the type specimen, was known as the "Neanderthal cranium" or "Neanderthal skull" in anthropological literature, and the individual reconstructed on the basis of the skull was occasionally called "the Neanderthal man".^[16] The binomial name *Homo neanderthalensis*—extending the name "Neanderthal man" from the individual specimen to the entire species, and formally recognising it as distinct from humans—was first proposed by Irish geologist William King in a paper read to the 33rd British Science Association in 1863.^{[17][18][19]} However, in 1864, he recommended that Neanderthals and modern humans be classified in different genera as he compared the Neanderthal braincase to that of a chimpanzee and argued that they were "incapable of moral and [theistic^[d]] conceptions".^[20]

Discovery

A number of Neanderthal fossils had been discovered before their antiquity was fully understood. The first Neanderthal remains—Engis 2 (a skull)—were discovered in 1829 by Dutch/Belgian prehistorian Philippe-Charles Schmerling in the Grottes d'Engis, Belgium. He concluded that these "poorly developed" human remains must have been buried at the same time and by the same causes as the co-existing remains of extinct animal species.^[21] In 1848, Gibraltar 1 from Forbes' Quarry was presented to the Gibraltar Scientific Society by their Secretary Lieutenant Edmund Henry René Flint, but was thought to be a modern human skull.^[22]

- *H. heringsdorfensis*
Werthe, 1928
- *H. galilensis*
Joleaud, 1931
- *H. primigenius galilaeensis*
Sklerj, 1937
- *H. kiikobiensis*
Bontsch-Osmolovskii, 1940
- *H. sapiens krapinensis*
Campbell, 1962
- *H. erectus mapaensis*
Kurth, 1965

Palaeoanthropus

- *P. neanderthalensis*
McCown and Keith, 1939^[6]
- *P. heidelbergensis*
McCown and Keith, 1939^[6]
- *P. ehringsdorfensis*
Paterson, 1940^[6]
- *P. krapinensis*
Sergi, 1911^[6]
- *P. palestinensis*
McCown and Keith, 1939^[6]
- *P. europaeus*
Sergi, 1910

Protanthropus

- *P. atavus*
Haeckel, 1895
- *P. tabunensis*
Bonarelli, 1944

Acanthropus

- *A. neanderthalensis*
Arltdt, 1915
- *A. primigenius*
Abel, 1920

In 1856, local schoolteacher Johann Carl Fuhlrott recognised bones from Kleine Feldhofer Grotte in Neander Valley—Neanderthal 1—as distinct from

modern humans,^[e] and gave them to German anthropologist Hermann Schaaffhausen to study in 1857. It comprised the cranium, thigh bones, right arm, left humerus and ulna, left ilium



Skullcap of Neanderthal 1, the type specimen, at the Musée de l'Homme, Paris

■ *A. neanderthalensis*

Dawkins, 1926



The site of Kleine Feldhofer Grotte where Neanderthal 1 was discovered^[a]

(hip bone), part of the right shoulder blade, and pieces of the ribs.^{[20][23]}

Research history

Following Charles Darwin's 1859 *On the Origin of Species*, Fuhlrott and Schaaffhausen argued that Neanderthal 1 represents a primitive lower human form, aligning more closely with non-human apes as well as Negroids, Eskimos, and Aboriginal Australians (which were variably classified as separate species or subspecies of human at the time).^{[24][20][25][26]} The uniqueness of Neanderthal Man met opposition namely from the pathologist Rudolf Virchow, who argued against defining new species based on only a single find. In 1872, Virchow erroneously interpreted Neanderthal characteristics as evidence of senility, disease, and malformation instead of archaicism,^[27] which stalled Neanderthal research until the end of the century.^{[24][25]}

By the early 20th century, numerous other Neanderthal discoveries were made, establishing *H. neanderthalensis* as a legitimate species. At first, many palaeontologists considered Neanderthals to be an intermediary phase between modern humans and more apelike ancestors, as suggested by German anatomist Gustav Albert Schwalbe. This hypothesis was notably opposed by French palaeontologist Marcellin Boule, who authored several publications starting in 1908 describing the French Neanderthal specimen La Chapelle-aux-Saints 1 ("The Old Man") as a slouching, ape-like creature distantly related to modern man. Boule's ideas would define discussions of Neanderthals for some time.^{[24][28][29][30][31]}

Boule suggested two different lineages existed in Ice Age Europe: a more evolved one descending from the British Piltdown Man (a hoax) to the French Grimaldi Man (a Cro-Magnon) which would culminate with modern Europeans; and a less evolved dead-end lineage leading from the German Heidelberg Man to Neanderthal Man. As the focus of human origins shifted from Europe to East Asia ("Out of Asia" hypothesis) by the 1930s and 40s with discoveries such as Java Man and Peking Man (as well as the marginalisation of Piltdown Man), the question of a "Neanderthal phase" in human evolution once again became a topic of

discussion. Several specimens around the Old World were classified as "progressive" Neanderthals which would eventually evolve into some local subspecies of *H. sapiens* (polycentricism), or in Europe into either the modern European subspecies or the "classic" Neanderthals.^[32]

In the 1970s, with the formulation of cladistics and the consequent refinement of the anatomical definitions of species, this "global morphological pattern" fell apart.

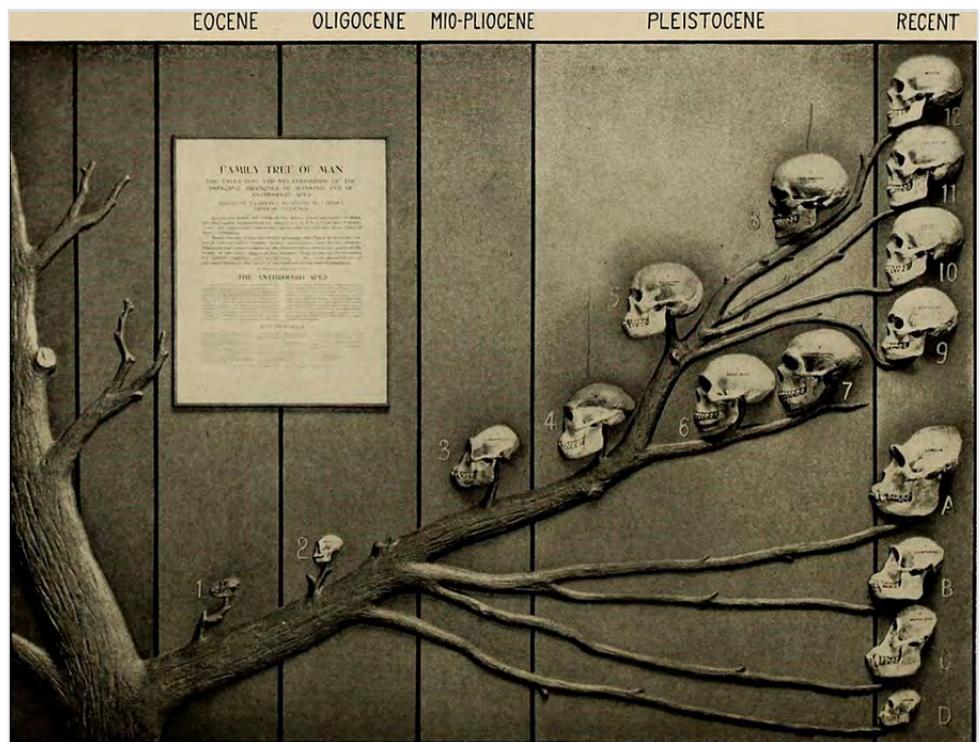
The "Neanderthaloids" of Africa and East Asia were reclassified as distant relatives to *H. neanderthalensis*.^[33]

At around the same time, the "Out of Asia" hypothesis was overturned by the "Out of Africa" hypothesis, which posited that all modern

humans share a fully modern common ancestor (monogenism). There were two main schools of thought: modern humans competitively replaced all other archaic humans ("Replacement"), or extensively interbred with them while dispersing throughout the world ("Regional Continuity").^[34] In 2010, the first mapping of the Neanderthal genome demonstrated that there was at least some interbreeding between archaic and modern humans.^[35] Subsequent genetic studies continue to raise questions on how Neanderthals should be classified relative to modern humans.^[36]

Classification

Neanderthals can be classified as a unique species as *H. neanderthalensis*, though some authors argue expanding the definition of *H. sapiens* to include other ancient humans, with combinations such as *H. sapiens neanderthalensis* (splitters and lumpers). The latter opinion has generally been justified using Neanderthal genetics, as well as inferences on the complexity of Neanderthal behaviour based on the archaeological record. While there seems to have been



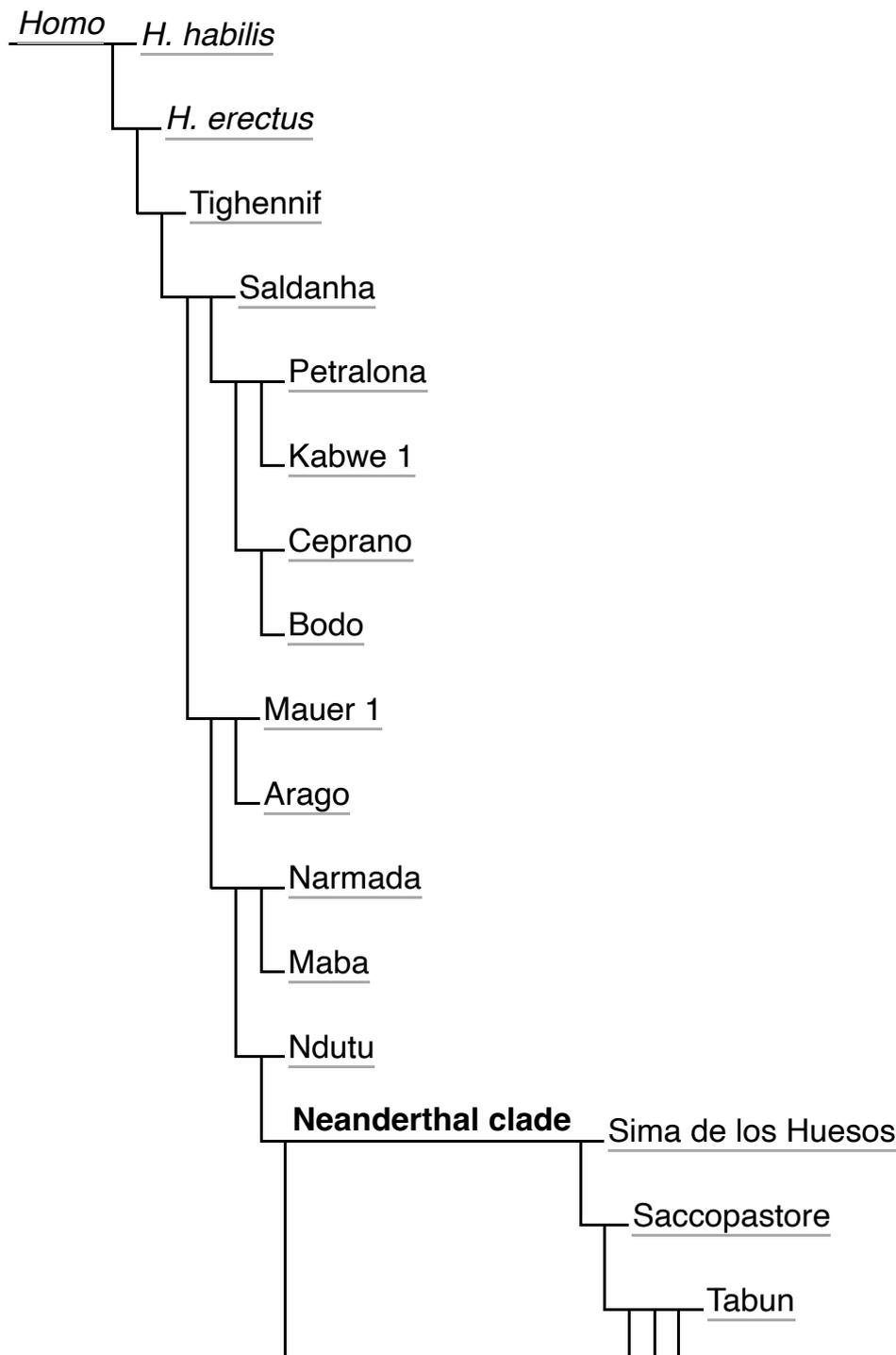
William K. Gregory's *The Family Tree of Man* exhibit at the American Museum of Natural History, 1924

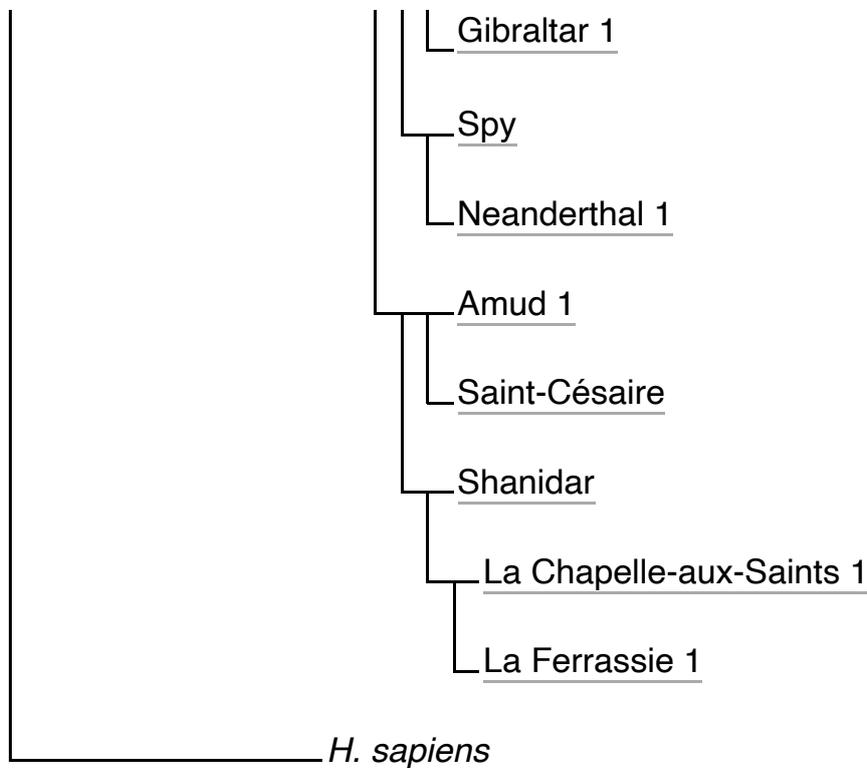
- 1) Notharctus
- 2) Propliopithecus
- 3) Dryopithecus
- 4) Java Man
- 5) Pittdown Man
- 6) Heidelberg Man
- 7) Neanderthal Man
- 8) Cro-Magnon Man
- 9) Australian Black-fellow (pejorative term for Aboriginal Australians)
- 10) Hottentot (pejorative term for South African pastoralists)
- 11) Chinese
- 12) American Caucasian

some genetic contact between these two groups, there are potential indicators of hybrid incompatibility,^[f] which if true could justify species distinction. The crux of the issue lies in the vagueness of the term "species" (the species problem).^{[36][38][39]}

Among identified archaic humans, Neanderthals are most closely related to Denisovans based on nuclear DNA (nDNA) analyses. Denisovans are an enigmatic group of Late Pleistocene humans only recognisable by a genetic signature.^[40] Likely due to more recent interbreeding episodes, the mitochondrial DNA (mtDNA, passed down maternally)^[41] and Y-chromosome DNA (passed down paternally)^[42] are more similar between Neanderthals and modern humans than between Neanderthals and Denisovans. Similarly, 430,000 year old fossils from the Sima de los Huesos are more closely related to Neanderthals using nDNA, but their mtDNA aligns more closely with Denisovans.^[43]

A 2021 phylogeny of some Middle Pleistocene and Neanderthal fossils using tip dating:^[44]





Evolution



A "pre-Neanderthal" skull ("Miguelón") from Sima de los Huesos, Spain

Typical Neanderthal skull traits appear in the European fossil record near the beginning of the Middle Pleistocene, in specimens usually classified as H. heidelbergensis. These "pre-Neanderthals" seem to have gradually accreted these traits ("Neanderthalization") as populations adapted to the cold environment, evolving a "hyper-arctic" physique. Circumpolar peoples (namely Inuit groups) are often used as modern Neanderthal analogues to study "hyper-arctic" adaptations. Additionally, glacial periods may have forced populations into small refugia, reducing genetic diversity, leading to the development of other typical Neanderthal traits through genetic drift or pleiotropy.

[33] The 120,000 to 140,000-year-old Israeli Nesher Ramla remains may represent one such source population which would recolonise Europe following the Penultimate Glacial Period. [45]

The occurrence of typical Neanderthal traits in the Middle Pleistocene was highly variable even among individuals of the same population. [33] The speed of Neanderthalization may have also been impeded by gene flow between Western Europe and Africa, exemplified by anomalous specimens which lack typical Neanderthal traits, such as Ceprano Man. [43] The first recognisable "early Neanderthals" show up in the fossil record by the end of Marine Isotope Stage 7 (beginning roughly 243,000 years ago) and give way to "classic" or "late Neanderthals" by the end of Marine Isotope Stage 5e. This spans the Penultimate Glacial Period to the Last Interglacial. Some early Neanderthal teeth from Payré, France, potentially date to MIS 8, but the dating is uncertain. [1][33]

Genetic data usually estimates that Neanderthals diverged from modern humans sometime during the early Middle Pleistocene. Neanderthals and Denisovans are more closely related to each other than they are to modern humans, meaning the Neanderthal/Denisovan split occurred sometime later.^{[43][46][47]} Before splitting, Neanderthal/Denisovans (or "Neandersovans") migrating out of Africa into Europe apparently interbred with an unidentified "superarchaic" human species who were already present there; these superarchaics were the descendants of a very early migration out of Africa around 1.9 million years ago.^[48]

Genetic data indicates that Neanderthals, at least after 100,000 years ago, maintained a small population with low genetic diversity, weakening natural selection and proliferating harmful mutations. It is unclear how long European populations suffered this population stress, or to what extent it influenced Neanderthalization.^[49]

Demographics

Range



Neanderthal skull from Tabun Cave, Israel, at the Israel Museum

The Neanderthals were the first human species to permanently occupy Europe.^[50] While pre-Neanderthals are mostly identified around Western Europe, classic Neanderthals are recorded across Europe as well as Southwest^[33] and Central Asia, up to the Altai Mountains in southern Siberia. Pre- and early Neanderthals seem to have continuously occupied only France, Spain, and Italy, although some appear to have moved out of this "core-area" to form temporary settlements eastward (without leaving Europe). Nonetheless, southwestern France has the highest density of sites for pre- and classic Neanderthals.^[51]

The southernmost find was recorded at Shuqba Cave, Levant;^[52] reports of Neanderthals from the North African Jebel Irhoud^[53] and Haua Fteah^[54] have been reidentified as *H. sapiens*. Their easternmost presence is recorded at Denisova Cave, Siberia 85°E; the southeast Chinese Maba Man, a skull, shares several physical attributes with Neanderthals, although these may be the result of convergent evolution rather than Neanderthals extending their range to the Pacific Ocean.^[55] The northernmost bound is generally accepted to have been 55°N, with unambiguous sites known between 50–53°N, but this is difficult to assess because glacial advances destroy most human remains.^{[56][57]} Middle Palaeolithic artefacts have been found up to 60°N on the Russian plains,^{[58][59][60]} but these are more likely attributed to modern humans.^[61]

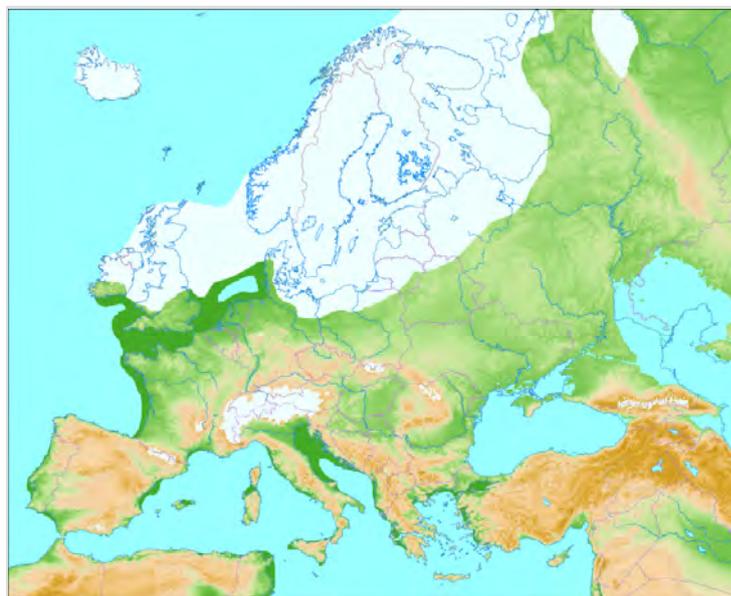
It is possible Neanderthal range expanded and contracted as the ice retreated and grew, respectively, to avoid permafrost areas, residing in certain refuge zones during glacial maxima.^[62] Stable environments with mild mean annual temperatures may have been the most suitable

Neanderthal habitats.^[63]

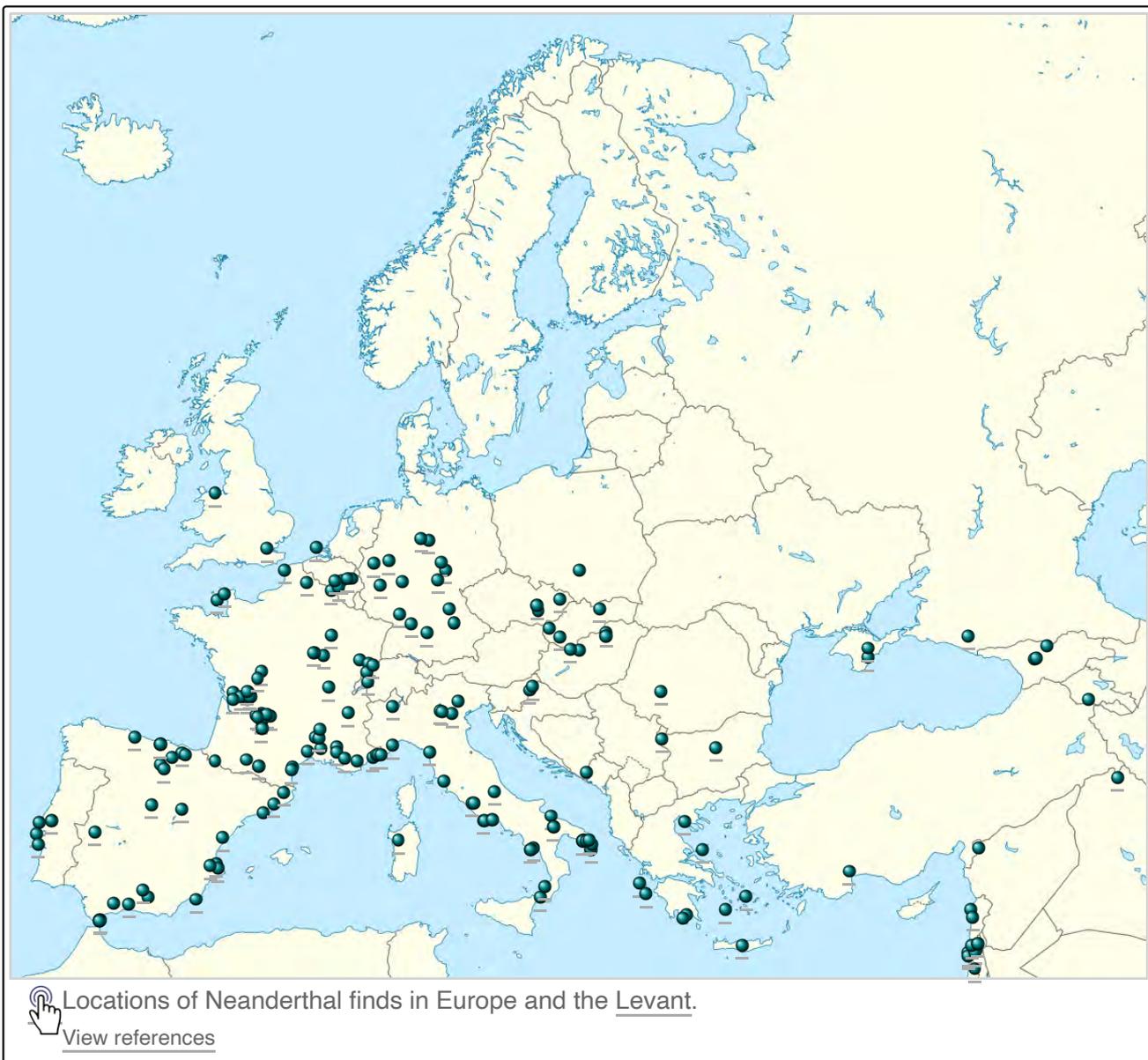
Population

Like modern humans, Neanderthals probably descended from a very small population with an effective population—the number of individuals who can bear or father children—of 3,000 to 12,000 approximately. Neanderthals maintained this low population, proliferating weakly harmful genes due to the reduced effectivity of natural selection.^{[64][65]} Archaeological evidence suggests that the initial Cro-Magnon population was 10 times higher than Neanderthals.^[66]

Neanderthals may have been at a demographic disadvantage due to a lower fertility rate, a higher infant mortality rate, or a combination of the two.^{[67][62]} In a sample of 206 Neanderthals, based on the abundance of young and mature adults in comparison to other age demographics, about 80% of them above the age of 20 died before reaching 40. This high mortality rate was probably due to their high-stress environment.^[68] Infant mortality was estimated to have been very high for Neanderthals, about 43% in northern Eurasia.^[69]



Map of Europe during the Würm glaciation 70–20,000 years ago



- Show map of Europe
- Show map of Asia
- Show all

Anatomy

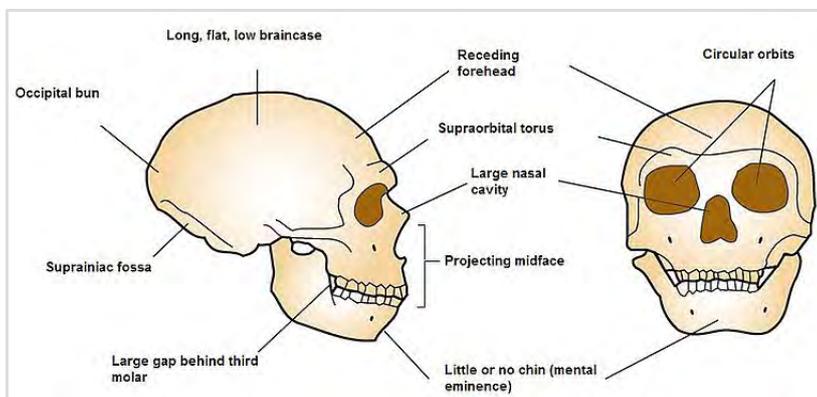
Skull

The Neanderthal skull has a flat and broad skullcap, rounded supraorbital torus (the brow ridges), high orbits (eye sockets), a broad nose, mid-facial prognathism (the face projects far from the base of the skull), an "en bombe" (bomb-like) skull shape when viewed from the back, and an occipital bun at the back of the skull.^[33]

The Neanderthal braincase averages 1,640 cm³ (100 cu in) for males and 1,460 cm³ (89 cu in) for females,^[70] which is significantly larger than the averages for all living populations.^[71] The largest Neanderthal brain, Amud 1, was calculated to be 1,736 cm³ (105.9 cu in), one of the largest ever recorded in humans.^[72] Neanderthal brain organisation differs in areas related to cognition and language, which may be implicated in the comparative simplicity of Neanderthal

behaviour compared to Cro-Magnons in the archaeological record.^{[73][74][75]}

Neanderthals had large and wide noses, probably an adaptation to warm greater quantities of cold air to fuel their assumed heightened metabolism and activity levels.^[76] A large nose does not necessarily equate to a better sense of smell, and neurologically, because the olfactory bulbs are smaller, Neanderthals may have had a poorer sense of smell and olfactory memory than modern humans.^[77]



Neanderthal skull features

The cheek bones are strong, the incisors are large and shovel-shaped, the molars have a swollen tooth pulp (taurodontism), and there is a gap behind the molars (retromolar space). These dental traits are usually interpreted as a response to habitual heavy loading of the front teeth, either to process mechanically challenging or attritive foods, or because Neanderthals regularly used the mouth as a third hand.^[78]

Build



A modern human (left) and Neanderthal (right) skeleton at the American Museum of Natural History

Neanderthals were generally short and stocky. In a sample of 45 Neanderthal long bones from 14 men and 7 women, the average height was 164 to 168 cm (5 ft 5 in to 5 ft 6 in) for males and 152 to 156 cm (5 ft 0 in to 5 ft 1 in) for females.^[79] The fossil record shows that adult Neanderthals varied from about 147.5 to 177 cm (4 ft 10 in to 5 ft 10 in) in height.^[80] Average male body mass index would have been 26.9–28.2 (overweight) using a size of 164 to 168 cm (5 ft 5 in to 5 ft 6 in) and 76 kg (168 lb).^{[79][81]}

The Neanderthal chest was deep and wide, with a proportionally expansive thoracic cavity, and possibly stronger lung performance. Neanderthals also had relatively more fast-twitch muscle fibres,^[82] and much higher caloric demands.^[83] The limbs are proportionally short. The body plan has traditionally been explained as a "hyper-arctic" adaptation (Allen's rule).^{[84][85][86]} Stronger lungs, more fast-twitch muscle, and shorter limbs would have also boosted sprinting efficiency.^{[82][87]}

Skin colour seems to have ranged from dark to light. Some Neanderthals had dark or brown hair.^{[88][89]} If red was another possible hair colour, it does not appear to have been a common one.^[90]

Pathology

Neanderthals suffered a high rate of traumatic injury, with an estimated 79–94% of specimens showing evidence of healed major trauma, of which 37–52% were severely injured, and 13–19% injured before reaching adulthood.^[91] One extreme example is Shanidar 1, who shows signs of an amputation of the right arm likely due to a nonunion after breaking a bone in adolescence, osteomyelitis (a bone infection) on the left clavicle, an abnormal gait, vision problems in the left eye, and possible hearing loss^[92] (perhaps swimmer's ear).^[93] The high trauma rate may be ascribed to a dangerous hunting strategy,^[68] or frequent animal attacks.^[94]

Low population caused a low genetic diversity and probably inbreeding, which reduced the population's ability to filter out harmful mutations (inbreeding depression). It is unknown how this affected a single Neanderthal's genetic burden and, thus, if this caused a higher rate of birth defects than in modern humans.^[95]

Culture

Social structure

It is difficult to infer Neanderthal group size, but indirect data generally suggests small bands of 10 to 30 individuals.^[97] Bands likely moved between certain caves depending on the season, indicated by remains of seasonal materials, such as certain foods. They returned to the same locations generation after generation, and some sites may have been used for over a century.^[98] Neanderthals may have been outcompeting cave bears for cave space.^[99] Intergroup movement may have been predominantly female-driven, with at least some groups practicing patrilocal residency (the woman moves out of her group to live with her mate).^[100]



Genetically, Neanderthals can be grouped into three distinct regions (above). Dots indicate sampled specimens.^[96]

Neanderthals maintained a low population across their range, which may have hindered their ability to maintain long-distance trade routes^[101] and avoid inbreeding.^[102] They may have regularly interacted with closely neighbouring communities within a region, but not as often beyond.^[103] Genetic analysis indicates there were at least three distinct geographical groups: Western Europe, the Mediterranean coast, and east of the Caucasus, with some migration among these regions.^[96]

While Cro-Magnons are usually assumed to have practised sexual division of labour with men hunting and women gathering like in recent hunter-gatherer societies, it is unclear to what extent this can be applied to Neanderthals. Both Neanderthal men and women have similar traumatic injury patterns, which might imply that both sexes were involved in hunting. Dental wearing patterns, on the other hand, could indicate men and women typically carried different items with their mouths, maybe during tasks not related to subsistence. The women at El Sidrón Cave, Spain, may have been eating more seeds and nuts than the men. The lack of a strict sexual division in Neanderthals has usually been linked to their small population and group size, falling short of the demographic threshold where task specialisation becomes feasible — which may also explain the comparative simplicity of Neanderthal material culture.^[104]

Food



Reconstruction of a Neanderthal man butchering a goat at the Neanderthal Museum

Neanderthals were once thought of as scavengers, but are now considered to have been apex predators.^[105] They appear to have eaten predominantly what was abundant within their immediate surroundings.^[106] Cro-Magnons, in contrast, seem to have used more complex food extraction strategies and generally had a more diverse diet.^{[107][108]}

In many European sites, prey items include reindeer, horse, aurochs, and steppe bison. Neanderthals in Southwest Asia more commonly hunted mountain gazelle, Persian fallow deer, wild goat, and camels.^[107]

They may have less frequently taken down larger Pleistocene megafauna whenever locally abundant, such as woolly mammoth and woolly rhinoceros.^[109] At the 125,000 year old Neumark-Nord site, Germany, there is

evidence of regular hunting of straight-tusked elephants maybe every 5 to 6 years.^[110] Some waterside communities ate fish and shellfish; and at Vanguard Cave, Gibraltar, dolphin and Mediterranean monk seal.^[111] Neanderthals also hunted small game, and some caves show evidence of regular rabbit and tortoise consumption. At Gibraltar sites, there are butchered remains of 143 different bird species, many ground-dwelling such as the common quail, corn crake, woodlark, and crested lark.^[111] Neanderthals also consumed a variety of plants and mushrooms across their range — at Kebara Cave, Israel, over 50 species of seeds, nuts, fruits, and cereals.^{[112][113]}

Neanderthals possibly employed a wide range of food preparation techniques. At Cueva del Sidrón, Spain, Neanderthals may have been roasting and smoking meat, and used certain plants —such as yarrow and camomile—for flavouring,^[114] although these plants may have instead been used for their medicinal properties.^{[115][116]} At Gorham's Cave, Gibraltar, Neanderthals may have been roasting pinecones to access pine nuts,^[111] and at Gruta da Figueira Brava, brown crabs to soften the shell before cracking them open.^[117] At Grotte du Lazaret, France, a total of twenty-three red deer, six ibexes, three aurochs, and one roe deer appear to have been

hunted in a single autumn hunting season, when strong male and female deer herds would group together for rut. It is possible these Neanderthals were curing and storing all this meat before winter set in.^[118]

Neanderthals competed with several large carnivores, but also seem to have hunted them down, namely cave lions and wolves,^[119] as well as cave and brown bear both in and out of hibernation.^[120] Neanderthals and other predators may have sometimes avoided competition by pursuing different prey, namely with cave hyenas^[107] and wolves (niche differentiation).^[121] Neanderthals, nonetheless, were frequently victims of animal attacks.^[94]

There are multiple instances of Neanderthals practicing cannibalism, but it may have only been done in times of extreme food shortages, as in some cases in recorded human history.^[122]

The arts

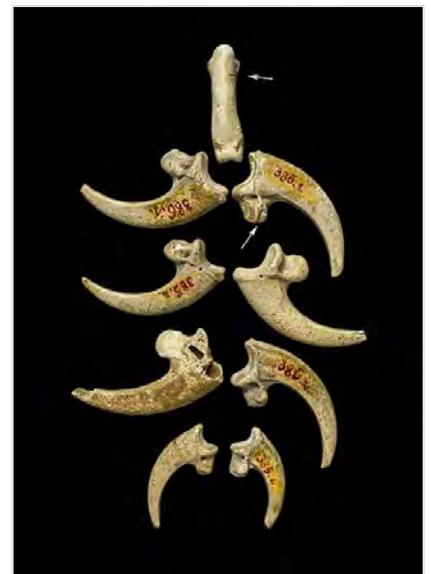
Neanderthals collected non-functional, uniquely-shaped objects, namely shells, fossils, and gems. It is unclear if these objects were simply picked up for their aesthetic qualities, or if some symbolic significance was applied to them.^[123] Some shells may have been painted.^[124] Gibraltarian palaeoanthropologists Clive and Geraldine Finlayson suggested that Neanderthals used various bird parts as artistic media, especially black feathers.^[125]^[126] A 2020 study found evidence of a 3-ply cord fragment made from conifer inner-bark fibres at Abri du Maras, France, which can be used to knit light items, such as strings for hanging beads. 115,000-year-old perforated shell beads from Cueva Antón were possibly strung together to make a necklace.^[127]

There are several instances of nondescript engravings and scratches on flints, bones, pebbles, and stone slabs — as of 2014, 63 purported engravings have been reported from 27 different European and Middle Eastern Lower-to-Middle Palaeolithic sites. It is debated if these were made with symbolic intent.^[128] Neanderthals may have produced finger flutings on the walls of La Roche-Cotard over 57,000 years ago.^[129]

Neanderthals used ochre, a clay earth pigment. While modern humans have used this for decorative or symbolic colouration, it has also been used as medicine, hide tanning agent, food preservative, and insect repellent.^[130]

The 43,000-year-old Divje Babe flute (a cave bear femur) from Slovenia has been attributed by some researchers to Neanderthals, though its status as a Palaeolithic flute is heavily disputed. Many researchers consider it to be most likely the product of a carnivorous animal chewing the bone.^[131]

Technology



Speculative reconstruction of white-tailed eagle talon jewellery from Krapina, Croatia (arrows indicate cut marks)



Mousterian point

Neanderthals manufactured Middle Palaeolithic stone tools, and are associated with the Mousterian industry, specifically the Levallois technique. After developing this technology from the Acheulean industry,^[132] there is a 150,000 year stagnation in Neanderthal stone tool innovation. Stalled technological growth may have followed from their low population, impeding complex ideas from being spread across their range or passed down generationally.^{[62][91]} Neanderthals normally collected raw materials from a nearby source, no more than 5 km (3.1 mi).^[97] Some communities were also making tools from shells^[133] and bone.^[134] They may have hafted tips onto spears using birch bark tar.^[135] European populations have also been manufacturing wood spears, namely the 400,000 year old British Clacton Spear; 300,000 year old German Schöningen spears; and 120,000 year old German Lehringen Spear,^[136] including both likely thrown (Schöningen)^[137] and thrusting (Lehringen) types.^[138] It has been suggested that Neanderthals likely specifically selected particular wood types (such as European yew in the case of the Clacton and Lehringen spears) for manufacturing spears for their beneficial material properties.^[138]

Many Neanderthal sites have evidence of fire, some for extended periods of time, though it is unclear whether they were capable of starting fire or simply scavenged from naturally occurring wildfires.^{[139][140][141]} They may have been using fire for cooking, keeping warm, and deterring predators.^[142] They were also capable of zoning areas for specific activities, such as for knapping, butchering, hearths, and wood storage.^[97] At Abric Romaní rock shelter, Spain, Neanderthals may have maintained eight evenly spaced hearths lined up against the rock wall, likely used to stay warm while sleeping, with one person sleeping on either side of the fire.^[143]

The only known Neanderthal tools that could have been used to fashion clothes are hide scrapers as no bone sewing-needles and stitching awls have been found as in Cro-Magnon sites. Hide scrapers could have been used to make items similar to blankets or ponchos. There is no direct evidence that Neanderthals could make fitted clothes from animal hide.^{[144][145]} Unfitted clothes would have limited range of mobility while dressed, and decreased the time Neanderthals could spend unprotected from the elements away from shelters.^[146]

Neanderthals appear to have lived lives of frequent traumatic injury and recovery, indicating the setting of splints and dressing of major wounds. By and large, they appear to have avoided severe infections, indicating long-term treatment. The quality of medical care may have ensured their survival as a species for so long. Their knowledge of medicinal plants was comparable to that of Cro-Magnons.^[147]

Stone tools on various Greek islands could indicate early seafaring through the Mediterranean, employing simple reed boats for one-day crossings,^[148] but the evidence for such a big claim is limited.^[149]

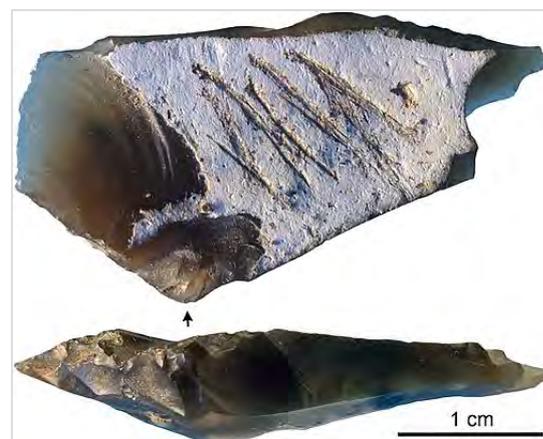
Language

It is unclear if Neanderthals had the capacity for complex language, but some researchers have argued that Neanderthals required complex communications to discuss locations, hunting and gathering, and tool-making techniques in order to survive in their harsh environment.^{[150][151][152]} In experiments with modern humans, the Levallois technique can be taught with purely observational learning without spoken instruction.^[153]

Anatomically, the Neanderthal hyoid bone (which supports the tongue) is almost identical to that in modern humans, but this does not provide insight of the entire vocal tract.^[154] Neanderthals had the FOXP2 gene, which is associated with speech and language development, but not the modern human variant.^[155]

Burials and religion

Neanderthals, probably uncommonly, buried their dead. This may explain the abundance of fossil remains.^[106] The behaviour is not indicative of a religious belief of life after death because it could also have had non-symbolic motivations.^{[156][157]} The dead were buried in simple, shallow graves and pits,^[157] but special care seems to have been given to child graves. The graves of children and infants, especially, are associated with grave goods such as artefacts and bones.^[158] Some sites with multiple well-preserved Neanderthal skeletons may represent cemeteries.^[157]



Engraved flint from a Neanderthal grave at Kiik-Koba, Crimea

One grave in Shanidar Cave, Iraq, was associated with the pollen of several flowers that may have been in bloom at the time of deposition—yarrow, centaury, ragwort, grape hyacinth, joint pine and hollyhock.^[159] The medicinal properties of the plants led American archaeologist Ralph Solecki to claim that the man buried was some leader, healer, or shaman, and that "the association of flowers with Neanderthals adds a whole new dimension to our knowledge of his humanness, indicating that he had 'soul' ".^[160] It is also possible the pollen was deposited by a small rodent after the man's death.^[161]

Neanderthals were once thought to have ritually killed and eaten cave bears or other Neanderthals, but the evidence is circumstantial.^[156] The Finlayson's speculate that Neanderthals viewed the golden eagle as a symbol of power.^[126]

Interbreeding

Hybridisation between Neanderthals and early modern humans had been suggested early on,^[163] such as by English anthropologist Thomas Huxley in 1890,^[164] Danish ethnographer Hans Peder Steensby in 1907,^[165] and Coon in 1962.^[166] In the early 2000s, supposed hybrid

specimens were discovered: Lagar Velho 1^{[167][168][169][170]} and Muierii 1^[171] Similar anatomy could also have been caused by adapting to a similar environment rather than interbreeding.^[172]



Reconstruction of Oase 2 with around 7.3% Neanderthal DNA (from an ancestor 4–6 generations back)^[162]

The first Neanderthal genome sequence was published in 2010, and strongly indicated interbreeding between Neanderthals and early modern humans.^[35] Neanderthal-derived genes descend from at least 2 interbreeding episodes outside of Africa: one about 250,000 years ago, and another 40,000 to 54,000 years. Interbreeding also occurred in other populations which are not ancestral to any living person.^[173] An individual whose ancestry lies beyond sub-Saharan Africa may carry about 2% of Neanderthal DNA. Sub-Saharan Africans can carry Neanderthal DNA, presumably descending from modern human migration between Eurasia and Africa.^[174] In all, approximately 20% of the Neanderthal genome appears to have survived in the modern human gene pool.^[175] This Neanderthal DNA may descend primarily from the children of female modern humans and male Neanderthals.^{[176][177]}

Due to their low population and proliferation of deleterious mutations, many Neanderthal genes were probably selected out of the modern human gene pool (negative selection). Similarly, a large portion of surviving introgression appears to be non-coding ("junk") DNA with few biological functions.^[172] Some Neanderthal-derived genes, nonetheless, may have functional (though not necessarily positive) implications related to metabolism, brain function, and skeletal and muscular development.^{[35][178]} Some genes may have helped immigrating modern humans populations acclimatise faster, such as genes related to immune response.^[179]

Neanderthals in the Siberian Altai Mountains interbred with the local Denisovan population, and it may have been a common occurrence here.^[180] About 17% of the genome of one Altai Denisovan specimen derived from Neanderthals.^[181]

Extinction

The extinction of Neanderthals was part of the broader Late Pleistocene megafaunal extinction event.^[183] Neanderthals were replaced by modern humans, indicated by the near-complete replacement of Middle Palaeolithic Mousterian stone technology with modern human Upper Palaeolithic Aurignacian stone technology across Europe (the Middle-to-Upper Palaeolithic Transition) from 39,000 to 41,000 years ago.^{[182][184][185]} Neanderthals may have persisted in Spain for longer, but the dates of the latest Mousterian and earliest Aurignacian are poorly constrained. In Catalonia and Aragón (northern Spain), the Mousterian may have survived to about 39,000 years ago, and in southern Spain and Gibraltar potentially 32,000 to 35,000 years

ago.^[186] Similar refuge zones have also been proposed on other temperate European peninsulas, namely Italy, the Balkans, and Crimea.^{[187][188]}

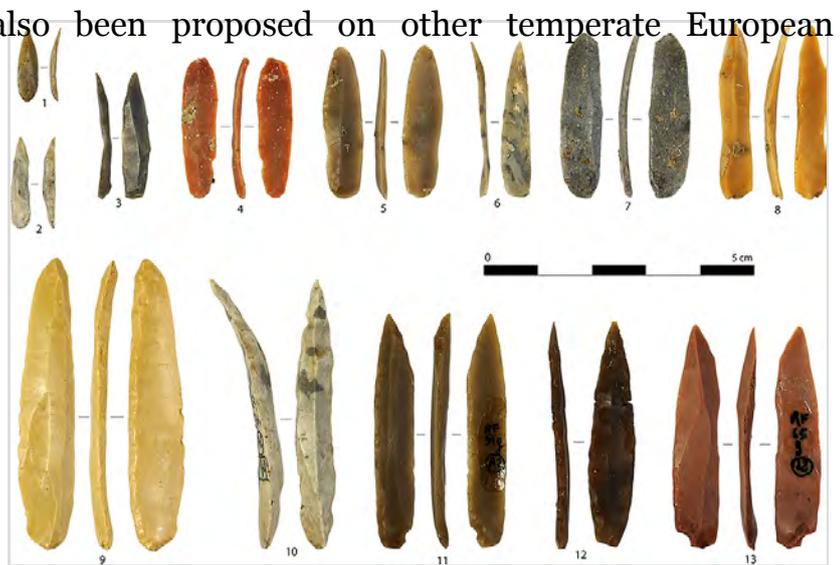
Historically, the cause of extinction of Neanderthals and other archaic humans was viewed under an imperialistic guise, with the superior invading modern humans exterminating and replacing the inferior species.^[24]

When *sapiens* began to expand and spread, he eliminated the other contemporary races [including Neanderthals] just as the white man drove out the Australian aborigines and the North American Indians.

— Ernst Mayr, 1950^[189]

In general, the extinction of Neanderthals is ascribed to predominantly competition with modern humans. The success of modern humans over Neanderthals is usually attributed to a higher birth rate and population, better long-distance mobility, and more complex technologies and subsistence strategies. Some Neanderthal populations may have also been assimilated into modern human populations rather than being ecologically outcompeted.^[190] Assimilation had long been hypothesised with supposed hybrid specimens, and was revitalised with the discovery of archaic human DNA in modern humans.^[191] Similarly, the Châtelperronian industry of central France and northern Spain may represent a culture of Neanderthals adopting modern human techniques, via acculturation.^{[192][193]} Other ambiguous transitional cultures include the Italian Uluzzian industry,^[194] and the Central European Szeletian industry.^[195]

Neanderthal extinction has also been ascribed to their low population as well as the resulting mutational meltdown, making them less adaptable to major environmental changes or new diseases introduced by immigrating modern humans.^[196] It is unclear if climatic degradation would have severely impacted Neanderthals given how many glacial periods they persisted through in Europe. If areas were depopulated of Neanderthals as a consequence of climate change (specifically Heinrich event 4) or a natural disaster (the Campanian Ignimbrite eruption), Neanderthals may not have been as fast as modern humans in recolonising.^[197] The Laschamp event 39,000 to 42,000 years ago may have increased ultraviolet radiation, disproportionately affecting Neanderthals who lacked protective fitted clothes, and may not have utilised ochre as sunscreen to the extent Cro-Magnons did.^[146]



The Neanderthal Mousterian culture was replaced by modern human Aurignacian culture (above, Protoaurignacian bladelets).^[182]

In popular culture

Neanderthals have been portrayed in popular culture including appearances in literature, visual media and comedy. The "caveman" archetype often mocks Neanderthals and depicts them as primitive, hunchbacked, knuckle-dragging, club-wielding, grunting, nonsocial characters driven solely by animal instinct. "Neanderthal" can also be used as an insult. [198]

In literature, they are sometimes depicted as brutish or monstrous, such as in H. G. Wells' *The Grisly Folk* and Elizabeth Marshall Thomas' *The Animal Wife*, but sometimes with a civilised but unfamiliar culture, as in William Golding's *The Inheritors*, Björn Kurtén's *Dance of the Tiger*, and Jean M. Auel's *Clan of the Cave Bear* and her *Earth's Children* series. [24]



Cavemen in *The Black Terror* #16 (1946)

See also

- Denisovan – Asian archaic human
- Early human migrations
- Cro-Magnon – Earliest anatomically modern humans in Europe
- Homo floresiensis – Extinct small human species found in Flores
- Homo luzonensis – Archaic human from Luzon, Philippines
- Homo naledi – South African archaic human species
- Timeline of human evolution

Footnotes

- After being mined for limestone, the cave caved in and was lost by 1900. It was rediscovered in 1997 by archaeologists Ralf Schmitz and Jürgen Thissen. [9]
- The German spelling *Thal* ("valley") was current until 1901 but has been *Tal* since then. (The German noun is cognate with English *dale*.) The German */t/* phoneme was frequently spelled *th* from the 15th to 19th centuries, but the spelling *Tal* became standardised in 1901 and the old spellings of the German names *Neanderthal* for the valley and *Neanderthaler* for the species were both changed to the spellings without *h*. [10]
- In Mettmann, "Neander Valley", there is a local idiosyncrasy in use of the outdated spellings with *th*, such as with the Neanderthal Museum (but the name is in English [German would require *Neandertalermuseum*]), the Neanderthal station (Bahnhof Neanderthal), and some other rare occasions meant for tourists. Beyond these, city convention is to use *th* when referring to the species. [10]
- King made a typo and said "theositic".

- e. The bones were discovered by workers of Wilhelm Beckershoff and Friedrich Wilhelm Pieper. Initially, the workers threw the bones out as debris, but Beckershoff then told them to store the bones. Pieper asked Fuhlrott to come up to the cave and investigate the bones, which Beckershoff and Pieper believed belonged to a cave bear.^[9]
- f. The X-chromosome carries far less archaic DNA than any autosome, which has either been explained as hybrid incompatibility (the large-X effect — background selection) or male sex bias (hybrids were normally the children of a male Neanderthal and female modern human).^[37]

References

1. Richards, Gary D.; Guipert, Gaspard; Jabbour, Rebecca S.; Defleur, Alban R. (2021). "Neanderthal cranial remains from Baume Moula-Guercy (Soyons, Ardèche, France)". *American Journal of Physical Anthropology*. **175** (1): 201–226. doi:10.1002/ajpa.24256 (<https://doi.org/10.1002%2Fajpa.24256>). ISSN 1096-8644 (<https://search.worldcat.org/issn/1096-8644>).
2. Haeckel, E. (1895). *Systematische Phylogenie: Wirbelthiere* (<https://archive.org/details/systematischephy03haec/page/601>) (in German). G. Reimer. p. 601.
3. Schwalbe, G. (1906). *Studien zur Vorgeschichte des Menschen* (<https://www.biodiversitylibrary.org/item/126001#page/13>) [*Studies on the pre-history of man*] (in German). Stuttgart, E. Nägele. doi:10.5962/bhl.title.61918 (<https://doi.org/10.5962%2Fbhl.title.61918>). hdl:2027/uc1.b4298459 (<https://hdl.handle.net/2027%2Fuc1.b4298459>).
4. Klaatsch, H. (1909). "Preuves que l'*Homo Mousteriensis Hauseri* appartient au type de Neandertal" (<https://gallica.bnf.fr/ark:/12148/bpt6k5864483g/f25.image>.) [Evidence that *Homo Mousteriensis Hauseri* belongs to the Neanderthal type]. *L'Homme Préhistorique* (in French). **7**: 10–16.
5. Romeo, L. (1979). *Ecce Homo!: a lexicon of man* (<https://books.google.com/books?id=jj1iftPqCssC&pg=PA92>). John Benjamins Publishing Company. p. 92. ISBN 978-90-272-2006-6.
6. McCown, T.; Keith, A. (1939). *The stone age of Mount Carmel. The fossil human remains from the Levalloisso-Mousterian*. Vol. 2. Clarendon Press.
7. Szalay, F. S.; Delson, E. (2013). *Evolutionary history of the Primates* (<https://books.google.com/books?id=jE7gBAAQBAJ&pg=PA508>). Academic Press. p. 508. ISBN 978-1-4832-8925-0.
8. Wells, J. (2008). *Longman pronunciation dictionary* (3rd ed.). Harlow, England: Pearson Longman. ISBN 978-1-4058-8118-0.
9. Schmitz, R. W.; Serre, D.; Bonani, G.; et al. (2002). "The Neanderthal type site revisited: interdisciplinary investigations of skeletal remains from the Neander Valley, Germany" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC130635>). *Proceedings of the National Academy of Sciences*. **99** (20): 13342–13347. Bibcode:2002PNAS...9913342S (<https://ui.adsabs.harvard.edu/abs/2002PNAS...9913342S>). doi:10.1073/pnas.192464099 (<https://doi.org/10.1073%2Fpnas.192464099>). PMC 130635 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC130635>). PMID 12232049 (<https://pubmed.ncbi.nlm.nih.gov/12232049>).
10. "Neandertal oder Neanderthal? Was ist denn nun richtig?" (<https://web.archive.org/web/20200809042411/https://www.mettmann.de/neandertal/schreibweise.php>) [Neandertal or Neanderthal? So which is actually right?]. Kreisstadt Mettmann. Retrieved February 1, 2017. "Heute sollten Ortsbezeichnungen das 'Neandertal' ohne 'h' bezeichnen. Alle Namen, die sich auf den prähistorischen Menschen beziehen, führen das 'h'. (Nowadays, place names should refer to the Neander Valley ['Neandertal'] without an 'h'. All names referring to the prehistoric humans have the 'h'.)"
11. Chisholm, Hugh, ed. (1911). "Neander, Joachim" (https://en.wikisource.org/wiki/1911_Encyc

- lop%C3%A6dia_Britannica/Neander,_Joachim). *Encyclopædia Britannica*. Vol. 19 (11th ed.). Cambridge University Press. pp. 320–321.
12. "Neanderthal" (<https://www.collinsdictionary.com/dictionary/english/neanderthal>). *Collins English Dictionary*. Retrieved February 18, 2020.
 13. "Neanderthal" (<https://www.merriam-webster.com/dictionary/Neanderthal>). *Merriam-Webster Dictionary*. Retrieved February 18, 2020.
 14. "Neanderthal" (<https://www.ahdictionary.com/word/search.html?q=Neanderthal>). *American Heritage Dictionary*. Retrieved February 18, 2020.
 15. Alex, B. (2016). "Is It Neander-TAL or Neander-THAL?" (<https://www.discovermagazine.com/planet-earth/is-it-neander-tal-or-neander-thal>). *Discover*. Retrieved March 3, 2025.
 16. Vogt, K. C. (1864). *Lectures on man: his place in creation, and in the history of the earth* (<https://archive.org/stream/lecturesonmanhi00huntgoog#page/n330/mode/2up>). London, UK: Longman, Green, Longman and Roberts. pp. 302, 473.
 17. King, W. (1864). "On the Neanderthal skull, or reasons for believing it to belong to the Clydian Period and to a species different from that represented by man" (<https://biodiversitylibrary.org/page/29371003>). *Report of the British Association for the Advancement of Science, Notices and Abstracts, Newcastle-upon-Tyne, 1863*. **33**: 81–82 – via Biodiversity Heritage Library.
 18. Murray, J.; Nasheuer, H. P.; Seoighe, C.; McCormack, G. P.; Williams, D. M.; Harper, D. A. T. (2015). "The contribution of William King to the early development of palaeoanthropology". *Irish Journal of Earth Sciences*. **33**: 1–16. doi:10.3318/ijes.2015.33.1 (<https://doi.org/10.3318%2Fijes.2015.33.1>). JSTOR 10.3318/ijes.2015.33.1 (<https://www.jstor.org/stable/10.3318/ijes.2015.33.1>). S2CID 131804686 (<https://api.semanticscholar.org/CorpusID:131804686>).
 19. Winner, A. K. (1964). "Terminology". *Current Anthropology*. **5** (2): 119–122. doi:10.1086/200469 (<https://doi.org/10.1086%2F200469>). JSTOR 2739959 (<https://www.jstor.org/stable/2739959>). S2CID 224796921 (<https://api.semanticscholar.org/CorpusID:224796921>).
 20. King, W. (1864). "The reputed fossil man of the Neanderthal" (<https://biostor.org/reference/195152>). *Quarterly Journal of Science*. **1**: 96.
 21. Schmerling, P. (1834). *Recherches sur les ossemens fossiles découverts dans les cavernes de la province de Liège* (<https://orbi.uliege.be/handle/2268/207986>) [*Research on the fossil specimens discovered in the caves of Liège*]. P. J. Collardin. pp. 30–32. hdl:2268/207986 (<https://hdl.handle.net/2268%2F207986>).
 22. Menez, A. (2018). "Custodian of the Gibraltar skull: the history of the Gibraltar Scientific Society". *Earth Sciences History*. **37** (1): 34–62. Bibcode:2018ESHis..37...34M (<https://ui.adsabs.harvard.edu/abs/2018ESHis..37...34M>). doi:10.17704/1944-6178-37.1.34 (<https://doi.org/10.17704%2F1944-6178-37.1.34>).
 23. Schaaffhausen, H. (1858). "Zur Kenntnis der ältesten Rassenschädel" [Acknowledging the oldest racial skull]. *Archiv für Anatomie, Physiologie und Wissenschaftliche Medicin* (in German): 453–478.
 24. Drell, J. R. R. (2000). "Neanderthals: a history of interpretation". *Oxford Journal of Archaeology*. **19** (1): 1–24. doi:10.1111/1468-0092.00096 (<https://doi.org/10.1111%2F1468-0092.00096>). S2CID 54616107 (<https://api.semanticscholar.org/CorpusID:54616107>).
 25. Schlager, S.; Wittwer-Backofen, U. (2015). "Images in Paleoanthropology: Facing Our Ancestors". In Henke, W.; Tattersall, I. (eds.). *Handbook of Paleoanthropology*. Springer-Verlag Berlin Heidelberg. pp. 1019–1027. doi:10.1007/978-3-642-39979-4_70 (https://doi.org/10.1007%2F978-3-642-39979-4_70). ISBN 978-3-642-39978-7.
 26. Fuhlrott, J. C. (1859). "Menschliche Überreste aus einer Felsengrotte des Düsselthales" (https://www.naturhistorischerverein.de/neandertaler_ebook.pdf) [Human remains from a rock grotto in Düsselthal] (PDF). *Verh Naturhist Ver Preuss Rheinl* (in German). **16**: 131–153.

27. Virchow, R. (1872). "Untersuchung des Neanderthal-Schädels" [Examinations on the Neandertal skull]. *Verh Berl Anthropol Ges* (in German). **4**: 157–165.
28. Boule, M. (1911). *L'homme fossile de La Chapelle-aux-Saints* (<https://archive.org/details/b22463355>) [*Fossil man from La Chapelle-aux-Saints*] (in French). Masson. pp. 1 (<https://archive.org/details/b22463355/page/n16>)–62.
29. Van Reybrouck, D. (2002). "Boule's error: on the social context of scientific knowledge". *Antiquity*. **76** (291): 158–164. doi:10.1017/S0003598X00089936 (<https://doi.org/10.1017%2FS0003598X00089936>). S2CID 164060946 (<https://api.semanticscholar.org/CorpusID:164060946>).
30. Langdon, J. H. (2016). "Case study 18. Neanderthals in the mirror: imagining our relatives". *The science of human evolution: getting it right*. Springer. ISBN 978-3-319-41584-0.
31. Sommer, M. (2006). "Mirror, mirror on the wall: Neanderthal as image and 'distortion' in early 20th-century French science and press" (http://blog.wbkolleg.unibe.ch/wp-content/uploads/Sommer2006_MirrorMirrorNeanderthals.pdf) (PDF). *Social Studies of Science*. **36** (2): 207–240. doi:10.1177/0306312706054527 (<https://doi.org/10.1177%2F0306312706054527>). S2CID 145778787 (<https://api.semanticscholar.org/CorpusID:145778787>).
32. Spencer, F.; Smith, F. H. (1981). "The significance of Aleš Hrdlička's 'Neanderthal phase of man': A historical and current assessment". *American Journal of Physical Anthropology*. **56** (4): 435–459. doi:10.1002/ajpa.1330560417 (<https://doi.org/10.1002%2Fajpa.1330560417>).
33. Hublin, J.-J. (2002). "Climatic Changes, Paleogeography, and the Evolution of the Neandertals". In Akazawa, T.; Aoki, K.; Bar-Yosef, O. (eds.). *Neandertals and Modern Humans in Western Asia*. doi:10.1007/b109961 (<https://doi.org/10.1007%2Fb109961>). ISBN 978-0-306-45924-5.
34. Holliday, T. W.; Gautney, J. R.; Friedl, L. (2014). "Right for the Wrong Reasons". *Current Anthropology*. **55** (6): 696–724. doi:10.1086/679068 (<https://doi.org/10.1086%2F679068>).
35. Green, R. E.; Krause, J.; Briggs, A. W.; et al. (2010). "A draft sequence of the Neandertal genome" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5100745>). *Science*. **328** (5979): 710–722. Bibcode:2010Sci...328..710G (<https://ui.adsabs.harvard.edu/abs/2010Sci...328..710G>). doi:10.1126/science.1188021 (<https://doi.org/10.1126%2Fscience.1188021>). PMC 5100745 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5100745>). PMID 20448178 (<https://pubmed.ncbi.nlm.nih.gov/20448178>).
36. Meneganzin, A.; Stringer, C. (2024). "*Homo sapiens*, Neanderthals and speciation complexity in palaeoanthropology" (<https://doi.org/10.1093%2Fevolinnean%2Fkzae033>). *Evolutionary Journal of the Linnean Society*. **3** (1). doi:10.1093/evolinnean/kzae033 (<https://doi.org/10.1093%2Fevolinnean%2Fkzae033>).
37. Chevy, Elizabeth T.; Huerta-Sánchez, Emilia; Ramachandran, Sohini (August 14, 2023). "Integrating sex-bias into studies of archaic introgression on chromosome X" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10449224>). *PLOS Genetics*. **19** (8): e1010399. doi:10.1371/journal.pgen.1010399 (<https://doi.org/10.1371%2Fjournal.pgen.1010399>). ISSN 1553-7404 (<https://search.worldcat.org/issn/1553-7404>). PMC 10449224 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10449224>). PMID 37578977 (<https://pubmed.ncbi.nlm.nih.gov/37578977>).
38. Pääbo, S. (2014). *Neanderthal man: in search of lost genomes*. New York: Basic Books. p. 237.
39. Hofreiter, M. (2011). "Drafting human ancestry: What does the Neanderthal genome tell us about hominid evolution? Commentary on Green et al. (2010)" (<https://digitalcommons.wayne.edu/cgi/viewcontent.cgi?article=1316&context=humbiol>). *Human Biology*. **83** (1): 1–11. doi:10.3378/027.083.0101 (<https://doi.org/10.3378%2F027.083.0101>). PMID 21453001 (<https://pubmed.ncbi.nlm.nih.gov/21453001>). S2CID 15005225 (<https://api.semanticscholar.org/CorpusID:15005225>).
40. Petr, Martin; Hajdinjak, Mateja; Fu, Qiaomei; Essel, Elena; Rougier, Hélène; Crevecoeur,

- Isabelle; Semal, Patrick; Golovanova, Liubov V.; Doronichev, Vladimir B.; Lalueza-Fox, Carles; de la Rasilla, Marco; Rosas, Antonio; Shunkov, Michael V.; Kozlikin, Maxim B.; Derevianko, Anatoli P. (September 25, 2020). "The evolutionary history of Neanderthal and Denisovan Y chromosomes" (<https://www.science.org/doi/10.1126/science.abb6460>). *Science*. **369** (6511): 1653–1656. Bibcode:2020Sci...369.1653P (<https://ui.adsabs.harvard.edu/abs/2020Sci...369.1653P>). doi:10.1126/science.abb6460 (<https://doi.org/10.1126%2Fscience.abb6460>). hdl:21.11116/0000-0007-11C2-A (<https://hdl.handle.net/21.11116%2F0000-0007-11C2-A>). ISSN 0036-8075 (<https://search.worldcat.org/issn/0036-8075>). PMID 32973032 (<https://pubmed.ncbi.nlm.nih.gov/32973032>).
41. Posth, C.; Wißing, C.; Kitagawa, K.; et al. (2017). "Deeply divergent archaic mitochondrial genome provides lower time boundary for African gene flow into Neanderthals" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5500885>). *Nature Communications*. **8**: 16046. Bibcode:2017NatCo...816046P (<https://ui.adsabs.harvard.edu/abs/2017NatCo...816046P>). doi:10.1038/ncomms16046 (<https://doi.org/10.1038%2Fncmms16046>). PMC 5500885 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5500885>). PMID 28675384 (<https://pubmed.ncbi.nlm.nih.gov/28675384>).
42. Petr, Martin; Hajdinjak, Mateja; Fu, Qiaomei; Essel, Elena; Rougier, H el ene; Crevecoeur, Isabelle; Semal, Patrick; Golovanova, Liubov V.; Doronichev, Vladimir B.; Lalueza-Fox, Carles; de la Rasilla, Marco; Rosas, Antonio; Shunkov, Michael V.; Kozlikin, Maxim B.; Derevianko, Anatoli P.; Vernot, Benjamin; Meyer, Matthias; Kelso, Janet (2020). "The evolutionary history of Neanderthal and Denisovan Y chromosomes" (<https://www.science.org/doi/10.1126/science.abb6460>). *Science*. **369** (6511): 1653–1656. doi:10.1126/science.abb6460 (<https://doi.org/10.1126%2Fscience.abb6460>). hdl:21.11116/0000-0007-11C2-A (<https://hdl.handle.net/21.11116%2F0000-0007-11C2-A>).
43. Meyer, M.; Arsuaga, J.; de Filippo, C.; Nagel, S. (2016). "Nuclear DNA sequences from the Middle Pleistocene Sima de los Huesos hominins". *Nature*. **531** (7595): 504–507. Bibcode:2016Natur.531..504M (<https://ui.adsabs.harvard.edu/abs/2016Natur.531..504M>). doi:10.1038/nature17405 (<https://doi.org/10.1038%2Fnature17405>). PMID 26976447 (<https://pubmed.ncbi.nlm.nih.gov/26976447>). S2CID 4467094 (<https://api.semanticscholar.org/CorpusID:4467094>).
44. Ni, Xijun; Ji, Qiang; Wu, Wensheng; Shao, Qingfeng; Ji, Yannan; Zhang, Chi; Liang, Lei; Ge, Junyi; Guo, Zhen; Li, Jinhua; Li, Qiang; Gr un, Rainer; Stringer, Chris (2021). "Massive cranium from Harbin in northeastern China establishes a new Middle Pleistocene human lineage" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8454562>). *The Innovation*. **2** (3): 100130. Bibcode:2021Innov...200130N (<https://ui.adsabs.harvard.edu/abs/2021Innov...200130N>). doi:10.1016/j.xinn.2021.100130 (<https://doi.org/10.1016%2Fj.xinn.2021.100130>). ISSN 2666-6758 (<https://search.worldcat.org/issn/2666-6758>). PMC 8454562 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8454562>). PMID 34557770 (<https://pubmed.ncbi.nlm.nih.gov/34557770>).
45. Hershkovitz, I.; May, H.; Sarig, R.; et al. (2021). "A Middle Pleistocene *Homo* from Neshar Ramla, Israel". *Science*. **372** (6549): 1424–1428. Bibcode:2021Sci...372.1424H (<https://ui.adsabs.harvard.edu/abs/2021Sci...372.1424H>). doi:10.1126/science.abh3169 (<https://doi.org/10.1126%2Fscience.abh3169>). S2CID 235628111 (<https://api.semanticscholar.org/CorpusID:235628111>).
46. Pr ufer, K.; et al. (2014). "The complete genome sequence of a Neanderthal from the Altai Mountains" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4031459>). *Nature*. **505** (7481): 43–49. Bibcode:2014Natur.505...43P (<https://ui.adsabs.harvard.edu/abs/2014Natur.505...43P>). doi:10.1038/nature12886 (<https://doi.org/10.1038%2Fnature12886>). PMC 4031459 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4031459>). PMID 24352235 (<https://pubmed.ncbi.nlm.nih.gov/24352235>).
47. Sawyer, S.; Renaud, G.; Viola, B.; Hublin, J. J. (2015). "Nuclear and mitochondrial DNA sequences from two Denisovan individuals" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4697428>). *Proceedings of the National Academy of Sciences*. **112** (51): 15696–15700.

- Bibcode:2015PNAS..11215696S (<https://ui.adsabs.harvard.edu/abs/2015PNAS..11215696S>). doi:10.1073/pnas.1519905112 (<https://doi.org/10.1073%2Fpnas.1519905112>). PMC 4697428 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4697428>). PMID 26630009 (<https://pubmed.ncbi.nlm.nih.gov/26630009>).
48. Rogers, A. R.; Harris, N. S.; Achenbach, A. A. (2020). "Neanderthal-Denisovan ancestors interbred with a distantly related hominin" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7032934>). *Science Advances*. **6** (8): eaay5483. Bibcode:2020SciA....6.5483R (<https://ui.adsabs.harvard.edu/abs/2020SciA....6.5483R>). doi:10.1126/sciadv.aay5483 (<https://doi.org/10.1126%2Fsciadv.aay5483>). PMC 7032934 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7032934>). PMID 32128408 (<https://pubmed.ncbi.nlm.nih.gov/32128408>).
 49. Sánchez-Quinto, F.; Lalueza-Fox, C. (2015). "Almost 20 years of Neanderthal palaeogenetics: adaptation, admixture, diversity, demography and extinction" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4275882>). *Philosophical Transactions of the Royal Society B*. **370** (1660): 20130374. doi:10.1098/rstb.2013.0374 (<https://doi.org/10.1098%2Frstb.2013.0374>). PMC 4275882 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4275882>). PMID 25487326 (<https://pubmed.ncbi.nlm.nih.gov/25487326>).
 50. French 2021, p. 133.
 51. Serangeli, J.; Bolus, M. (2008). "Out of Europe - The dispersal of a successful European hominin form" (https://web.archive.org/web/20200229163117/http://www.quartaer.eu/pdfs/2008/2008_serangeli.pdf) (PDF). *Quartär*. **55**: 83–98. Archived from the original (http://www.quartaer.eu/pdfs/2008/2008_serangeli.pdf) (PDF) on February 29, 2020. Retrieved October 11, 2022.
 52. Callander, J. (2004). "Dorothy Garrod's excavations in the Late Mousterian of Shukbah Cave in Palestine reconsidered". *Proceedings of the Prehistoric Society*. **70**: 207–231. doi:10.1017/S0079497X00001171 (<https://doi.org/10.1017%2FS0079497X00001171>). S2CID 191630165 (<https://api.semanticscholar.org/CorpusID:191630165>).
 53. Smith, T. M.; Tafforeau, P.; Reid, D. J.; et al. (2007). "Earliest evidence of modern human life history in North African early *Homo sapiens*" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1828706>). *Proceedings of the National Academy of Sciences of the United States of America*. **104** (15): 6128–6133. Bibcode:2007PNAS..104.6128S (<https://ui.adsabs.harvard.edu/abs/2007PNAS..104.6128S>). doi:10.1073/pnas.0700747104 (<https://doi.org/10.1073%2Fpnas.0700747104>). PMC 1828706 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1828706>). PMID 17372199 (<https://pubmed.ncbi.nlm.nih.gov/17372199>).
 54. Douka, K.; J., Zenobia; Lane, C.; et al. (2014). "The chronostratigraphy of the Haua Fteah cave (Cyrenaica, northeast Libya)" (<https://doi.org/10.1016%2Fj.jhevol.2013.10.001>). *Journal of Human Evolution*. **66**: 39–63. Bibcode:2014JHumE..66...39D (<https://ui.adsabs.harvard.edu/abs/2014JHumE..66...39D>). doi:10.1016/j.jhevol.2013.10.001 (<https://doi.org/10.1016%2Fj.jhevol.2013.10.001>). PMID 24331954 (<https://pubmed.ncbi.nlm.nih.gov/24331954>).
 55. Wu, X.-J.; Bruner, E. (2016). "The endocranial anatomy of Maba 1". *American Journal of Physical Anthropology*. **160** (4): 633–643. doi:10.1002/ajpa.22974 (<https://doi.org/10.1002%2Fajpa.22974>). PMID 26972814 (<https://pubmed.ncbi.nlm.nih.gov/26972814>).
 56. Nielsen, T. K.; Benito, B. M.; et al. (2017). "Investigating Neanderthal dispersal above 55°N in Europe during the Last Interglacial Complex". *Quaternary International*. **431**: 88–103. Bibcode:2017QuInt.431...88N (<https://ui.adsabs.harvard.edu/abs/2017QuInt.431...88N>). doi:10.1016/j.quaint.2015.10.039 (<https://doi.org/10.1016%2Fj.quaint.2015.10.039>).
 57. Nielsen, T. K.; Riede, F. (2018). "On research history and Neanderthal occupation at its northern margins". *European Journal of Archaeology*. **21** (4): 506–527. doi:10.1017/eea.2018.12 (<https://doi.org/10.1017%2Feea.2018.12>). S2CID 165849999 (<https://api.semanticscholar.org/CorpusID:165849999>).
 58. Pavlov, P.; Roebroeks, W.; Svendsen, J. I. (2004). "The Pleistocene colonization of northeastern Europe: a report on recent research". *Journal of Human Evolution*. **47** (1–2):

- 3–17. [Bibcode:2004JHumE..47....3P](https://ui.adsabs.harvard.edu/abs/2004JHumE..47....3P) (<https://ui.adsabs.harvard.edu/abs/2004JHumE..47....3P>). doi:10.1016/j.jhevol.2004.05.002 (<https://doi.org/10.1016%2Fj.jhevol.2004.05.002>). PMID 15288521 (<https://pubmed.ncbi.nlm.nih.gov/15288521>).
59. Slimak, L.; Svendsen, J. I.; Mangerud, J.; Plisson, H. (2011). "Late Mousterian persistence near the Arctic Circle". *Science*. **332** (6031): 841–845. [Bibcode:2011Sci...332..841S](https://ui.adsabs.harvard.edu/abs/2011Sci...332..841S) (<https://ui.adsabs.harvard.edu/abs/2011Sci...332..841S>). doi:10.1126/science.1203866 (<https://doi.org/10.1126%2Fscience.1203866>). JSTOR 29784275 (<https://www.jstor.org/stable/29784275>). PMID 21566192 (<https://pubmed.ncbi.nlm.nih.gov/21566192>). S2CID 24688365 (<https://api.semanticscholar.org/CorpusID:24688365>).
60. Slimak, L. (2012). "Response to "Comment on Late Mousterian persistence near the Arctic Circle" " (<https://doi.org/10.1126%2Fscience.1210211>). *Science*. **335** (6065): 167. [Bibcode:2012Sci...335..167S](https://ui.adsabs.harvard.edu/abs/2012Sci...335..167S) (<https://ui.adsabs.harvard.edu/abs/2012Sci...335..167S>). doi:10.1126/science.1210211 (<https://doi.org/10.1126%2Fscience.1210211>). PMID 22246757 (<https://pubmed.ncbi.nlm.nih.gov/22246757>).
61. Zwyns, N. (2012). "Comment on Late Mousterian persistence near the Arctic Circle" (<https://doi.org/10.1126%2Fscience.1209908>). *Science*. **335** (6065): 167. [Bibcode:2012Sci...335..167Z](https://ui.adsabs.harvard.edu/abs/2012Sci...335..167Z) (<https://ui.adsabs.harvard.edu/abs/2012Sci...335..167Z>). doi:10.1126/science.1209908 (<https://doi.org/10.1126%2Fscience.1209908>). PMID 22246757 (<https://pubmed.ncbi.nlm.nih.gov/22246757>).
62. Bocquet-Appel, J.; Degioanni, A. (2013). "Neanderthal demographic estimates". *Current Anthropology*. **54**: 202–214. doi:10.1086/673725 (<https://doi.org/10.1086%2F673725>). S2CID 85090309 (<https://api.semanticscholar.org/CorpusID:85090309>).
63. Pederzani, Sarah; Britton, Kate; Jones, Jennifer Rose; Agudo Pérez, Lucía; Geiling, Jeanne Marie; Marín-Arroyo, Ana B. (July 17, 2023). "Late Pleistocene Neanderthal exploitation of stable and mosaic ecosystems in northern Iberia shown by multi-isotope evidence" (https://www.cambridge.org/core/product/identifier/S0033589423000327/type/journal_article). *Quaternary Research*. **116**: 108–132. [Bibcode:2023QuRes.116..108P](https://ui.adsabs.harvard.edu/abs/2023QuRes.116..108P) (<https://ui.adsabs.harvard.edu/abs/2023QuRes.116..108P>). doi:10.1017/qua.2023.32 (<https://doi.org/10.1017%2Fqua.2023.32>). hdl:2164/21236 (<https://hdl.handle.net/2164%2F21236>). ISSN 0033-5894 (<https://search.worldcat.org/issn/0033-5894>). Retrieved February 7, 2024.
64. Juric, I.; Aeschbacher, S.; Coop, G. (2016). "The strength of selection against Neanderthal introgression" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5100956>). *PLOS Genetics*. **12** (11): e1006340. doi:10.1371/journal.pgen.1006340 (<https://doi.org/10.1371%2Fjournal.pgen.1006340>). PMC 5100956 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5100956>). PMID 27824859 (<https://pubmed.ncbi.nlm.nih.gov/27824859>).
65. Mafessoni, F.; Prüfer, K. (2017). "Better support for a small effective population size of Neandertals and a long shared history of Neandertals and Denisovans" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5715791>). *Proceedings of the National Academy of Sciences*. **114** (48): 10256–10257. [Bibcode:2017PNAS..11410256M](https://ui.adsabs.harvard.edu/abs/2017PNAS..11410256M) (<https://ui.adsabs.harvard.edu/abs/2017PNAS..11410256M>). doi:10.1073/pnas.1716918114 (<https://doi.org/10.1073%2Fpnas.1716918114>). PMC 5715791 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5715791>). PMID 29138326 (<https://pubmed.ncbi.nlm.nih.gov/29138326>).
66. Mellars, P.; French, J. C. (2011). "Tenfold population increase in Western Europe at the Neandertal-to-modern human transition". *Science*. **333** (6042): 623–627. [Bibcode:2011Sci...333..623M](https://ui.adsabs.harvard.edu/abs/2011Sci...333..623M) (<https://ui.adsabs.harvard.edu/abs/2011Sci...333..623M>). doi:10.1126/science.1206930 (<https://doi.org/10.1126%2Fscience.1206930>). PMID 21798948 (<https://pubmed.ncbi.nlm.nih.gov/21798948>). S2CID 28256970 (<https://api.semanticscholar.org/CorpusID:28256970>).
67. Trinkaus, E. (2011). "Late Pleistocene adult mortality patterns and modern human establishment" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3029716>). *Proceedings of the National Academy of Sciences*. **108** (4): 1267–1271. [Bibcode:2011PNAS..108.1267T](https://ui.adsabs.harvard.edu/abs/2011PNAS..108.1267T) (<https://ui.adsabs.harvard.edu/abs/2011PNAS..108.1267T>). doi:10.1073/pnas.1018700108 (<https://doi.org/10.1073%2Fpnas.1018700108>)

- [ps://doi.org/10.1073/pnas.1018/00108](https://doi.org/10.1073/pnas.1018/00108)). PMC 3029716 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3029716>). PMID 21220336 (<https://pubmed.ncbi.nlm.nih.gov/21220336>).
68. Trinkaus, E. (1995). "Neanderthal mortality patterns". *Journal of Archaeological Science*. **22** (1): 121–142. Bibcode:1995JArSc..22..121T (<https://ui.adsabs.harvard.edu/abs/1995JArSc..22..121T>). doi:10.1016/S0305-4403(95)80170-7 (<https://doi.org/10.1016%2FS0305-4403%2895%2980170-7>).
69. Pettitt, R. B. (2000). "Neanderthal lifecycles: developmental and social phases in the lives of the last archaics". *World Archaeology*. **31** (3): 351–366. doi:10.1080/00438240009696926 (<https://doi.org/10.1080%2F00438240009696926>). JSTOR 125106 (<https://www.jstor.org/stable/125106>). PMID 16475295 (<https://pubmed.ncbi.nlm.nih.gov/16475295>). S2CID 43859422 (<https://api.semanticscholar.org/CorpusID:43859422>).
70. Holloway, R. L. (1985). "The poor brain of *Homo sapiens neanderthalensis*: see what you please". In Delson, E. (ed.). *Ancestors: The hard evidence*. Alan R. Liss. ISBN 978-0-471-84376-4.
71. Beals, K.; Smith, C.; Dodd, S. (1984). "Brain size, cranial morphology, climate, and time machines" (<http://syslearn.oregonstate.edu/instruction/anth/smith/TimeMach1984.pdf>) (PDF). *Current Anthropology*. **12** (3): 301–30. doi:10.1086/203138 (<https://doi.org/10.1086%2F203138>). S2CID 86147507 (<https://api.semanticscholar.org/CorpusID:86147507>).
72. Amano, H.; Kikuchi, T.; Morita, Y.; Kondo, O.; Suzuki, H.; et al. (2015). "Virtual reconstruction of the Neanderthal Amud 1 cranium" (<https://www.zora.uzh.ch/id/eprint/120401/6/AmudPaper.pdf>) (PDF). *American Journal of Physical Anthropology*. **158** (2): 185–197. doi:10.1002/ajpa.22777 (<https://doi.org/10.1002%2Fajpa.22777>). hdl:10261/123419 (<https://hdl.handle.net/10261%2F123419>). PMID 26249757 (<https://pubmed.ncbi.nlm.nih.gov/26249757>). S2CID 36974955 (<https://api.semanticscholar.org/CorpusID:36974955>).
73. Hublin, Jean-Jacques; Neubauer, Simon; Gunz, Philipp (2015). "Brain Ontogeny and Life History in Pleistocene Hominins" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4305163>). *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*. **370** (1663): 1–11. doi:10.1098/rstb.2014.0062 (<https://doi.org/10.1098%2Frstb.2014.0062>). PMC 4305163 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4305163>). PMID 25602066 (<https://pubmed.ncbi.nlm.nih.gov/25602066>).
74. Bastir, Markus; Rosas, Antonio; Lieberman, Daniel E; O'Higgins, Paul (2008). "Middle Cranial Fossa Anatomy and the Origin of Modern Humans" (<http://nrs.harvard.edu/urn-3:HU.L.InstRepos:3716473>). *The Anatomical Record*. **291** (2): 130–140. doi:10.1002/ar.20636 (<https://doi.org/10.1002%2Far.20636>). PMID 18213701 (<https://pubmed.ncbi.nlm.nih.gov/18213701>). S2CID 9755048 (<https://api.semanticscholar.org/CorpusID:9755048>).
75. Gunz, Philipp; Maureille, Bruno; Hublin, Jean-Jacques (2010). "Brain Development after Birth Differs between Neanderthals and Modern Humans" (<https://doi.org/10.1016%2Fj.cub.2010.10.018>). *Current Biology*. **20** (21): R921 – R922. Bibcode:2010CBio...20.R921G (<https://ui.adsabs.harvard.edu/abs/2010CBio...20.R921G>). doi:10.1016/j.cub.2010.10.018 (<https://doi.org/10.1016%2Fj.cub.2010.10.018>). PMID 21056830 (<https://pubmed.ncbi.nlm.nih.gov/21056830>). S2CID 29295311 (<https://api.semanticscholar.org/CorpusID:29295311>).
76. de Azevedo, S.; González, M. F.; Cintas, C.; et al. (2017). "Nasal airflow simulations suggest convergent adaptation in Neanderthals and modern humans" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5703271>). *Proceedings of the National Academy of Sciences*. **114** (47): 12442–12447. Bibcode:2017PNAS..11412442D (<https://ui.adsabs.harvard.edu/abs/2017PNAS..11412442D>). doi:10.1073/pnas.1703790114 (<https://doi.org/10.1073%2Fpnas.1703790114>). PMC 5703271 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5703271>). PMID 29087302 (<https://pubmed.ncbi.nlm.nih.gov/29087302>).
77. Bastir, Markus; Rosas, Antonio; Gunz, Philipp; Peña-Melian, Angel; Manzi, Giorgio; Harvati, Katerina; Kruszynski, Robert; Stringer, Chris; Hublin, Jean-Jacques (2011). "Evolution of the Base of the Brain in Highly Encephalized Human Species" (<https://doi.org/10.1038%2Fncoms1593>). *Nature Communications*. **2** (2): 588. Bibcode:2011NatCo...2..588B (<https://ui.adsabs.harvard.edu/abs/2011NatCo...2..588B>). doi:10.1038/ncomms1593 (<https://doi.org/10.1038/ncomms1593>).

ds.harvard.edu/abs/2011NatCO...2..500B). doi:10.1038/ncomms1593 (<https://doi.org/10.1038%2Fncmms1593>). hdl:10261/123641 (<https://hdl.handle.net/10261%2F123641>). PMID 22158443 (<https://pubmed.ncbi.nlm.nih.gov/22158443>).

78. Clement, A. F.; Hillson, S. W.; Aiello, L. C. (2012). "Tooth wear, Neanderthal facial morphology and the anterior dental loading hypothesis" (<https://doi.org/10.1016%2Fj.jhevol.2011.11.014>). *Journal of Human Evolution*. **62** (3): 367–376. Bibcode:2012JHumE..62..367C (<https://ui.adsabs.harvard.edu/abs/2012JHumE..62..367C>). doi:10.1016/j.jhevol.2011.11.014 (<https://doi.org/10.1016%2Fj.jhevol.2011.11.014>). PMID 22341317 (<https://pubmed.ncbi.nlm.nih.gov/22341317>).
79. Helmuth, H. (1998). "Body height, body mass and surface area of the Neanderthals". *Zeitschrift für Morphologie und Anthropologie*. **82** (1): 1–12. JSTOR 25757530 (<https://www.jstor.org/stable/25757530>). PMID 9850627 (<https://pubmed.ncbi.nlm.nih.gov/9850627>).
80. Duveau, J.; Berillon, G.; Verna, C.; Laisné, G.; Cliquet, D. (2019). "The composition of a Neanderthal social group revealed by the hominin footprints at Le Rozel (Normandy, France)" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6765299>). *Proceedings of the National Academy of Sciences*. **116** (39): 19409–19414. Bibcode:2019PNAS..11619409D (<https://ui.adsabs.harvard.edu/abs/2019PNAS..11619409D>). doi:10.1073/pnas.1901789116 (<https://doi.org/10.1073%2Fpnas.1901789116>). PMC 6765299 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6765299>). PMID 31501334 (<https://pubmed.ncbi.nlm.nih.gov/31501334>).
81. Froehle, A. W.; Churchill, S. E. (2009). "Energetic competition between Neanderthals and anatomically modern humans" (<http://www.paleoanthro.org/journal/content/PA20090096.pdf>) (PDF). *PaleoAnthropology*: 96–116.
82. Bastir, M.; Ruíz, J. M. G.; Rueda, J.; López, G. G.; Gómez-Recio, M.; Beyer, B.; San Juan, A. F.; Navarro, E. (2022). "Variation in human 3D trunk shape and its functional implications in hominin evolution" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9273616>). *Scientific Reports*. **12**: 11762. doi:10.1038/s41598-022-15344-x (<https://doi.org/10.1038%2Fs41598-022-15344-x>). PMC 9273616 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9273616>). PMID 35817835 (<https://pubmed.ncbi.nlm.nih.gov/35817835>).
83. Froehle, A. W.; Churchill, S. E. (2009). "Energetic competition between Neanderthals and anatomically modern humans" (<http://paleoanthro.reedd.webfactional.com/static/journal/content/PA20090096.pdf>) (PDF). *PaleoAnthropology*: 96–116.
84. Holliday, T. W. (1997). "Postcranial evidence of cold adaptation in European Neanderthals". *American Journal of Physical Anthropology*. **104** (2): 245–258. doi:10.1002/(SICI)1096-8644(199710)104:2<245::AID-AJPA10>3.0.CO;2-# (<https://doi.org/10.1002%2F%28SICI%291096-8644%28199710%29104%3A2%3C245%3A%3AAID-AJPA10%3E3.0.CO%3B2-%23>). PMID 9386830 (<https://pubmed.ncbi.nlm.nih.gov/9386830>).
85. Trinkaus, E. (1981). "Neanderthal limb proportions and cold adaptation". In Stringer, C. B. (ed.). *Aspects of human evolution*. Taylor and Francis Ltd.
86. Weaver, T. D. (2009). "The meaning of Neanderthal skeletal morphology" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2752516>). *Proceedings of the National Academy of Sciences*. **106** (38): 16, 028–16, 033. doi:10.1073/pnas.0903864106 (<https://doi.org/10.1073%2Fpnas.0903864106>). PMC 2752516 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2752516>). PMID 19805258 (<https://pubmed.ncbi.nlm.nih.gov/19805258>).
87. Stewart, J.R.; García-Rodríguez, O.; Knul, M.V.; Sewell, L.; Montgomery, H.; Thomas, M.G.; Diekmann, Y. (2019). "Palaeoecological and genetic evidence for Neanderthal power locomotion as an adaptation to a woodland environment" (<https://www.researchgate.net/publication/329811193>). *Quaternary Science Reviews*. **217**: 310–315. Bibcode:2019QSRv..217..310S (<https://ui.adsabs.harvard.edu/abs/2019QSRv..217..310S>). doi:10.1016/j.quascirev.2018.12.023 (<https://doi.org/10.1016%2Fj.quascirev.2018.12.023>). S2CID 133980969 (<https://api.semanticscholar.org/CorpusID:133980969>).
88. Lalueza-Fox, C.; Rompler, H.; Caramelli, D.; et al. (2007). "A melanocortin 1 receptor allele suggests varying pigmentation among Neanderthals". *Science*. **318** (5855): 1453–1455. doi:10.1126/science.1141501 (<https://doi.org/10.1126/science.1141501>). PMID 17683322 (<https://pubmed.ncbi.nlm.nih.gov/17683322>).

- Bibcode:2007Sci...318.1453L (<https://ui.adsabs.harvard.edu/abs/2007Sci...318.1453L>). doi:10.1126/science.1147417 (<https://doi.org/10.1126%2Fscience.1147417>). PMID 17962522 (<https://pubmed.ncbi.nlm.nih.gov/17962522>). S2CID 10087710 (<https://api.semanticscholar.org/CorpusID:10087710>).
89. Cerqueira, C. C.; Piixão-Côrtés, V. R.; Zambra, F. M. B.; Hünemeier, T.; Bortolini, M. (2012). "Predicting *Homo* pigmentation phenotype through genomic data: From neanderthal to James Watson". *American Journal of Human Biology*. **24** (5): 705–709. doi:10.1002/ajhb.22263 (<https://doi.org/10.1002%2Fajhb.22263>). PMID 22411106 (<https://pubmed.ncbi.nlm.nih.gov/22411106>). S2CID 25853632 (<https://api.semanticscholar.org/CorpusID:25853632>).
90. Dannemann, M.; Kelso, J. (2017). "The contribution of Neanderthals to phenotypic variation in modern humans" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5630192>). *The American Journal of Human Genetics*. **101** (4): 584–585. doi:10.1016/j.ajhg.2017.09.010 (<https://doi.org/10.1016%2Fj.ajhg.2017.09.010>). PMC 5630192 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5630192>). PMID 28985494 (<https://pubmed.ncbi.nlm.nih.gov/28985494>).
91. Nakahashi, W. (2017). "The effect of trauma on Neanderthal culture: A mathematical analysis". *Homo*. **68** (2): 83–100. doi:10.1016/j.jchb.2017.02.001 (<https://doi.org/10.1016%2Fj.jchb.2017.02.001>). PMID 28238406 (<https://pubmed.ncbi.nlm.nih.gov/28238406>).
92. Trinkaus, E.; Villotte, S (2017). "External auditory exostoses and hearing loss in the Shanidar 1 Neandertal" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5650169>). *PLOS ONE*. **12** (10): e0186684. Bibcode:2017PLoSO..1286684T (<https://ui.adsabs.harvard.edu/abs/2017PLoSO..1286684T>). doi:10.1371/journal.pone.0186684 (<https://doi.org/10.1371%2Fjournal.pone.0186684>). PMC 5650169 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5650169>). PMID 29053746 (<https://pubmed.ncbi.nlm.nih.gov/29053746>).
93. Trinkaus, E.; Samsel, M.; Villotte, S. (2019). "External auditory exostoses among western Eurasian late Middle and Late Pleistocene humans" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6693685>). *PLOS ONE*. **14** (8): e0220464. Bibcode:2019PLoSO..1420464T (<https://ui.adsabs.harvard.edu/abs/2019PLoSO..1420464T>). doi:10.1371/journal.pone.0220464 (<https://doi.org/10.1371%2Fjournal.pone.0220464>). PMC 6693685 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6693685>). PMID 31412053 (<https://pubmed.ncbi.nlm.nih.gov/31412053>).
94. Camarós, E.; Cueto, M.; Lorenzo, C.; Villaverde, V. (2016). "Large carnivore attacks on hominins during the Pleistocene: a forensic approach with a Neanderthal example" (<https://www.researchgate.net/publication/276353034>). *Archaeological and Anthropological Sciences*. **8** (3): 635–646. Bibcode:2016ArAnS...8..635C (<https://ui.adsabs.harvard.edu/abs/2016ArAnS...8..635C>). doi:10.1007/s12520-015-0248-1 (<https://doi.org/10.1007%2Fs12520-015-0248-1>). hdl:10550/54275 (<https://hdl.handle.net/10550%2F54275>). S2CID 82001651 (<https://api.semanticscholar.org/CorpusID:82001651>).
95. Sánchez-Quinto, F.; Lalueza-Fox, C. (2015). "Almost 20 years of Neanderthal palaeogenetics: adaptation, admixture, diversity, demography and extinction" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4275882>). *Philosophical Transactions of the Royal Society B*. **370** (1660): 20130374. doi:10.1098/rstb.2013.0374 (<https://doi.org/10.1098%2Frstb.2013.0374>). PMC 4275882 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4275882>). PMID 25487326 (<https://pubmed.ncbi.nlm.nih.gov/25487326>).
96. Fabre, V.; Condemi, S.; Degioanni, A. (2009). "Genetic evidence of geographical groups among Neanderthals" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2664900>). *PLOS ONE*. **4** (4): e5151. Bibcode:2009PLoSO...4.5151F (<https://ui.adsabs.harvard.edu/abs/2009PLoSO...4.5151F>). doi:10.1371/journal.pone.0005151 (<https://doi.org/10.1371%2Fjournal.pone.0005151>). PMC 2664900 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2664900>). PMID 19367332 (<https://pubmed.ncbi.nlm.nih.gov/19367332>).
97. Hayden, B. (2012). "Neanderthal social structure?". *Oxford Journal of Archaeology*. **31** (1): 1–26. doi:10.1111/j.1468-0092.2011.00376.x (<https://doi.org/10.1111%2Fj.1468-0092.2011.00376.x>).
98. Fering, C. (2004). "Spatial patterning of Middle Palaeolithic sites". *Journal of Archaeological*

98. Galzy, C. (1994). Spatial patterning of middle Palaeolithic sites. *Journal of Anthropological Archaeology*. **13** (2): 153–160. doi:10.1006/jaar.1994.1010 (<https://doi.org/10.1006%2Fjaar.1994.1010>).
99. Stiller, M.; Baryshnikov, G.; Bocherens, H. (2010). "Withering away—25,000 years of genetic decline preceded cave bear extinction" (<https://doi.org/10.1093%2Fmolbev%2Fmsq083>). *Molecular Biology and Evolution*. **27** (5): 975–978. doi:10.1093/molbev/msq083 (<https://doi.org/10.1093%2Fmolbev%2Fmsq083>). PMID 20335279 (<https://pubmed.ncbi.nlm.nih.gov/20335279>).
100. Lalueza-Fox, C.; Rosas, A.; Estalrich, A. (2011). "Genetic evidence for patrilocal mating behavior among Neandertal groups" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3017130/>). *Proceedings of the National Academy of Sciences*. **108** (1): 250–253. doi:10.1073/pnas.1011553108 (<https://doi.org/10.1073%2Fpnas.1011553108>). PMC 3017130 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3017130/>). PMID 21173265 (<https://pubmed.ncbi.nlm.nih.gov/21173265/>).
101. Pearce, E.; Stringer, C.; Dunbar, R. I. M. (2013). "New insights into differences in brain organization between Neanderthals and anatomically modern humans" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3619466/>). *Proceedings of the Royal Society B*. **280** (1758): 20130168. doi:10.1098/rspb.2013.0168 (<https://doi.org/10.1098%2Frspb.2013.0168>). PMC 3619466 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3619466/>). PMID 23486442 (<https://pubmed.ncbi.nlm.nih.gov/23486442/>).
102. Sánchez-Quinto, F.; Lalueza-Fox, C. (2015). "Almost 20 years of Neanderthal palaeogenetics: adaptation, admixture, diversity, demography and extinction" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4275882/>). *Philosophical Transactions of the Royal Society B*. **370** (1660): 20130374. doi:10.1098/rstb.2013.0374 (<https://doi.org/10.1098%2Frstb.2013.0374>). PMC 4275882 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4275882/>). PMID 25487326 (<https://pubmed.ncbi.nlm.nih.gov/25487326/>).
103. Ruebens, K. (2013). "Regional behaviour among late Neanderthal groups in Western Europe: A comparative assessment of late Middle Palaeolithic bifacial tool variability" (<https://www.academia.edu/4182063>). *Journal of Human Evolution*. **65** (4): 341–362. Bibcode:2013JHumE..65..341R (<https://ui.adsabs.harvard.edu/abs/2013JHumE..65..341R>). doi:10.1016/j.jhevol.2013.06.009 (<https://doi.org/10.1016%2Fj.jhevol.2013.06.009>). PMID 23928352 (<https://pubmed.ncbi.nlm.nih.gov/23928352/>).
104. French, Jennifer C. (2024). "Sex, gender, and the division of labour in the European Middle and Upper Palaeolithic". *The Routledge Handbook of Gender Archaeology*. London: Routledge. pp. 161–174. doi:10.4324/9781003257530-14 (<https://doi.org/10.4324%2F9781003257530-14>). ISBN 978-1-003-25753-0.
105. Jaouen, K.; et al. (2019). "Exceptionally high $\delta^{15}\text{N}$ values in collagen single amino acids confirm Neanderthals as high-trophic level carnivores" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6421459/>). *Proceedings of the National Academy of Sciences*. **116** (11): 4928–4933. Bibcode:2019PNAS..116.4928J (<https://ui.adsabs.harvard.edu/abs/2019PNAS..116.4928J>). doi:10.1073/pnas.1814087116 (<https://doi.org/10.1073%2Fpnas.1814087116>). PMC 6421459 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6421459/>). PMID 30782806 (<https://pubmed.ncbi.nlm.nih.gov/30782806/>).
106. Tattersall 2015.
107. Dusseldorp, G. L. (2013). "Neanderthals and Cave Hyenas: Co-existence, Competition or Conflict?" (https://link.springer.com/content/pdf/10.1007%2F978-94-007-6766-9_12.pdf) (PDF). In Clark, J. L.; Speth, J. D. (eds.). *Zooarchaeology and Modern Human Origins*. Vertebrate paleobiology and paleoanthropology. Springer Science+Business Media Dordrecht. pp. 191–208. doi:10.1007/978-94-007-6766-9_12 (https://doi.org/10.1007%2F978-94-007-6766-9_12). ISBN 978-94-007-6765-2.
108. El Zaatari, S.; Grine, F. E.; Ungar, P. S.; Hublin, J.-J. (2016). "Neandertal versus modern human dietary responses to climatic fluctuations" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4917867/>). *PLoS ONE*. **11** (4): e0152277. Bibcode:2016PLoSO..1152277E (<https://ui.adsabs.harvard.edu/abs/2016PLoSO..1152277E>)

- PMC4847867). Bibcode:2014PLoSOne.114.0153277E. Bibcode:2014PLoSOne.1153277E (<https://ui.adsabs.harvard.edu/abs/2016PLoSOne.1153277E>). doi:10.1371/journal.pone.0153277 (<https://doi.org/10.1371/journal.pone.0153277>). PMC 4847867 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4847867>). PMID 27119336 (<https://pubmed.ncbi.nlm.nih.gov/27119336>).
109. Smith, G. M. (2015). "Neanderthal megafaunal exploitation in Western Europe and its dietary implications: A contextual reassessment of La Cotte de St Brelade (Jersey)". *Journal of Human Evolution*. **78**: 181–201. doi:10.1016/j.jhevol.2014.10.007 (<https://doi.org/10.1016/j.jhevol.2014.10.007>). ISSN 0047-2484 (<https://search.worldcat.org/issn/0047-2484>).
110. Gaudzinski-Windheuser, Sabine; Kindler, Lutz; MacDonald, Katharine; Roebroeks, Wil (February 3, 2023). "Hunting and processing of straight-tusked elephants 125,000 years ago: Implications for Neanderthal behavior" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9891704>). *Science Advances*. **9** (5): eadd8186. Bibcode:2023SciA...9D8186G (<https://ui.adsabs.harvard.edu/abs/2023SciA...9D8186G>). doi:10.1126/sciadv.add8186 (<https://doi.org/10.1126/sciadv.add8186>). ISSN 2375-2548 (<https://search.worldcat.org/issn/2375-2548>). PMC 9891704 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9891704>). PMID 36724231 (<https://pubmed.ncbi.nlm.nih.gov/36724231>).
111. Brown 2011.
112. Power, R. C.; Salazar-García, D. C.; Rubini, M.; Darlas, A.; Harvati, K.; Walker, M.; Hublin, J.; Henry, A. G. (2018). "Dental calculus indicates widespread plant use within the stable Neanderthal dietary niche". *Journal of Human Evolution*. **119**: 27–41. Bibcode:2018JHumE.119...27P (<https://ui.adsabs.harvard.edu/abs/2018JHumE.119...27P>). doi:10.1016/j.jhevol.2018.02.009 (<https://doi.org/10.1016/j.jhevol.2018.02.009>). hdl:10550/65536 (<https://hdl.handle.net/10550/65536>). ISSN 0047-2484 (<https://search.worldcat.org/issn/0047-2484>). PMID 29685752 (<https://pubmed.ncbi.nlm.nih.gov/29685752>). S2CID 13831823 (<https://api.semanticscholar.org/CorpusID:13831823>).
113. Shipley, G. P.; Kindscher, K. (2016). "Evidence for the paleoethnobotany of the Neanderthal: a review of the literature" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5098096>). *Scientifica*. **2016**: 1–12. doi:10.1155/2016/8927654 (<https://doi.org/10.1155/2016/8927654>). PMC 5098096 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5098096>). PMID 27843675 (<https://pubmed.ncbi.nlm.nih.gov/27843675>).
114. Krief, S.; Daujeard, C.; Moncel, M.; Lamon, N.; Reynolds, V. (2015). "Flavouring food: the contribution of chimpanzee behaviour to the understanding of Neanderthal calculus composition and plant use in Neanderthal diets" (<https://www.researchgate.net/publication/283861536>). *Antiquity*. **89** (344): 464–471. doi:10.15184/aqy.2014.7 (<https://doi.org/10.15184/aqy.2014.7>). S2CID 86646905 (<https://api.semanticscholar.org/CorpusID:86646905>).
115. Buckley, S.; Hardy, K.; Huffman, M. (2013). "Neanderthal self-medication in context" (<https://www.researchgate.net/publication/256374897>). *Antiquity*. **87** (337): 873–878. doi:10.1017/S0003598X00049528 (<https://doi.org/10.1017/S0003598X00049528>). S2CID 160563162 (<https://api.semanticscholar.org/CorpusID:160563162>).
116. Hardy, K.; Buckley, S.; Collins, M. J.; Estalrich, A. (2012). "Neanderthal medics? Evidence for food, cooking, and medicinal plants entrapped in dental calculus" (<https://www.researchgate.net/publication/229160372>). *The Science of Nature*. **99** (8): 617–626. Bibcode:2012NW....99..617H (<https://ui.adsabs.harvard.edu/abs/2012NW....99..617H>). doi:10.1007/s00114-012-0942-0 (<https://doi.org/10.1007/s00114-012-0942-0>). PMID 22806252 (<https://pubmed.ncbi.nlm.nih.gov/22806252>). S2CID 10925552 (<https://api.semanticscholar.org/CorpusID:10925552>).
117. Nabais, M.; Portero, R.; Zilhão, J. (2024). "Neanderthal brown crab recipes: A combined approach using experimental, archaeological and ethnographic evidence". *Historical Biology*. **36** (8): 1487–1495. Bibcode:2024HBio...36.1487N (<https://ui.adsabs.harvard.edu/abs/2024HBio...36.1487N>). doi:10.1080/08912963.2023.2220005 (<https://doi.org/10.1080/08912963.2023.2220005>). hdl:10366/156668 (<https://hdl.handle.net/10366/156668>).
118. Valensi, P.; Michel, V.; et al. (2013). "New data on human behavior from a 160,000 year old Acheulean occupation level at Lazaret cave, south-east France: An archaeozoological

118. ...approach". *Quaternary International*. **316**: 123–139. Bibcode:2013QuInt.316..123V (<https://ui.adsabs.harvard.edu/abs/2013QuInt.316..123V>). doi:10.1016/j.quaint.2013.10.034 (<https://doi.org/10.1016%2Fj.quaint.2013.10.034>).
119. Shipman 2015, pp. 120–143.
120. Romandini, M.; Terlato, G.; Nannini, N. (2018). "Bears and humans, a Neanderthal tale. Reconstructing uncommon behaviors from zooarchaeological evidence in southern Europe". *Journal of Archaeological Science*. **90**: 71–91. Bibcode:2018JArSc..90...71R (<https://ui.adsabs.harvard.edu/abs/2018JArSc..90...71R>). doi:10.1016/j.jas.2017.12.004 (<https://doi.org/10.1016%2Fj.jas.2017.12.004>). hdl:11392/2381729 (<https://hdl.handle.net/11392%2F2381729>). S2CID 53410125 (<https://api.semanticscholar.org/CorpusID:53410125>).
121. Ecker, Michaela; Bocherens, Hervé; Julien, Marie-Anne; Rivals, Florent; Raynal, Jean-Paul; Moncel, Marie-Hélène (October 2013). "Middle Pleistocene ecology and Neanderthal subsistence: Insights from stable isotope analyses in Payre (Ardèche, southeastern France)" (<https://linkinghub.elsevier.com/retrieve/pii/S0047248413001590>). *Journal of Human Evolution*. **65** (4): 363–373. doi:10.1016/j.jhevol.2013.06.013 (<https://doi.org/10.1016%2Fj.jhevol.2013.06.013>). PMID 23920410 (<https://pubmed.ncbi.nlm.nih.gov/23920410>).
122. Yravedra, J.; Yustos, M. (2015). "Cannibalism in the Neanderthal world: an exhaustive revision" (<https://www.researchgate.net/publication/316915426>). *Journal of Taphonomy*. **13** (1): 33–52.
123. Moncel, M.-H.; Chiotti, L.; Gaillard, C.; Onorardini, G.; Pleurdeau, D. (2012). "Non utilitarian objects in the Palaeolithic: emergence of the sense of precious?" (<https://www.researchgate.net/publication/230703161>). *Archaeology, Ethnology & Anthropology of Eurasia*. **401**: 25–27. doi:10.1016/j.aeae.2012.05.004 (<https://doi.org/10.1016%2Fj.aeae.2012.05.004>).
124. Hoffman, D. L.; Angelucci, D. E.; Villaverde, V.; Zapata, Z.; Zilhão, J. (2018). "Symbolic use of marine shells and mineral pigments by Iberian Neandertals 115,000 years ago" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5833998>). *Science Advances*. **4** (2): eaar5255. Bibcode:2018SciA...4.5255H (<https://ui.adsabs.harvard.edu/abs/2018SciA...4.5255H>). doi:10.1126/sciadv.aar5255 (<https://doi.org/10.1126%2Fsciadv.aar5255>). PMC 5833998 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5833998>). PMID 29507889 (<https://pubmed.ncbi.nlm.nih.gov/29507889>).
125. Finlayson 2019, pp. 129–132.
126. Finlayson, S.; Finlayson, G.; Guzman, F. G.; Finlayson, C. (2019). "Neanderthals and the cult of the sun bird". *Quaternary Science Reviews*. **217**: 217–224. Bibcode:2019QSRv..217..217F (<https://ui.adsabs.harvard.edu/abs/2019QSRv..217..217F>). doi:10.1016/j.quascirev.2019.04.010 (<https://doi.org/10.1016%2Fj.quascirev.2019.04.010>). S2CID 149949579 (<https://api.semanticscholar.org/CorpusID:149949579>).
127. Hardy, B. L.; Moncel, M.-H.; Kerfant, C.; Lebon, M.; Bellot-Gurlet, L.; Mélard, N. (April 9, 2020). "Direct evidence of Neanderthal fibre technology and its cognitive and behavioral implications" (<https://www.nature.com/articles/s41598-020-61839-w>). *Scientific Reports*. **10** (1). doi:10.1038/s41598-020-61839-w (<https://doi.org/10.1038%2Fs41598-020-61839-w>). ISSN 2045-2322 (<https://search.worldcat.org/issn/2045-2322>). PMC 7145842 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7145842>). PMID 32273518 (<https://pubmed.ncbi.nlm.nih.gov/32273518>).
128. Majkić, A.; d'Errico, F.; Stepanchuk, V. (2018). "Assessing the significance of Palaeolithic engraved cortexes. A case study from the Mousterian site of Kiik-Koba, Crimea" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5931501>). *PLOS ONE*. **13** (5): e0195049. Bibcode:2018PLoSO..1395049M (<https://ui.adsabs.harvard.edu/abs/2018PLoSO..1395049M>). doi:10.1371/journal.pone.0195049 (<https://doi.org/10.1371%2Fjournal.pone.0195049>). PMC 5931501 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5931501>). PMID 29718916 (<https://pubmed.ncbi.nlm.nih.gov/29718916>).
129. Marquet, J.-C.; Freiesleben, T. H.; Thomsen, K. J. (2023). "The earliest unambiguous Neanderthal engravings on cave walls: La Roche-Cotard, Loire Valley, France" (<https://doi.org/10.1016/j.jhevol.2023.06.013>).

- Neanderthal engravings on cave walls. La Vache-Coutard, Loire valley, France (<https://doi.org/10.1371/journal.pone.0286568>). *PLOS ONE*. **18** (6): e0286568. Bibcode:2023PLoSO..1886568M (<https://ui.adsabs.harvard.edu/abs/2023PLoSO..1886568M>). doi:10.1371/journal.pone.0286568 (<https://doi.org/10.1371/journal.pone.0286568>). PMID 37343032 (<https://pubmed.ncbi.nlm.nih.gov/37343032>).
130. Roebroeks, W.; Sier, M. J.; Nielsen, T. K.; et al. (2012). "Use of red ochre by early Neandertals" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3277516>). *Proceedings of the National Academy of Sciences of the United States of America*. **109** (6): 1889–1894. Bibcode:2012PNAS..109.1889R (<https://ui.adsabs.harvard.edu/abs/2012PNAS..109.1889R>). doi:10.1073/pnas.1112261109 (<https://doi.org/10.1073/pnas.1112261109>). PMC 3277516 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3277516>). PMID 22308348 (<https://pubmed.ncbi.nlm.nih.gov/22308348>).
131. Morley, Iain (2006). "Mousterian Musicianship? The Case of the Divje Babe I Bone" (<https://www.researchgate.net/publication/227587744>). *Oxford Journal of Archaeology*. **25** (4): 317–333. doi:10.1111/j.1468-0092.2006.00264.x (<https://doi.org/10.1111/j.1468-0092.2006.00264.x>). Retrieved May 30, 2024.
132. Lycett, S. J.; von Cramon-Taubadel, N. (2013). "A 3D morphometric analysis of surface geometry in Levallois cores: patterns of stability and variability across regions and their implications". *Journal of Archaeological Science*. **40** (3): 1508–1517. Bibcode:2013JArSc..40.1508L (<https://ui.adsabs.harvard.edu/abs/2013JArSc..40.1508L>). doi:10.1016/j.jas.2012.11.005 (<https://doi.org/10.1016/j.jas.2012.11.005>).
133. Villa, P.; Soriano, S.; Pollarolo, L. (2020). "Neandertals on the beach: use of marine resources at Grotta dei Moscerini (Latium, Italy)" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6961883>). *PLOS ONE*. **15** (1): e0226690. Bibcode:2020PLoSO..1526690V (<https://ui.adsabs.harvard.edu/abs/2020PLoSO..1526690V>). doi:10.1371/journal.pone.0226690 (<https://doi.org/10.1371/journal.pone.0226690>). PMC 6961883 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6961883>). PMID 31940356 (<https://pubmed.ncbi.nlm.nih.gov/31940356>).
134. Martisius, N. L.; Welker, F.; Dogandžić, T.; et al. (2020). "Non-destructive ZooMS identification reveals strategic bone tool raw material selection by Neandertals" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7210944>). *Scientific Reports*. **10** (1): 7746. Bibcode:2020NatSR..10.7746M (<https://ui.adsabs.harvard.edu/abs/2020NatSR..10.7746M>). doi:10.1038/s41598-020-64358-w (<https://doi.org/10.1038/s41598-020-64358-w>). PMC 7210944 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7210944>). PMID 32385291 (<https://pubmed.ncbi.nlm.nih.gov/32385291>).
135. Degano, I.; Soriano, S.; Villa, P.; Pollarolo, L.; Lukejko, J. J.; Jacobs, Z.; Douka, K.; Vitagliano, S.; Tozzi, C. (2019). "Hafting of Middle Paleolithic tools in Latium (central Italy): new data from Fossellone and Sant'Agostino caves" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6586293>). *PLOS ONE*. **14** (6): e0213473. Bibcode:2019PLoSO..1413473D (<https://ui.adsabs.harvard.edu/abs/2019PLoSO..1413473D>). doi:10.1371/journal.pone.0213473 (<https://doi.org/10.1371/journal.pone.0213473>). PMC 6586293 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6586293>). PMID 31220106 (<https://pubmed.ncbi.nlm.nih.gov/31220106>).
136. Allington-Jones, L (2015). "The Clacton Spear: The Last One Hundred Years". *Archaeological Journal*. **172** (2): 277–278. doi:10.1080/00665983.2015.1008839 (<https://doi.org/10.1080/00665983.2015.1008839>). hdl:10141/622351 (<https://hdl.handle.net/10141/622351>).
137. Schoch, Werner H.; Bigga, Gerlinde; Böhner, Utz; Richter, Pascale; Terberger, Thomas (December 2015). "New insights on the wooden weapons from the Paleolithic site of Schöningen" (<https://linkinghub.elsevier.com/retrieve/pii/S0047248415002080>). *Journal of Human Evolution*. **89**: 214–225. doi:10.1016/j.jhevol.2015.08.004 (<https://doi.org/10.1016/j.jhevol.2015.08.004>).
138. Milks, A. (2020) *Yew wood, would you? An exploration of the selection of wood for Pleistocene spears* (<https://sticks-and-stones.blog/wp-content/uploads/2022/11/milks-2021.pdf>). In: Berihuete-Azorin, M., Martin Seijo, M., Lopez-Bulto, O. and Pique, R. (eds.) *The*

Missing Woodland Resources: Archaeobotanical studies of the use of plant raw materials. *Advances in Archaeobotany*, 6 (6). Barkhuis Publishing, Groningen, pp. 5-22. ISBN 9789493194359

139. Sorensen, A. C.; Claud, E.; Soressi, M. (2018). "Neandertal fire-making technology inferred from microwear analysis" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6053370>). *Scientific Reports*. **8** (1): 10065. Bibcode:2018NatSR...810065S (<https://ui.adsabs.harvard.edu/abs/2018NatSR...810065S>). doi:10.1038/s41598-018-28342-9 (<https://doi.org/10.1038%2Fs41598-018-28342-9>). ISSN 2045-2322 (<https://search.worldcat.org/issn/2045-2322>). PMC 6053370 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6053370>). PMID 30026576 (<https://pubmed.ncbi.nlm.nih.gov/30026576>).
140. Brittingham, A.; Hren, M. T.; Hartman, G.; Wilkinson, K. N.; Mallol, C.; Gasparyan, B.; Adler, D. S. (2019). "Geochemical evidence for the control of fire by Middle Palaeolithic hominins" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6814844>). *Scientific Reports*. **9** (1): 15368. Bibcode:2019NatSR...915368B (<https://ui.adsabs.harvard.edu/abs/2019NatSR...915368B>). doi:10.1038/s41598-019-51433-0 (<https://doi.org/10.1038%2Fs41598-019-51433-0>). PMC 6814844 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6814844>). PMID 31653870 (<https://pubmed.ncbi.nlm.nih.gov/31653870>).
141. Heyes, P. J.; Anastasakis, K.; de Jong, W.; van Hoesel, A.; Roebroeks, W.; Soressi, M. (2016). "Selection and Use of Manganese Dioxide by Neanderthals" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4770591>). *Scientific Reports*. **6** (1): 22,159. Bibcode:2016NatSR...622159H (<https://ui.adsabs.harvard.edu/abs/2016NatSR...622159H>). doi:10.1038/srep22159 (<https://doi.org/10.1038%2Fsrep22159>). PMC 4770591 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4770591>). PMID 26922901 (<https://pubmed.ncbi.nlm.nih.gov/26922901>).
142. Angelucci, Diego E.; Nabais, Mariana; Zilhão, João (2023). "Formation processes, fire use, and patterns of human occupation across the Middle Palaeolithic (MIS 5a-5b) of Gruta da Oliveira (Almonda karst system, Torres Novas, Portugal)" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10566745>). *PLOS ONE*. **18** (10): e0292075. Bibcode:2023PLoSO..1892075A (<https://ui.adsabs.harvard.edu/abs/2023PLoSO..1892075A>). doi:10.1371/journal.pone.0292075 (<https://doi.org/10.1371%2Fjournal.pone.0292075>). PMC 10566745 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10566745>). PMID 37819902 (<https://pubmed.ncbi.nlm.nih.gov/37819902>).
143. Kedar, Y.; Barkai, R. (2019). "The significance of air circulation and hearth location at Paleolithic cave sites" (<https://doi.org/10.5334%2Fq.52>). *Open Quaternary*. **5** (1): 4. doi:10.5334/oq.52 (<https://doi.org/10.5334%2Fq.52>).
144. Collard, M.; Tarle, L.; Sandgathe, D.; Allan, A. (2016). "Faunal evidence for a difference in clothing use between Neanderthals and early modern humans in Europe". *Journal of Anthropological Archaeology*. **44**: 235–246. doi:10.1016/j.jaa.2016.07.010 (<https://doi.org/10.1016%2Fj.jaa.2016.07.010>). hdl:2164/9989 (<https://hdl.handle.net/2164%2F9989>).
145. Wales, N. (2012). "Modeling Neanderthal clothing using ethnographic analogues". *Journal of Human Evolution*. **63** (6): 781–795. Bibcode:2012JHumE..63..781W (<https://ui.adsabs.harvard.edu/abs/2012JHumE..63..781W>). doi:10.1016/j.jhevol.2012.08.006 (<https://doi.org/10.1016%2Fj.jhevol.2012.08.006>). PMID 23084621 (<https://pubmed.ncbi.nlm.nih.gov/23084621>).
146. Mukhopadhyay, A.; Panovska, S.; Garvey, R.; Liemohn, M. W.; Ganjushkina, N.; Brenner, A.; Usoskin, I.; Balikhin, M.; Welling, D. T. (2025). "Wandering of the auroral oval 41,000 Years Ago" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC12002135>). *Science Advances*. **11** (16). doi:10.1126/sciadv.adq7275 (<https://doi.org/10.1126%2Fsciadv.adq7275>). PMC 12002135 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC12002135>). PMID 40238891 (<https://pubmed.ncbi.nlm.nih.gov/40238891>).
147. Spikins, P.; Needham, A.; Wright, B. (2019). "Living to fight another day: The ecological and evolutionary significance of Neanderthal healthcare" (<https://doi.org/10.1016%2Fj.quascirev.2018.08.011>). *Quaternary Science Reviews*. **217**: 98–118. Bibcode:2019QSRv..217...98S (h

- <https://ui.adsabs.harvard.edu/abs/2019QSRv..217...98S>).
[doi:10.1016/j.quascirev.2018.08.011](https://doi.org/10.1016/j.quascirev.2018.08.011) (<https://doi.org/10.1016%2Fj.quascirev.2018.08.011>).
148. Ferentinos, G.; Gkioni, M.; Geraga, M.; Papatheodorou, G. (2012). "Early seafaring activity in the southern Ionian Islands, Mediterranean Sea". *Journal of Archaeological Science*. **39** (7): 2167–2176. Bibcode:2011JQS....26..553S (<https://ui.adsabs.harvard.edu/abs/2011JQS....26..553S>). [doi:10.1016/j.jas.2012.01.032](https://doi.org/10.1016/j.jas.2012.01.032) (<https://doi.org/10.1016%2Fj.jas.2012.01.032>).
149. Broodbank 2013, pp. 107–108.
150. Dediu, D.; Levinson, S. C. (2018). "Neanderthal language revisited: not only us" (https://pure.mpg.de/rest/items/item_2521815_7/component/file_2538918/content). *Current Opinion in Behavioral Sciences*. **21**: 49–55. [doi:10.1016/j.cobeha.2018.01.001](https://doi.org/10.1016/j.cobeha.2018.01.001) (<https://doi.org/10.1016%2Fj.cobeha.2018.01.001>). [hdl:21.11116/0000-0000-1667-4](https://hdl.handle.net/21.11116/0000-0000-1667-4) (<https://hdl.handle.net/21.11116%2F0000-0000-1667-4>). S2CID 54391128 (<https://api.semanticscholar.org/CorpusID:54391128>).
151. Johansson, S. (2015). "Language abilities in Neanderthals" (<https://doi.org/10.1146%2Fannurev-linguist-030514-124945>). *Annual Review of Linguistics*. **1**: 311–322. [doi:10.1146/annurev-linguist-030514-124945](https://doi.org/10.1146/annurev-linguist-030514-124945) (<https://doi.org/10.1146%2Fannurev-linguist-030514-124945>).
152. Whiting, K.; Konstantakos, L.; Sadler, G.; Gill, C. (2018). "Were Neanderthals rational? A stoic approach" (<https://doi.org/10.3390%2Fh7020039>). *Humanities*. **7** (2): 39. [doi:10.3390/h7020039](https://doi.org/10.3390/h7020039) (<https://doi.org/10.3390%2Fh7020039>).
153. K. Ohnuma; K. Aoki; T. Akazawa (1997). "Transmission of tool-making through verbal and non-verbal communication: Preliminary experiments in Levallois flake production" (<https://doi.org/10.1537%2Fase.105.159>). *Journal of Anthropological Sciences*. **105** (3): 159–68. [doi:10.1537/ase.105.159](https://doi.org/10.1537/ase.105.159) (<https://doi.org/10.1537%2Fase.105.159>).
154. J.T. Laitman; .S. Reidenberg; D.R. Friedland; P.J. Gannon (1991). "What sayeth thou Neanderthal? A look at the evolution of their vocal tract and speech" (<https://doi.org/10.1002%2Fajpa.1330340505>). *American Journal of Physical Anthropology*. **34** (S12): 109. [doi:10.1002/ajpa.1330340505](https://doi.org/10.1002/ajpa.1330340505) (<https://doi.org/10.1002%2Fajpa.1330340505>).
155. Mozzi, A.; Forni, D.; Clerici, M.; Pozzoli, U.; Mascheretti, S. (2016). "The evolutionary history of genes involved in spoken and written language: beyond FOXP2" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4766443>). *Scientific Reports*. **6**: 22157. Bibcode:2016NatSR...622157M (<https://ui.adsabs.harvard.edu/abs/2016NatSR...622157M>). [doi:10.1038/srep22157](https://doi.org/10.1038/srep22157) (<https://doi.org/10.1038%2Fsrep22157>). PMC 4766443 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4766443>). PMID 26912479 (<https://pubmed.ncbi.nlm.nih.gov/26912479>).
156. Wunn, I. (2001). "Cave bear worship in the Paleolithic" (https://www.udc.es/files/iux/almacen/articulos/cd26_art32.pdf) (PDF). *Cadernos do Laboratorio Xeolóxico de Laxe*. **26**: 457–463.
157. Pettitt, Paul (2017). *The Oxford Handbook of Archaeology* (<https://global.oup.com/academic/product/the-oxford-handbook-of-archaeology-9780198855200?cc=us&lang=en&>). New York: Oxford University Press. pp. 354–355. ISBN 978-0-19-885520-0. Retrieved July 30, 2022.
158. Spikins, P.; Hitchens, G.; Needham, A.; et al. (2014). "The Cradle of Thought: Growth, Learning, Play and Attachment in Neanderthal Children" (http://eprints.whiterose.ac.uk/83027/1/NeanderthalChildhood_OA_Images_sml.pdf) (PDF). *Oxford Journal of Archaeology*. **33** (2): 111–134. [doi:10.1111/ojoa.12030](https://doi.org/10.1111/ojoa.12030) (<https://doi.org/10.1111%2Fojoa.12030>).
159. Leroi-Gourhan, A. (1975). "The flowers found with Shanidar IV, a Neanderthal burial in Iraq". *Science*. **190** (4214): 562–564. Bibcode:1975Sci...190..562L (<https://ui.adsabs.harvard.edu/abs/1975Sci...190..562L>). [doi:10.1126/science.190.4214.562](https://doi.org/10.1126/science.190.4214.562) (<https://doi.org/10.1126%2Fscience.190.4214.562>). S2CID 140686473 (<https://api.semanticscholar.org/CorpusID:140686473>).
160. Solecki, R. S. (1975). "Shanidar IV: a Neanderthal flower burial in northern Iraq". *Science*

160. Conrath, H. G. (1976). "Shanidar IV: a Neanderthal flower burial in northern Iraq". *Science*. **190** (4217): 880–881. Bibcode:1975Sci...190..880S (<https://ui.adsabs.harvard.edu/abs/1975Sci...190..880S>). doi:10.1126/science.190.4217.880 (<https://doi.org/10.1126%2Fscience.190.4217.880>). S2CID 71625677 (<https://api.semanticscholar.org/CorpusID:71625677>).
161. Sommer, J. D. (1999). "The Shanidar IV 'flower burial': a re-evaluation of Neanderthal burial ritual". *Cambridge Archaeological Journal*. **9** (1): 127–129. doi:10.1017/s0959774300015249 (<https://doi.org/10.1017%2Fs0959774300015249>). S2CID 162496872 (<https://api.semanticscholar.org/CorpusID:162496872>).
162. Fu, Q.; Hajdinjak, M.; Moldovan, O. T.; et al. (2015). "An early modern human from Romania with a recent Neanderthal ancestor" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4537386>). *Nature*. **524** (7564): 216–219. Bibcode:2015Natur.524..216F (<https://ui.adsabs.harvard.edu/abs/2015Natur.524..216F>). doi:10.1038/nature14558 (<https://doi.org/10.1038%2Fnature14558>). PMC 4537386 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4537386>). PMID 26098372 (<https://pubmed.ncbi.nlm.nih.gov/26098372>).
163. Cairney, C. T. (1989). *Clans and families of Ireland and Scotland, an ethnography of the Gael* (<http://www.electricscotland.com/webclans/cairney/14.htm>). McFarland. p. 14. ISBN 978-0-89950-362-2.
164. Huxley, T. (1891). "The Aryan question and pre-historic man" (<http://aleph0.clarku.edu/huxley/CE7/Aryan.html>). *The Popular Science Monthly*. **38**: 512–516.
165. Steensby, H. P. (1907). "Racestudier i Danmark" (http://img.kb.dk/tidsskriftdk/pdf/gto/gto_0019-PDF/gto_0019_67206.pdf) [Race Studies in Denmark] (PDF). *Geographical Journal* (in Danish). **9**. Geografisk Tidsskrift.
166. Coon, C. S. (1962). "The origin of races" (<https://archive.org/details/B-001-001-289/page/n631>). *Science*. **140** (3563). Knopf: 548–549. doi:10.1126/science.140.3563.208 (<https://doi.org/10.1126%2Fscience.140.3563.208>). PMID 14022816 (<https://pubmed.ncbi.nlm.nih.gov/14022816>).
167. Tattersall, I.; Schwartz, J. H. (1999). "Hominids and hybrids: The place of Neanderthals in human evolution" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC33580>). *Proceedings of the National Academy of Sciences*. **96** (13): 7117–19. Bibcode:1999PNAS...96.7117T (<https://ui.adsabs.harvard.edu/abs/1999PNAS...96.7117T>). doi:10.1073/pnas.96.13.7117 (<https://doi.org/10.1073%2Fpnas.96.13.7117>). JSTOR 48019 (<https://www.jstor.org/stable/48019>). PMC 33580 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC33580>). PMID 10377375 (<https://pubmed.ncbi.nlm.nih.gov/10377375>).
168. Duarte, C.; Maurício, J.; Pettitt, P. B.; Souto, P.; Trinkaus, E.; van der Plicht, H.; Zilhão, J. (1999). "The early Upper Paleolithic human skeleton from the Abrigo do Lagar Velho (Portugal) and modern human emergence in Iberia" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC22133>). *Proceedings of the National Academy of Sciences of the United States of America*. **96** (13): 7604–7609. Bibcode:1999PNAS...96.7604D (<https://ui.adsabs.harvard.edu/abs/1999PNAS...96.7604D>). doi:10.1073/pnas.96.13.7604 (<https://doi.org/10.1073%2Fpnas.96.13.7604>). PMC 22133 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC22133>). PMID 10377462 (<https://pubmed.ncbi.nlm.nih.gov/10377462>).
169. Hublin, J. J. (2009). "The origin of Neandertals" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2752594>). *Proceedings of the National Academy of Sciences*. **106** (38): 16022–16027. Bibcode:2009PNAS..10616022H (<https://ui.adsabs.harvard.edu/abs/2009PNAS..10616022H>). doi:10.1073/pnas.0904119106 (<https://doi.org/10.1073%2Fpnas.0904119106>). JSTOR 40485013 (<https://www.jstor.org/stable/40485013>). PMC 2752594 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2752594>). PMID 19805257 (<https://pubmed.ncbi.nlm.nih.gov/19805257>).
170. Harvati, K.; Frost, S. R.; McNulty, K. P. (2004). "Neanderthal taxonomy reconsidered: implications of 3D primate models of intra- and interspecific differences" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC337021>). *Proceedings of the National Academy of Sciences*. **101** (5): 1147–52. Bibcode:2004PNAS..101.1147H (<https://ui.adsabs.harvard.edu/abs/2004PNAS..101.1147H>). doi:10.1073/pnas.0308085100 (<https://doi.org/10.1073%2Fpnas.0308085100>).

- 85100). PMC 337021 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC337021>). PMID 14745010 (<https://pubmed.ncbi.nlm.nih.gov/14745010>).
171. Soficaru, A.; Dobos, A.; Trinkaus, E. (2006). "Early modern humans from the Peștera Muierii, Baia de Fier, Romania" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1859909>). *Proceedings of the National Academy of Sciences*. **103** (46): 17196–17201. Bibcode:2006PNAS..10317196S (<https://ui.adsabs.harvard.edu/abs/2006PNAS..10317196S>). doi:10.1073/pnas.0608443103 (<https://doi.org/10.1073%2Fpnas.0608443103>). JSTOR 30052409 (<https://www.jstor.org/stable/30052409>). PMC 1859909 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1859909>). PMID 17085588 (<https://pubmed.ncbi.nlm.nih.gov/17085588>).
172. Reich 2018.
173. Daniel Harris; Alexander Platt; Matthew E.B. Hansen; Shaohua Fan; Michael A. McQuillan; Thomas Nyambo; Sununguko Wata Mpoloka; Gaonyadiwe George Mokone; Gurja Belay; Charles Fokunang; Alfred K. Njamnshi; Sarah A. Tishkoff (2023). "Diverse African genomes reveal selection on ancient modern human introgressions in Neanderthals" (<https://www.sciencedirect.com/science/article/pii/S0960982223013155>). *Current Biology*. **33** (22): 4905–4916.e5. doi:10.1016/j.cub.2023.09.066 (<https://doi.org/10.1016%2Fj.cub.2023.09.066>). ISSN 0960-9822 (<https://search.worldcat.org/issn/0960-9822>). PMC 10841429 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10841429>). Retrieved May 8, 2024.
174. Chen, L.; Wolf, A. B.; Fu, W.; Akey, J. M. (2020). "Identifying and Interpreting Apparent Neanderthal Ancestry in African Individuals" (<https://doi.org/10.1016%2Fj.cell.2020.01.012>). *Cell*. **180** (4): 677–687.e16. doi:10.1016/j.cell.2020.01.012 (<https://doi.org/10.1016%2Fj.cell.2020.01.012>). PMID 32004458 (<https://pubmed.ncbi.nlm.nih.gov/32004458>). S2CID 210955842 (<https://api.semanticscholar.org/CorpusID:210955842>).
175. Vernot, B.; Akey, J. M. (2014). "Resurrecting surviving Neandertal lineages from modern human genomes" (<https://doi.org/10.1126%2Fscience.1245938>). *Science*. **343** (6174): 1017–1021. Bibcode:2014Sci...343.1017V (<https://ui.adsabs.harvard.edu/abs/2014Sci...343.1017V>). doi:10.1126/science.1245938 (<https://doi.org/10.1126%2Fscience.1245938>). PMID 24476670 (<https://pubmed.ncbi.nlm.nih.gov/24476670>). S2CID 23003860 (<https://api.semanticscholar.org/CorpusID:23003860>).
176. Reilly, Patrick F.; Tjahjadi, Audrey; Miller, Samantha L.; Akey, Joshua M.; Tucci, Serena (September 2022). "The contribution of Neanderthal introgression to modern human traits" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9741939>). *Current Biology*. **32** (18): R970 – R983. Bibcode:2022CBio...32.R970R (<https://ui.adsabs.harvard.edu/abs/2022CBio...32.R970R>). doi:10.1016/j.cub.2022.08.027 (<https://doi.org/10.1016%2Fj.cub.2022.08.027>). PMC 9741939 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9741939>). PMID 36167050 (<https://pubmed.ncbi.nlm.nih.gov/36167050>).
177. Chevy, Elizabeth T.; Huerta-Sánchez, Emilia; Ramachandran, Sohini (August 14, 2023). "Integrating sex-bias into studies of archaic introgression on chromosome X" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10449224>). *PLOS Genetics*. **19** (8): e1010399. doi:10.1371/journal.pgen.1010399 (<https://doi.org/10.1371%2Fjournal.pgen.1010399>). ISSN 1553-7404 (<https://search.worldcat.org/issn/1553-7404>). PMC 10449224 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10449224>). PMID 37578977 (<https://pubmed.ncbi.nlm.nih.gov/37578977>). "We have shown that the observed low level of archaic coverage on chromosome X could be explained merely by a reduction in the effect of heterosis and sex-biases in the introgression events, without involving a more complex model with hybrid incompatibilities. Our work also suggests that negative selection was likely acting on archaic variants, and provides an appropriate set of null models for evaluating positive selection on introgressed segments on chromosome X."
178. Dolgova, O.; Lao, O. (2018). "Evolutionary and medical consequences of archaic introgression into modern human genomes" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6070777>). *Genes*. **9** (7): 358. doi:10.3390/genes9070358 (<https://doi.org/10.3390%2Fgenes9070358>). PMID 30707777 (<https://pubmed.ncbi.nlm.nih.gov/30707777>).

90/U358). PMC 60/U/// (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC60/U///>). PMID 30022013 (<https://pubmed.ncbi.nlm.nih.gov/30022013>).

179. Nédélec, Y.; Sanz, J.; Baharian, G.; et al. (2016). "Genetic ancestry and natural selection drive population differences in immune responses to pathogens" (<https://doi.org/10.1016%2Fj.cell.2016.09.025>). *Cell*. **167** (3): 657–669. doi:10.1016/j.cell.2016.09.025 (<https://doi.org/10.1016%2Fj.cell.2016.09.025>). PMID 27768889 (<https://pubmed.ncbi.nlm.nih.gov/27768889>).
180. Warren, Matthew (2018). "Mum's a Neanderthal, dad's a Denisovan: First discovery of an ancient-human hybrid" (<https://doi.org/10.1038%2Fd41586-018-06004-0>). *Nature News*. **560** (7719): 417–418. Bibcode:2018Natur.560..417W (<https://ui.adsabs.harvard.edu/abs/2018Natur.560..417W>). doi:10.1038/d41586-018-06004-0 (<https://doi.org/10.1038%2Fd41586-018-06004-0>). PMID 30135540 (<https://pubmed.ncbi.nlm.nih.gov/30135540>).
181. Pennisi, E. (2013). "More genomes from Denisova Cave show mixing of early human groups". *Science*. **340** (6134): 799. Bibcode:2013Sci...340..799P (<https://ui.adsabs.harvard.edu/abs/2013Sci...340..799P>). doi:10.1126/science.340.6134.799 (<https://doi.org/10.1126%2Fscience.340.6134.799>). PMID 23687020 (<https://pubmed.ncbi.nlm.nih.gov/23687020>).
182. Higham, T.; Douka, K.; Wood, R.; Ramsey, C. B.; Brock, F.; Basell, L.; Camps, M.; Arrizabalaga, A.; Baena, J.; Barroso-Ruíz, C.; C. Bergman; C. Boitard; P. Boscato; M. Caparrós; N.J. Conard; C. Draily; A. Froment; B. Galván; P. Gambassini; A. Garcia-Moreno; S. Grimaldi; P. Haesaerts; B. Holt; M.-J. Iriarte-Chiapusso; A. Jelinek; J.F. Jordá Pardo; J.-M. Maíllo-Fernández; A. Marom; J. Maroto; M. Menéndez; L. Metz; E. Morin; A. Moroni; F. Negrino; E. Panagopoulou; M. Peresani; S. Pirson; M. de la Rasilla; J. Riel-Salvatore; A. Ronchitelli; D. Santamaria; P. Semal; L. Slimak; J. Soler; N. Soler; A. Villaluenga; R. Pinhasi; R. Jacobi; et al. (2014). "The timing and spatiotemporal patterning of Neanderthal disappearance". *Nature*. **512** (7514): 306–309. Bibcode:2014Natur.512..306H (<https://ui.adsabs.harvard.edu/abs/2014Natur.512..306H>). doi:10.1038/nature13621 (<https://doi.org/10.1038%2Fnature13621>). hdl:1885/75138 (<https://hdl.handle.net/1885%2F75138>). PMID 25143113 (<https://pubmed.ncbi.nlm.nih.gov/25143113>). S2CID 205239973 (<https://api.semanticscholar.org/CorpusID:205239973>). "We show that the Mousterian [the Neanderthal tool-making tradition] ended by 41,030–39,260 calibrated years BP (at 95.4% probability) across Europe. We also demonstrate that succeeding 'transitional' archaeological industries, one of which has been linked with Neanderthals (Châtelperronian), end at a similar time."
183. Hortolà, Policarp; Martínez-Navarro, Bienvenido (May 8, 2013). "The Quaternary megafaunal extinction and the fate of Neanderthals: An integrative working hypothesis" (<http://www.sciencedirect.com/science/article/pii/S1040618212001188>). *Quaternary International*. East meets West: First settlements and human evolution in Eurasia. **295**: 69–72. Bibcode:2013QuInt.295...69H (<https://ui.adsabs.harvard.edu/abs/2013QuInt.295...69H>). doi:10.1016/j.quaint.2012.02.037 (<https://doi.org/10.1016%2Fj.quaint.2012.02.037>). ISSN 1040-6182 (<https://search.worldcat.org/issn/1040-6182>). Retrieved February 5, 2024 – via Elsevier Science Direct.
184. Higham, T. (2011). "European Middle and Upper Palaeolithic radiocarbon dates are often older than they look: problems with previous dates and some remedies". *Antiquity*. **85** (327): 235–249. doi:10.1017/s0003598x00067570 (<https://doi.org/10.1017%2Fs0003598x00067570>). S2CID 163207571 (<https://api.semanticscholar.org/CorpusID:163207571>). "Few events of European prehistory are more important than the transition from ancient to modern humans about 40,000 years ago, a period that unfortunately lies near the limit of radiocarbon dating. This paper shows that as many as 70 per cent of the oldest radiocarbon dates in the literature may be too young, due to contamination by modern carbon."
185. Agustí, J.; Rubio-Campillo, X. (2017). "Were Neanderthals responsible for their own extinction?". *Quaternary International*. **431**: 232–237. Bibcode:2017QuInt.431..232A (<https://ui.adsabs.harvard.edu/abs/2017QuInt.431..232A>). doi:10.1016/j.quaint.2016.02.017 (<https://doi.org/10.1016%2Fj.quaint.2016.02.017>).

186. Straus, Lawrence Guy (2020). "Neanderthal last stand? Thoughts on Iberian refugia in late MIS 3". *Journal of Quaternary Science*. **37** (2): 283–290. doi:10.1002/jqs.3252 (<https://doi.org/10.1002%2Fjqs.3252>). ISSN 1099-1417 (<https://search.worldcat.org/issn/1099-1417>).
187. Bicho, Nuno; Carvalho, Milena (2022). "Peninsular southern Europe refugia during the Middle Palaeolithic: an introduction" (<https://doi.org/10.1002%2Fjqs.3410>). *Journal of Quaternary Science*. **37** (2): 133–135. doi:10.1002/jqs.3410 (<https://doi.org/10.1002%2Fjqs.3410>). ISSN 1099-1417 (<https://search.worldcat.org/issn/1099-1417>).
188. Pigott, E. M.; Uthmeier, T.; Chabai, V.; Higham, T. F. G. (2024). "The Late Middle and Early Upper Palaeolithic in Crimea (Ukraine)—A Review of the Neanderthal Refugium Hypothesis" (<https://doi.org/10.1007%2Fs41982-024-00194-y>). *Journal of Paleolithic Archaeology*. **7** (1): 27. doi:10.1007/s41982-024-00194-y (<https://doi.org/10.1007%2Fs41982-024-00194-y>). ISSN 2520-8217 (<https://search.worldcat.org/issn/2520-8217>).
189. Mayr, E. (1950). "Taxonomic categories in fossil hominids". *Cold Spring Harbor Symposia on Quantitative Biology*. **15** (0): 109–118. doi:10.1101/SQB.1950.015.01.013 (<https://doi.org/10.1101%2FSQB.1950.015.01.013>).
190. Timmermann, Axel (2020). "Quantifying the potential causes of Neanderthal extinction: Abrupt climate change versus competition and interbreeding" (<https://doi.org/10.1016%2Fj.quascirev.2020.106331>). *Quaternary Science Reviews*. **238**: 106331. doi:10.1016/j.quascirev.2020.106331 (<https://doi.org/10.1016%2Fj.quascirev.2020.106331>). ISSN 0277-3791 (<https://search.worldcat.org/issn/0277-3791>).
191. Villa, P.; Roebroeks, W. (2014). "Neandertal demise: an archaeological analysis of the modern human superiority complex" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4005592>). *PLOS ONE*. **9** (4): e96424. Bibcode:2014PLoSO...996424V (<https://ui.adsabs.harvard.edu/abs/2014PLoSO...996424V>). doi:10.1371/journal.pone.0096424 (<https://doi.org/10.1371%2Fjournal.pone.0096424>). PMC 4005592 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4005592>). PMID 24789039 (<https://pubmed.ncbi.nlm.nih.gov/24789039>).
192. Djakovic, I.; Roussel, M.; Soressi, M. (2024). "Stone Tools in Shifting Sands: Past, Present, and Future Perspectives on the Châtelperronian Stone Tool Industry" (<https://doi.org/10.1007%2Fs41982-024-00193-z>). *Journal of Paleolithic Archaeology*. **7** (29). doi:10.1007/s41982-024-00193-z (<https://doi.org/10.1007%2Fs41982-024-00193-z>).
193. Roussel, M.; Soressi, M.; Hublin, J.-J. (2016). "The Châtelperronian conundrum: blade and bladelet lithic technologies from Quinçay, France". *Journal of Human Evolution*. **95**: 13–32. Bibcode:2016JHumE..95...13R (<https://ui.adsabs.harvard.edu/abs/2016JHumE..95...13R>). doi:10.1016/j.jhevol.2016.02.003 (<https://doi.org/10.1016%2Fj.jhevol.2016.02.003>). PMID 27260172 (<https://pubmed.ncbi.nlm.nih.gov/27260172>).
194. Villa, P.; Pollarolo, L.; Conforti, J.; et al. (2018). "From Neandertals to modern humans: new data on the Uluzzian" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5942857>). *PLOS ONE*. **13** (5): e0196786. Bibcode:2018PLoSO..1396786V (<https://ui.adsabs.harvard.edu/abs/2018PLoSO..1396786V>). doi:10.1371/journal.pone.0196786 (<https://doi.org/10.1371%2Fjournal.pone.0196786>). PMC 5942857 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5942857>). PMID 29742147 (<https://pubmed.ncbi.nlm.nih.gov/29742147>).
195. Hoffercker, J. F. (2009). "The spread of modern humans in Europe" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2752585>). *Proceedings of the National Academy of Sciences of the United States of America*. **106** (38): 16040–16045. Bibcode:2009PNAS..10616040H (<https://ui.adsabs.harvard.edu/abs/2009PNAS..10616040H>). doi:10.1073/pnas.0903446106 (<https://doi.org/10.1073%2Fpnas.0903446106>). PMC 2752585 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2752585>). PMID 19571003 (<https://pubmed.ncbi.nlm.nih.gov/19571003>).
196. Degioanni, A.; Bonenfant, C.; Cabut, S.; Condemi, S. (2019). "Living on the edge: Was demographic weakness the cause of Neanderthal demise?" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6541251>). *PLOS ONE*. **14** (5). e0216742. Bibcode:2019PLoSO..1416742D (<https://ui.adsabs.harvard.edu/abs/2019PLoSO..1416742D>). doi:10.1371/journal.pone.0216742 (<https://doi.org/10.1371%2Fjournal.pone.0216742>).

PMC 6541251 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6541251>). PMID 31141515 (<https://pubmed.ncbi.nlm.nih.gov/31141515>).

197. Staubwasser, M.; Drăgușin, V.; Onac, B. P. (2018). "Impact of climate change on the transition of Neanderthals to modern humans in Europe" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6140518>). *Proceedings of the National Academy of Sciences of the United States of America*. **115** (37): 9116–9121. Bibcode:2018PNAS..115.9116S (<https://ui.adsabs.harvard.edu/abs/2018PNAS..115.9116S>). doi:10.1073/pnas.1808647115 (<https://doi.org/10.1073%2Fpnas.1808647115>). PMC 6140518 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6140518>). PMID 30150388 (<https://pubmed.ncbi.nlm.nih.gov/30150388>).
198. Papagianni & Morse 2013.

Sources

- Broodbank, Cyprian (2013). *The Making of the Middle Sea: A History of the Mediterranean from the Beginning to the Emergence of the Classical World*. London, UK: Thames & Hudson. ISBN 978-0-500-29208-2.
- Brown, K.; Fa, D. A.; Finlayson, G.; Finlayson, C. (2011). "Small game and marine resource exploitation by Neanderthals: the evidence from Gibraltar" (<https://www.researchgate.net/publication/227198441>). *Trekking the shore: changing coastlines and the antiquity of coastal settlement*. Interdisciplinary contributions to archaeology. Springer. ISBN 978-1-4419-8218-6.
- Romagnoli, Francesca; Rivals, Florent; Benazzi, Stefano (2022). *Updating Neanderthals: Understanding Behavioural Complexity in the Late Middle Palaeolithic* (<https://books.google.com/books?id=sTJcEAAQBAJ&pg=PA78>). Academic Press. ISBN 978-0-12-821429-9.
- Finlayson, C. (2019). *The smart Neanderthal: bird catching, cave art, and the cognitive revolution* (<https://books.google.com/books?id=7hqJDwAAQBAJ>). Oxford University Press. ISBN 978-0-19-251812-5.
- French, Jennifer (2021). *Palaeolithic Europe: A Demographic and Social Prehistory*. Cambridge, UK: Cambridge University Press. ISBN 978-1-108-49206-5.
- Papagianni, D.; Morse, M. A. (2013). "Still with us?" (<https://books.google.com/books?id=9As7CwAAQBAJ&pg=PT171>). *Neanderthals rediscovered: how modern science is rewriting their story*. Thames and Hudson. ISBN 978-0-500-77311-6.
- Pettitt, Paul; White, Mark (2012). *The British Palaeolithic: hominin societies at the edge of the Pleistocene world*. London: Routledge. ISBN 978-0415674546.
- Reich, D. (2018). "Encounters with Neanderthals". *Who we are and how we got here: ancient DNA and the new science of the human past* (<https://books.google.com/books?id=uLNSDwAAQBAJ&pg=PA25>). Oxford University Press. ISBN 978-0-19-882125-0.
- Shipman, P. (2015). "How humans and their dogs drove Neanderthals to extinction". *The invaders: how humans and their dogs drove Neanderthals to extinction*. Harvard University Press. doi:10.2307/j.ctvjf9zbs (<https://doi.org/10.2307%2Fj.ctvjf9zbs>). ISBN 978-0-674-42538-5. JSTOR j.ctvjf9zbs (<https://www.jstor.org/stable/j.ctvjf9zbs>).
- Stringer, C.; Gamble, C. (1993). *In search of the Neanderthals* (<https://archive.org/details/insearchofneande00stri>). Thames and Hudson. ISBN 978-0-500-05070-5.
- Sykes, Rebecca Wragg (2020). *Kindred: Neanderthal Life, Love, Death and Art*. London, UK: Bloomsbury Sigma. ISBN 978-1-4729-3749-0.
- Tattersall, I. (2015). "Neanderthals, DNA, and creativity". *The strange case of the Rickety Cossack: and other cautionary tales from human evolution*. St. Martin's Publishing Group. ISBN 978-1-4668-7943-0.

Further reading

- Hunt, Chris; et al. (August 28, 2023). "Shanidar et ses fleurs? Reflections on the palynology of the Neanderthal 'Flower Burial' hypothesis" (<https://doi.org/10.1016%2Fj.jas.2023.105822>). *Journal of Archaeological Science*. **159**: 105822. Bibcode:2023JArSc.159j5822H (<https://ui.adsabs.harvard.edu/abs/2023JArSc.159j5822H>). doi:10.1016/j.jas.2023.105822 (<https://doi.org/10.1016%2Fj.jas.2023.105822>). S2CID 261325698 (<https://api.semanticscholar.org/CorpusID:261325698>).

External links

- "*Homo neanderthalensis*" (<http://humanorigins.si.edu/evidence/human-fossils/species/homo-neanderthalensis>). The Smithsonian Institution. February 14, 2010.
- Human Timeline (Interactive) (<http://humanorigins.si.edu/evidence/human-evolution-timeline-interactive>) – Smithsonian, National Museum of Natural History (August 2016).
- "Neanderthal DNA" (<https://web.archive.org/web/20060617204513/http://www.isogg.org/neanderthaldna.htm>). International Society of Genetic Genealogy. Archived from the original (<https://www.isogg.org/neanderthaldna.htm>) on June 17, 2006.: Includes Neanderthal mtDNA sequences
- GenBank records for *H. s. neanderthalensis* (<https://www.ncbi.nlm.nih.gov/search/all/?term=homo%20sapiens%20neanderthalensis>) maintained by the National Center for Biotechnology Information (NCBI)
- Alex, Bridget (February 21, 2024). "What's Behind the Evolution of Neanderthal Portraits" (<https://www.sapiens.org/archaeology/neanderthal-art-paleolithic-archaeology/>). *SAPIENS*.
- The Climate Chronicles (<https://theclimatechronicles.com/>), explores the impact of Pleistocene climate change on Neanderthals and other hominins.

Retrieved from "<https://en.wikipedia.org/w/index.php?title=Neanderthal&oldid=1291048067>"