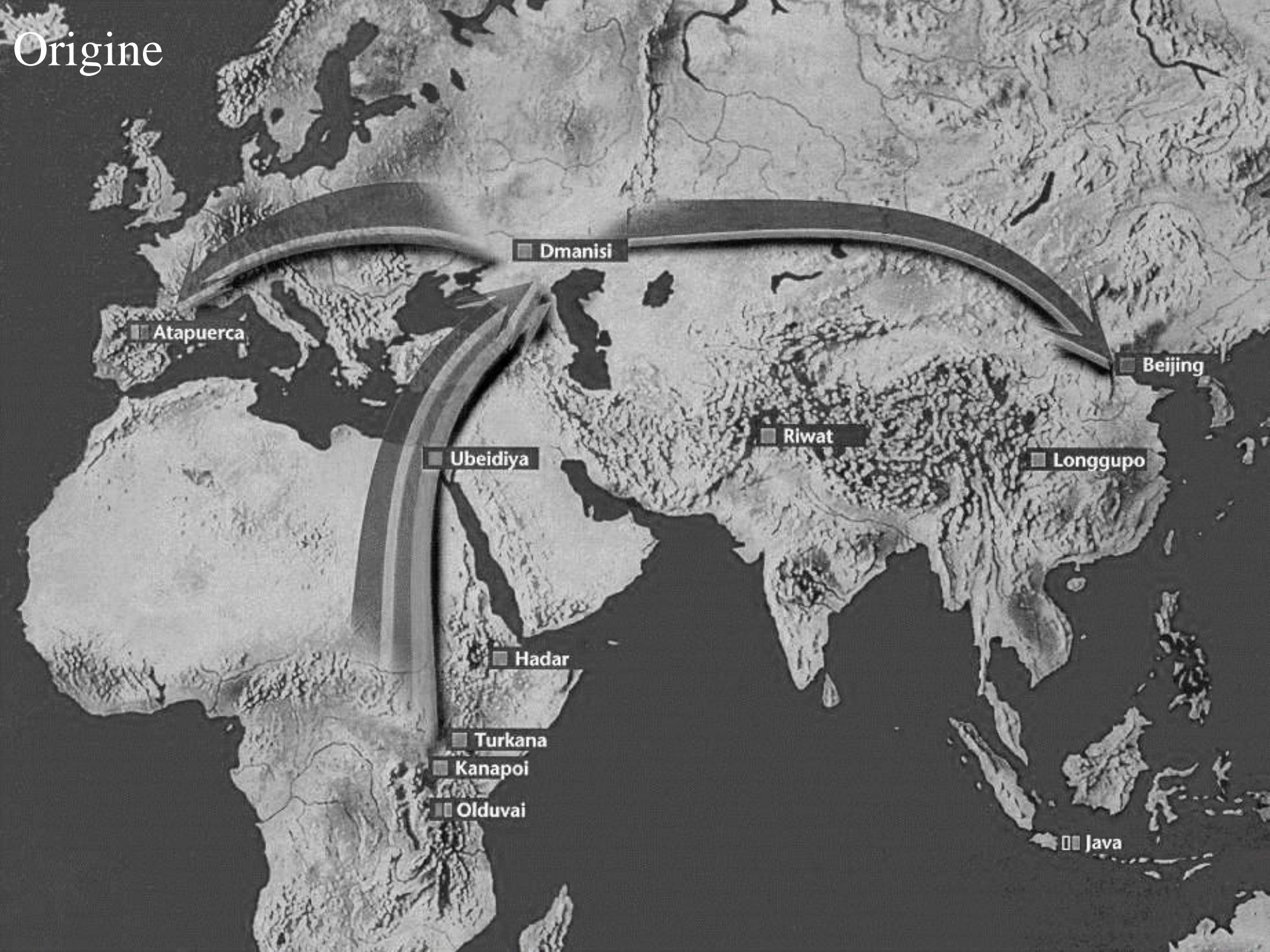




Il Popolamento dell'Europa

Julie Arnaud
julie.arnaud@unife.it

Origine

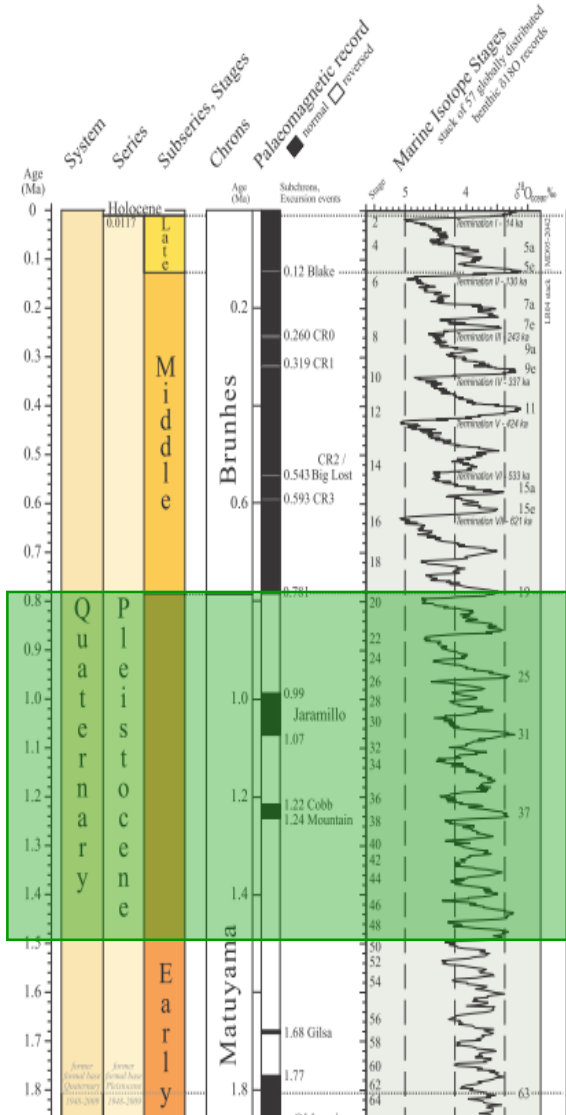




(Cavalli Sforza & Pievani, 2012)

profilo delle antiche coste durante le fasi glaciali

Origine : Prime testimonianze del popolamento europeo



(Cohen & Cibbard, 2010)



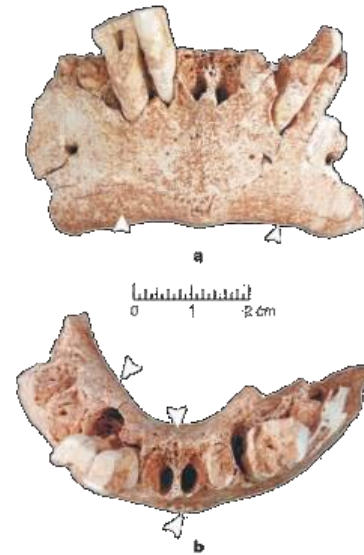


Le prime testimonianze

Anteneandertaliani : non hanno acquisito nessuna delle apomorfie dei neandertaliani

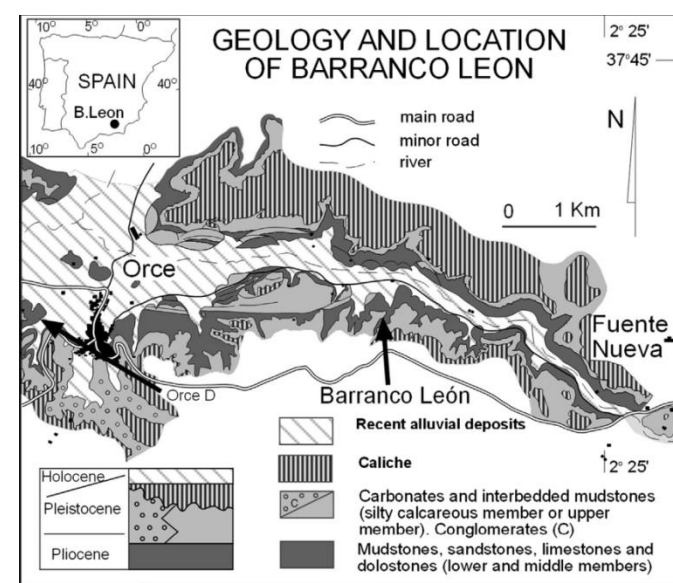
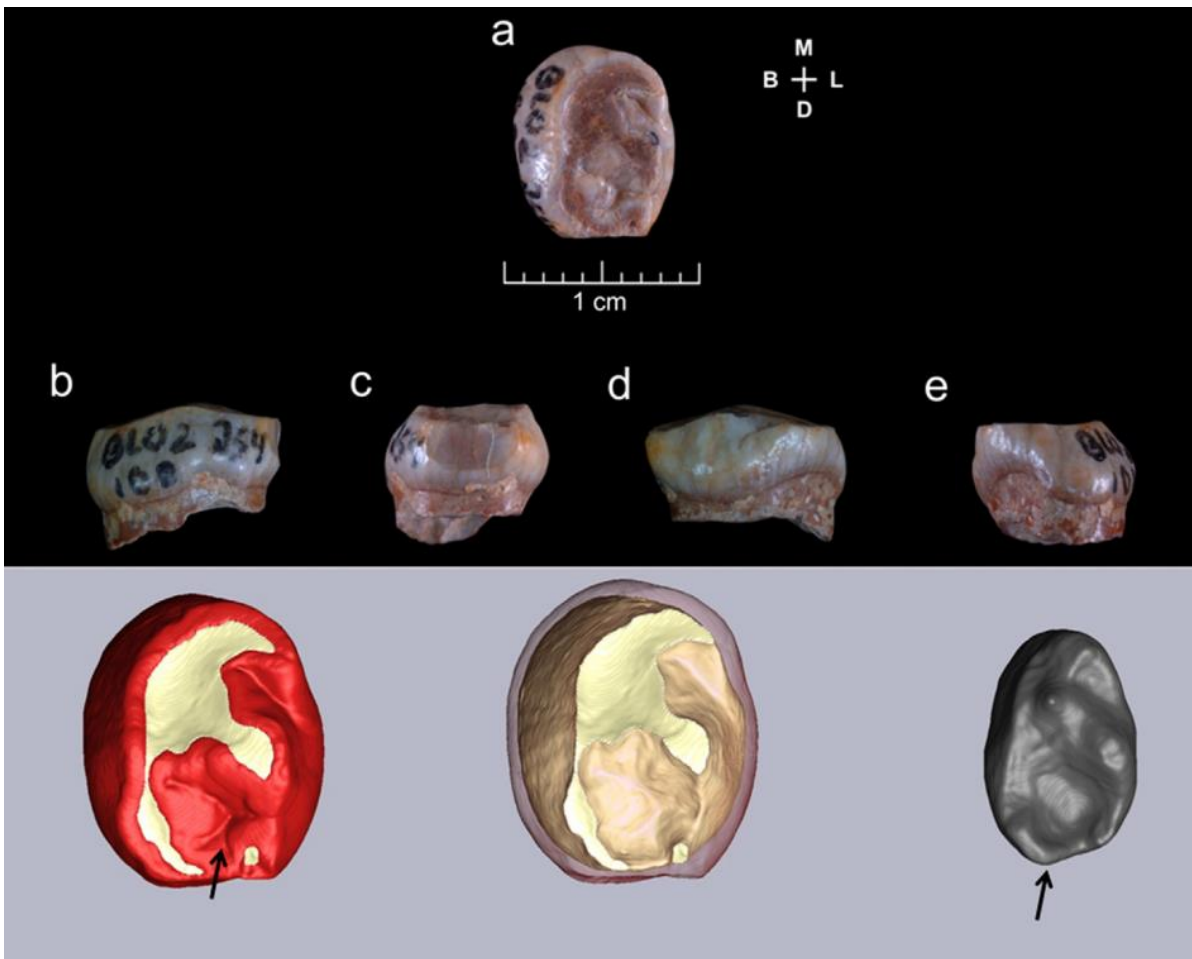


Gran Dolina
Homo antecessor 0,8
Myr (TD6)



Sima del Elefante
Homo sp.
1,3 Myr (Mandible ATE9-1)





dm1 di Barranco Leon BL02-J54-100
 ESR: 1.02 e 1.73 Ma
 Paleomagnetismo: 1.07 – 1.77 Ma
 Biocronologia: 1.4 Ma

Questo ritrovamento associato ad un importante insieme litico conferma che l'Europe occidentale è stata colonizzata poco dopo la prima espansione out of Africa, documentata da Dmanisi



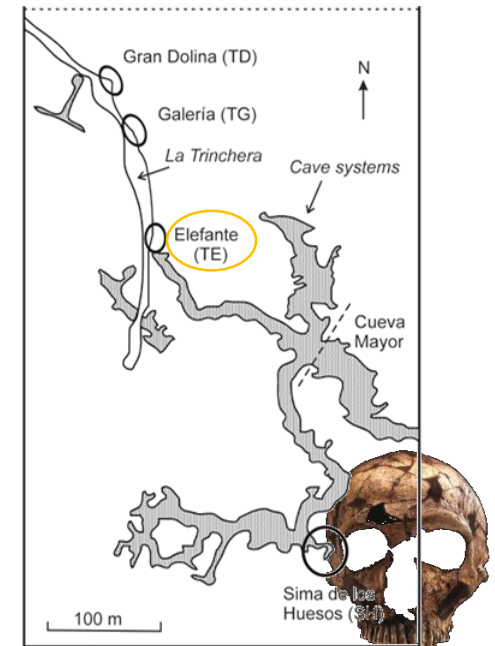
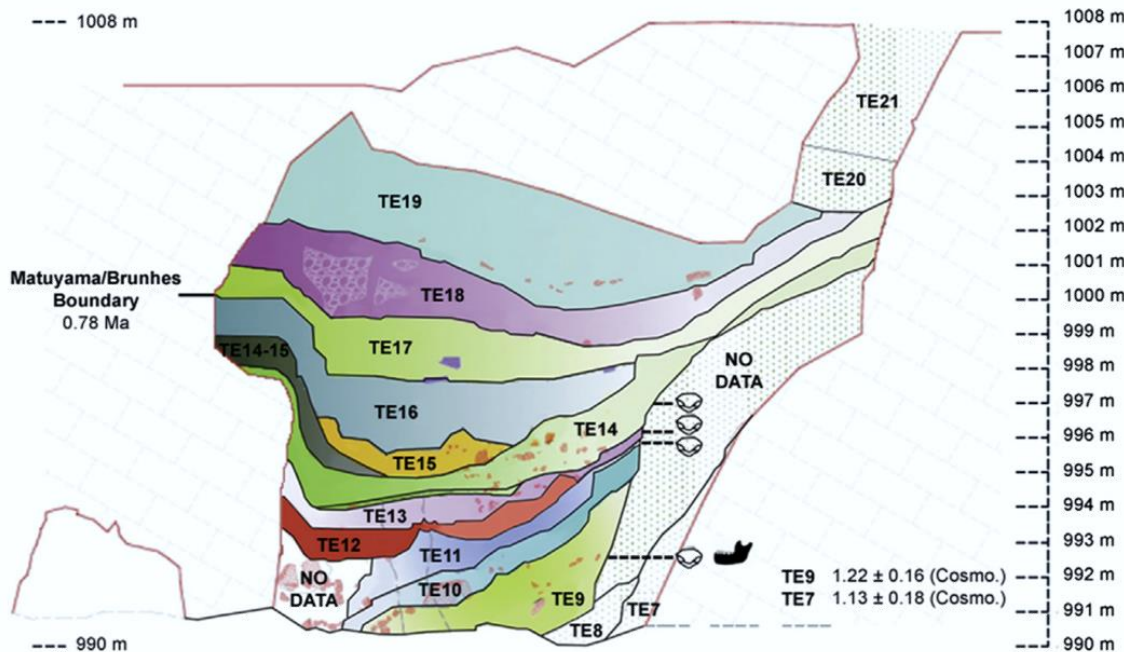
Sierra de Atapuerca – The goldmine of Paleoanthropologist...



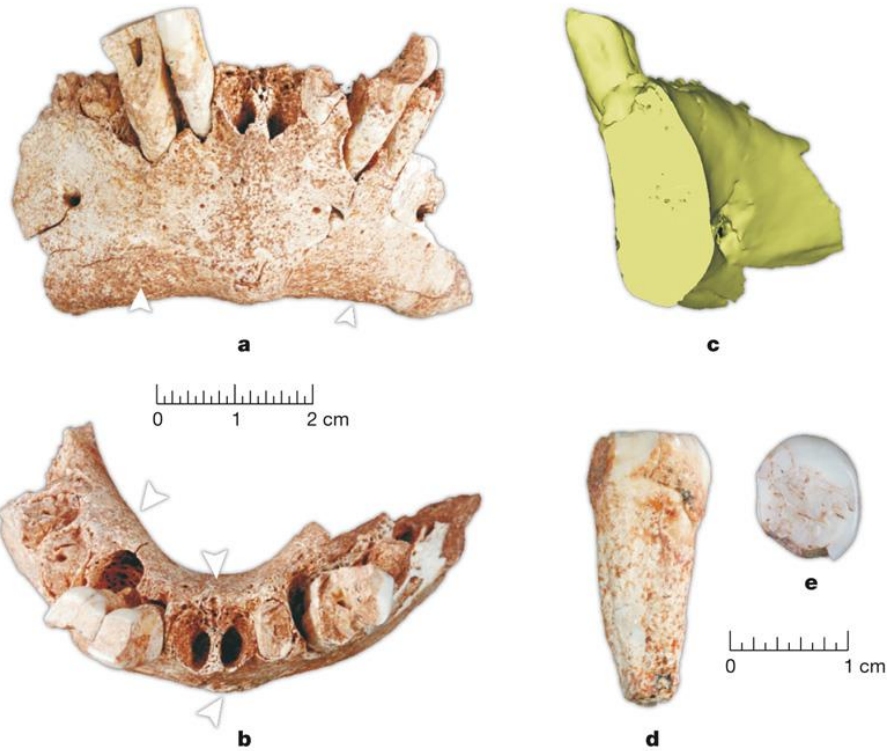
Javier Trueba / Madrid Scientific Films



Sima del Elefante



(Bermudez de Castro et al., 2013)



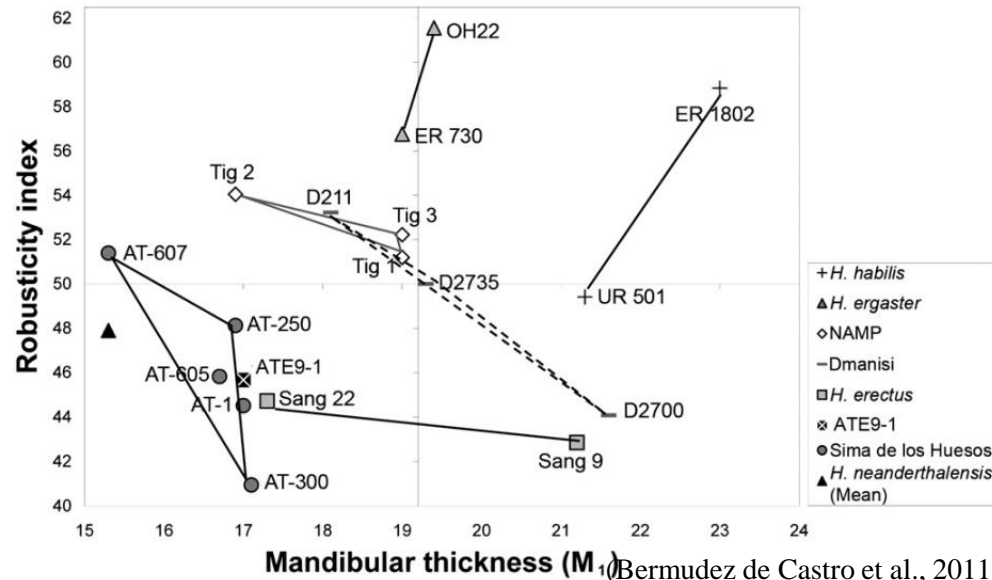
- Caratteri primitive per il genere *Homo*:
- Tubercolo marginale anteriore sotto C/P3
 - *Mentum osseum* poco marcato
 - Trigono mentoniero distinto
 - Presenza di una *incisura submentalis*
 - Morfologia dei premolari

Caratteri derivati rispetto ai primi *Homo* africani:

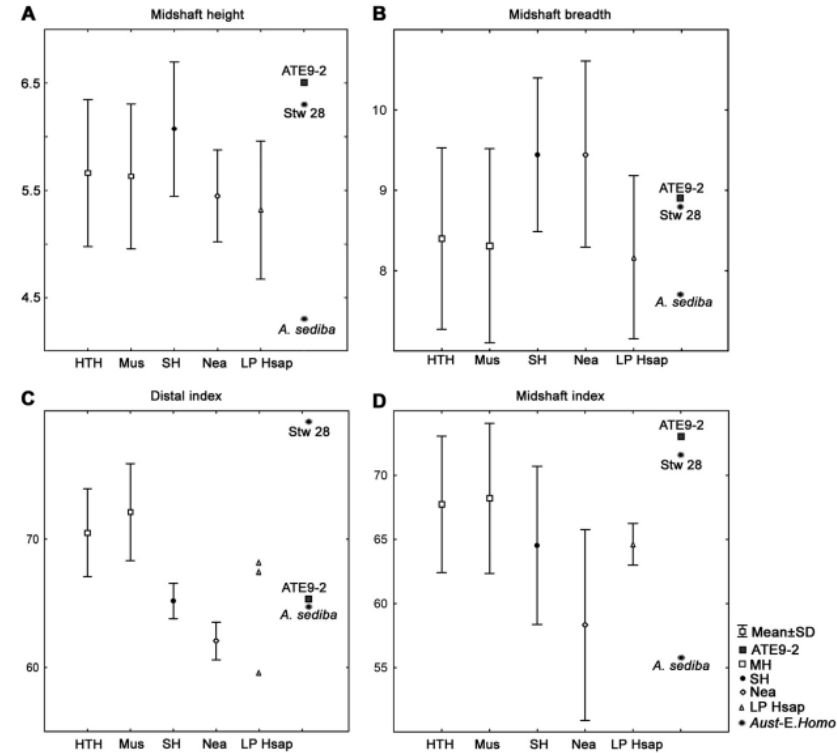
- Planum alveolare poco inclinato
- Assenza di uno toro trasverso superiore
- Corpo mandibolare poco spesso

(Carbonell et al., 2008)

ATE9-1 presenta alcuni caratteri morfologici che dimostrano una discrepanza con la variabilità osservata nei fossili di Dmanisi e del Pleistocene africano, implicando una comparsa precoce di un "identità europea" nei gruppi di ominini che hanno popolato il continente europeo.



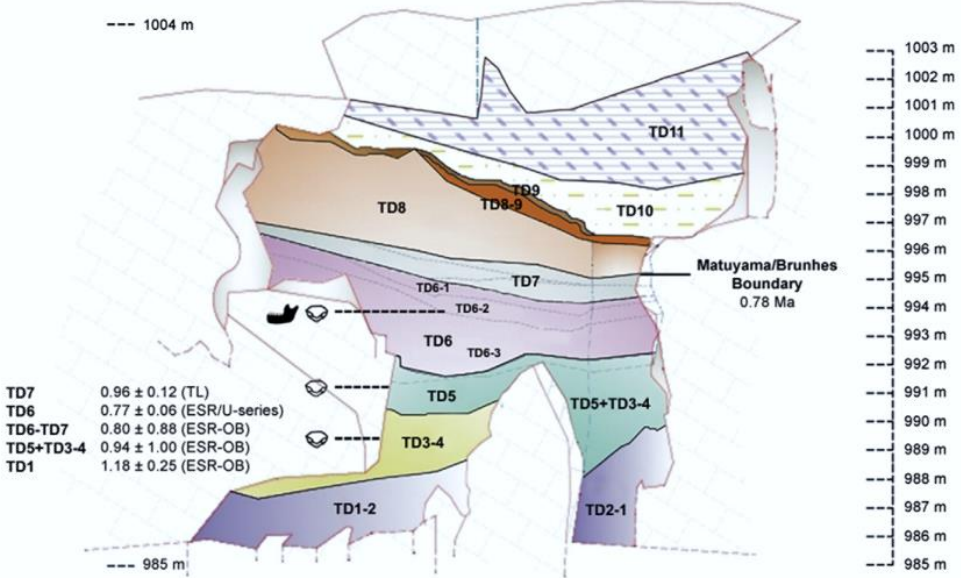
(Bermudez de Castro et al., 2011)



La falange ATE9-2, attribuita a *Homo* sp. non presenta particolare differenze con la collezione di confronto. Questo suggerisce che la morfologia della mano nel genere *Homo* è rimasta invariata da 1.2-1.3 Ma (Lorenzo et al., 2014).



Gran Dolina and the *Homo antecessor* hypodigm



(Bermudez de Castro et al., 2013)

Lithic industry Human remains

El yacimiento, por dentro

Estadística de la Gran Dolina

Trabajo de excavación: Controlar el enterramiento de la tierra con cuidado. Se utilizan procedimientos para no alterar la conectividad de la tierra.

Estadística de la Galería

Los estratificadores utilizan sistemas para no alterar el desarrollo de nivel arqueológico.

Para conocer el lugar exacto del que provienen los descubrimientos de *Homo antecessor*, la excavación se divide en cuadrícula y cuadrícula de un metro de lado.

Proyecto del Centro de "Homo antecessor"

ICMAYC - CDEC (Museo Nacional de Ciencias Naturales, Universidad Complutense de Madrid, Universidad Autónoma y otras)

Gráfico: Pablo Castañeda



Livello TD6 – c. 800 ka BP

NMI: 2 adulti, 3 adolescenti, 6 bambini

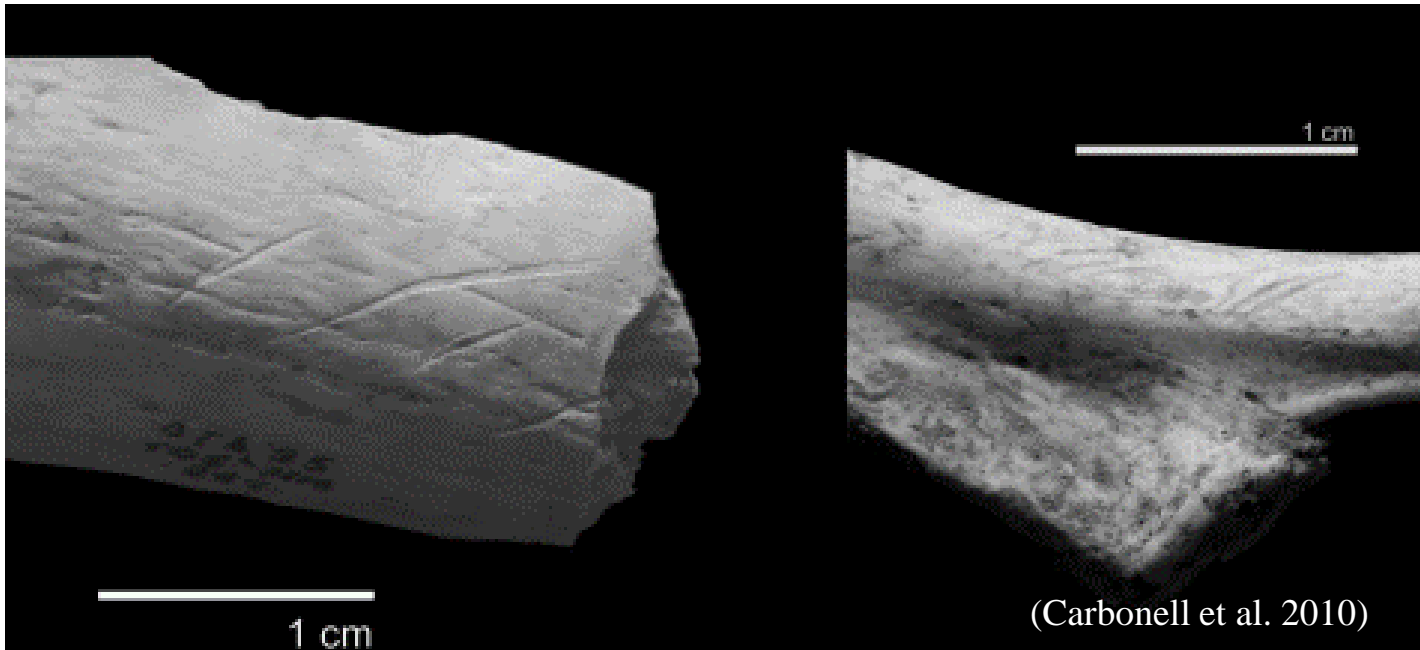
Interpretazione

- cannibalismo gastronomico (Fernandez-Jalvo et al. 1999)
- Cannibalismo culturale (Carbonell et al., 2010)
- Violenza e cannibalismo intergruppo; excocannibalismo (Saladié et al., 2012)



Tracce di macellazione su la diafisi di una tibia, interpretate come tracce di scarnificazione

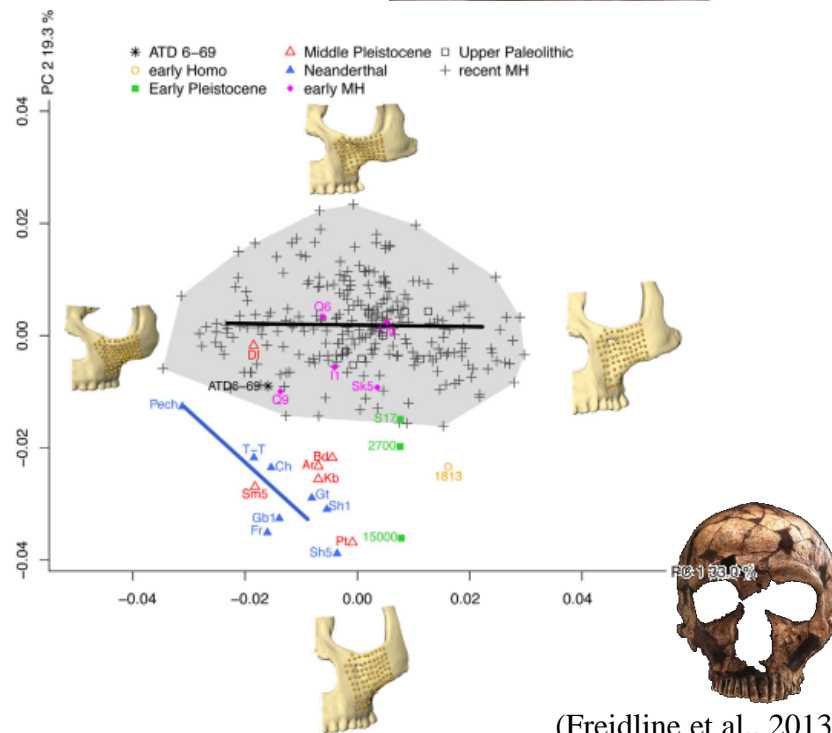
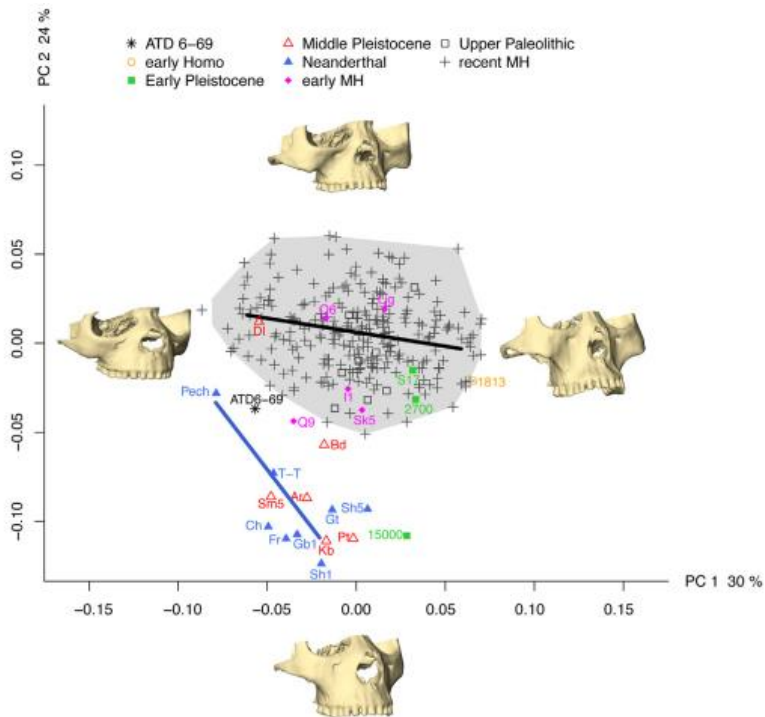
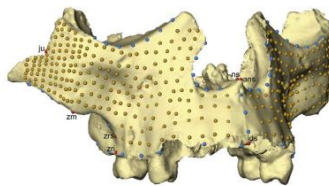
Costola umana con incisione



(Carbonell et al. 2010)



The fossil ATD6-69 has been suggested to mark the earliest appearance of modern human facial features. However, this specimen is a subadult and the interpretation of its morphology remains controversial, because it is unclear how developmental shape changes would affect the features that link ATD6-69 to modern humans.



Twentieth anniversary of *Homo antecessor* (1997-2017): a review

José María Bermúdez de Castro^{1,2*} | María Martín-Torres^{2,3*} |
Juan Luis Arsuaga⁴ | Eudald Carbonell^{5,6}



TABLE 1 List of some of the features observed in *Homo antecessor*

• *Plesiomorphic (primitive) features for the Homo clade*

- Fusion of the styloid process to the basicranium
- Nasal floor showing a level and sloping configuration
- Position of the mental foramen at the level of mandibular P₃-P₄
- Low position of the mylohyoid line in relation to the alveolar margin at the mandibular M₃ level
- Parallel trajectory of the mylohyoid line in relation to the alveolar margin
- Shallow relief of the pterygoid fossa
- Lateral intersection between the mandibular notch and the condyle
- Absence of retromolar space
- M₃ partially covered by the mandibular ramus
- Strong tuberculum molare on the deciduous dm¹
- Presence of mesial and lingual styles on the deciduous upper canine
- Buccal faces of the mandibular premolars showing mesial and distal marginal ridges and grooves, which connect with the shelf-like cingulum
- Crown shape of the mandibular P₃ is strongly asymmetrical, with a remarkable talonid and a large occlusal polygon
- Mandibular P₄ showing an asymmetrical outline, with a mesially displaced metaconid extended talonid, and a broad occlusal polygon
- Mandibular P₃ and P₄ showing a complex root system (2R: MB+DL)¹ formed by a mesiobuccal (MB) plate-like root with two pulp canals and a distolingual (DL) root with a single canal
- M₁<M₂ for both upper and lower molar series.
- Mandibular M₁ and M₂ exhibiting a Y-pattern of the buccal and lingual grooves separating the five principal cusps
- Enamel of the occlusal surface of the postcanine teeth is moderately or remarkably crenulated
- Absolutely and relatively long radial neck



• Apomorphic (derived features), shared with later hominins

-Doubled arched supraorbital torus

-Parietals showing parasagittal flattening of the upper surfaces

-Position of the lateral prominence at the level of the talonid of mandibular M₂

-Absence of alveolar prominence

-Oblique inclination of the trigonum postmolare

-Shallow relief of the masseteric fossa

-Moderately hollowed posterior subalveolar fossa

-Regular gonion profile

-Length/width index of the mandibular alveolar arcade clearly below 100 (following Rosas and Bermúdez de Castro⁴⁷)

-Permanent mandibular incisors buccolingually expanded with respect to *H. habilis* s.s. and other African and Eurasian Early Pleistocene hominins such as KNM ER 992 or Dmanisi

-P₃>P₄ size sequence for the crown area of the maxillary and mandibular premolars

-Postcanine teeth smaller than those of *H. habilis* s.s. and within the range of *H. ergaster* (or African *H. erectus*), *H. erectus* s.l., and European Middle Pleistocene hominins.

-Mandibular M₃ noticeably reduced with respect to M₁ and M₂

-Antero-medially facing radial tuberosities



• *Derived features, shared with Neandertals and modern humans*

- Convex superior border of the temporal squama²
- Anterior position of the incisive canal, which is nearly vertical
- Absence (or weak) planum alveolare

• *Derived features shared with modern humans*

- Modern-like mid-facial topography: infraorbital surface coronally oriented and sloping downward and backward (true canine fossa) with a horizontal and high rooted inferior border
- Medial position of the deepest point of the mandibular notch
- Relatively narrow patellae with high patellar indices

• *Derived features shared with Neandertals and the SH hominins*

- Presence of a medial pterygoid tubercle
- Rhomboidal and compressed occlusal polygon and a skewed external outline of the permanent M¹ with a bulging protrusion of the hypocone
- Permanent upper incisors showing a shovel shape,³ particularly marked in I²
- Large olecranon fossa and very thin medial and lateral pillars
- Clavicle absolutely very long (maximum length), relatively slender (low robusticity index), with pronounced shaft curvature and relatively small epiphyses⁴
- Relatively narrower trochlea of the talus⁴
- Presence of middle trigonid crest

All these features have been studied by some authors.^{1,5,23,27,34,35,40,45,46,48,49,54,57,59,63,65,67,123} In these studies, more detailed descriptions and discussions of the polarity of the TD6 features can be found.

1. According to the Wood et al.¹²⁴ classification.¹²⁴

2 This feature as also present in African and later Asian Middle Pleistocene fossils.²⁷

3. This feature is also common in other Middle Pleistocene Eurasian hominins.

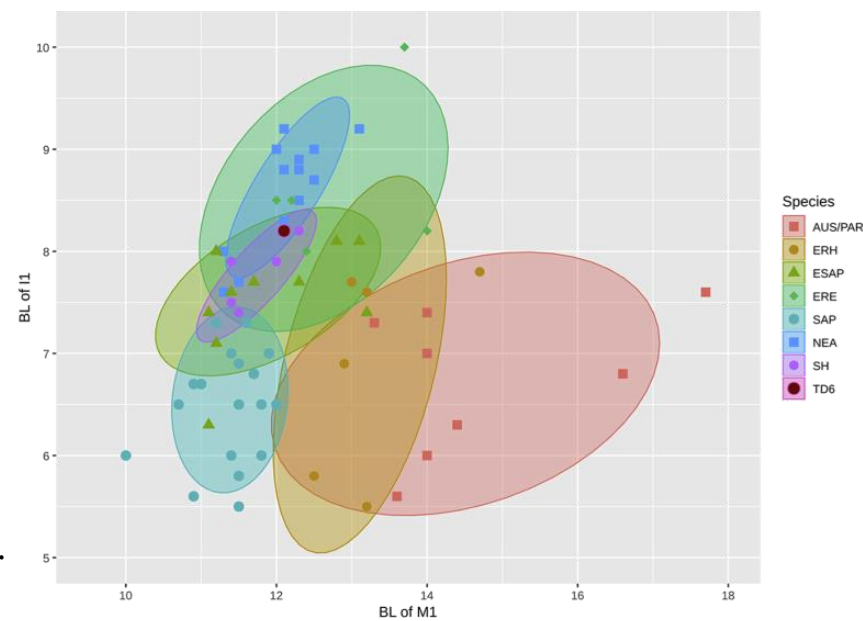
4. These features are found in Neandertals, but not in the SH hominins.⁶⁷





New permanent teeth from Gran Dolina-TD6 (Sierra de Atapuerca).
The bearing of *Homo antecessor* on the evolutionary scenario of Early
and Middle Pleistocene Europe

María Martín-Torres ^{a,b,*}, José María Bermúdez de Castro ^{a,b,*},
Marina Martínez de Pinillos ^a, Mario Modesto-Mata ^{a,b}, Song Xing ^{c,d},
Laura Martín-Francés ^{e,a}, Cecilia García-Campos ^a, Xijie Wu ^c, Wu Liu ^c



- Support the **taxonomic validity** of the *Homo antecessor*
- Unic mosaic of features:
 - Presence of **primitive traits** for the genus *Homo*
 - Presence of features **exclusively shared** with Early and Middle Pleistocene Eurasian hominins.
 - Some of these traits were retained by the MP hominins of Europe and became **the typical condition** of the Neanderthal lineage.
 - Teeth do not show **any synapomorphy** of modern humans and are **different** from Asian *Homo erectus*.



Compatible with the hypothesis about *H. antecessor* belonging to the **basal population** from which *H. sapiens*, *H. neanderthalensis*, and Denisovans emerged.



↑ 0.8
Tempo in milioni di anni
2

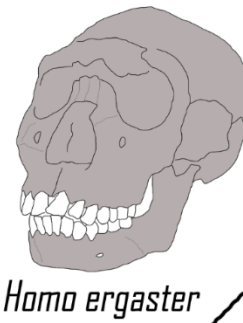
Europa



?

Pirro Nord

Africa



Homo erectus s.l.

Asia



I « Preneandertaliani »

I Preneandertaliani : Si cominciano ad individuare alcune apomorfie.

Le prime caratteristiche morfologiche di tale popolazione si osservano attorno a 350-400.000 anni fa, sui fossili dell'Arago (Francia) e di Sima de los Huesos (Spagna).

Some apomorphies start to be individualized. The first morphological features of this kind of population are observed around 350-400 000 years.



Arago 21



Atapuerca 5

L' Homo heidelbergensis presenta un mosaico di caratteri.

I caratteri derivati compaiono in un modo discontinuo, ma sono sistematicamente rappresentati negli ultimi Neanderthal.

The Homo heidelbergensis presents a mosaic of features.

The derived features appeared in an discontinued mode, but they are systematically represented in the last neandertal.



Principali siti con resti umani attribuiti ad *Homo heidelbergensis*



I PRIMI INSEDIAMENTI UMANI IN EUROPA



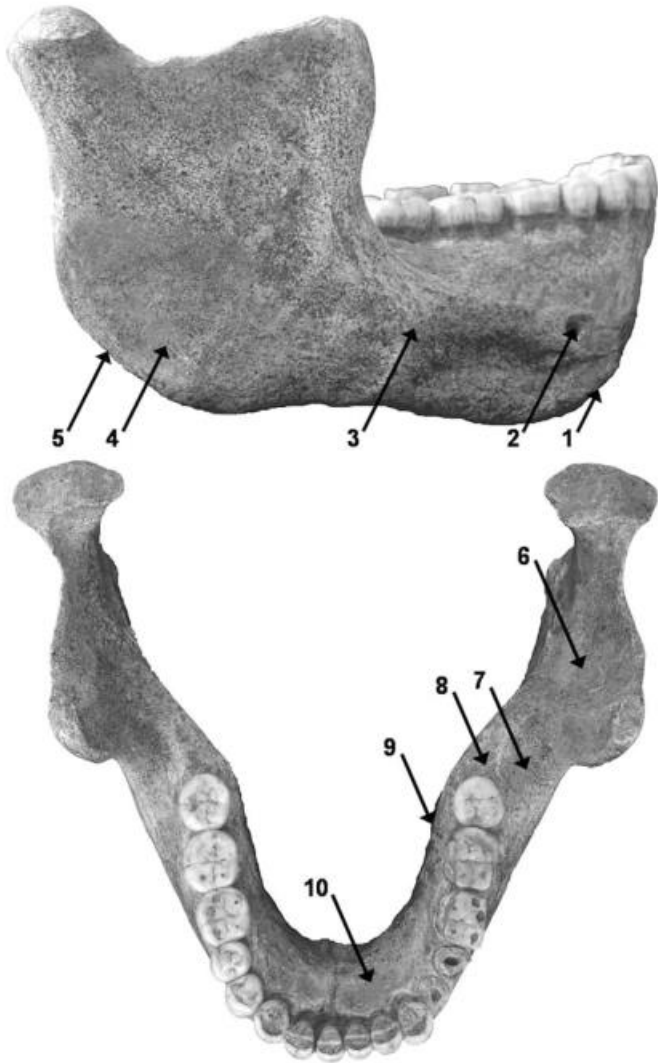
PRIME "INCURSIONI" DEL GENERE HOMO IN EUROPA.

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EN4STUDIO

- 1 Atapuerca Gran Dolina (1 200 000-780 000 anni fa)**
Homo antecessor
- 2 Atapuerca Sima de los Huesos (500 000 anni fa)**
Homo heidelbergensis
- 3 Arago (300 000-200 000 anni fa)**
Homo heidelbergensis
- 4 Terra Amata (400 000 anni fa - le prime capanne)**
Homo heidelbergensis
- 5 Mauer (600 000-500 000 anni fa)**
Homo heidelbergensis
- 6 Steinheim (350 000-250 000 anni fa)**
Homo heidelbergensis
- 7 Bilzingsleben (370 000 anni fa)**
Homo heidelbergensis
- 8 Boxgrove (524 000-478 000 anni fa)**
Homo heidelbergensis
- 9 Pakefield (700 000 anni fa)**
Homo heidelbergensis
- 10 Swanscombe (300 000-200 000 anni fa)**
Homo heidelbergensis
- 11 Petralona (350 000-200 000 anni fa)**
Homo heidelbergensis
- 12 Vértesszöllös (350 000 anni fa)**
Homo heidelbergensis
- 13 Ceprano (430 000-385 000 anni fa)**
Homo heidelbergensis

* Norfolk (UK) Happisburgh prints (850 ka)

Mauer – Olotipo della specie *Homo heidelbergensis* (600 ka)



Derived Neandertal-like traits

- foramina mentale posteriorly positioned (2)
- prominentia lateralis posteriorly positioned (3)
- truncated gonion (5)
- horizontal retromolar area (8)

Plesiomorphies

- incisura submentalis (1)
- deep fossa masseterica (4)
- strongly developed planum triangulare (6)
- gutterlike extramolar sulcus (7)
- parallel mylohyoid line (9)
- extensive planum alveolare (10)



Sima de los Huesos: 430 ka

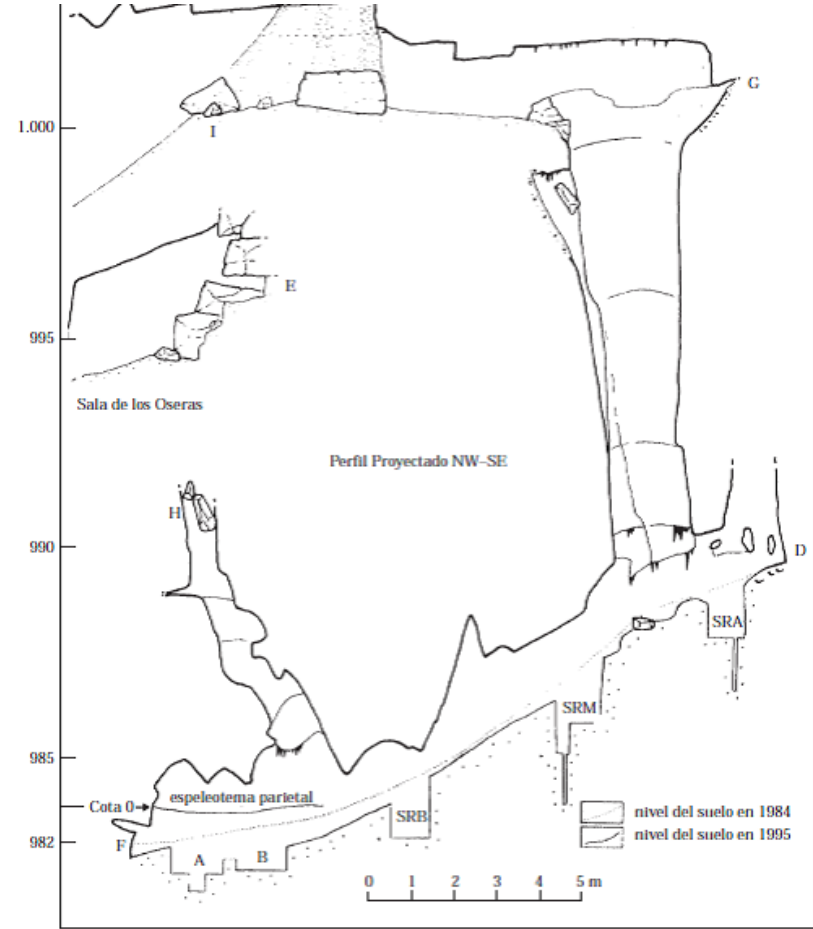
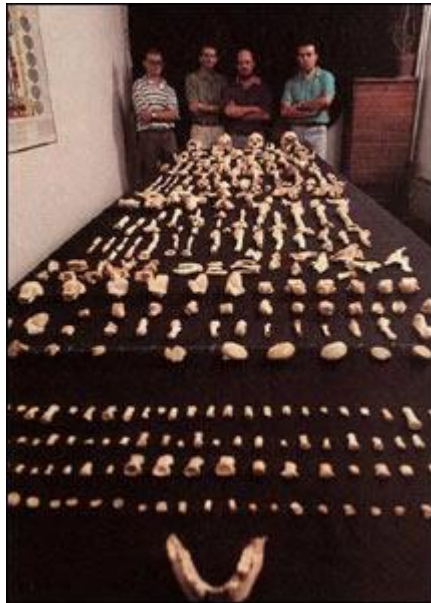
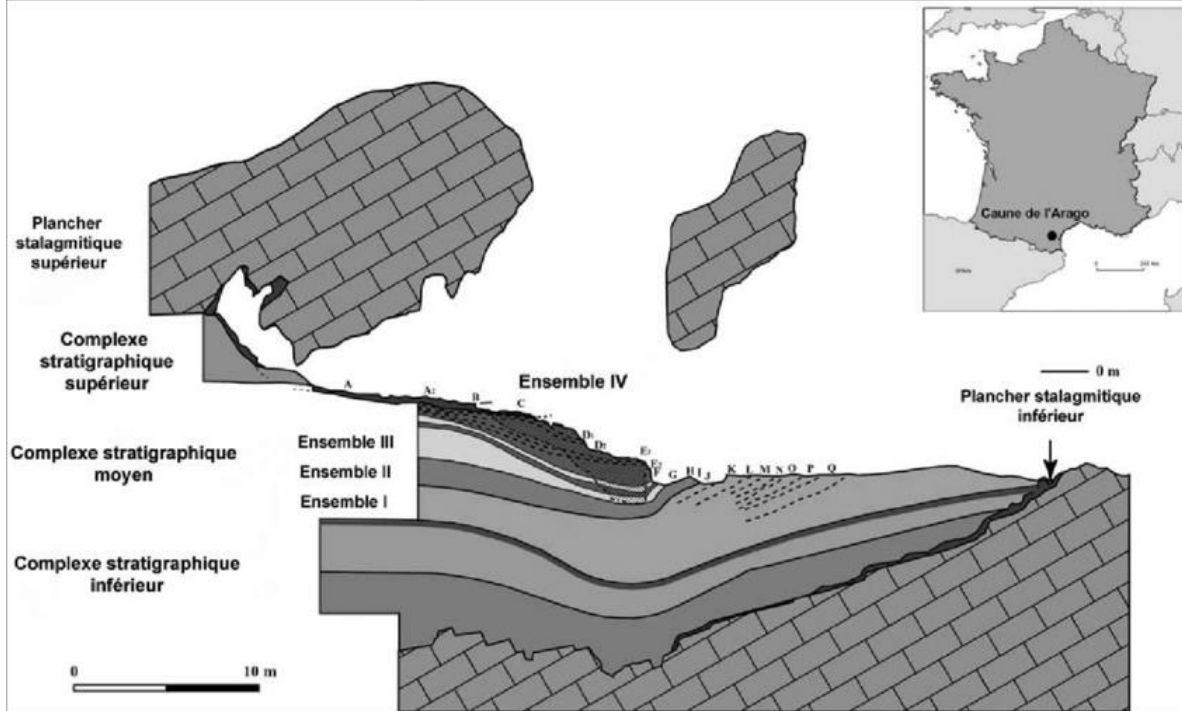
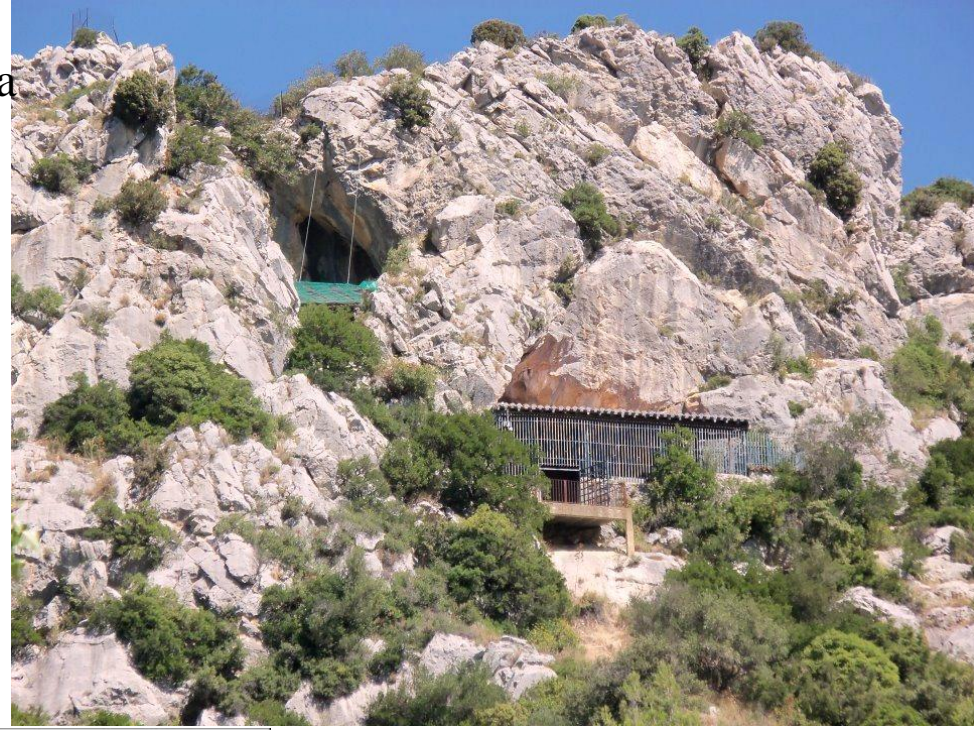


Figure 9. Sima de los Huesos profile (by G. E. Eidelweits, 1992-1996). Projection as in Figure 5. "Tapón de margas" indicates a cone of Neogene white marls coming from the outside. The levels of 1984 and 1995 floors are indicated, as well as a wall speleothem. The blind chimney in Sima de los Huesos behind (to the right of) the shaft, has not been completely drawn.



Caune de l'Arago – Tautavel (Francia) – 450 ka

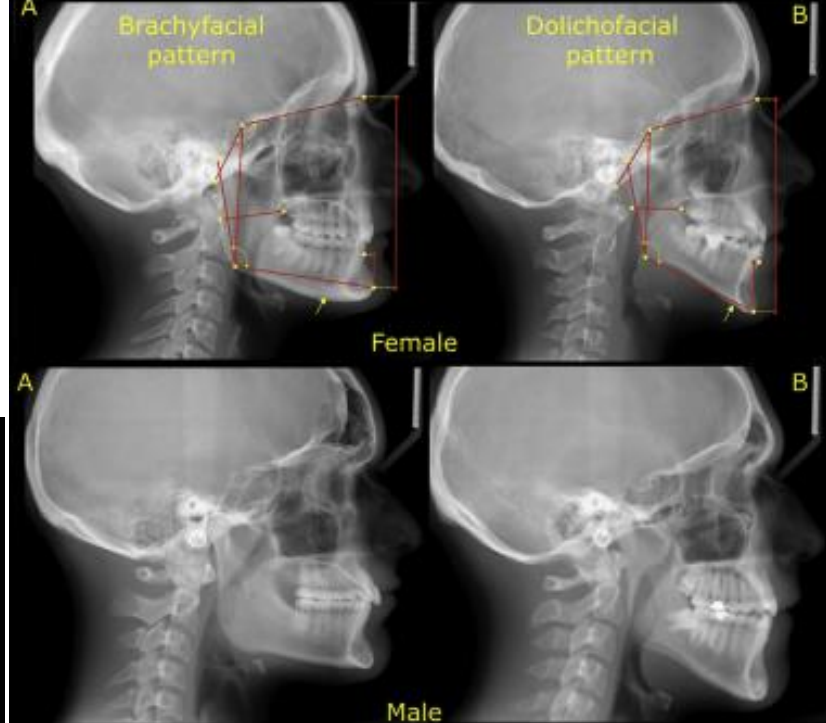
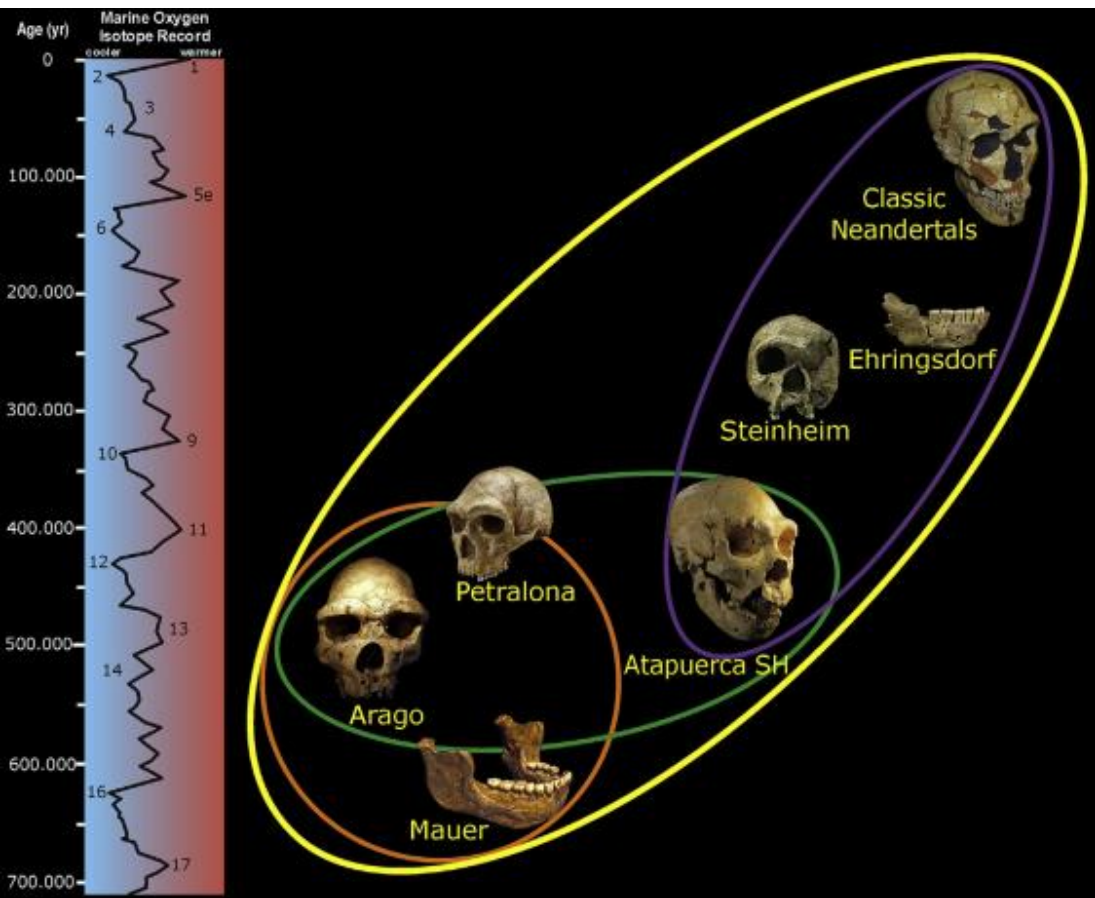




Tempo and mode in the Neandertal evolutionary lineage: A structuralist approach to mandible variation

Antonio Rosas ^{a,*}, Markus Bastir ^a, Jose Antonio Alarcón ^b

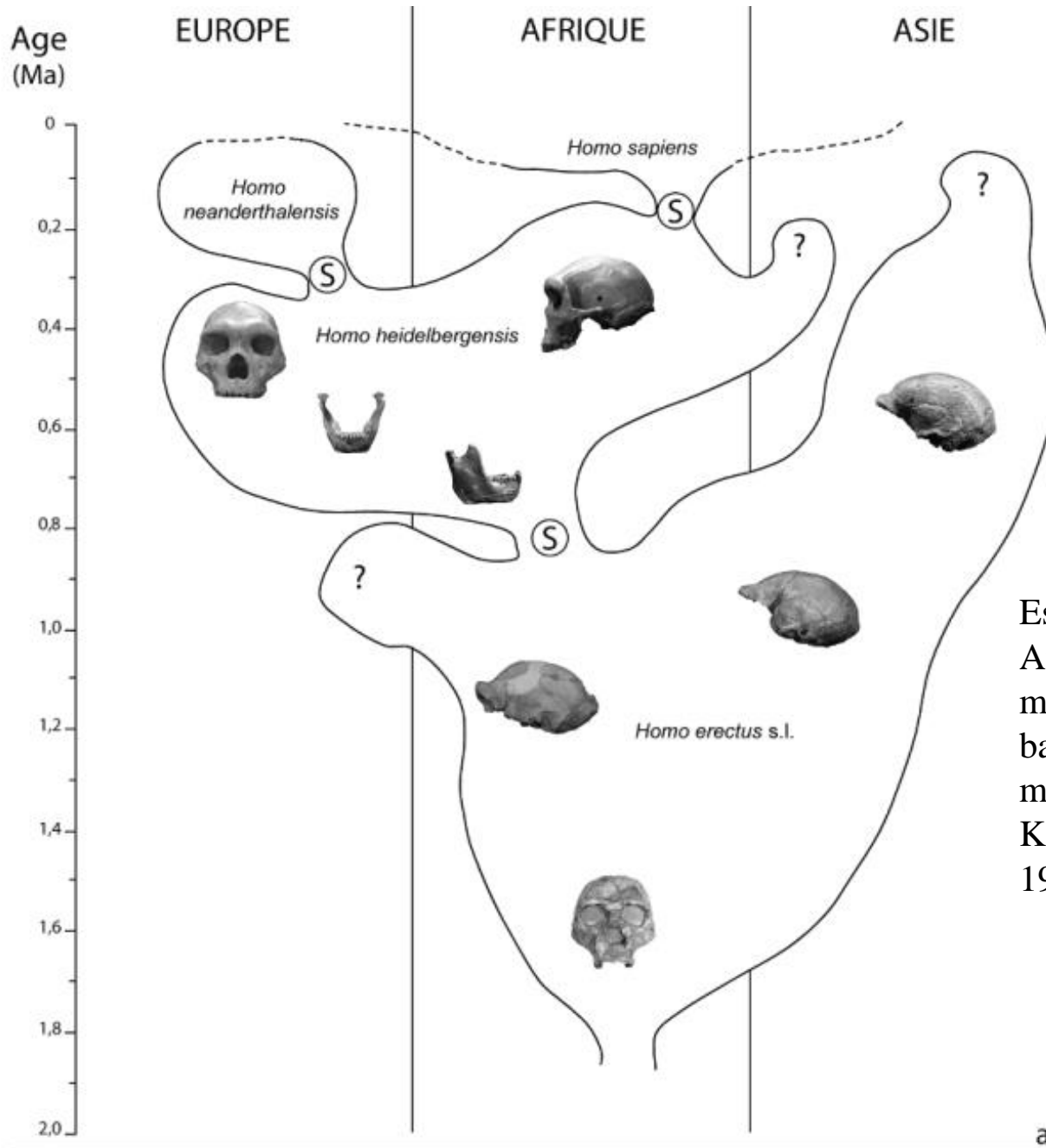
^a Paleanthropology Group, Department of Paleobiology, Museo Nacional de Ciencias Naturales, CSIC, Madrid, Spain
^b Department of Stomatology, Section of Orthodontics, Faculty of Odontology, University of Granada, Granada, Spain



Mauer and Arago = single deme and the presence of Neandertal derived traits represent the beginning of their evolutionary process.

Atapuerca-SH have similarities with Mauer and Arago which allows linking of them to this group. Then Atapuerca-SH are considered members of Neandertal lineage.

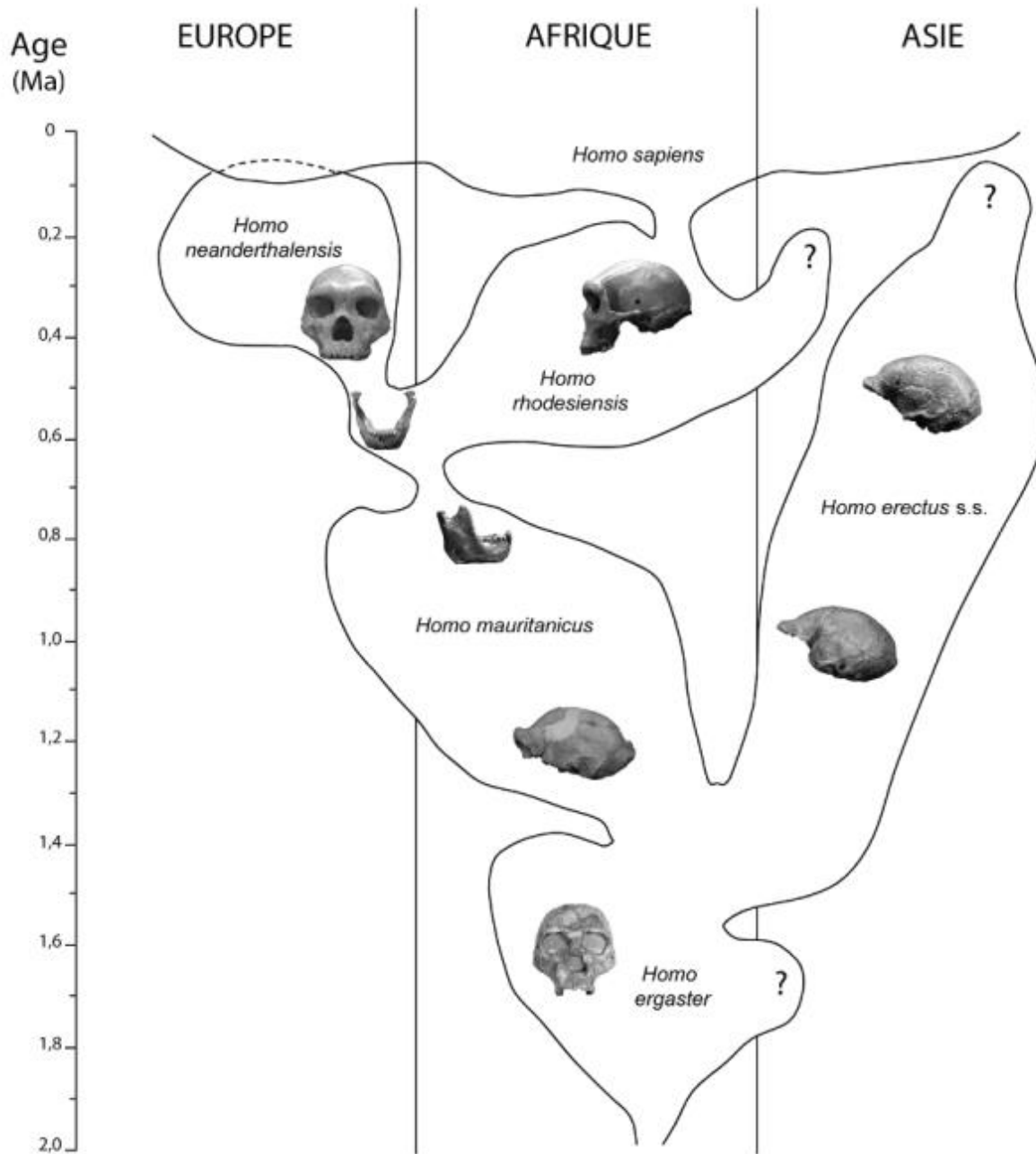
Ipotesi Evolutive: Origine Afro-europea



Esistenza nel P. medio di un taxa Afro-europeo ancestrali ai uomini moderni e ai Neandertaliani = basato sulle assomiglianze morfologiche tra Petralona Kabwe e Mauer. (Rightmire, 1998)



Ipotesi Evolutive: Origine Afro-europea

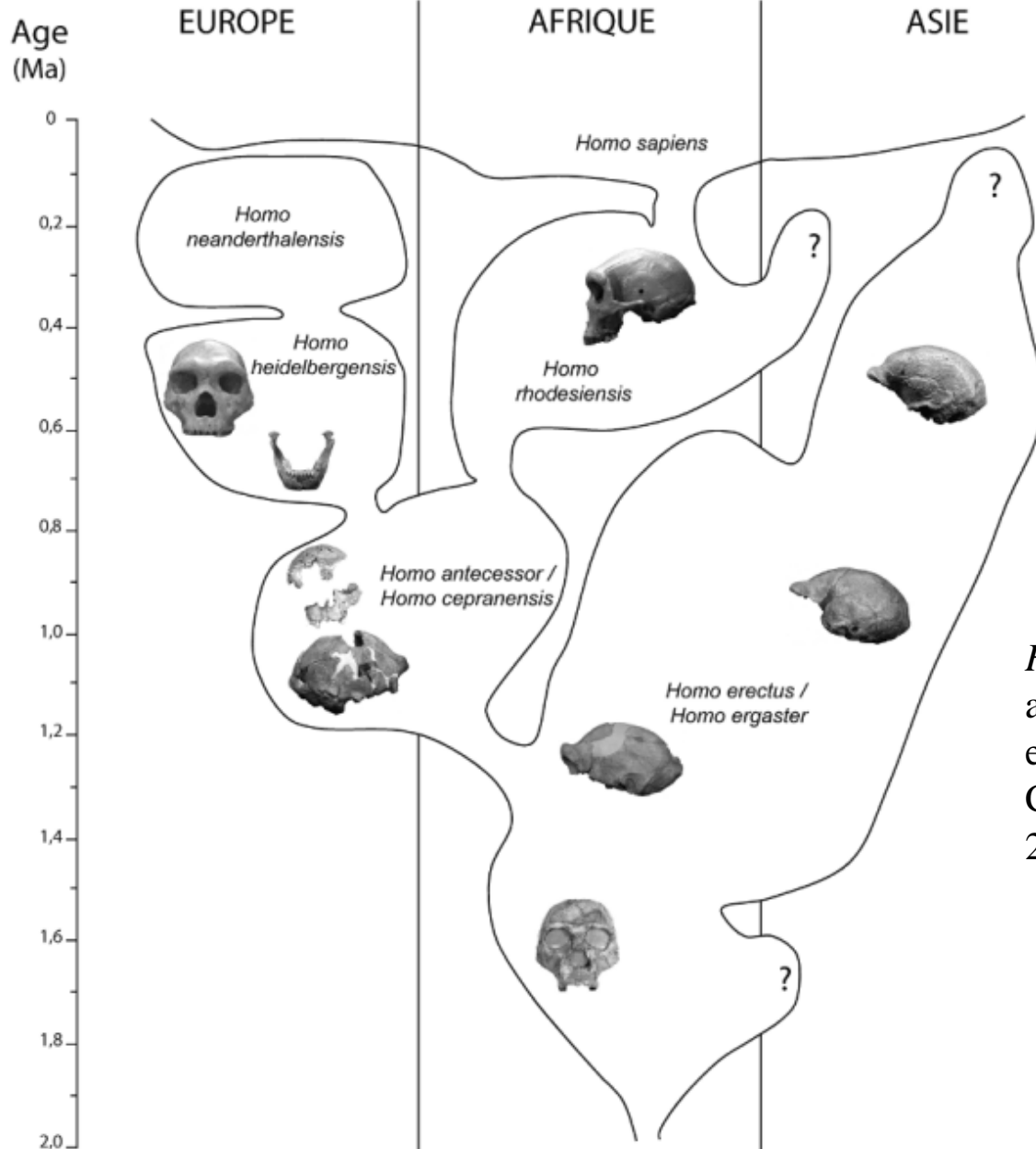


La presenza di caratteri Neandertaliani nella mandibola di Mauer giustifica la sua inclusione nella linea neandertaliana e quindi l'abbandono del nome *H. heidelbergensis* e l'introduzione del *H. mauritanicus* rappresentato dai resti di Tighenif e designato come l'ultimo antenato comune ai neandertaliani e i uomini moderni (Hublin, 2001)



b)

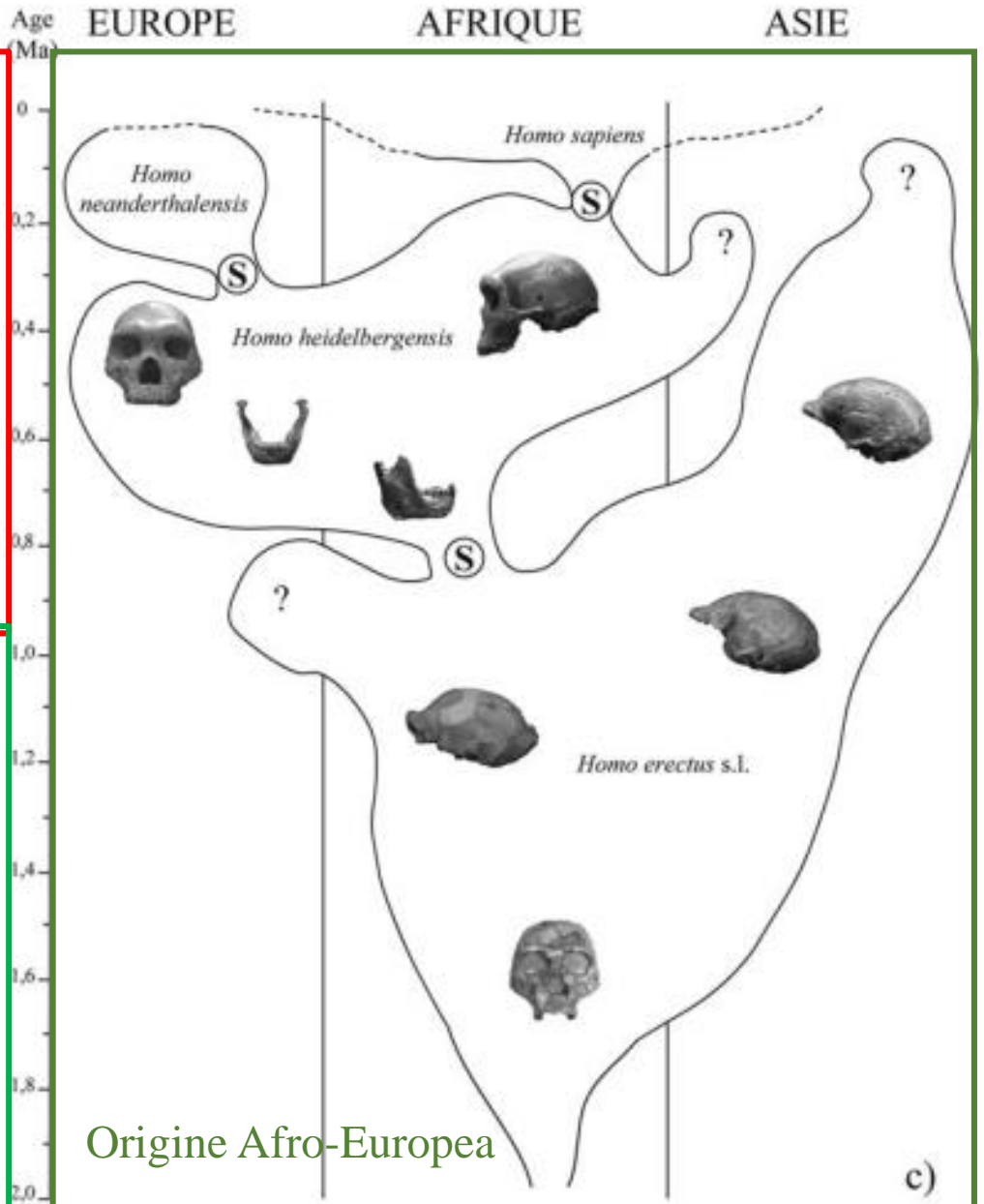
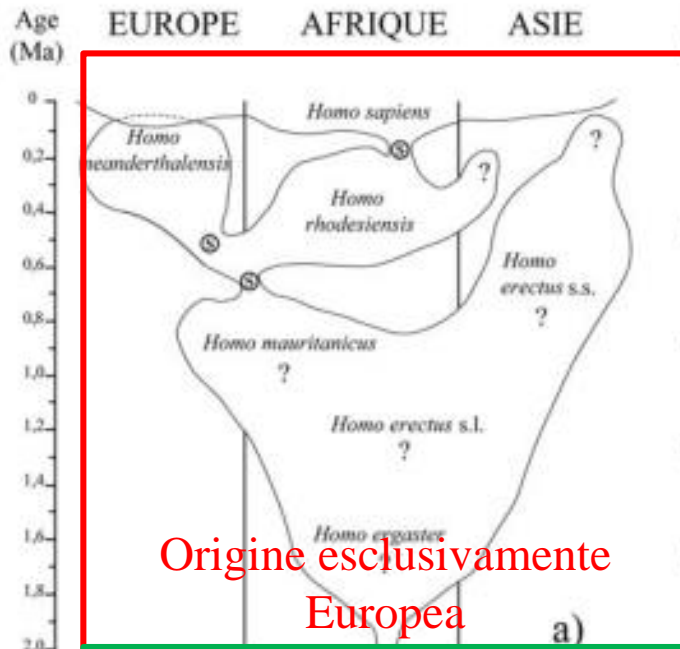
Ipotesi Evolutive: Origine esclusivamente Europea

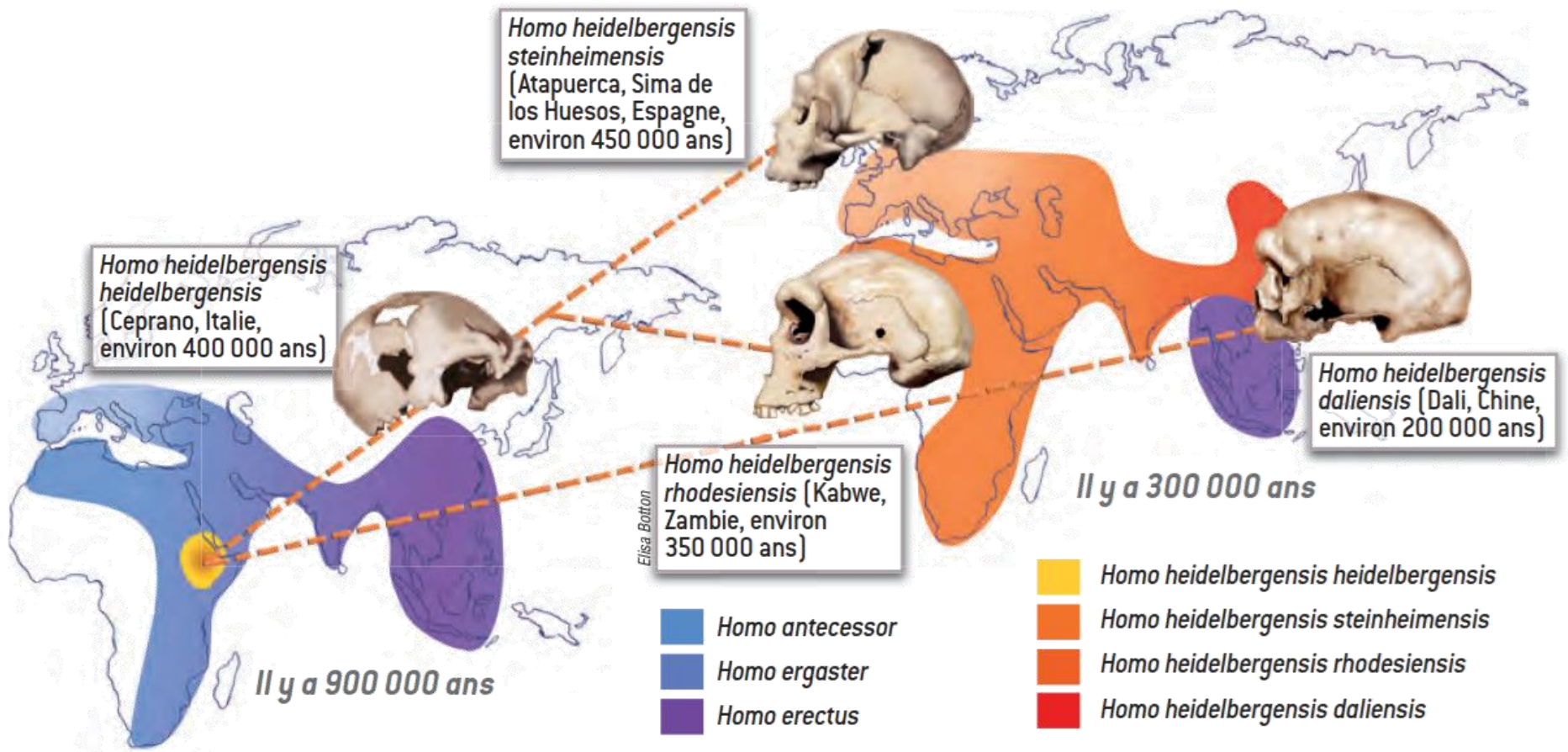


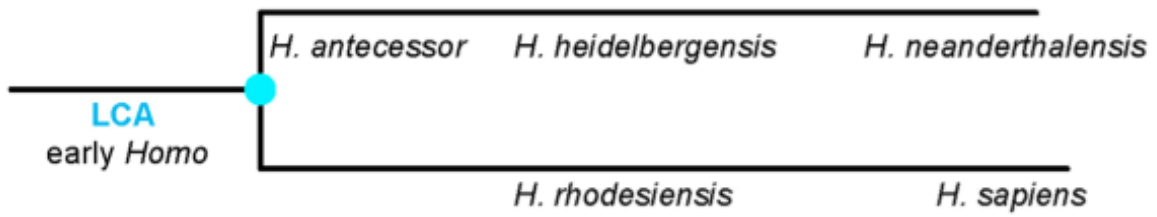
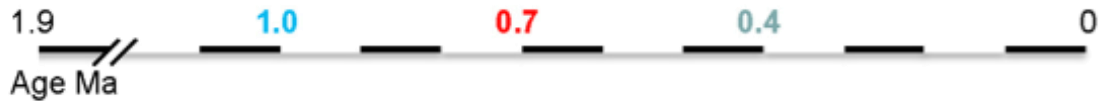
H. antecessor sarebbe l'ultimo antenato comune tra i neandertaliani e i uomini moderni (Bermudez de Castro et al., 1997; Mallegni et al., 2003)



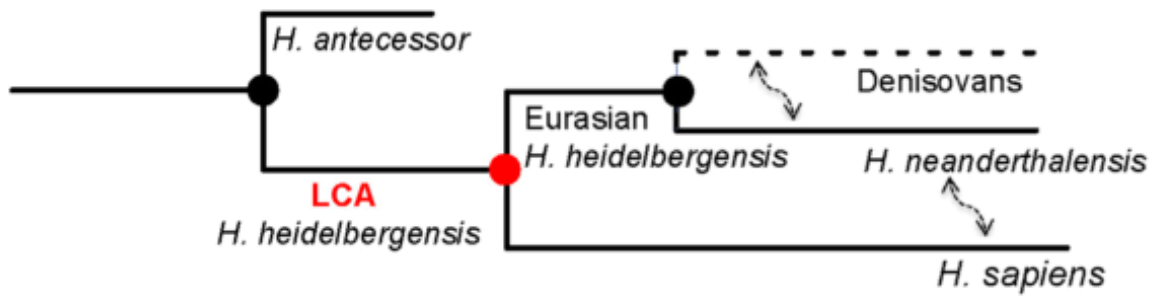
b)



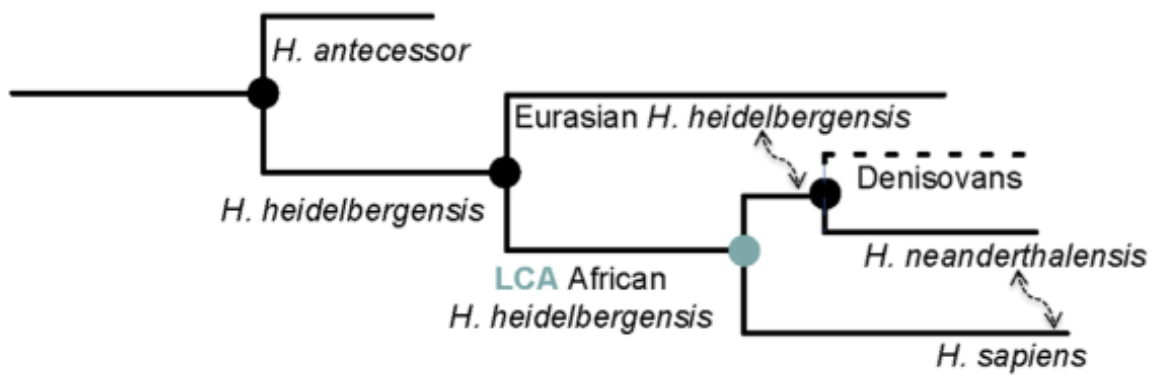




Model 1: late Lower Pleistocene (~1.0 Ma) modern human and Neandertal LCA

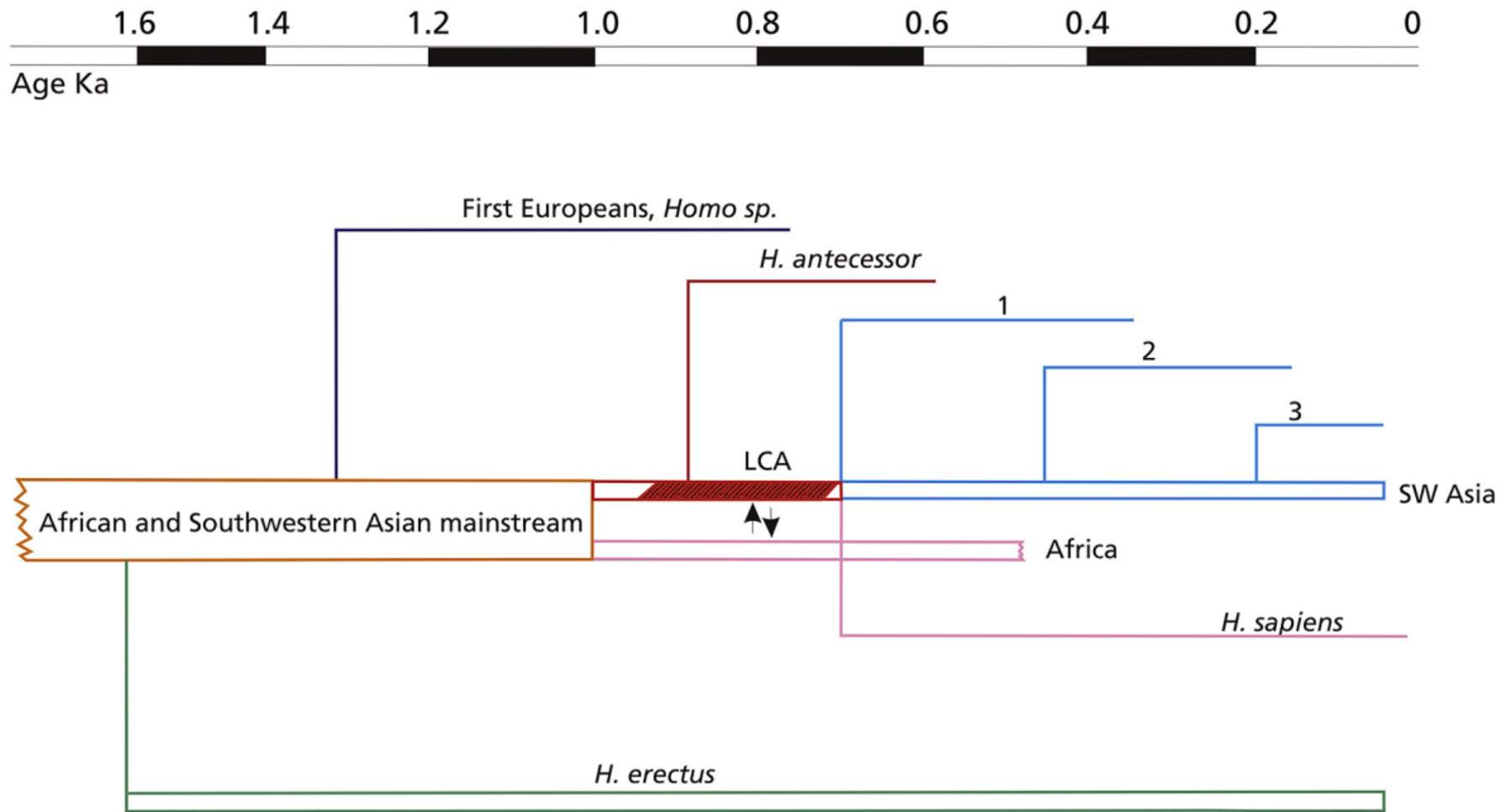


Model 2: early Middle Pleistocene (~0.7 Ma) modern human and Neandertal LCA



Model 3: mid-Middle Pleistocene (~0.4 Ma) modern human and Neandertal LCA





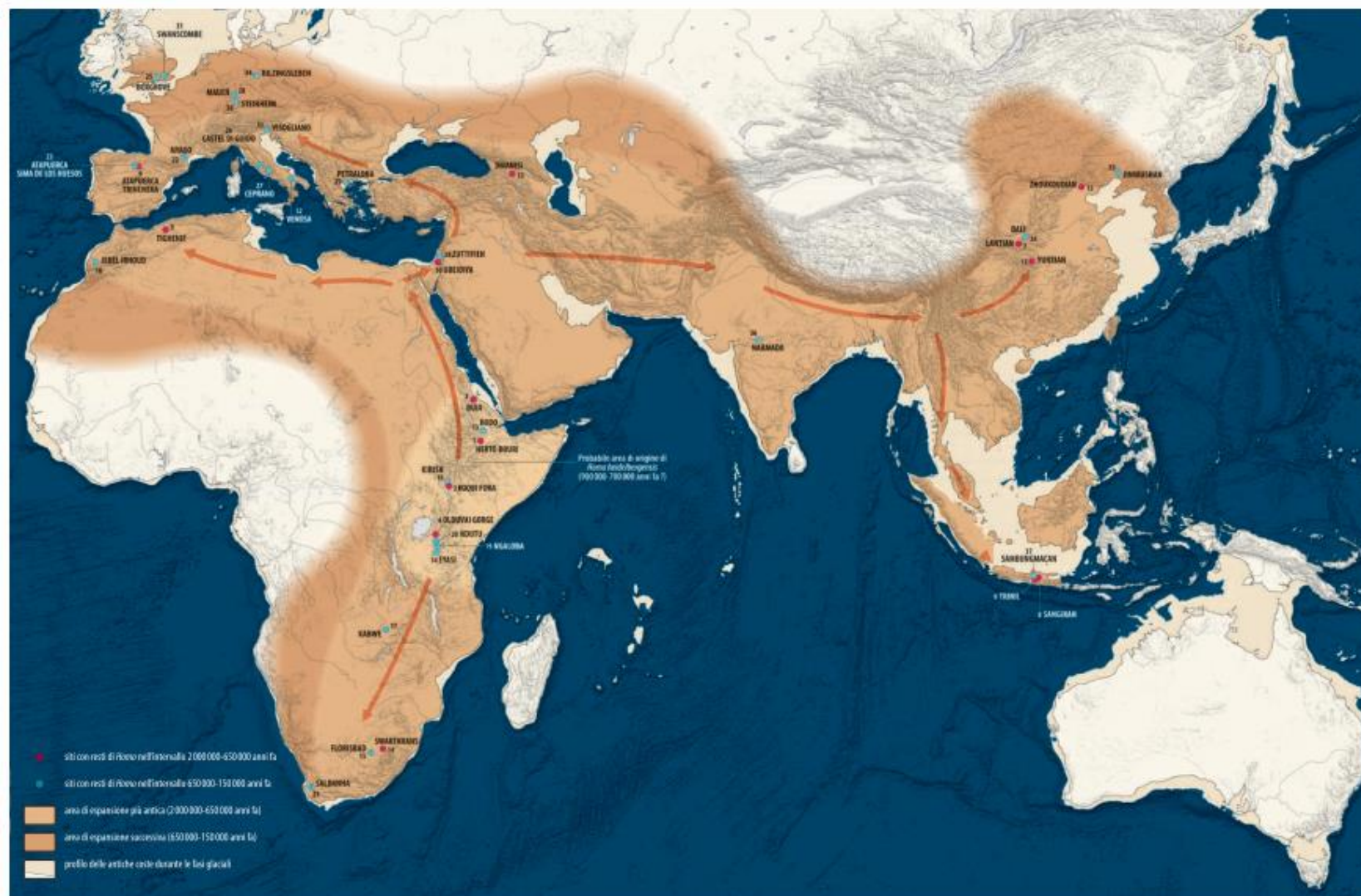
H. antecessor = European branch closely related to the LCA Neanderthal and MH

H. heidelbergensis removed of the hominin phylogeny

European Middle Pleistocene specimens could be included in two or more branches of the Neanderthal clade



LA SECONDA DIASPORA: ESPANSIONE DI HOMO HEIDELBERGENSIS E DELLE SUE VARIETÀ



OUT OF AFRICA 2. LA SECONDA DIASPORA, COMPIUTA QUESTA VOLTA DA HOMO HEIDELBERGENSIS.
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 E NASTUCCIO



Homo neanderthalensis



Definizione dei Neandertaliani S.S.

L'uomo di Neanderthal si caratterizza per la presenza di:

The Neandertals are characterized by the presence of:

- **Caratteri arcaici / Plesiomorfie** : dei caratteri ancestrali che non si ritrovano in nessun fossile moderno.

Archaic features / Plesiomorphies: These are ancestral features which are not found in the modern fossil.

- **Caratteri condivisi** con *Homo sapiens*.

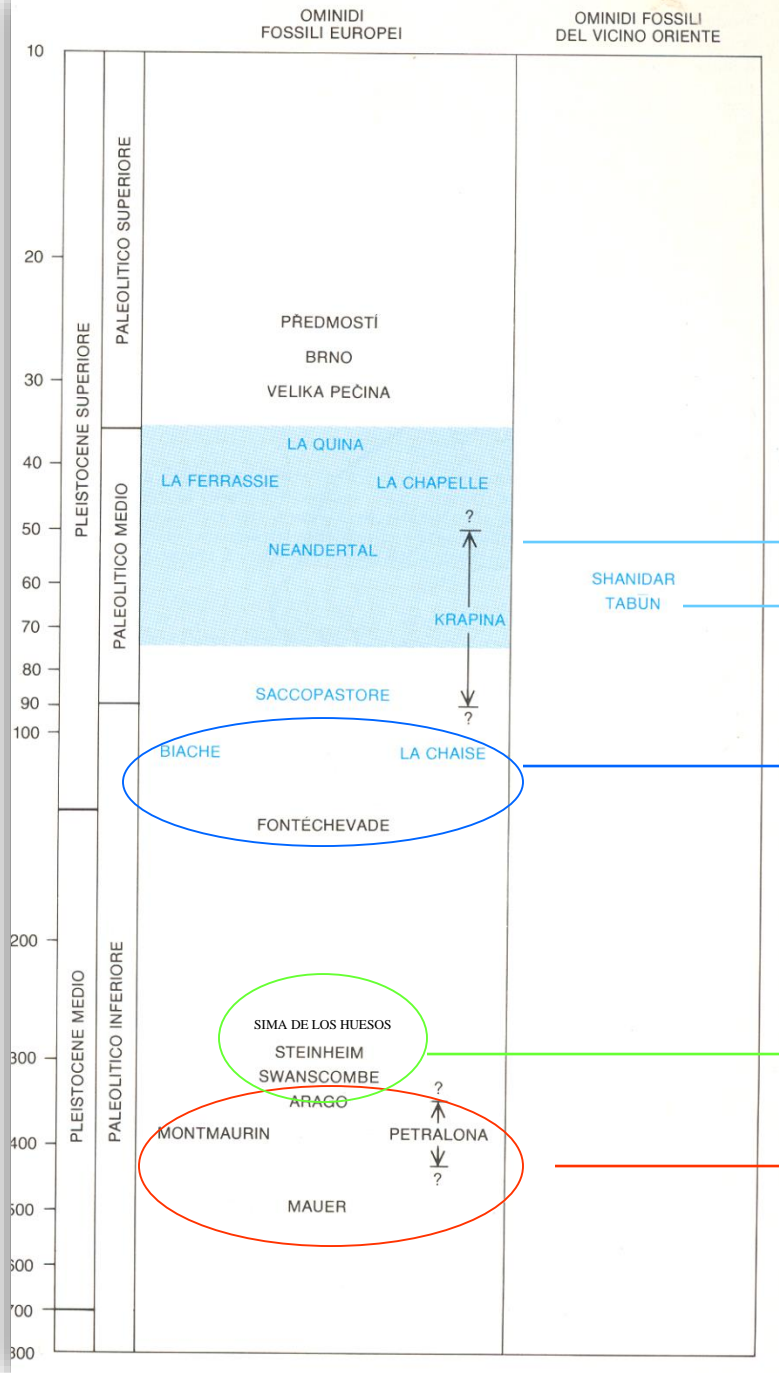
Feature shared with Homo sapiens

- **Caratteri derivati / Apomorfie** : presenti solo nei Neandertaliani, peculiari ed identificativi di questa specie.

Derivated features / Apomorphies: These are present only in the Neanderthals, and allow to identify this species.



I Neandertaliani



Neandertaliani classici

Neandertaliani orientali

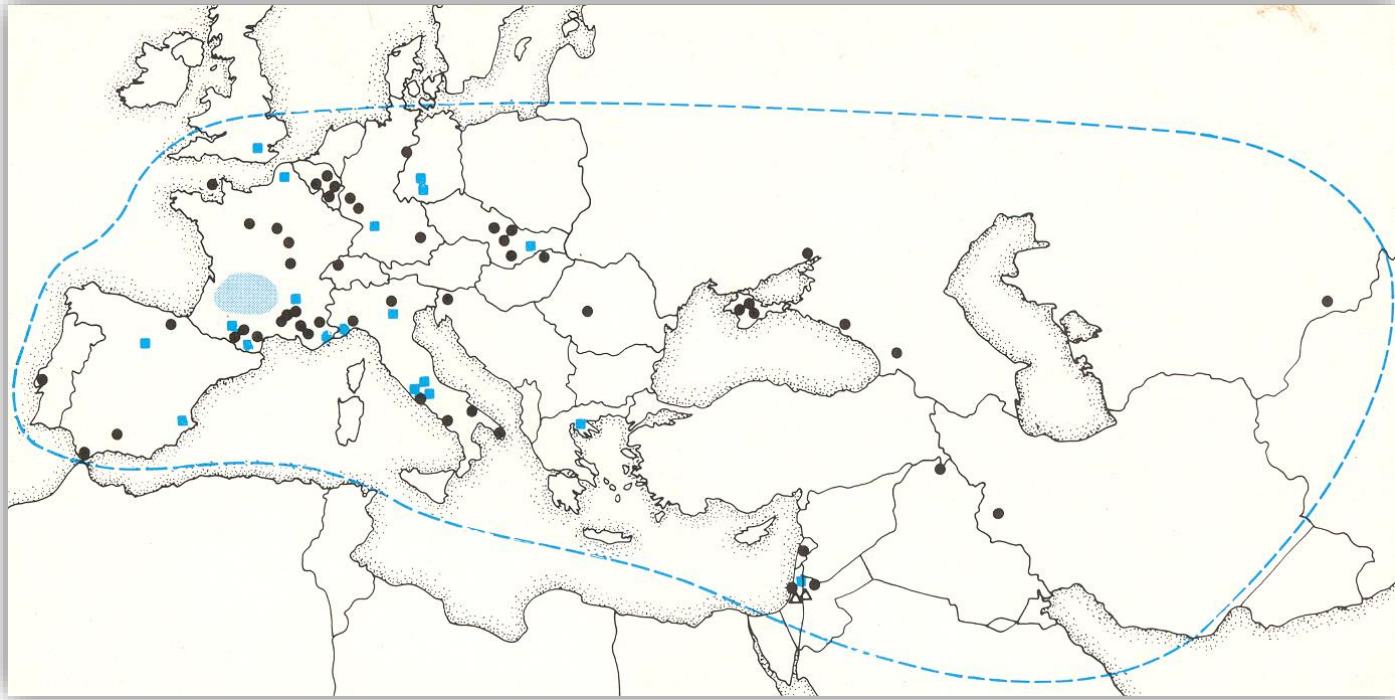
III fase (250.000-130.000):
stabilizzazione dei caratteri

II fase (400.000-250.000): regione
nucale e facciale

I fase (prima di 400.000): regione
infraorbitaria e mandibola



I Neandertaliani



Una speciazione di questi caratteri si osserva nel tempo e nello spazio, infatti i caratteri derivati si mostrano sempre più accentuati man mano che ci si sposta verso Ovest.

→ attorno a 50000 anni in Europa occidentale, gli individui di Neanderthal presentano dei caratteri derivati più pronunciati rispetto agli individui neandertaliani dell'Europa orientale.

A speciation of these features can be observed in time and space. In fact the derived features are more accentuated going toward Western Europe.

→ around 50 000 years in Western Europe, the neandertal present derived features more marked compared to the Neandertal from Eastern Europe.



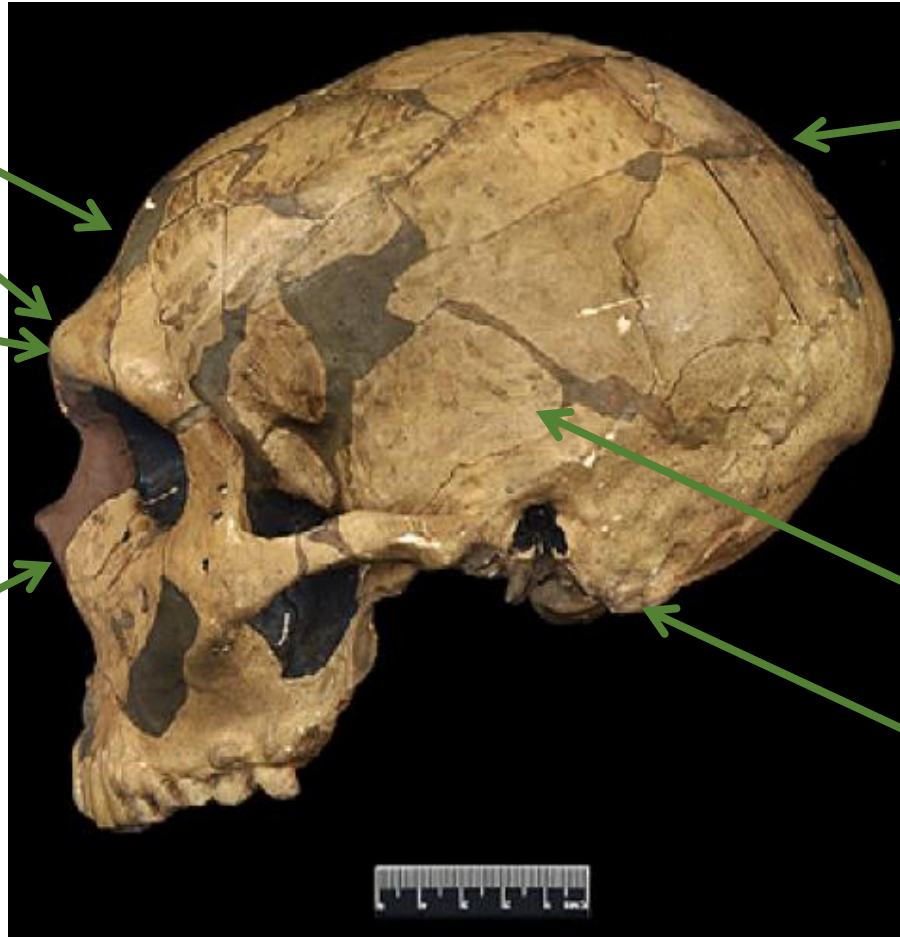
Grande capacità cranica 1500-1700 cm³

Frontale sfuggente

Toro sopraorbitario

Glabella sporgente

Naso alto, e proiettato verso avanti =
Prognatismo meso-facciale



Occipito-parietale
piatto

Occipitale pinzato
Piano nucale e Piano
occipitale formano un
angolo chiuso

Temporale basso

Apofisi mastoidee
piccole e poco sviluppate

Il cranio cerebrale è allungato per compensare la faccia voluminosa



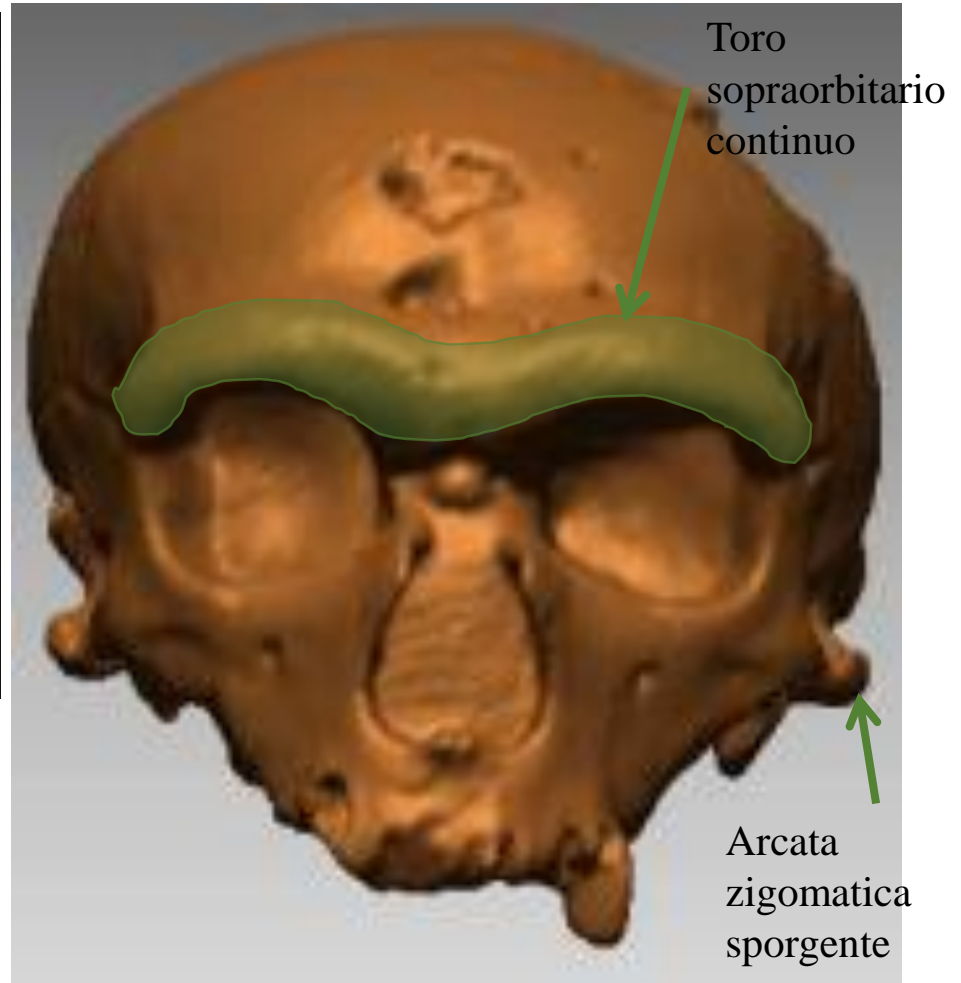
La Ferrassie 1

Orbite più large che alte,
arrotondate e grandi



La Ferrassie 1

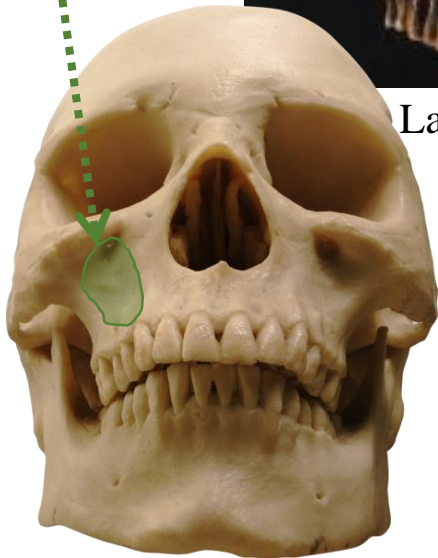
Cavità nasale alta e
voluminosa



Toro
sopraorbitario
continuo

Arcata
zigomatica
sporgente

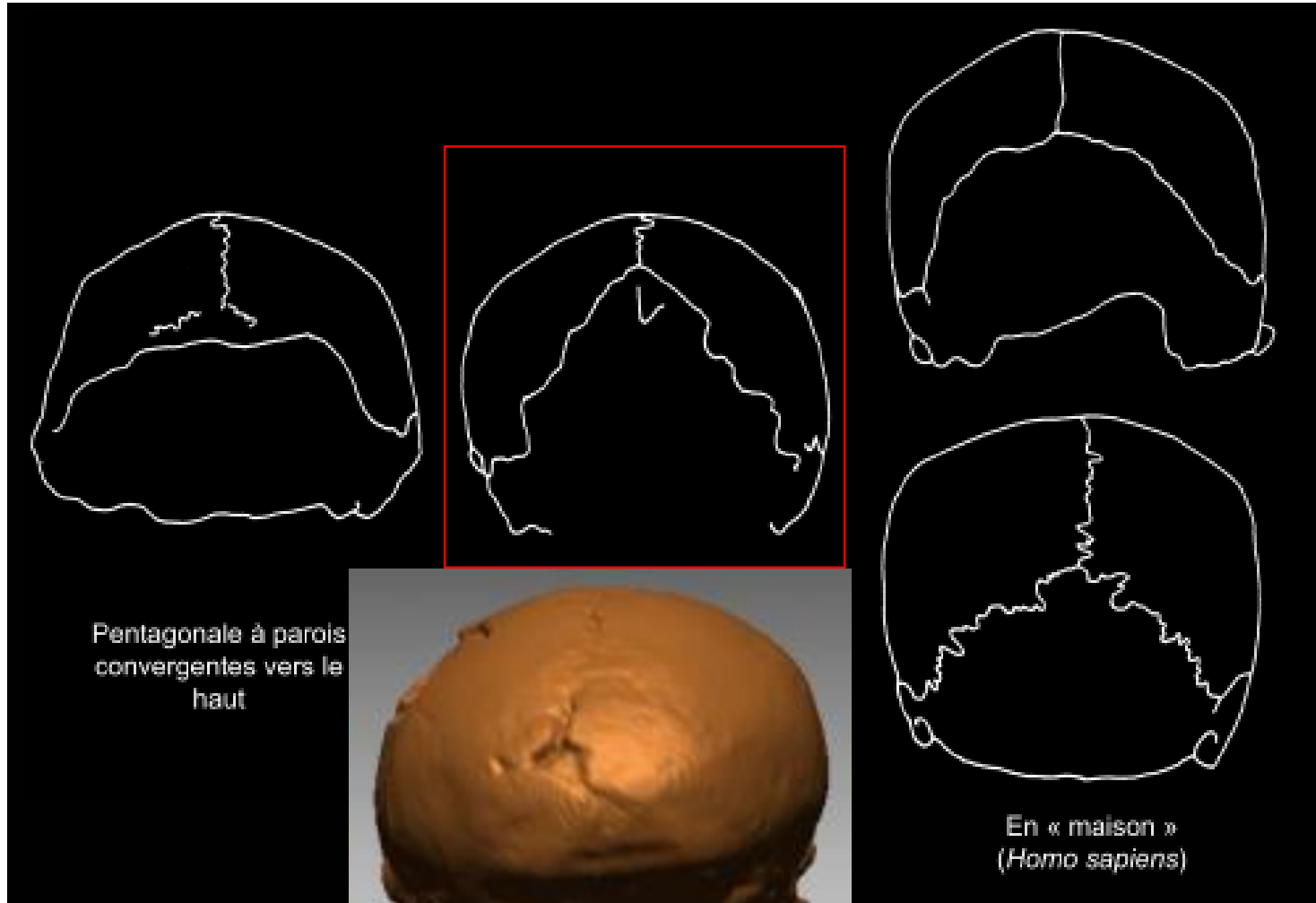
Assenza di
fossa canina



La Chapelle-aux-Saints 1

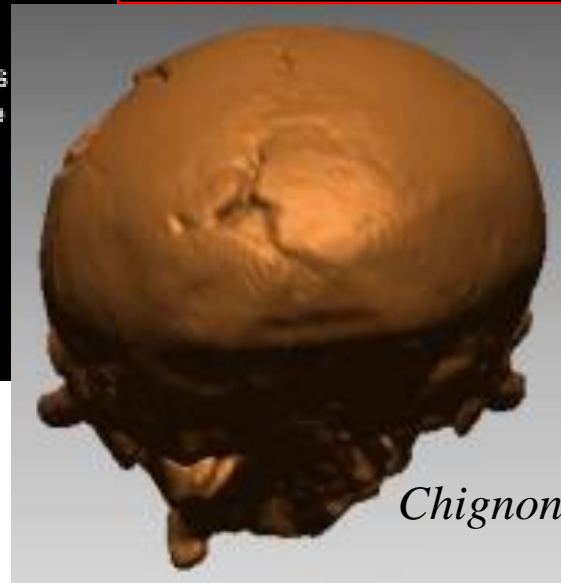


Forma circolare del cranio in vista posteriore
Circular shape of the cranium in posterior view



Pentagonale à parois
convergentes vers le
haut

En « maison »
(*Homo sapiens*)

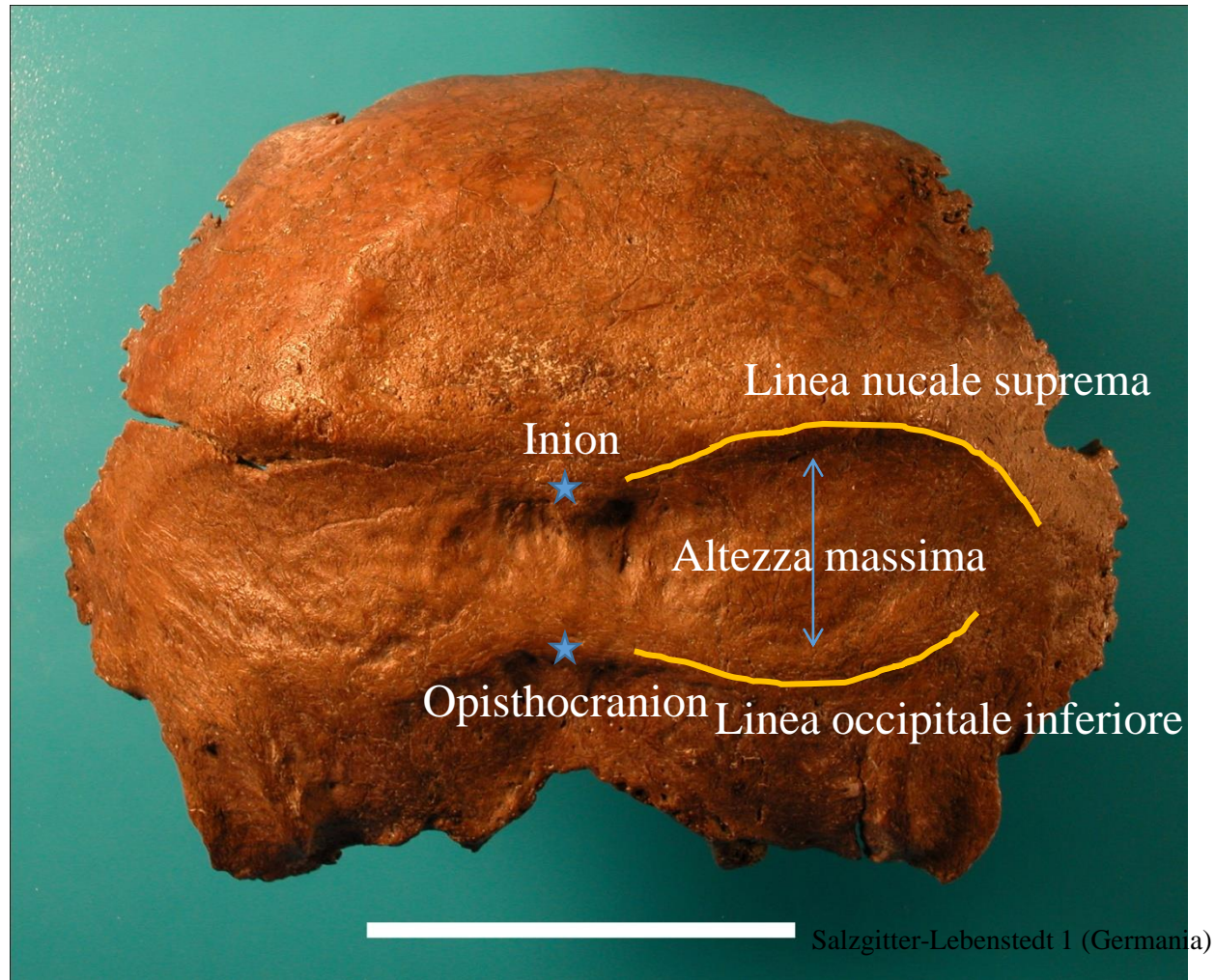


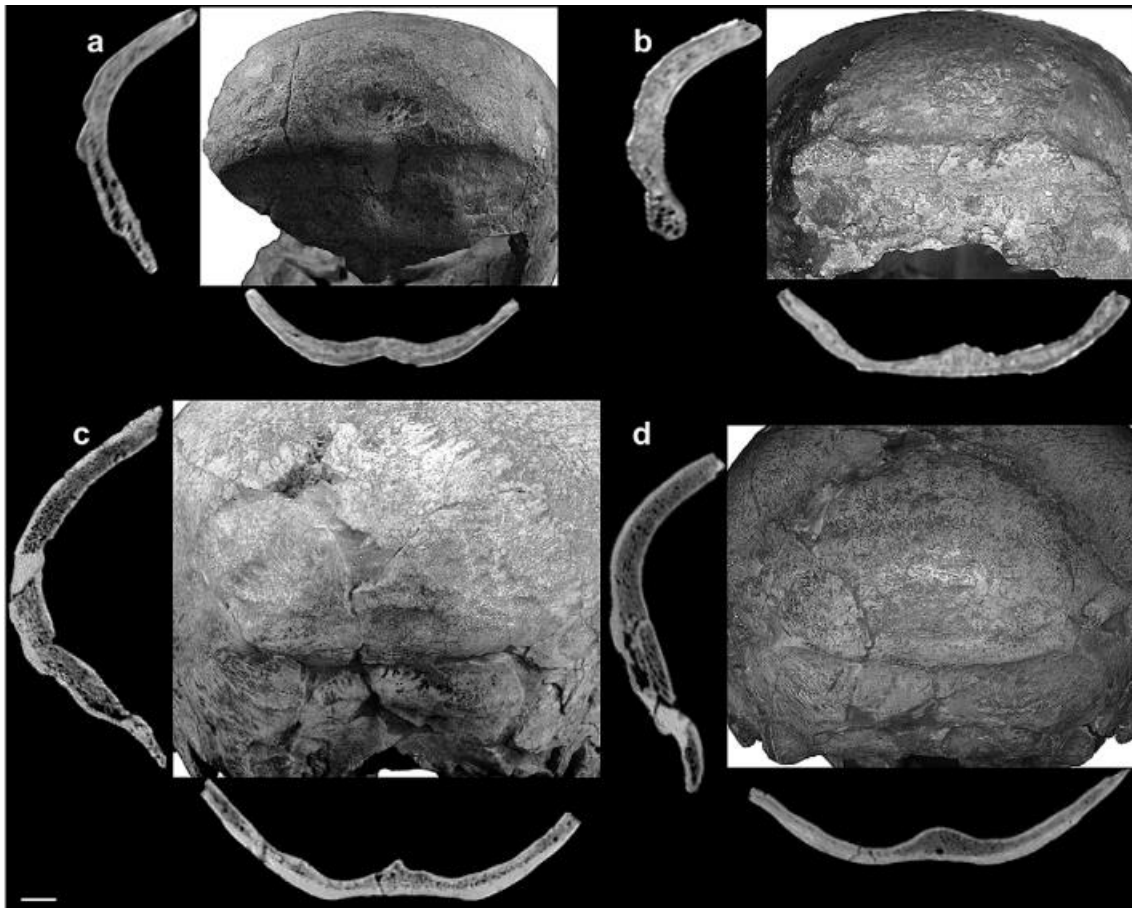
Chignon occipitale



La Chapelle-aux-Saints (Francia)

Fossa soprainiac / *suprainiac fossa*





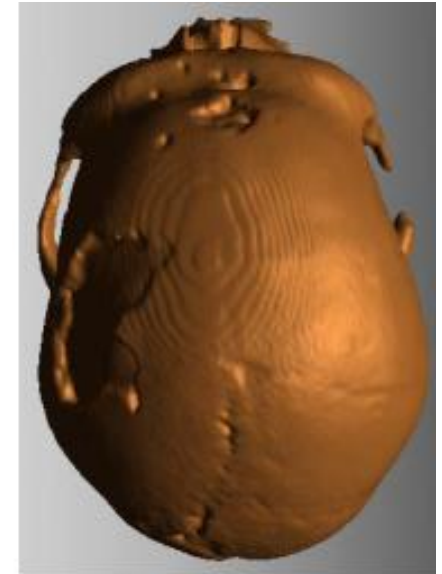
- a: Gibraltar 1
- b: Guattari 1
- c: La Chapelle-aux Saints 1
- d: La Ferrassie 1

(Balzeau, 2010)

La fossa soprainiacca è un carattere derivato dei neandertaliani che si ritrova in tutti i campioni, si individua già durante i primi stadi di sviluppo ed è presente presto nella differenziazione della linea.

Corrisponde ad un assottigliamento della diploe.





Homo neanderthalensis
(La Chapelle-aux-Saints
1)

Cranio allungato / *elongated cranium*

Zigomi sporgenti / *prominent zygomatic*

Larghezza massima in posizione bassa /
maximum width in a low position



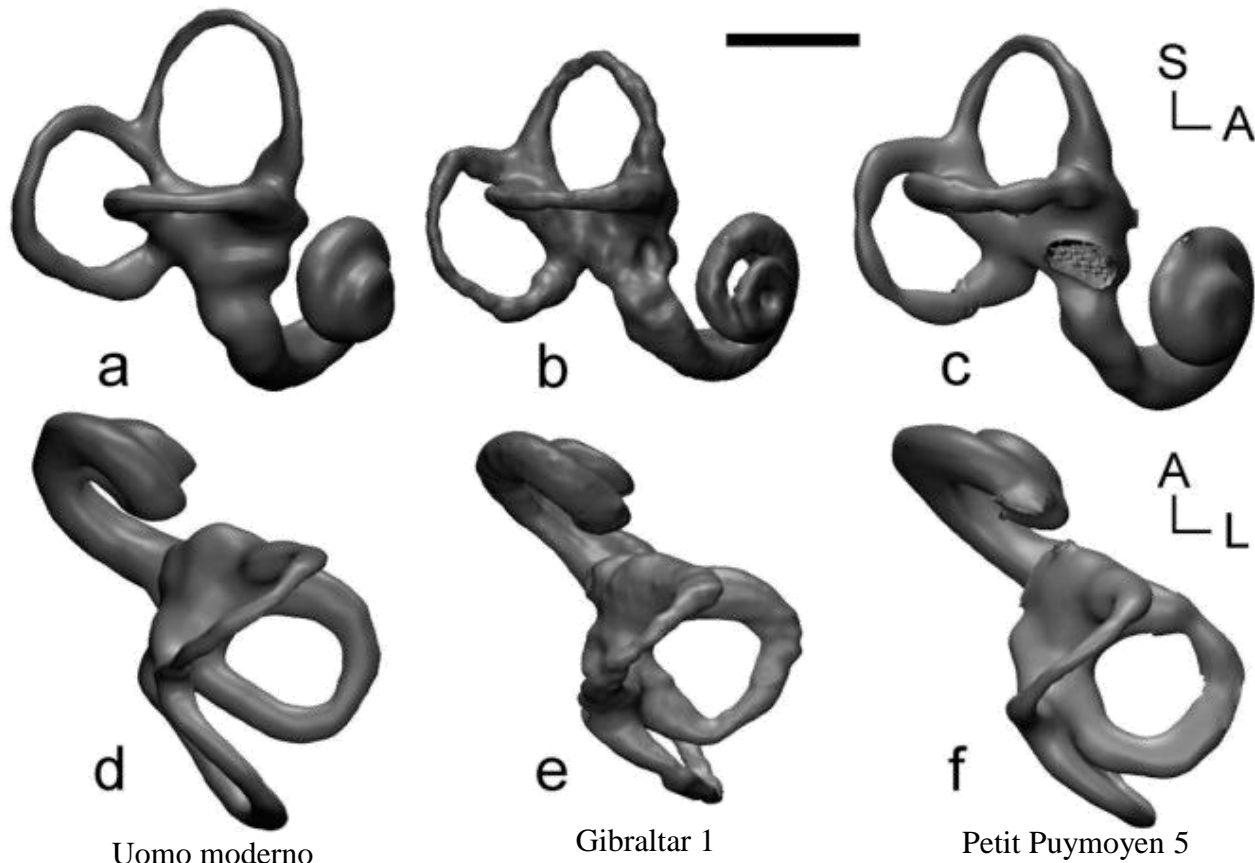
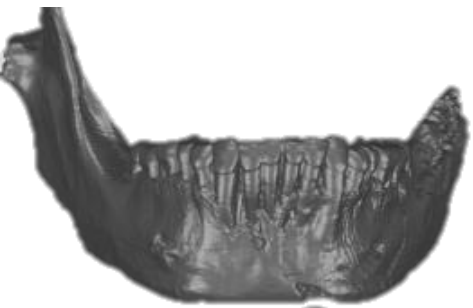


Fig. 2. Lateral (a)–(c) and superior (d)–(f) aspects of the right bony labyrinths of a Holocene human (a), (d), and the Neanderthal specimens Gibraltar 1 (b), (e) and Petit Puymoyen 5 (c), (f), reconstructed from sagittal CT scans. The lateral views are aligned according to the plane of the lateral semicircular canal. S, superior, A, anterior, and L, lateral. Scale bar is 5 mm.

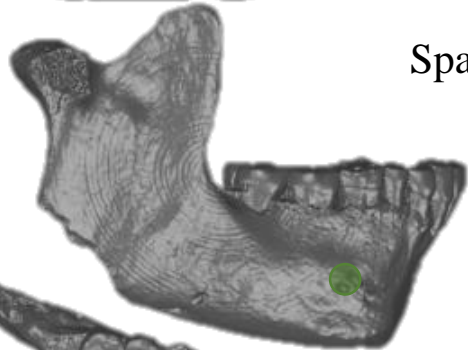
Rispetto all'uomo moderno l'orecchio interno del Neanderthal è caratterizzato da un arco del canale semicircolare anteriore più piccolo nel valore assoluto e relativo, abbastanza appuntito e con più torsioni.

Compared with Holocene humans the bony labyrinth of Neanderthals can be characterized by an anterior semicircular canal arc which is smaller in absolute and relative size, is relatively narrow, and shows more torsion.





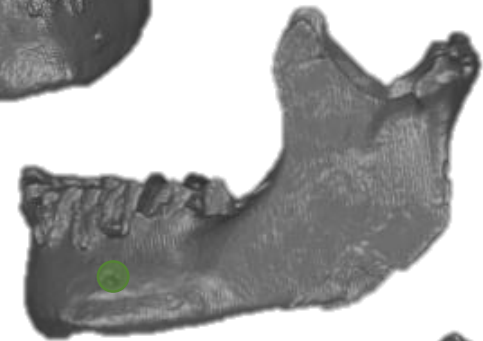
Ramo largo e divergente



Spazio retro-molare



Assenza di mento



Denti voluminosi

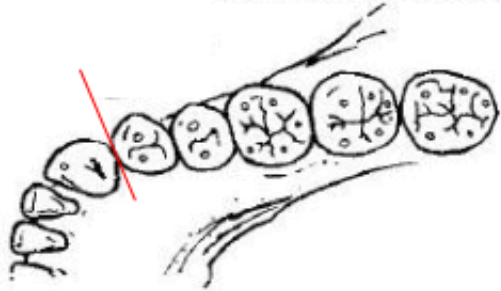


● Foramen mentoniero spostato indietro



Australopithecus africanus

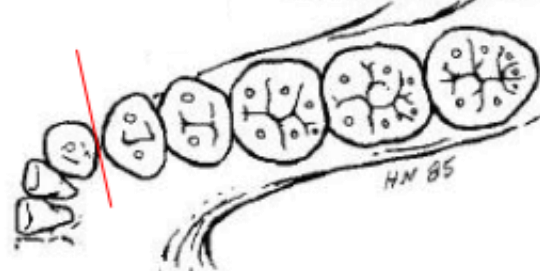
Less Robust Mandible



Relatively Larger Incisors and Canines
Relatively Smaller Premolars and Molars

Paranthropus

More Robust Mandible



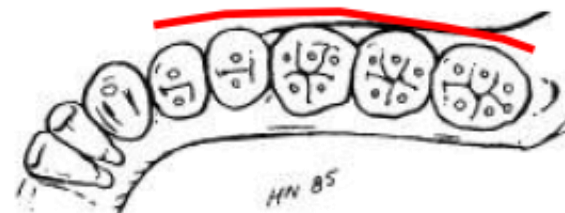
Relatively Smaller Incisors and Canines
Relatively Larger Premolars and Molars

Homo habilis



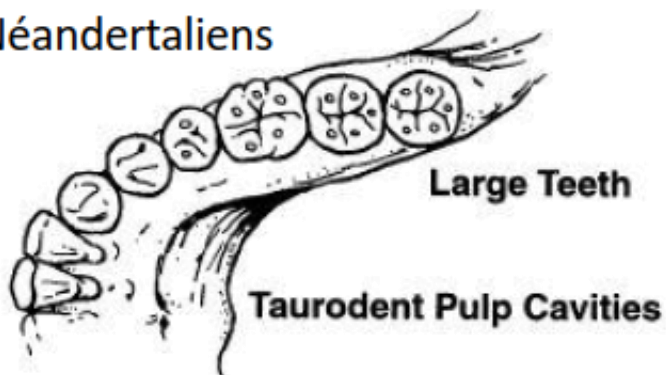
Larger Premolars and Molars

Homo erectus



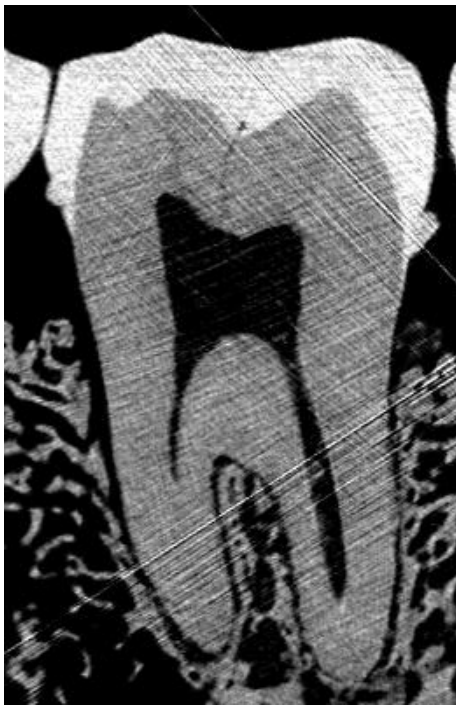
Smaller Premolars and Molars

Néandertaliens

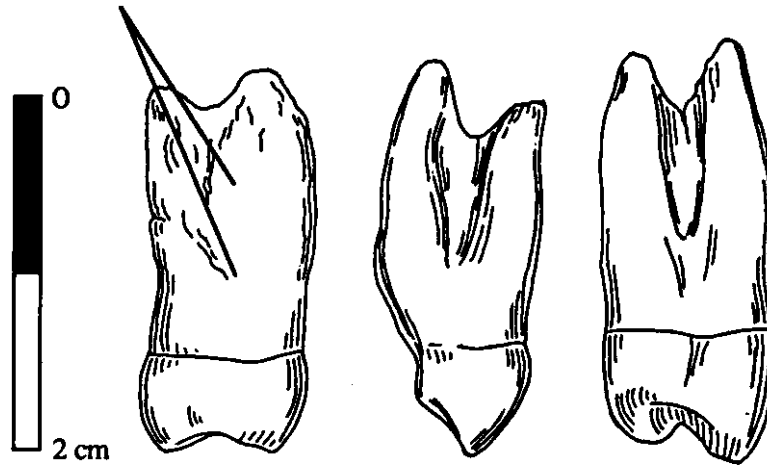


Homo sapiens

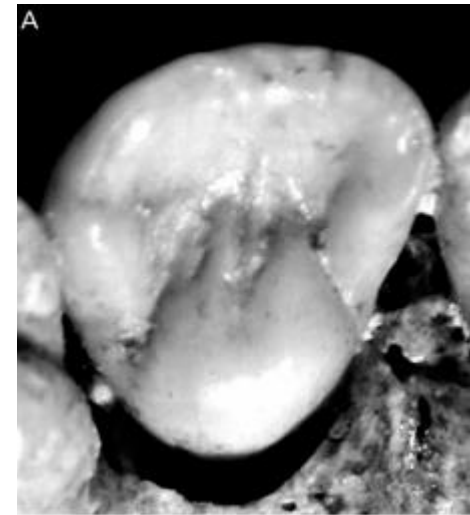




radici fuse
e cavità pulpare
ingrandita



Denti premolari e molari taurodonti di Krapina

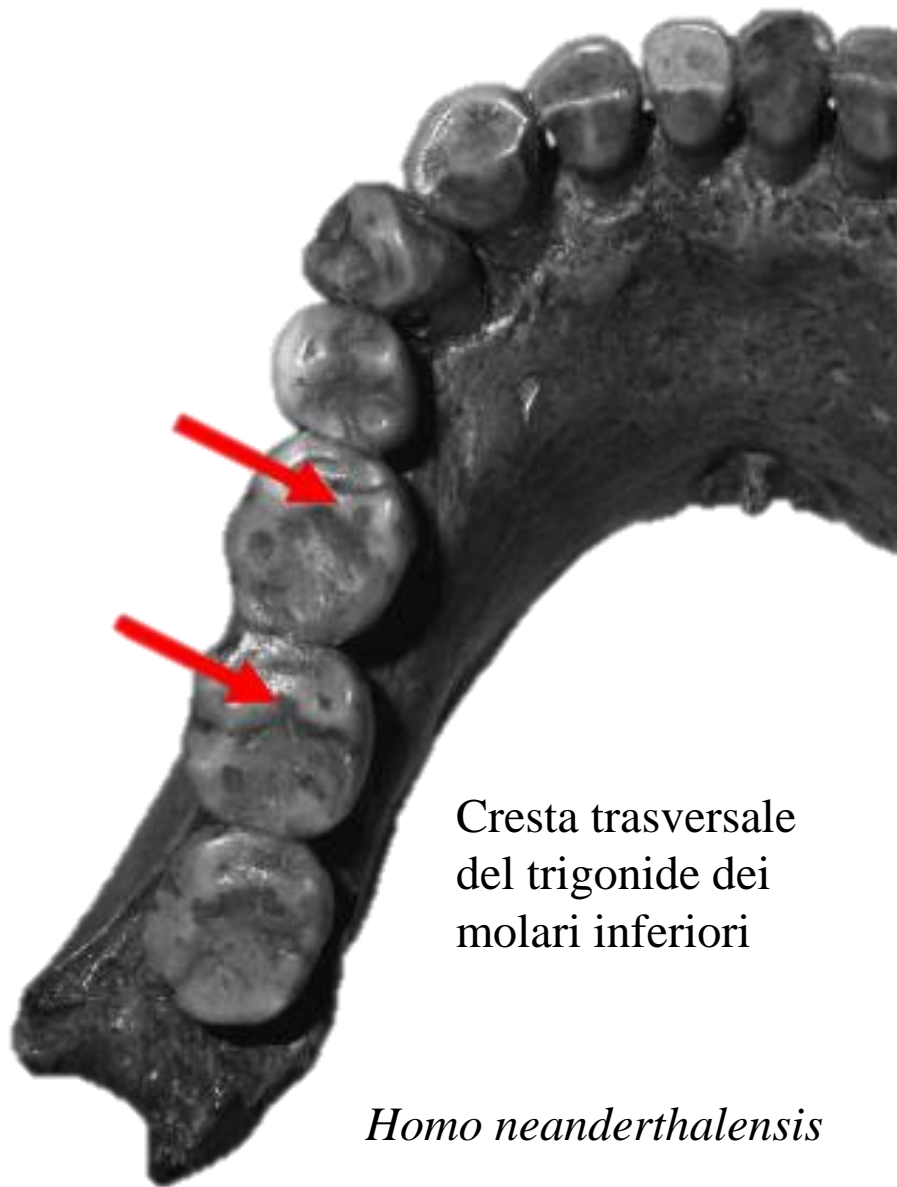


Incisivo con una forma di spatola e con una convessità labiale e un tubercolo linguale

Taurodontismo:
Grande cavità pulpare

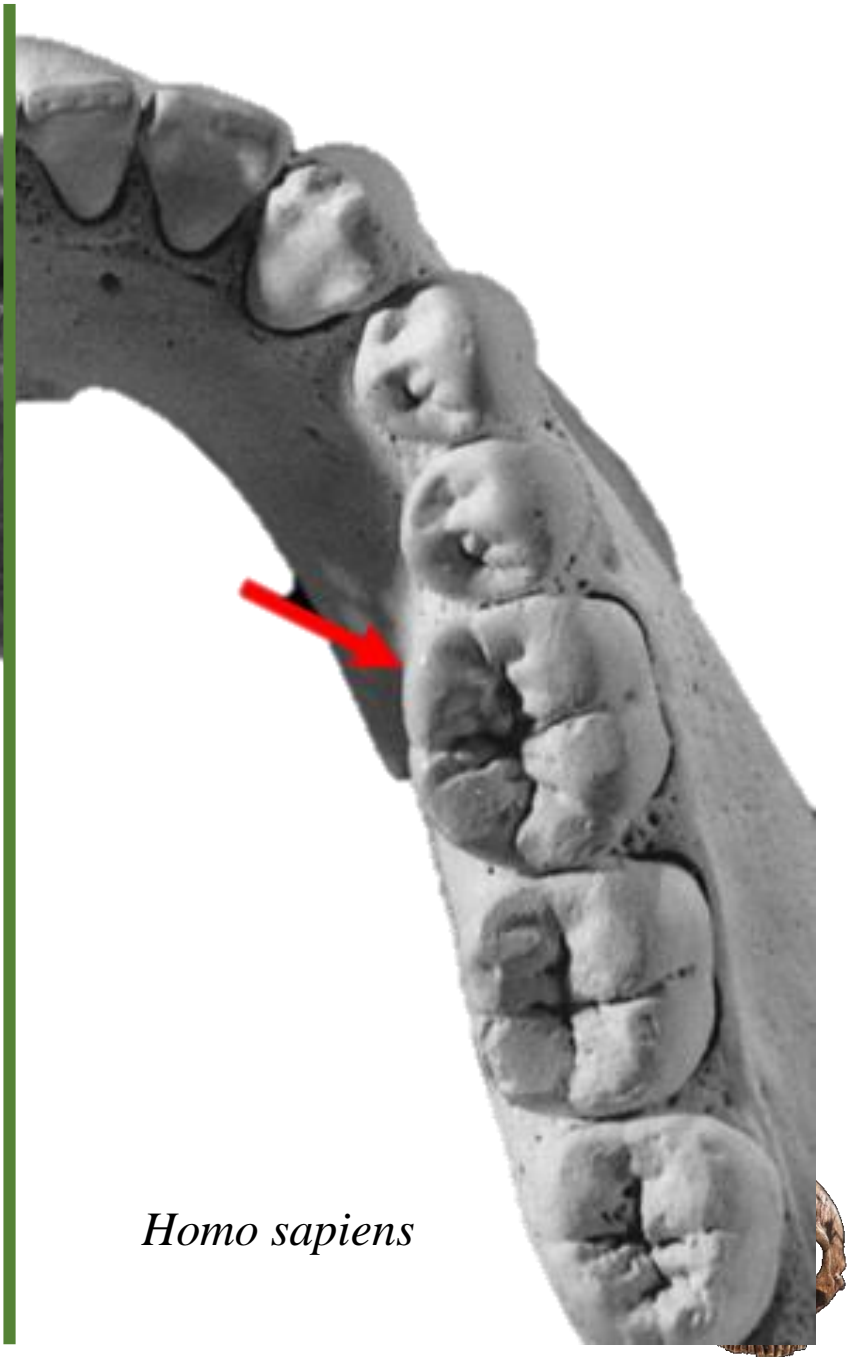
- Dimensione: *Homo* più antico > Neanderthal > *Homo sapiens*
- Incisivi di grandi dimensioni
- Incisivi superiori a forma di spatola
- Usura importante dei incisivi
- Spessore ridotto dello smalto
- Taurodontismo



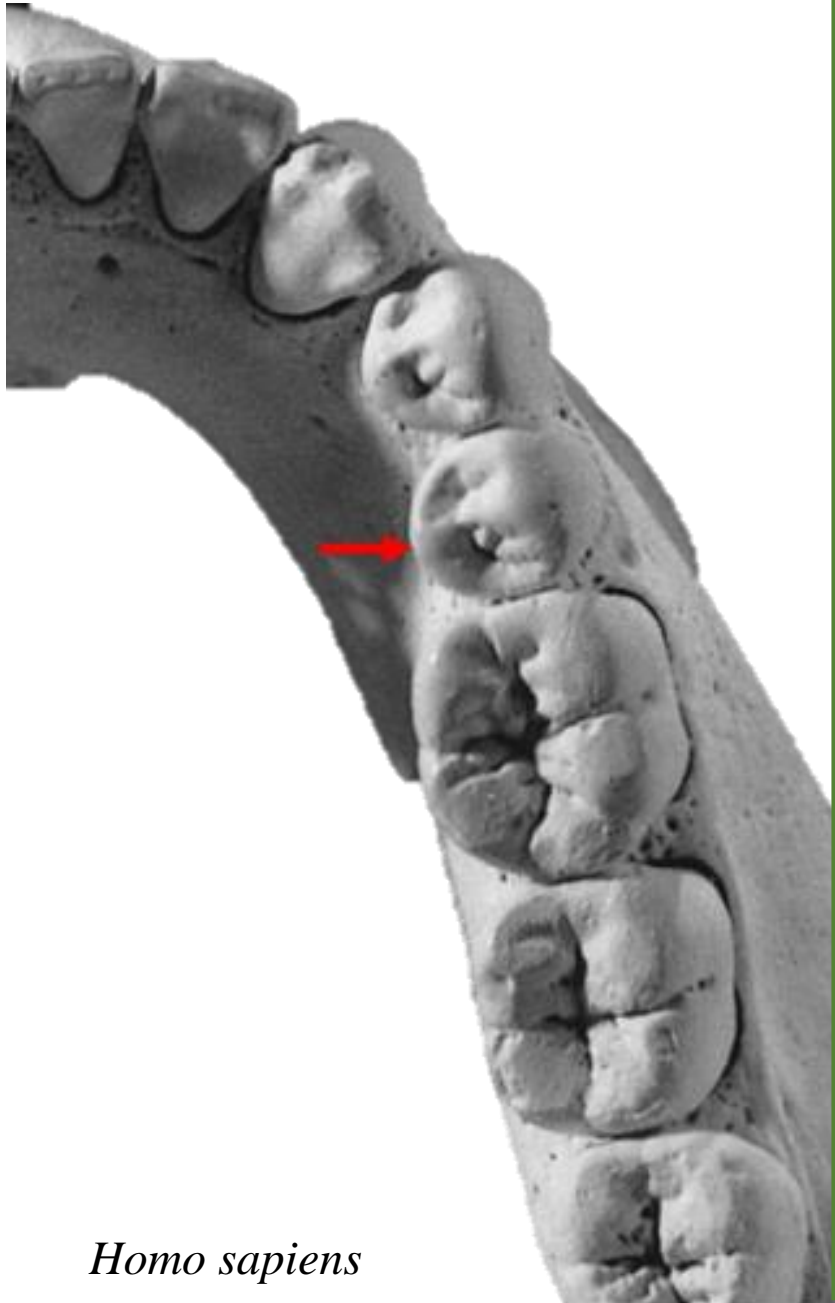


Cresta trasversale
del trigonide dei
molari inferiori

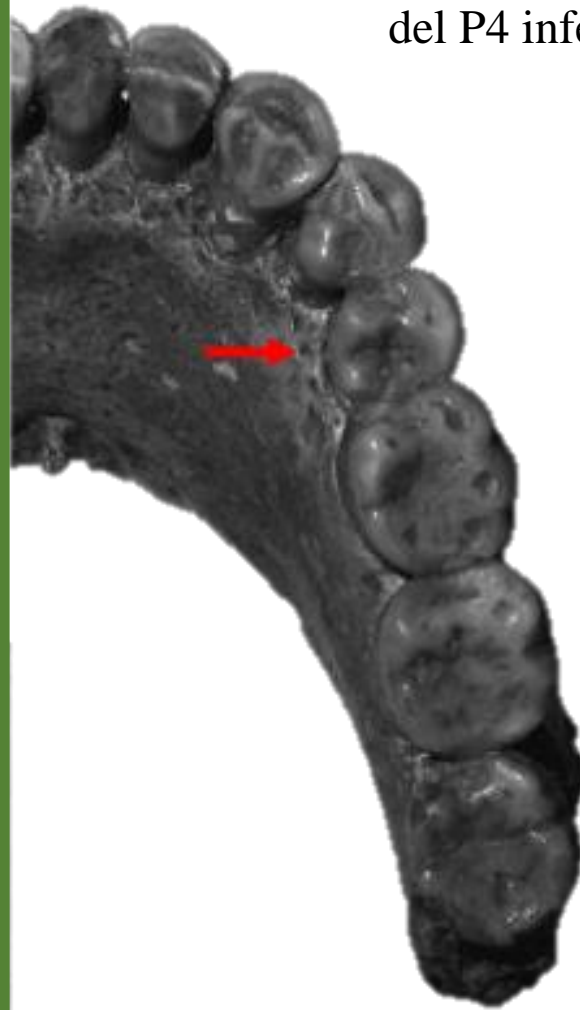
Homo neanderthalensis



Homo sapiens



Homo sapiens



Homo neanderthalensis

Asimmetria della
superficie linguale
del P4 inferiore



1,65m – 1,55m

Scheletro robusto con inserzioni muscolari robuste.

Robust skeleton with powerful muscular insertion

Vertebre cervicali che denotano un collo corto e tozzo

Cervical vertebra induce a short and squat neck

Muscolatura dorsale molto sviluppata

Dorsal musculature well developed

Torace largo, sviluppato lateralmente e verso l'avanti

Large thorax, lateraly and frontward developed

Il radio presenta una curvatura che denota una grande capacità di movimento.

The radius is curved which indicate an importante mouvement capacity.

Clavicola grande e gracile

Large and gracile clavicle

Mani grandi ma con dita corte: presa potente ed efficace

Large hand with short finger: powerful and effective hands



Allungamento mesio-laterale della branca orizzontale dell'osso pubico. Il pube risulta molto alto e gracile.

Extension meso-lateral of the horizontal crest of the pubic bone. This bone is high and gracile.

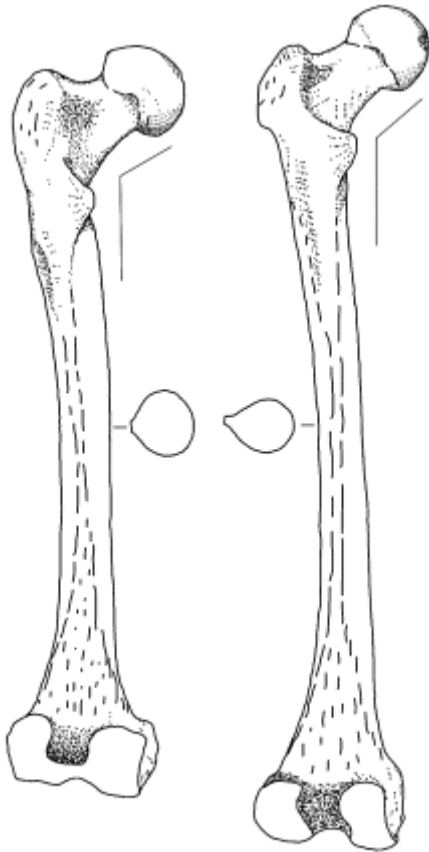
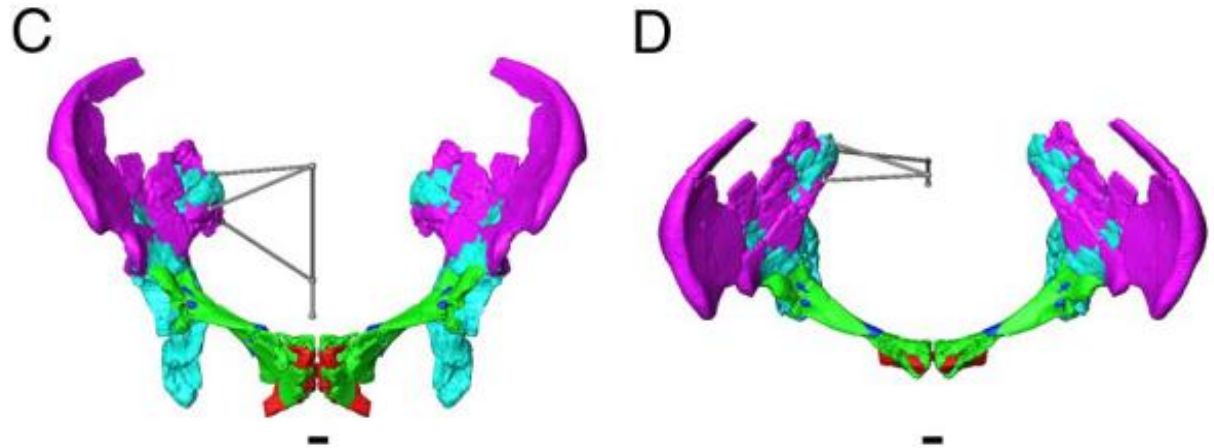


Fig. 1. Distinctive features of the Neanderthal femur. (Left) The Neanderthal 1 (Feldhofer Cave Neanderthal) femur. (Right) The Skhul IV near-modern human femur. Relative to near-modern humans, the Neanderthal femur has larger articulations (head and distal end), a thicker and rounder shaft, and a lower neck-shaft angle. Adapted from McCown and Keith (9).

(Weaver, 2003)



Ricostruzione virtuale delle pelvi del neandertal di Tabun (Weaver & Hublin)

Femore corto e curvo. L'epifisi è voluminosa e la diafisi presenta una sezione cilindrica.

L'angolo tra la testa e la diafisi è piccolo.

The femur short and curved. The epiphysis is voluminous and the diaphysis present a cylindrical section.

The angle between the femoral head and the diaphysis is small.



Significato della morfologia



Evoluzione della linea neandertaliana

Il modello di evoluzione dei Neanderthal è detto ad accrezione: questo gruppo di ominidi si è sviluppato in un parziale o completo isolamento dal resto dell'umanità.

Questo sviluppo è il risultato di un accumulazione graduale di tratti morfologici distintivi delle popolazioni Europee.

Alcuni studiosi hanno ipotizzato che i tratti neandertaliani si siano sviluppati seguendo a un adattamento a delle condizioni climatiche fredde :

Larga cavità nasale

Robustezza

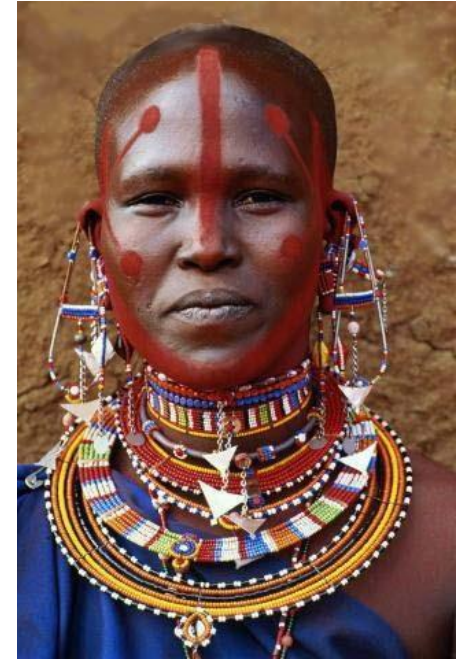
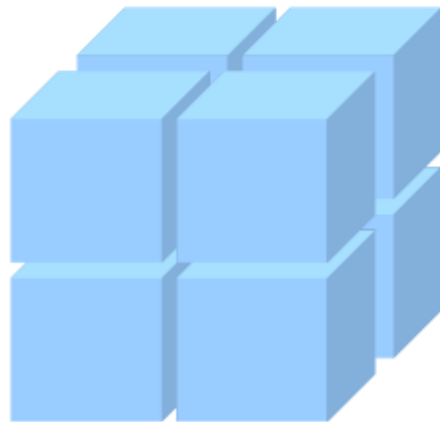
Morfologia tarchiata



Adattamento al freddo

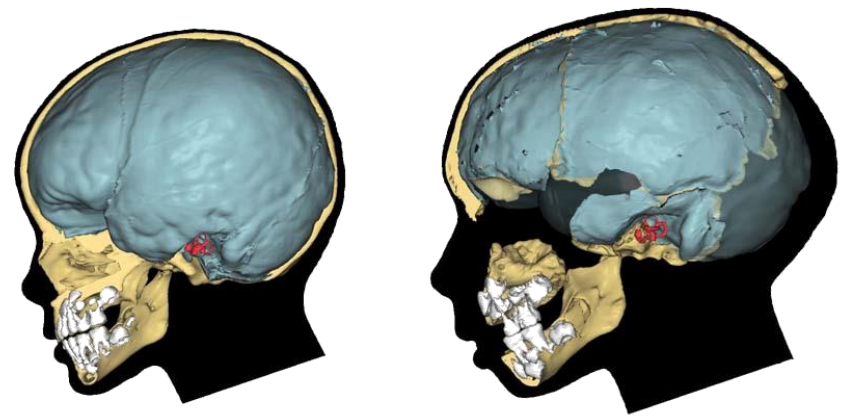
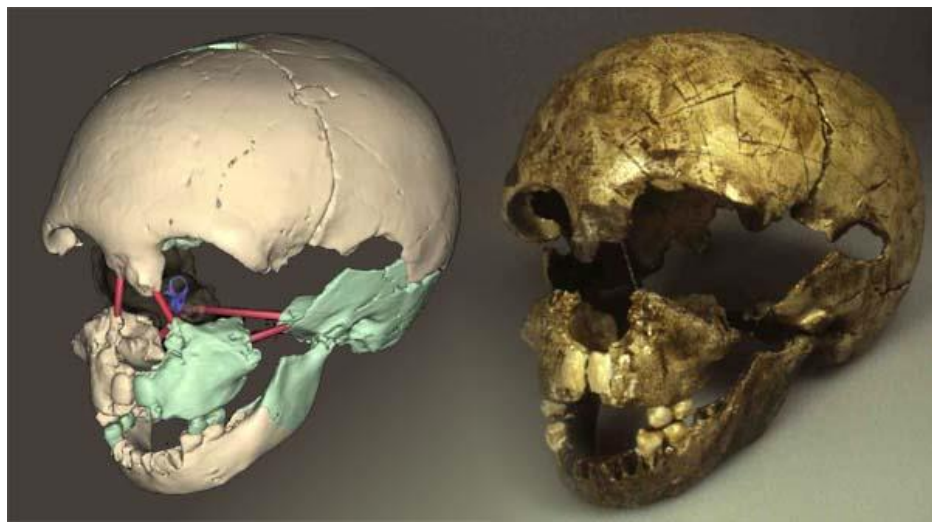
Regola di Allen : In un clima freddo, gli individui tendono ad essere più larghi e ad avere degli arti più corti rispetto a quelli che vivono in un clima temperato, poiché in questo modo la ritenzione del calore è più efficace (rapporto massa corporea/superficie esposta)

In cold climat, individuals tends to have shorter limbs than the one from warmer climates, in this way the heat rentention is more effective (ratio corporeal mass/exposed surface)



Ontogenesi

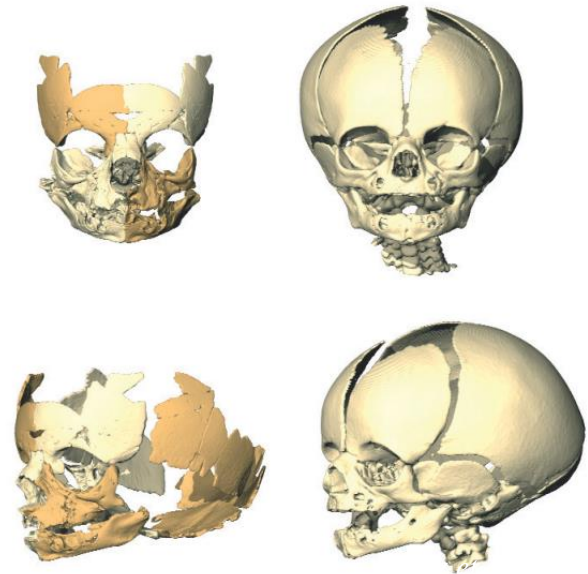




Gibraltar 2, Devil's Tower



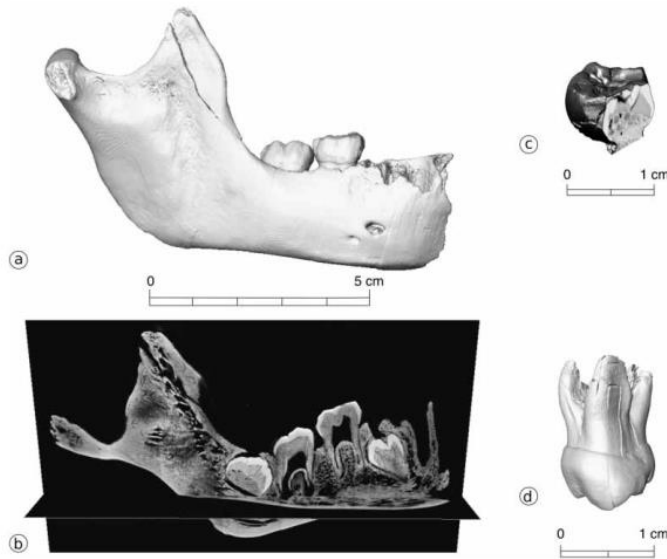
Dederiyeh, Syria



Le Moustier 2 is larger and more projected than in the modern human. Orbital, nasal shape and infraorbital surface of Le Moustier 2 are characteristic for Neanderthals

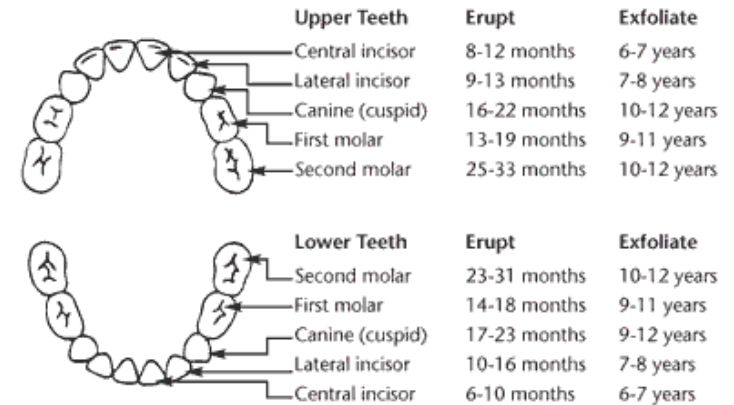


Eruzione dei denti in *Homo sapiens*

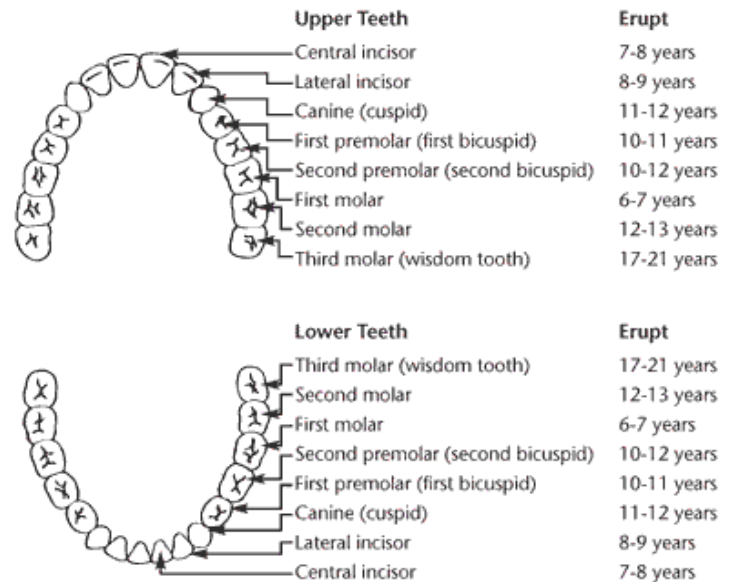


(a and b) Right hemi-mandible from Scladina (Scla 4A-1).
 (c) Probable Neandertal deciduous molar from Couvin. (d)
 deciduous second upper molar from Engis 2

PRIMARY DENTITION



PERMANENT DENTITION



Sequenze d'eruzione dei denti permanenti: differenze
 tra *sapiens* e *Neanderthal*

Homo sapiens: M1 – I1- I2 – P1 – C-P2-M2-M3

Homo neanderthalensis: M1-I1-I2-C-M2-P1-P2-M3

The image features two skulls against a dark, gradient background. The skull on the right is a fossilized hominid skull, shown in profile. It has a large, rounded braincase, a prominent brow ridge, and a sloping forehead. The teeth are large and thick. The skull on the left is a modern human skull, shown from a frontal perspective. It has a smaller, more rounded braincase, a less pronounced brow ridge, and a more vertical forehead. The teeth are smaller and thinner. The word "Confronti" is written in black text across the middle of the image, between the two skulls.

Confronti

Definizione dei Neandertaliani s.s.

L'uomo di Neanderthal si caratterizza per la presenza di:

The Neandertals are characterized by the presence of:

- **Caratteri arcaici / Plesiomorfie** : dei caratteri ancestrali che non si ritrovano in nessun fossile moderno.

Arcaic features / Plesiomorphies: These are ancestral features which are not found in the modern fossil.

- **Caratteri condivisi** con *Homo sapiens*.

Feature shared with Homo sapiens

- **Caratteri derivati / Apomorfie** : presenti solo nei Neandertaliani, peculiari ed identificativi di questa specie.

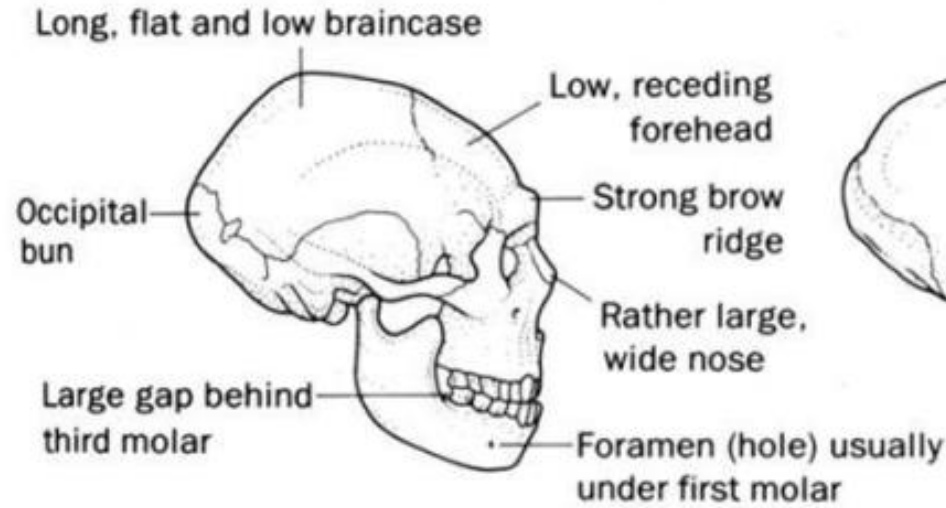
Derivated features / Apomorphies: These are present only in the Neanderthals, and allow to identify this species.



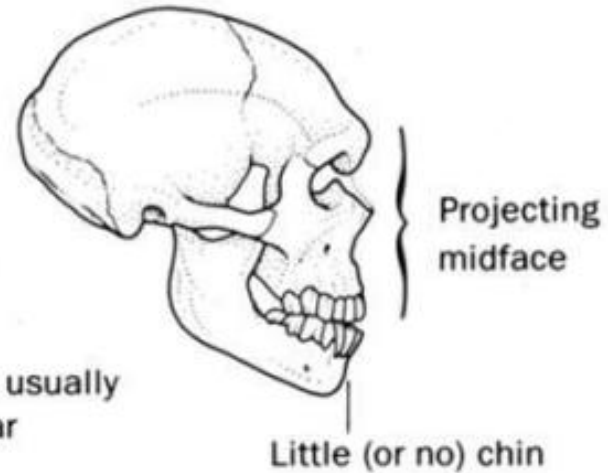
Homo neanderthalensis VS *Homo erectus*



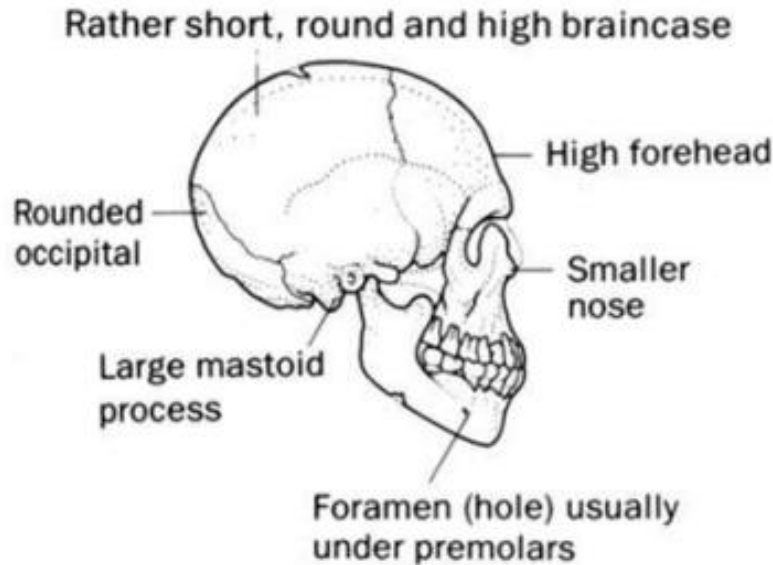
Homo neanderthalensis VS *Homo sapiens*



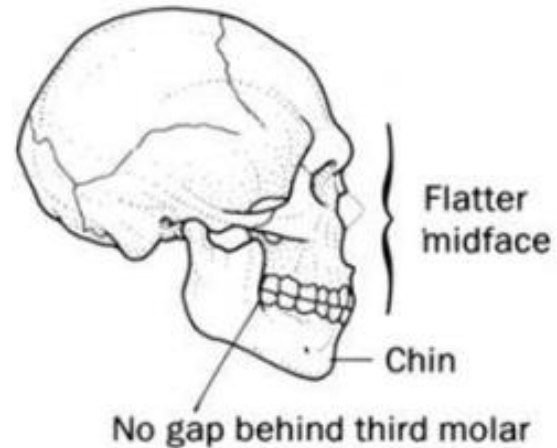
Shanidar 1



La Ferrassie 1



Qafzeh 9



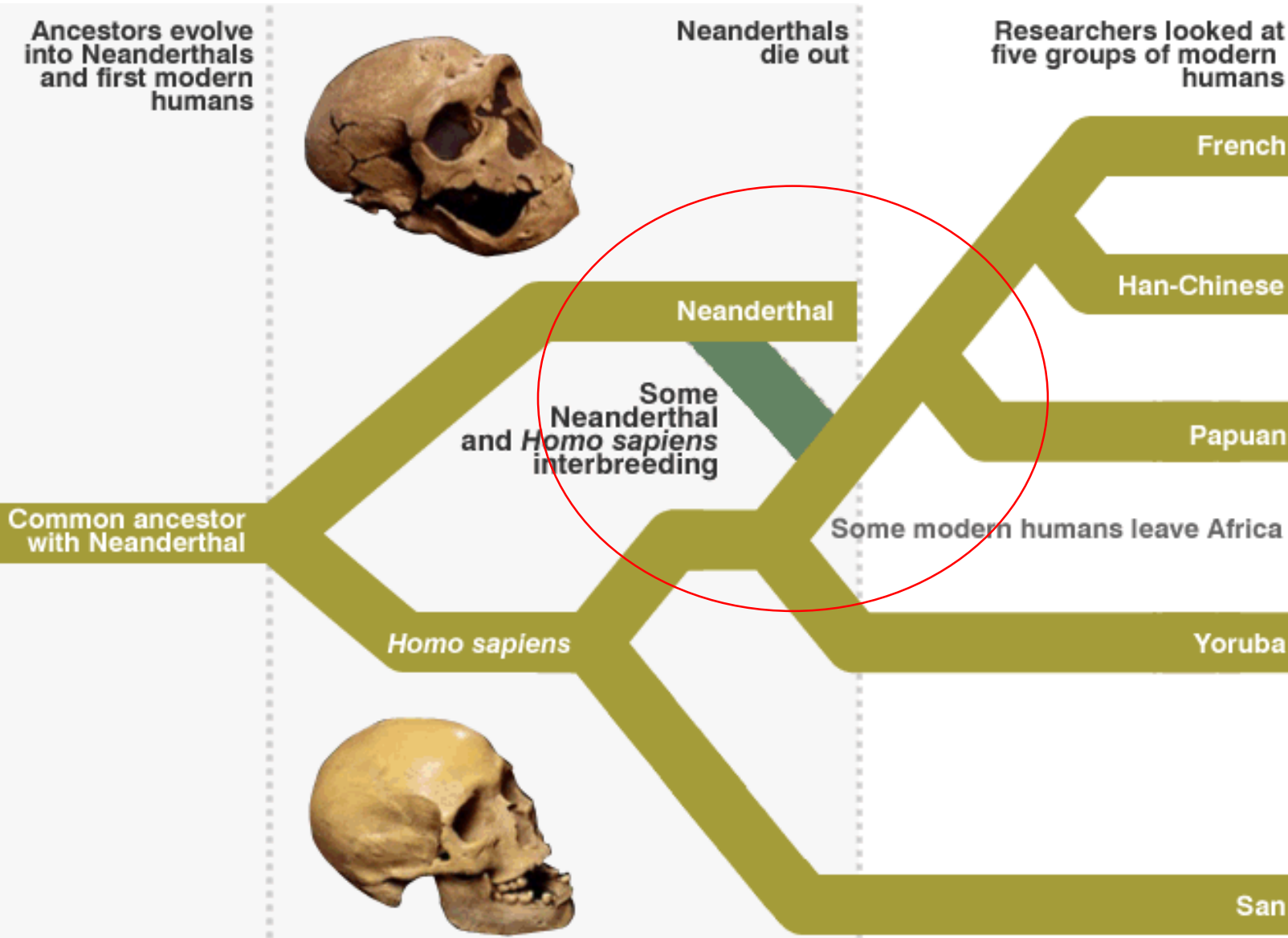
Předmostí 3



Genetica



Uno di noi?



Source: Science journal Note: Time periods not to scale

Green et al. (2010)

- Quando le popolazioni ancestrali Neandertaliane e umane moderne hanno subito una divergenza evolutiva? *Divergence time between the ancestral Neandertal population and the modern human :*

tra 270,000 e 440,000 anni fa

- Da 1 a 4 % del genoma della popolazione Euroasiatica è derivato dai Neandertaliani. Il flusso genetico tra uomini moderni e Neandertaliani è avvenuto prima della divergenza tra gli europei , gli asiatici, e i papuani, tra 50,000 e 80,000 anni fa, in concordanza con i ritrovamenti archeologici.

From 1 to 4 % of the Eurasiatic population's genoma derives from the Neandertal. The genetic flow between modern human and Neandertal occurred before the divergence between European, Asiatic and Papuan populations, between 50,000 and 80,000 years, in correspondence with the archeological discoveries.

- L'incontro è stato puntuale da un punto di visto cronologico e localizzato solo nel Vicino Oriente.

The encounter was punctual in a chronological point of view and localized only in a the Nearest.

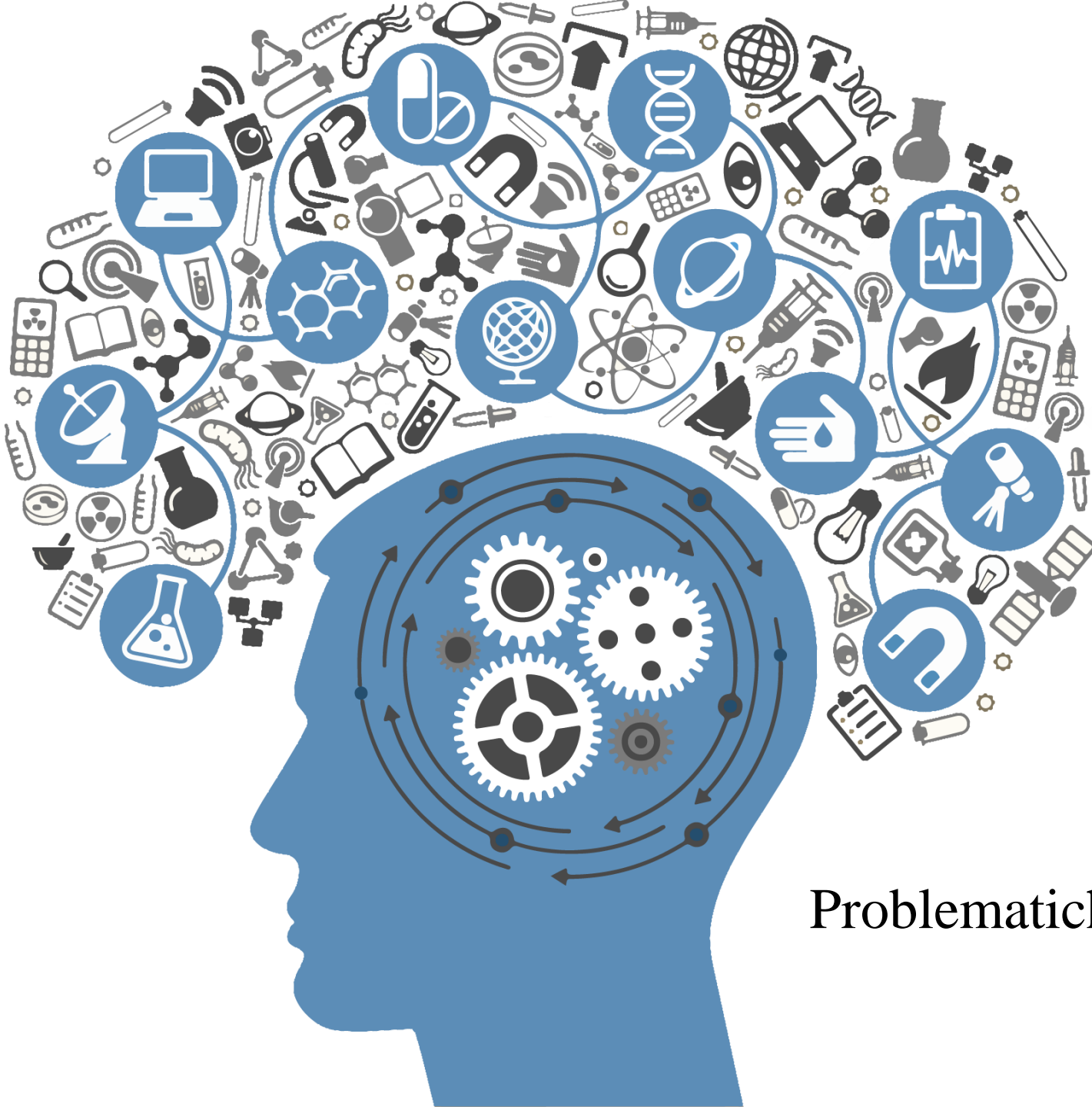


L'incontro in Europa



Peștera cu Oase, Romania
40 000 anni BP





Problematiche



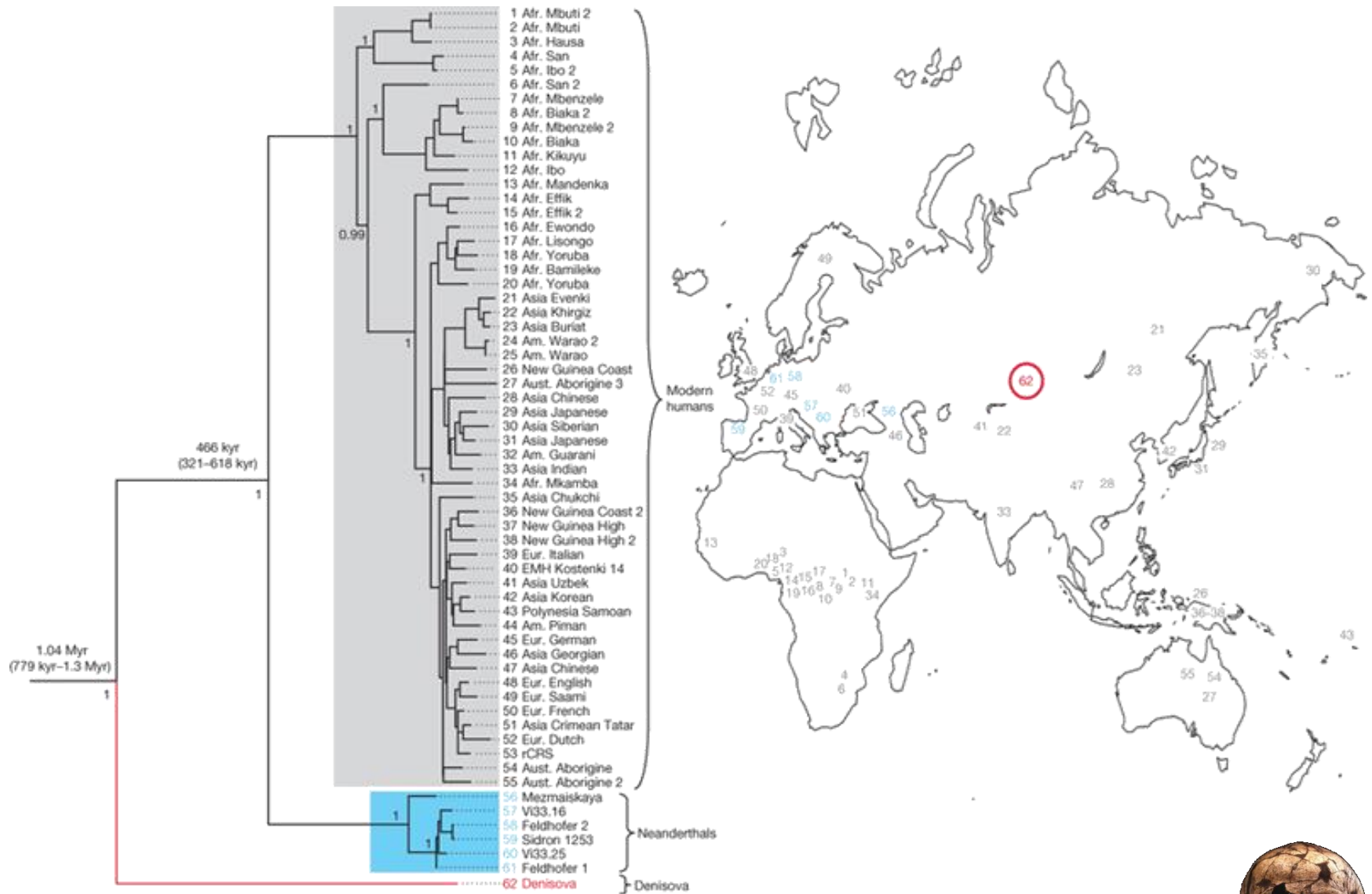
Denisova



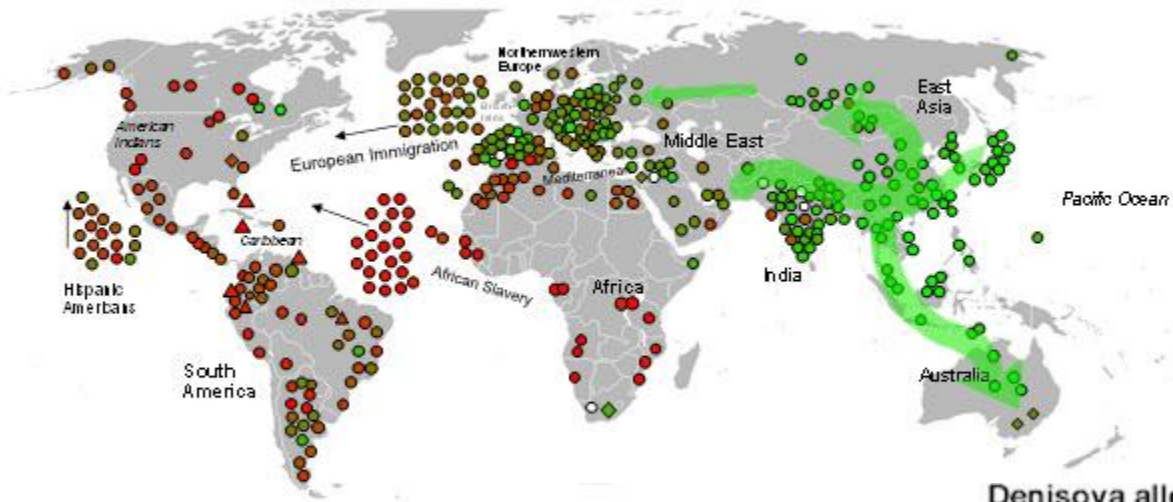
Replica of the finger bone fragment from the ancient Denisovan human who lived about 30-50 000 years ago. Scientists have obtained its complete genome. © Max Planck Institute for Evolutionary Anthropology



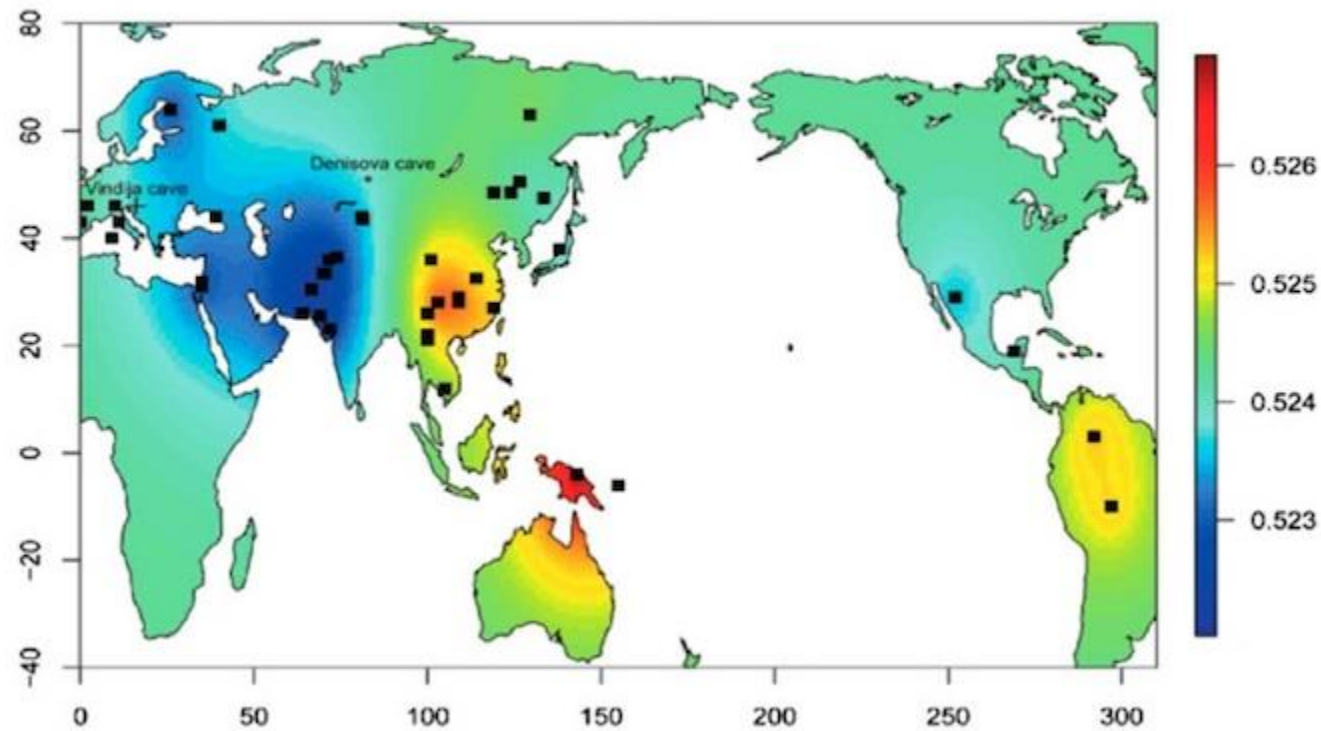
Phylogenetic tree of complete mtDNAs.

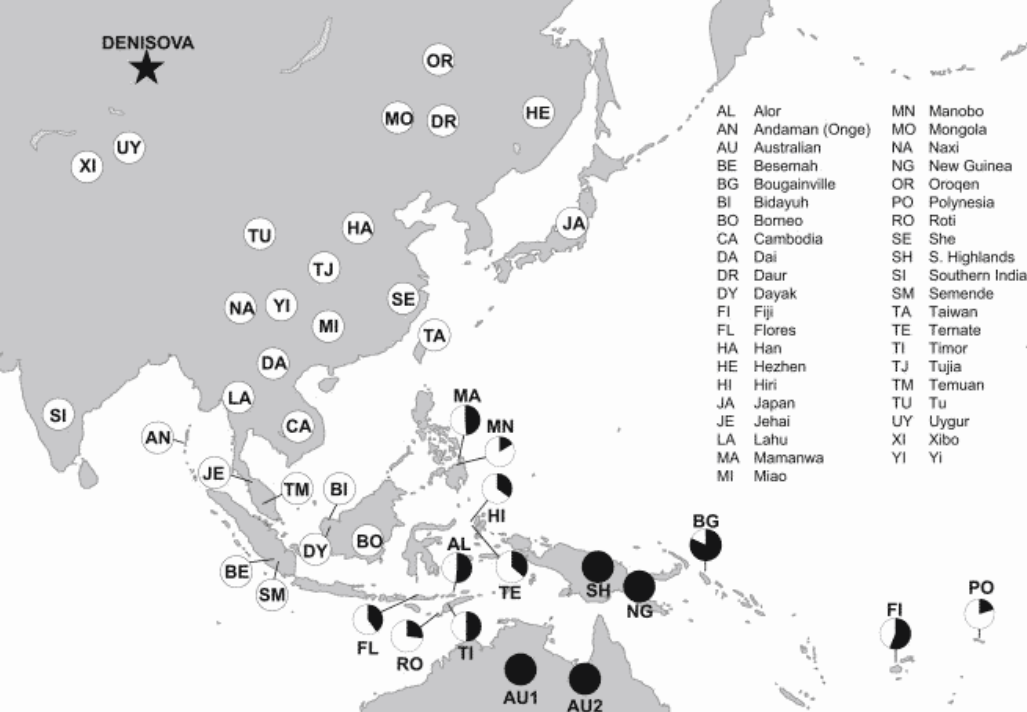


World Ancestry of the Denisovan Gene

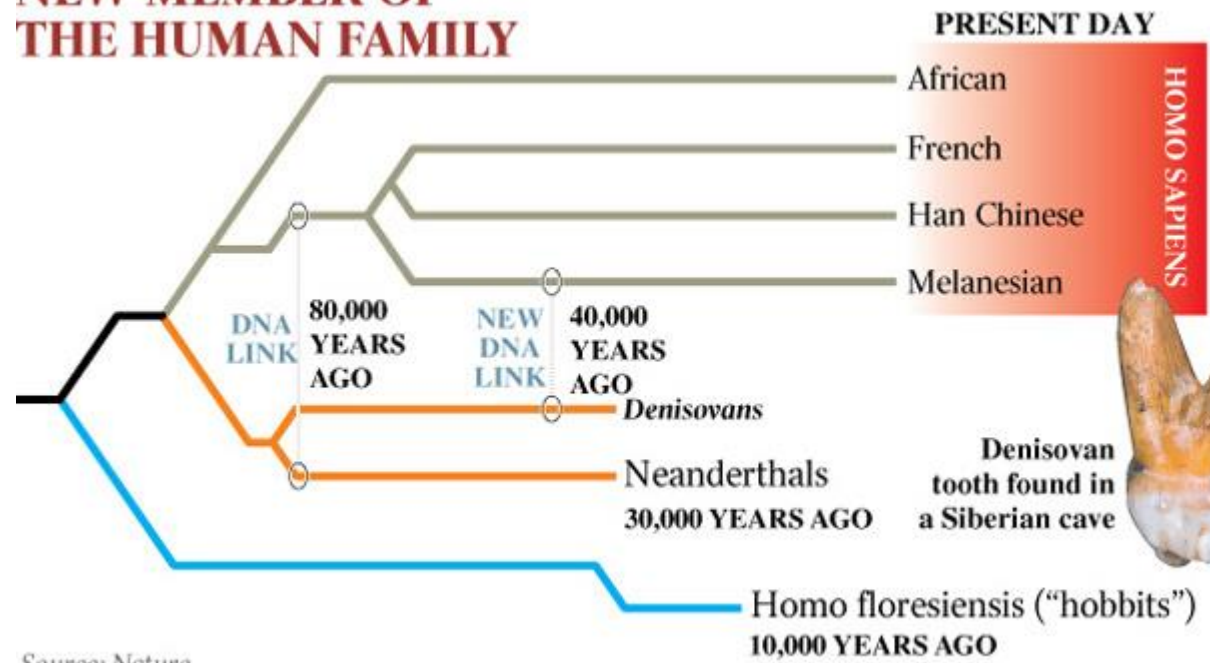


Denisova allele frequency

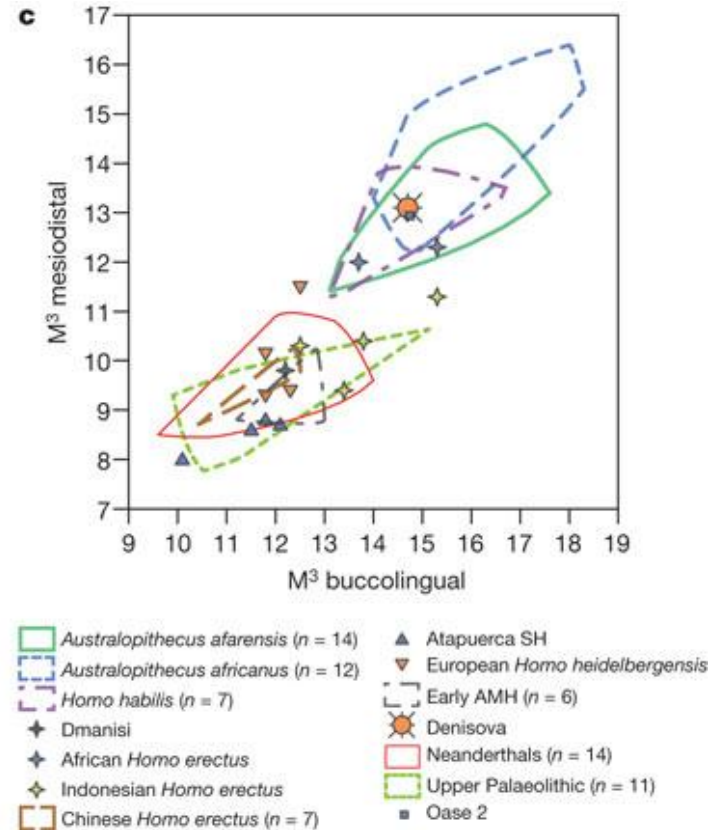
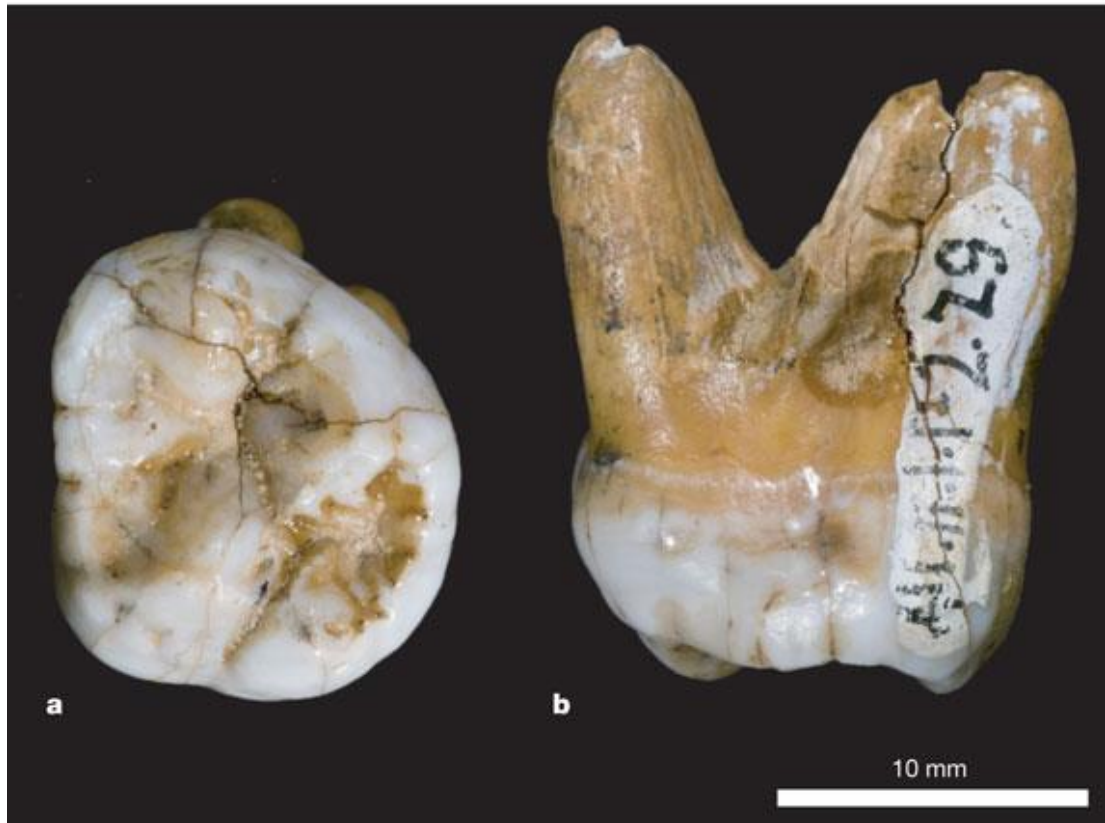




NEW MEMBER OF THE HUMAN FAMILY



Source: Nature



D Reich *et al.* *Nature* **468**, 1053-1060 (2010) doi:10.1038/nature09710

Il M3 o M2 ritrovato a Denisova presenta delle dimensioni al di fuori della variabilità dei taxa del genere *Homo* ed entra in quella dei Australopithecine.

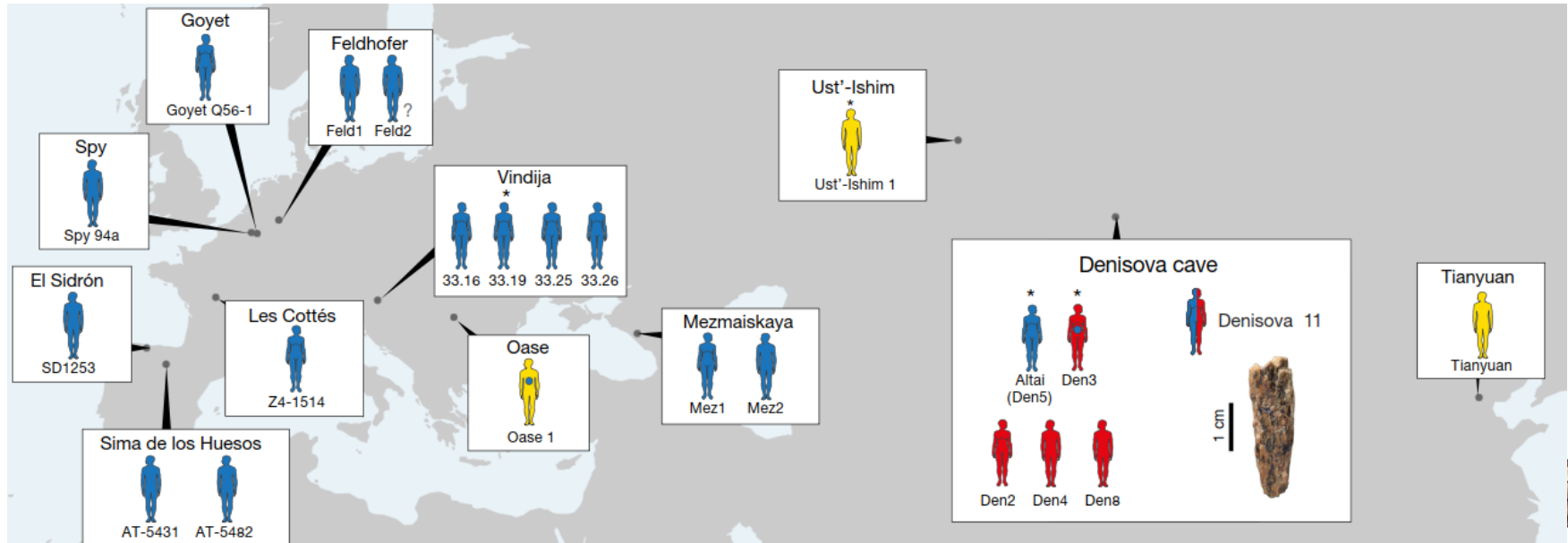
Questo molare appoggia le evidenze del DNA: La popolazione di Denisova era distinta dei Neandertaliani tardivi e dei uomini moderni. In effetti, i tratti primitivi del dente suggeriscono che i Denisoviani potrebbero essersi separati dalla linea neandertaliana prima dei dati che abbiamo sui tratti dentari Neandertaliani in Europa occidentale (>300 ka). Non escludiamo però la possibilità che questa morfologia sia dovuta ad una regressione.



The genome of the offspring of a Neanderthal mother and a Denisovan father

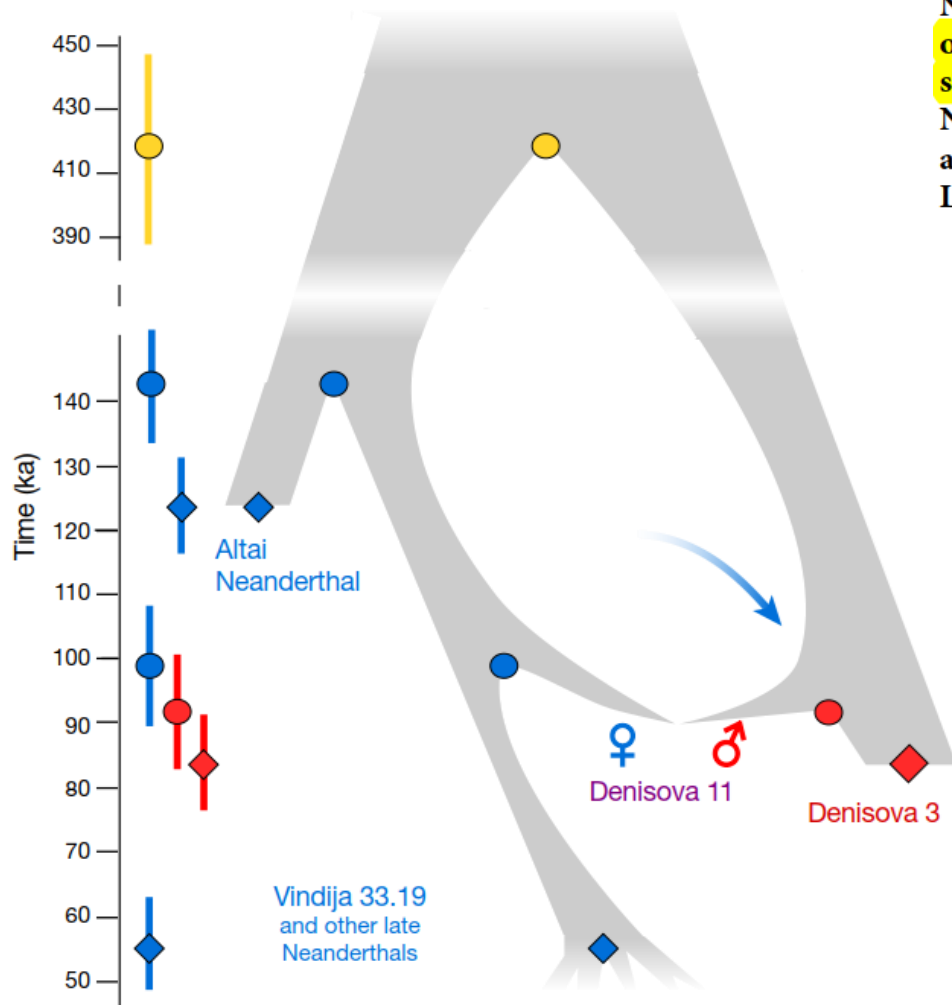
Viviane Slon^{1,7*}, Fabrizio Mafessoni^{1,7}, Benjamin Vernot^{1,7}, Cesare de Filippo¹, Steffi Grote¹, Bence Viola^{2,3}, Mateja Hajdinjak¹, Stéphane Peyrégne¹, Sarah Nagel¹, Samantha Brown⁴, Katerina Douka^{4,5}, Tom Higham⁵, Maxim B. Kozlikin³, Michael V. Shunkov^{3,6}, Anatoly P. Derevianko³, Janet Kelso¹, Matthias Meyer¹, Kay Prüfer¹ & Svante Pääbo^{1*}

Neanderthals and Denisovans are extinct groups of hominins that separated from each other more than 390,000 years ago^{1,2}. Here we present the genome of ‘Denisova 11’, a bone fragment from Denisova Cave (Russia)³ and show that it comes from an individual who had a Neanderthal mother and a Denisovan father. The father, whose genome bears traces of Neanderthal ancestry, came from a population related to a later Denisovan found in the cave^{4–6}. The mother came from a population more closely related to Neanderthals who lived later in Europe^{2,7} than to an earlier Neanderthal found in Denisova Cave⁸, suggesting that migrations of Neanderthals between eastern and western Eurasia occurred sometime after 120,000 years ago. The finding of a first-generation Neanderthal–Denisovan offspring among the small number of archaic specimens sequenced to date suggests that mixing between Late Pleistocene hominin groups was common when they met.



The genome of the offspring of a Neanderthal mother and a Denisovan father

Viviane Slon^{1,7*}, Fabrizio Mafessoni^{1,7}, Benjamin Vernot^{1,7}, Cesare de Filippo¹, Steffi Grote¹, Bence Viola^{2,3}, Mateja Hajdinjak¹, Stéphane Peyrégne¹, Sarah Nagel¹, Samantha Brown⁴, Katerina Douka^{4,5}, Tom Higham⁵, Maxim B. Kozlikin³, Michael V. Shunkov^{3,6}, Anatoly P. Derevianko³, Janet Kelso¹, Matthias Meyer¹, Kay Prüfer¹ & Svante Pääbo^{1*}

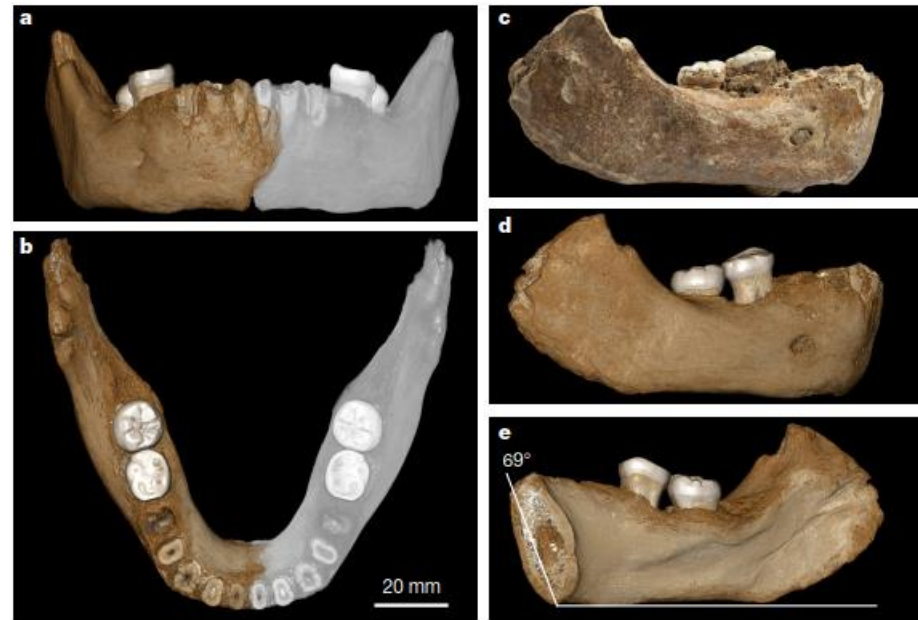
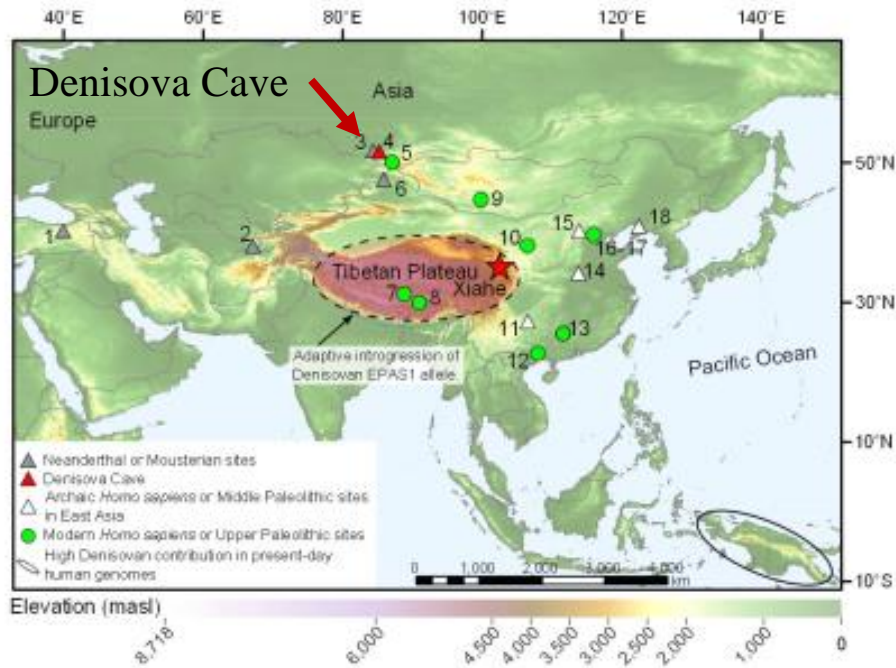


Neanderthals and Denisovans are extinct groups of hominins that separated from each other more than 390,000 years ago^{1,2}. Here we present the genome of ‘Denisova 11’, a bone fragment from Denisova Cave (Russia)³ and show that it comes from an individual who had a Neanderthal mother and a Denisovan father. The father, whose genome bears traces of Neanderthal ancestry, came from a population related to a later Denisovan found in the cave^{4–6}. The mother came from a population more closely related to Neanderthals who lived later in Europe^{2,7} than to an earlier Neanderthal found in Denisova Cave⁸, suggesting that migrations of Neanderthals between eastern and western Eurasia occurred sometime after 120,000 years ago. The finding of a first-generation Neanderthal–Denisovan offspring among the small number of archaic specimens sequenced to date suggests that mixing between Late Pleistocene hominin groups was common when they met.



A late Middle Pleistocene Denisovan mandible from the Tibetan Plateau

Fahu Chen^{1,2,15*}, Frido Welker^{2,3,4,15}, Chuan-Chou Shen^{5,6,15}, Shara E. Bailey^{3,7}, Inga Bergmann³, Simon Davis⁸, Huan Xia², Hui Wang^{9,10}, Roman Fischer⁸, Sarah E. Freidline³, Tsai-Luen Yu^{5,6}, Matthew M. Skinner^{3,11}, Stefanie Stelzer^{3,12}, Guangrong Dong², Qiomei Fu¹³, Guanghui Dong², Jian Wang², Dongju Zhang^{2*} & Jean-Jacques Hublin^{3,14*}



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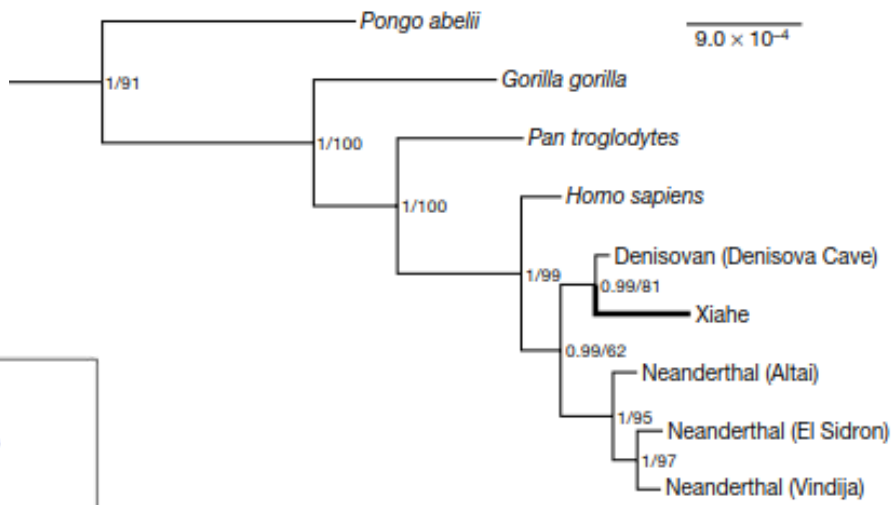
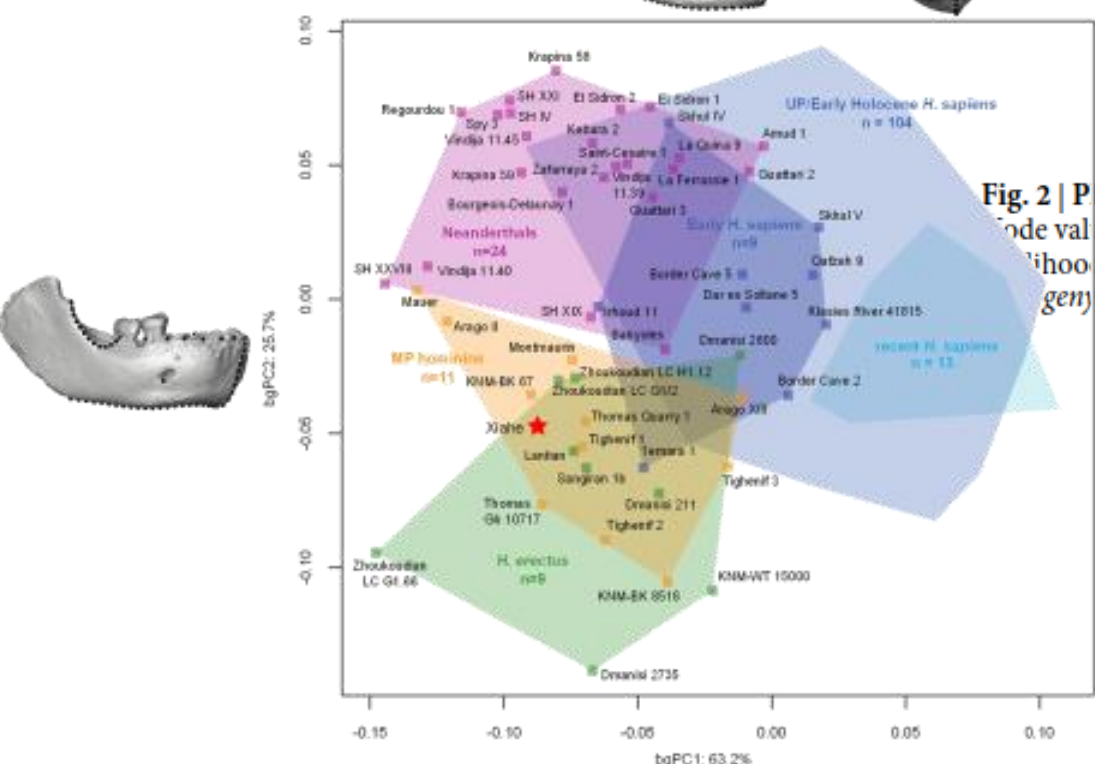
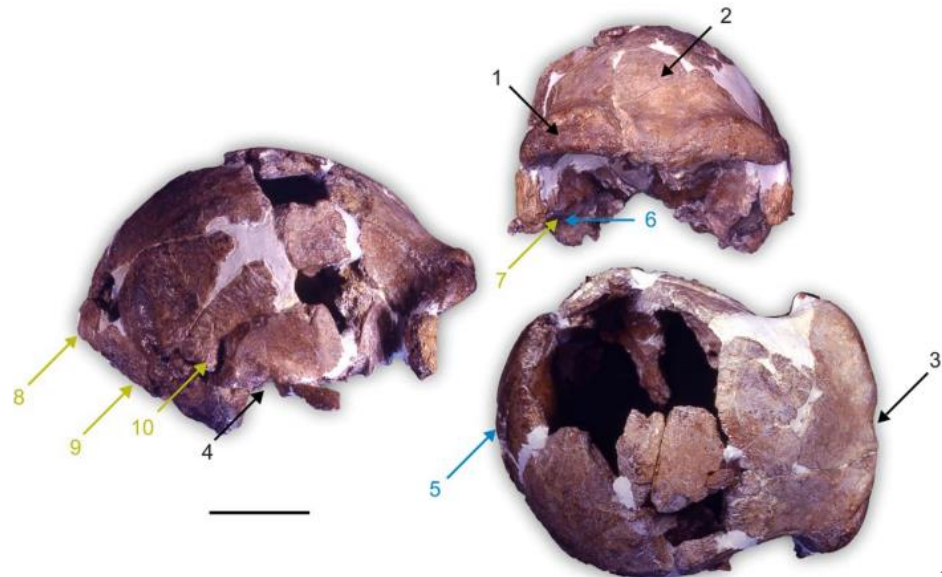
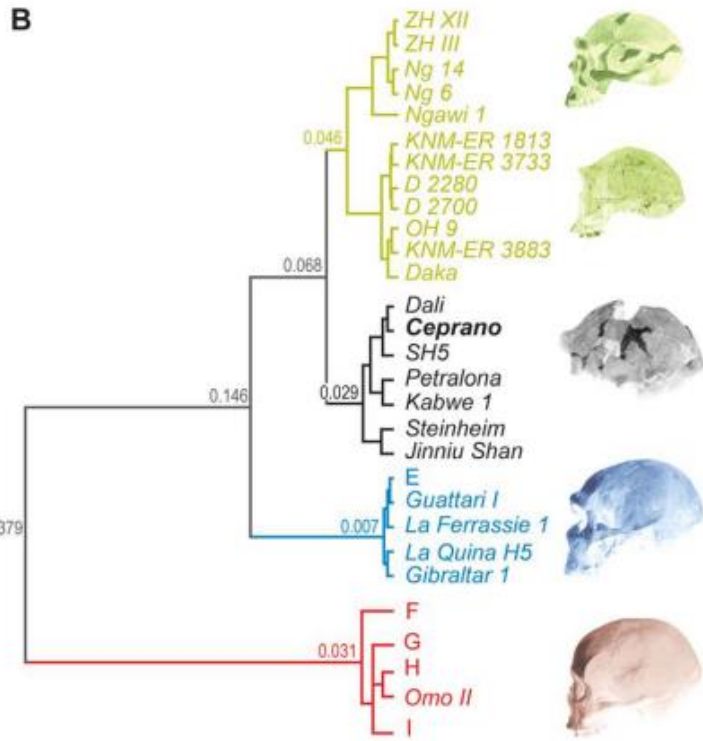


Fig. 2 | Phylogenetic position of the Xiahe proteome within Hominidae. Node values indicate Bayesian probability (0–1)/RAxML maximum likelihood (0–100%), respectively. *Macaca mulatta* and *Nomascus* spp. are used as outgroups (data not shown).



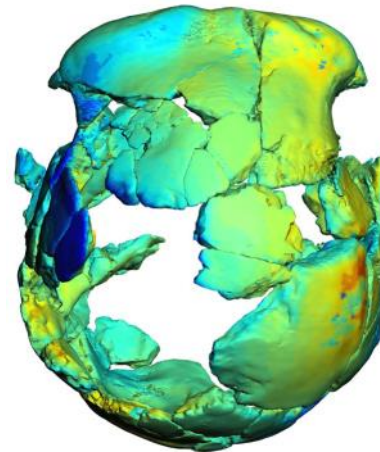
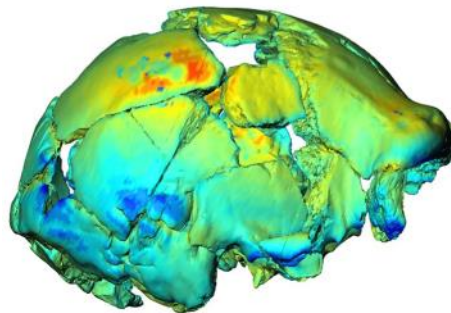
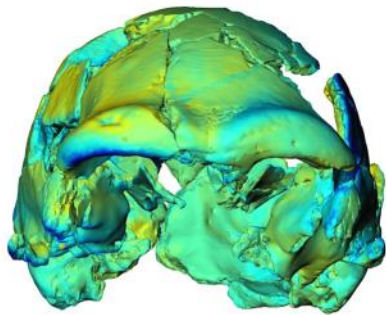
Ceprano : 430 - 385 ka



1 a 4
Tratti esclusivamente trovati nei specimen del P. medio

5 & 6
Tratti derivati

7 a 10
Tratti primitivi



Sima de los Huesos: 430 ka

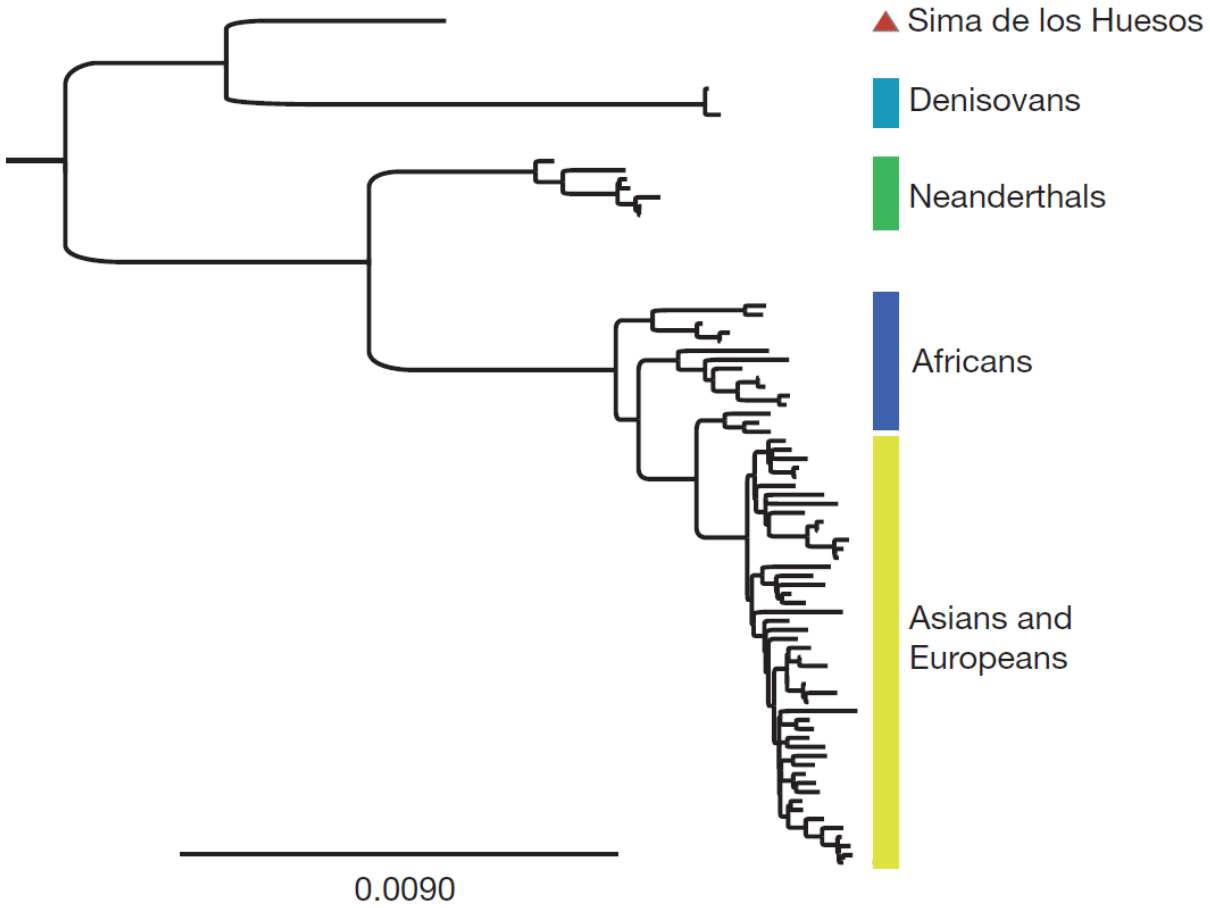


Figure 4 | Bayesian phylogenetic tree of hominin mitochondrial relationships based on the Sima de los Huesos mtDNA sequence determined using the inclusive filtering criteria. All nodes connecting the denoted hominin groups are supported with posterior probability of 1. The tree was rooted using chimpanzee and bonobo mtDNA genomes. The scale bar denotes substitutions per site.

Matthias Meyer et al. in Nature (2013)



Esempi di siti attribuiti a Neanderthal



La scoperta



Il primo fossile considerato come Neanderthal è stato scoperto nel 1856 nella valle di Neander, nella grotta di Feldhofer.

The first fossil considered as a Neanderthal was discovered in 1856 in the Neander Valle, in Feldhofer cave.

Al momento della scoperta gli operai trovarono sul suolo un cranio robusto, delle ossa lunghe, delle coste, un frammento di bacino e di scapola. Queste ossa, considerate dagli operai come i resti ossei di un orso delle caverne, furono portate a J.C. Fuhlrott, il maestro della regione appassionato naturalista. Fin dall'inizio Fuhlrott considerò queste ossa come quelle di un « nuovo » uomo.

When the site was discovered, the workers found a robust skull and some bones. First these bones was considered as bears bones. Later, J.C.Fuhlrott did some study and found that they were bones from a « new » Homo.



La scoperta

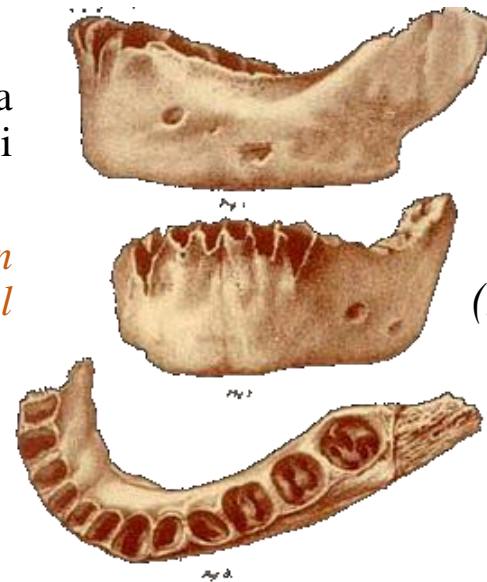
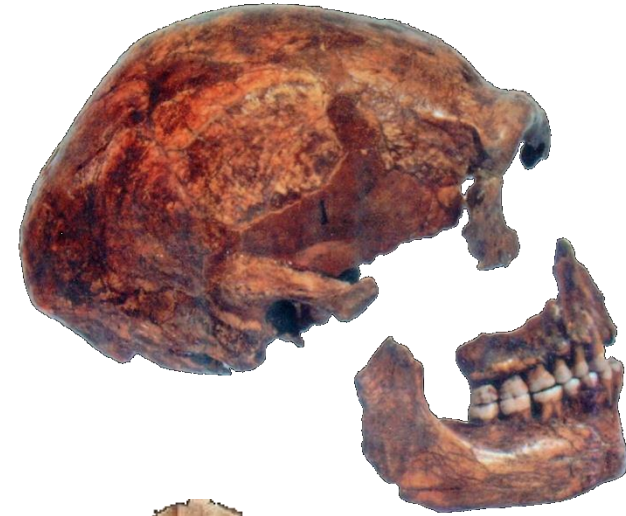
Questo fossile non fu il primo Neanderthaliano portato alla luce. Altri due fossili erano già stati trovati : uno a Engis in Belgio in 1929 e uno in Spagna a Gibraltar in 1848. Ma il fossile scoperto nella valle di Neander ha confermato l'esistenza di un Uomo fossile.

This fossil weren't the first Neanderthal highlight. Two other fossil were already found: One in Engis (Belgium) in 1929 and one at Gibraltar (Spain) in 1848. But with the discovery of the Neander Valle, the existance of a human fossil was confirmed.

Altre scoperte di altri fossili in Belgio a la Naulette e a Spy nel 1966 e 1886 confermarono la presenza dei Neanderthaliani in Europa.

Other discoveries in Belgium at La Naulette e a Spy in 1966 e 1886 has confirmed the presence of Neanderthal in Europa.

H. neandertalensis
(Spy, Belgio)



Mandibola
H. neandertalensis
(La naulette, Belgio)



Biache-Saint-Vaast (Francia) 250 ka BP

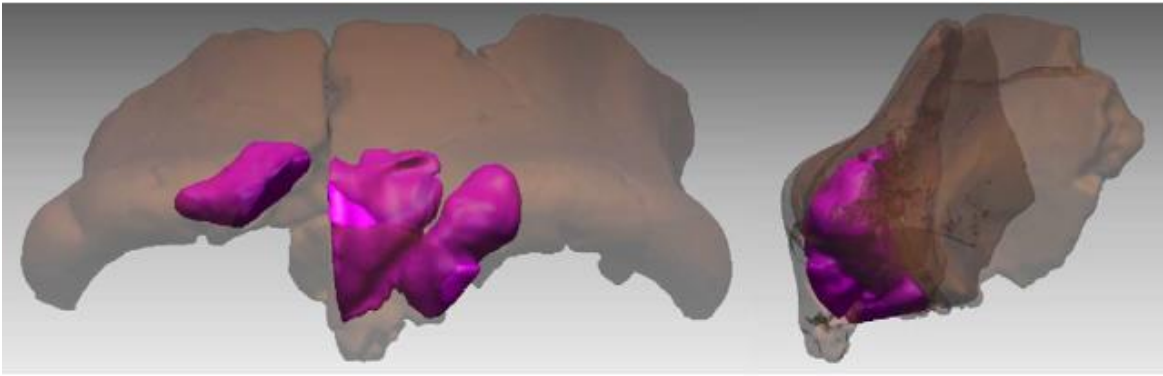


Fig. 4. Frontal sinuses of Biache-Saint-Vaast 2 after virtual reconstruction.

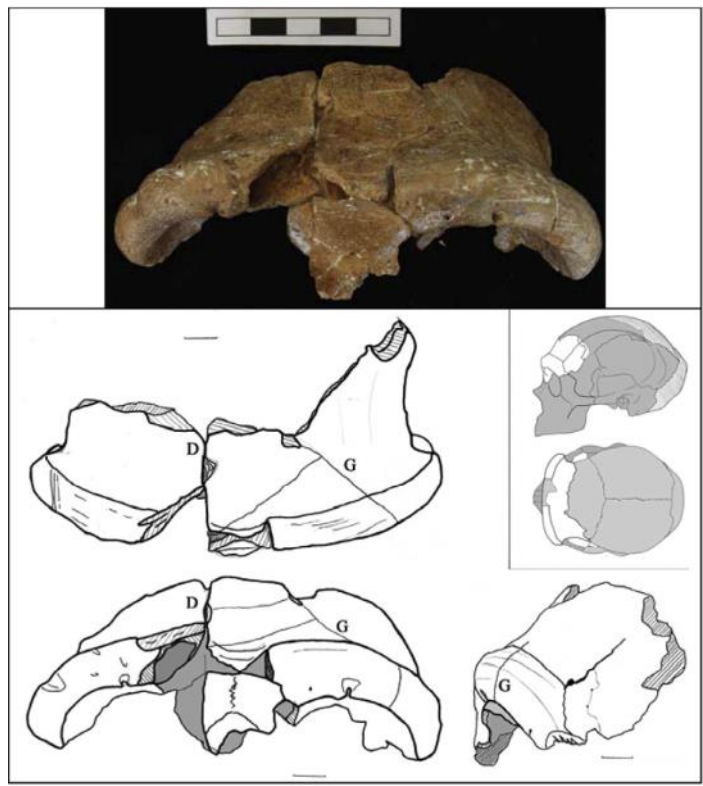
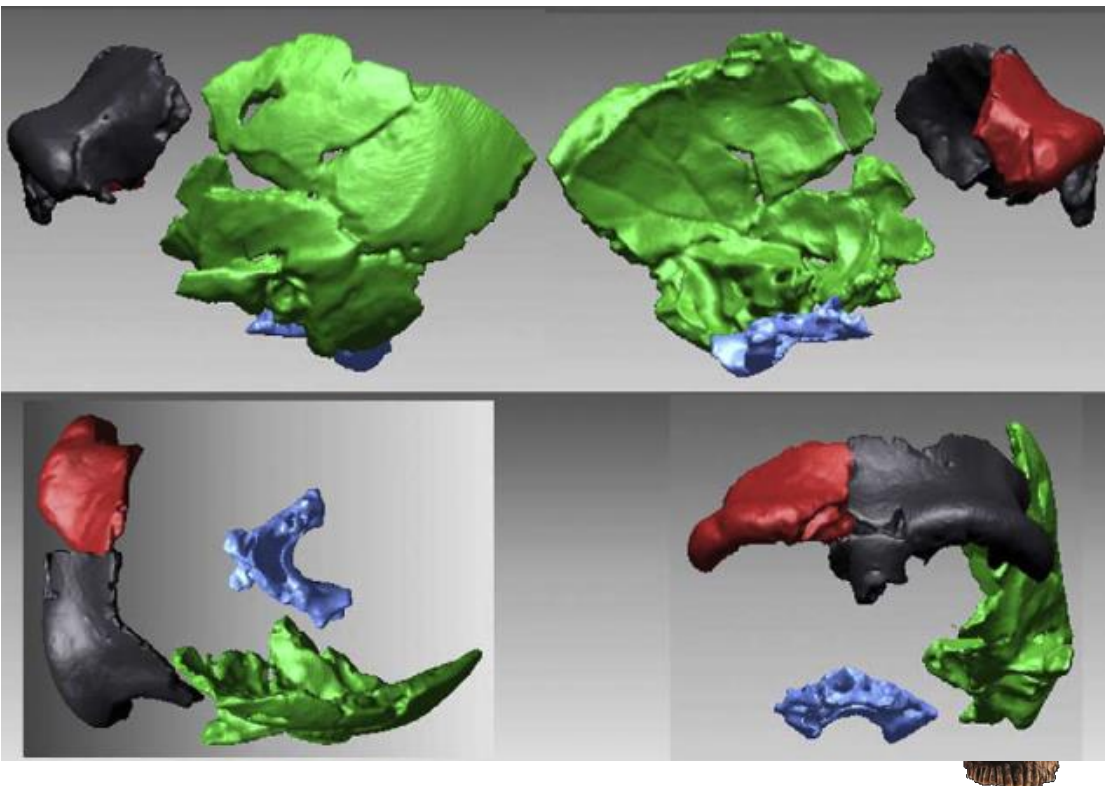
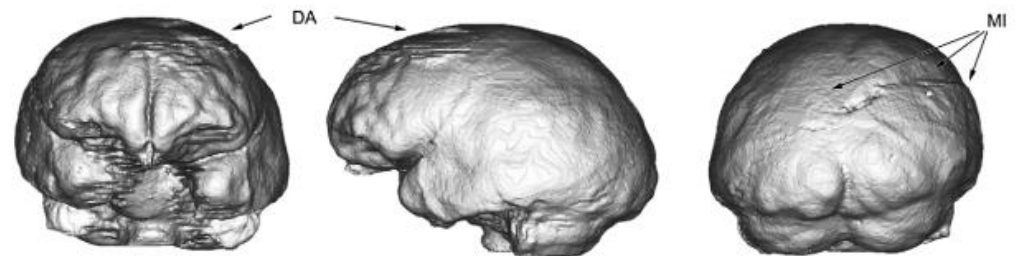


Fig. 1. Frontal bone of the Biache-Saint-Vaast 2 skull. Scale bar is 1 cm.



(Guipert et al. 2011)

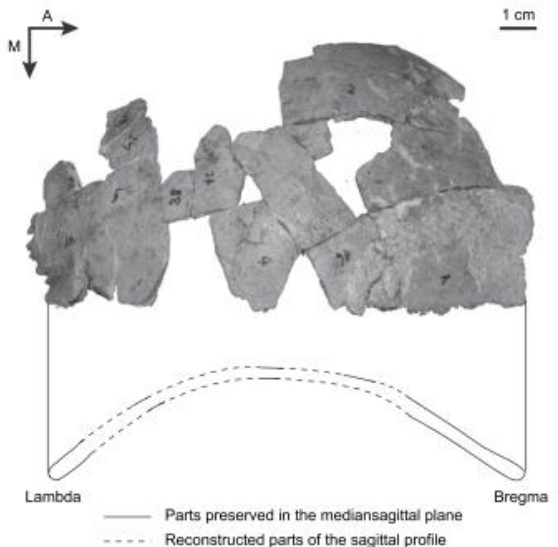
Italia : Saccopastore 250 ka BP



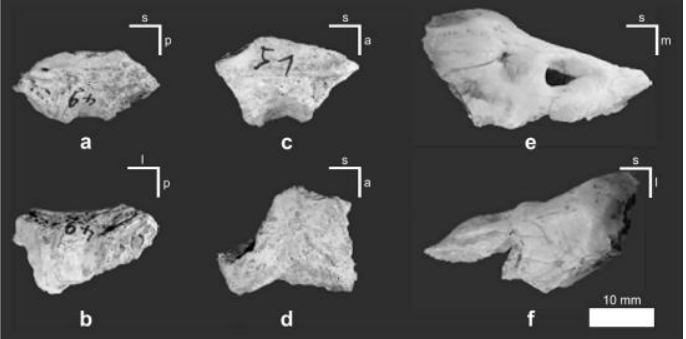
Uzbekistan: Grotta Obi-Rakhmat 60-90 ka BP



OR 1 : Denti permanenti superiori sinistri



Ricostruzione del parietale di OR 1.



Frammenti di temporale

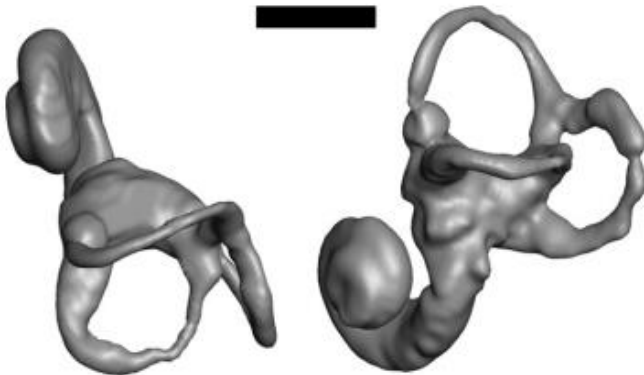
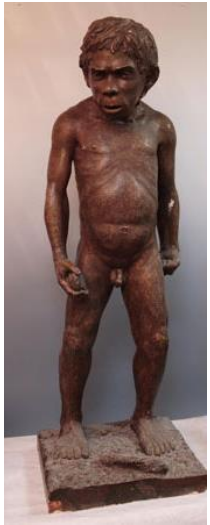


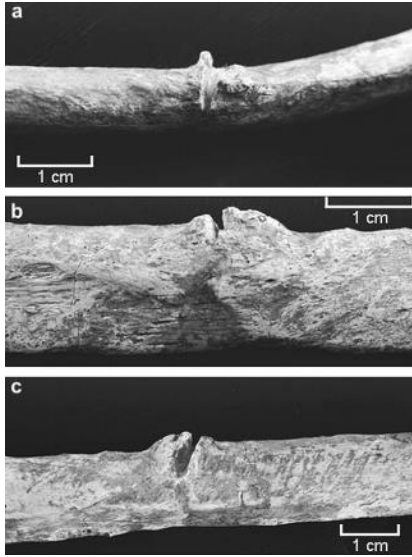
Fig. 9. Left semicircular canal of OR-1.



Uzbekistan: Teshik Tash 70 ka



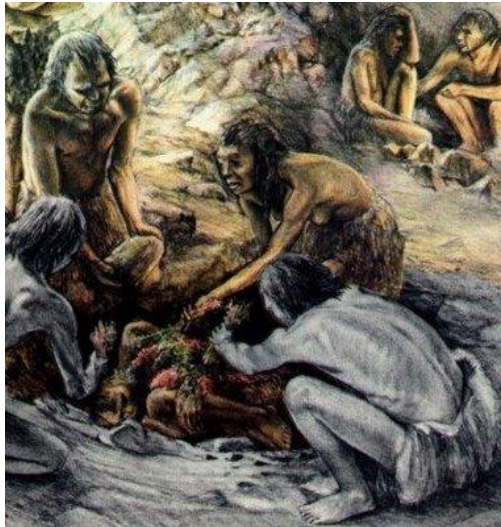
Iraq : Shanidar 50 ka BP



Shanidar 3: Lesione sulla 9 costa.



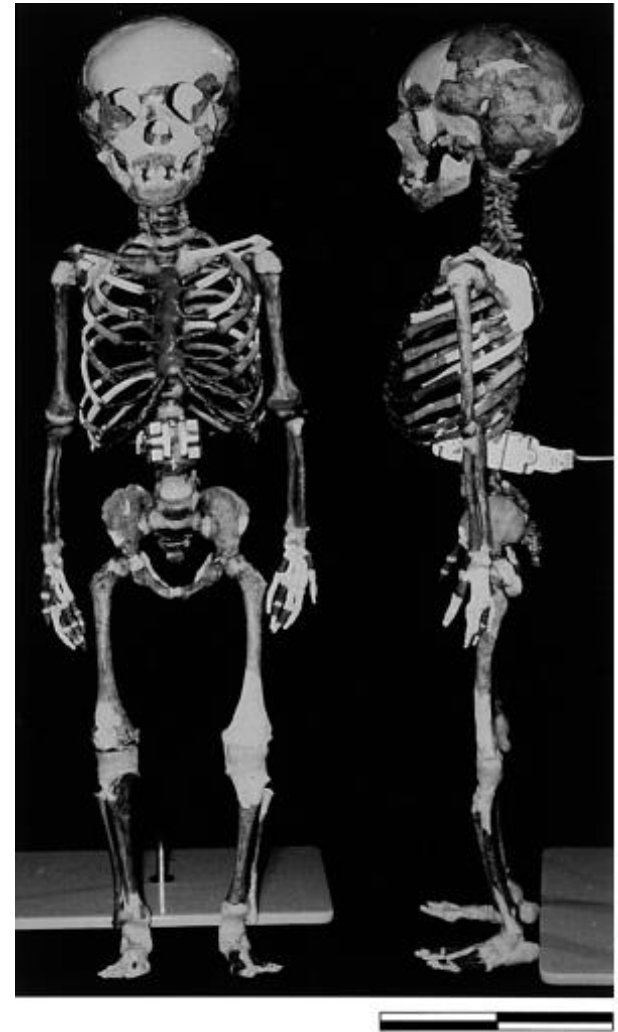
Shanidar 1



Syria : Dederyheh 50-60 ka BP



Prima sepoltura di bambini



Ricostruzione dello scheletro immaturo di 2^o anni.



Israël: Kebara 48-60 ka BP



Sepulture Kebara II *Moshe*



Osso ioide di Kebara II



Ricostruzione dello scheletro di Kebara II



Israël: Amud 47 ka BP



Amud 1 circa 47.000 anni, il Neandertaliano più alto (174 cm) e con maggiore cc (1640 cm³)



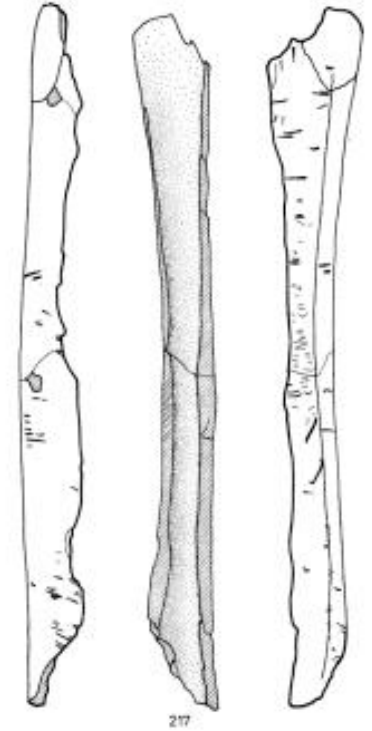
Croazia: Krapina 130 ka BP



Krapina 12 : Frammento di osso occipitale giovanile



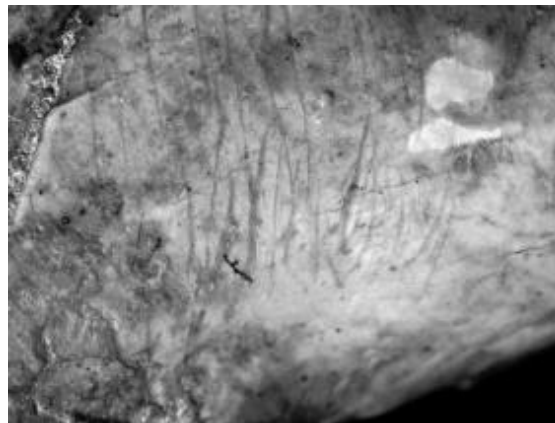
Krapina 59 : Mandibola



Tibia spaccata in 2 con tante cut marks.



emi-endocranio destro di Krapina 3



Cut marks nella sinfisi interna di K53.



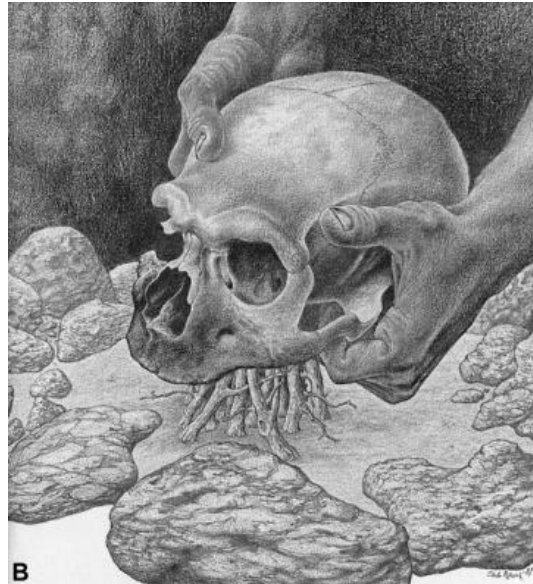
Italia : Guattari 51-57 ka BP



Guattari 1



Guattari 2



Ricostruzione ipotetica del culto del cranio



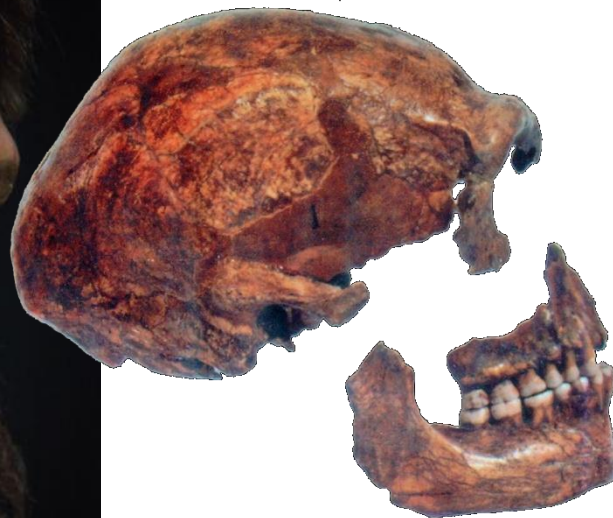
Belgio : Spy 40 ka BP



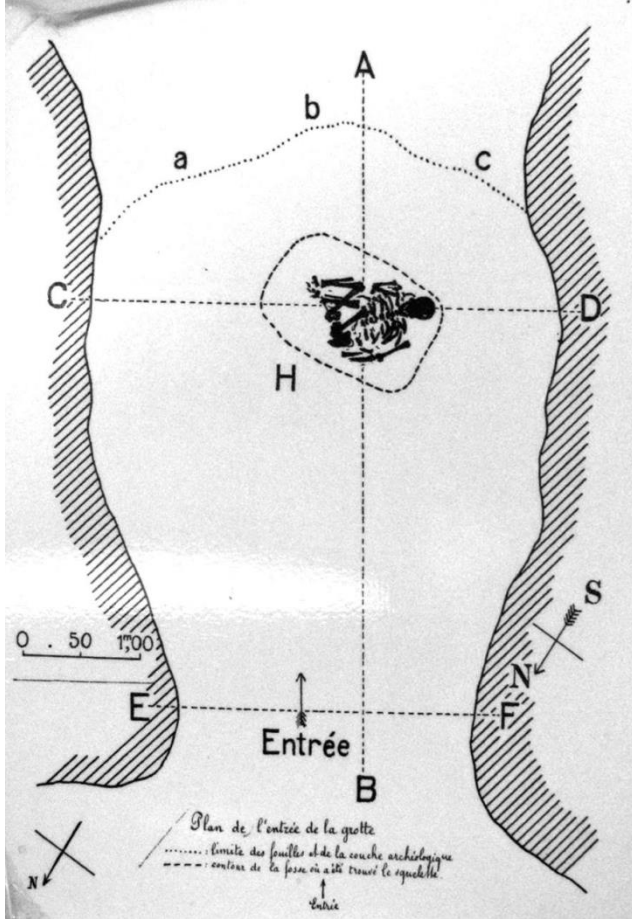
Engis 70 ka BP



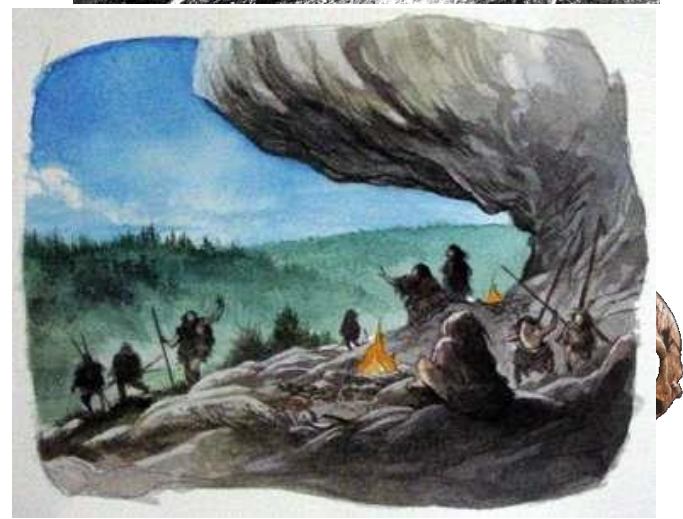
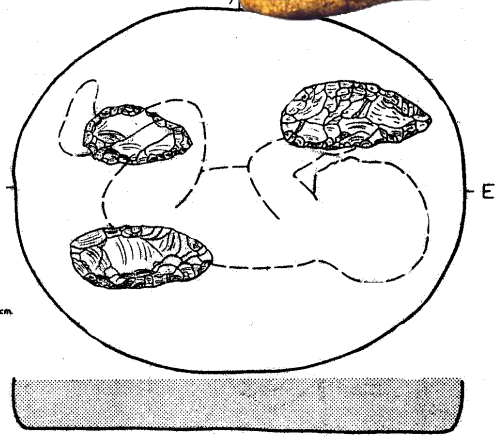
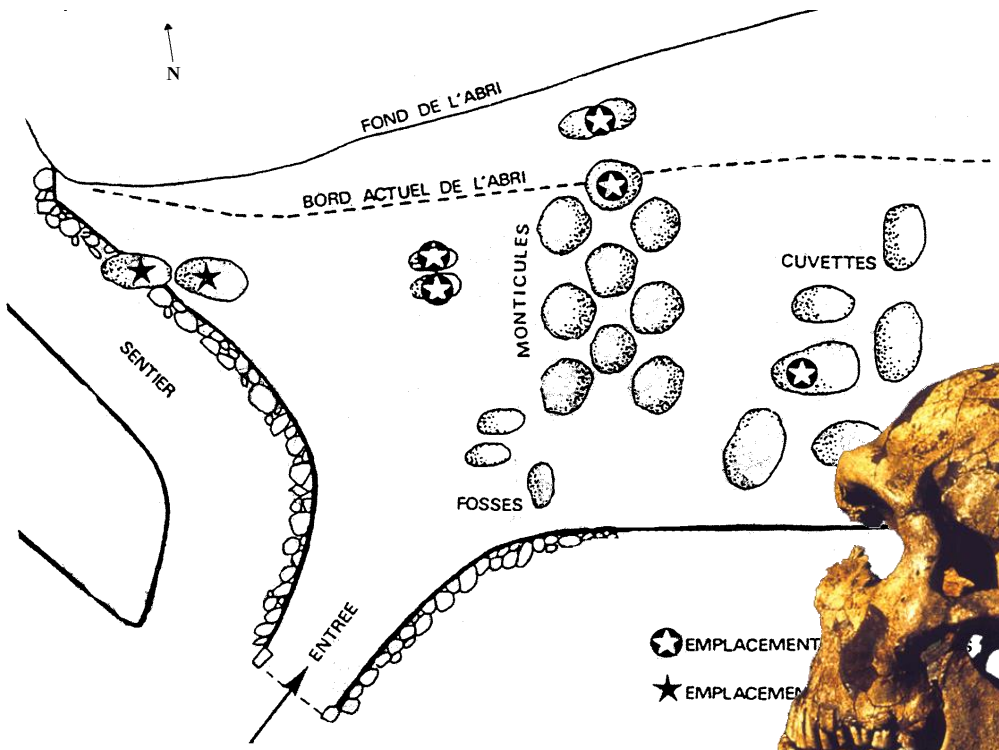
Engis 2



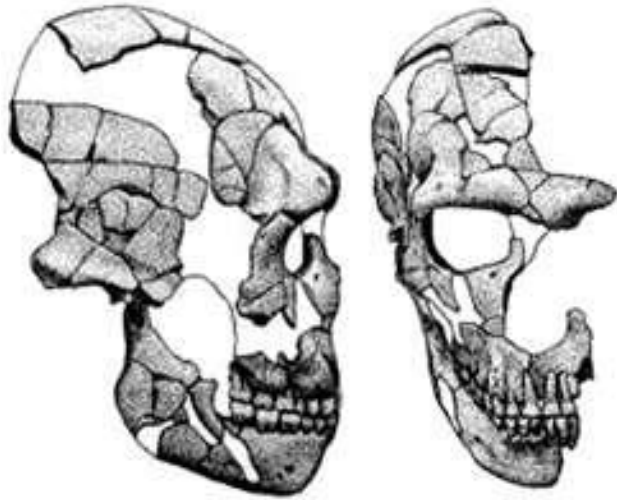
La Chapelle-aux-Saints (50 ka BP, Francia)



La Ferrassie (55 ka anni, Francia) – « Necropoli » di 8 schelettri



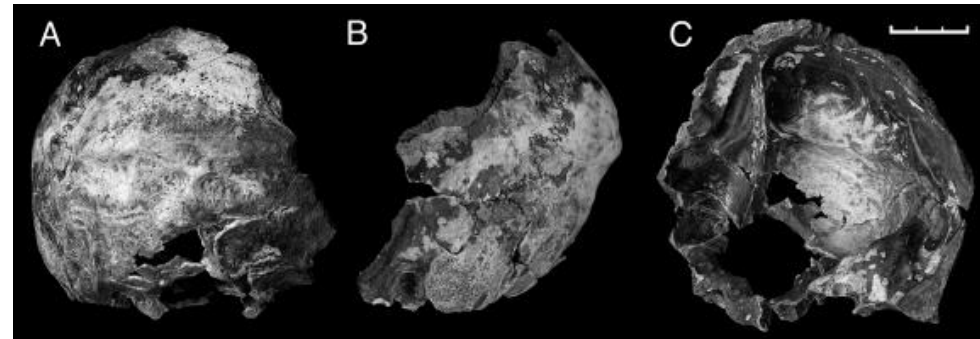
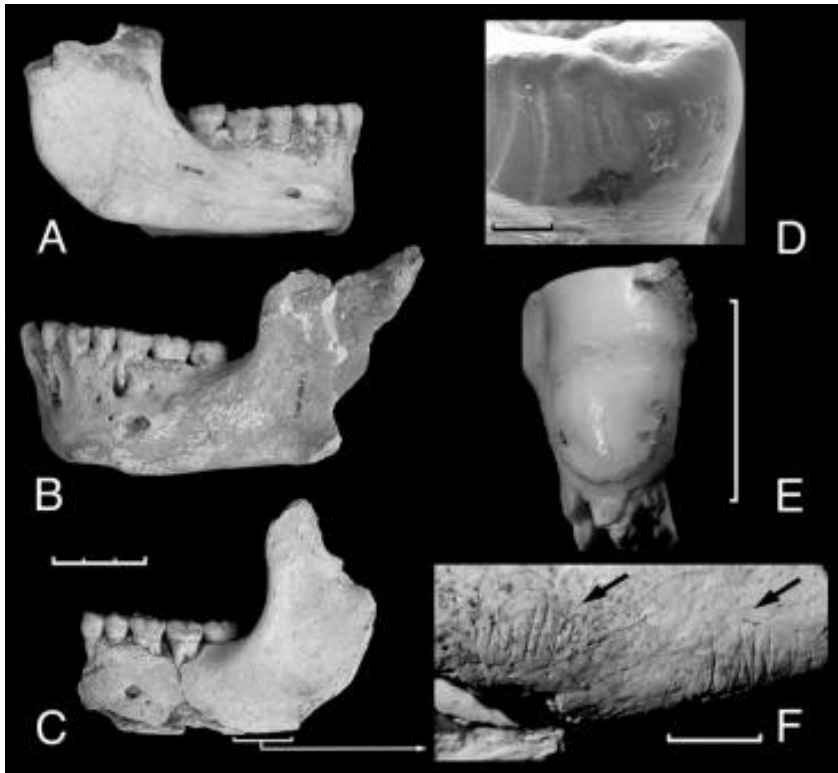
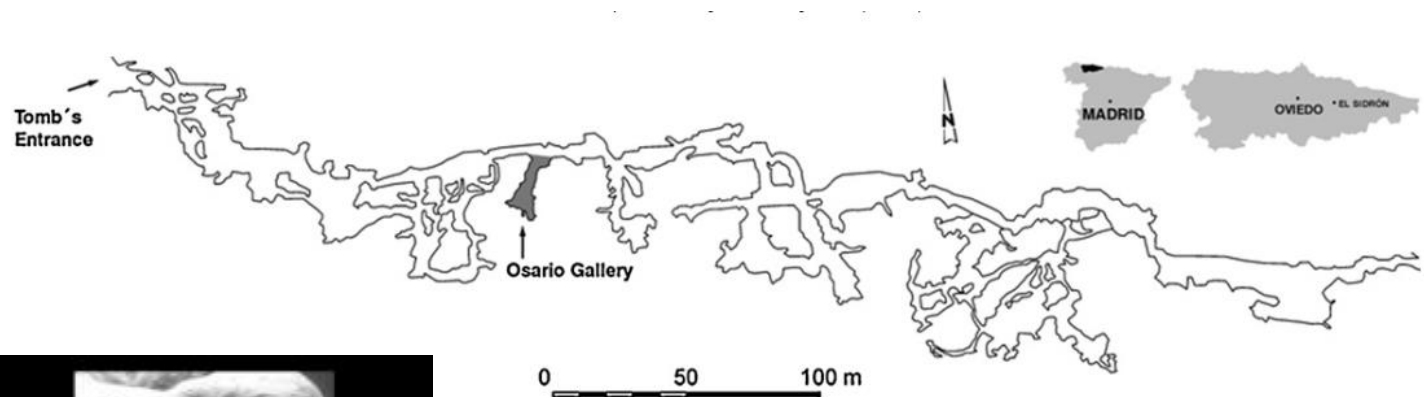
Francia : Saint-Césaire 36 ka BP



Cranio di Saint-Césaire 1



Spagna : El Sidron 43 ka BP

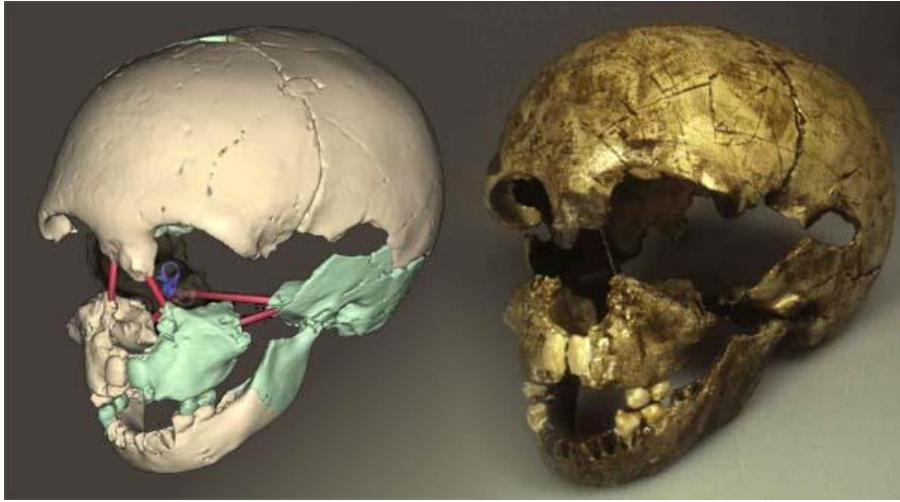


SD-1219. Regione Occipitomastoide

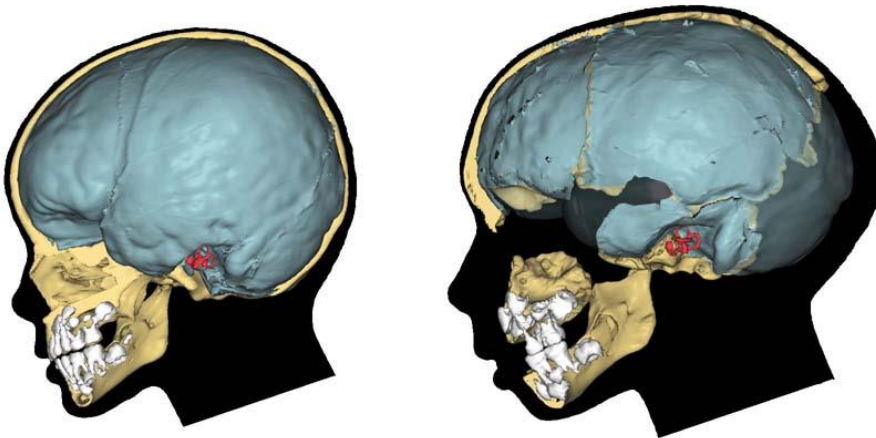


Mandibole con un'ipoplasia dello smalto e delle cut marks sul bordo basale (F)

Spagna : Gibraltari Devil's Tower 30 ka BP

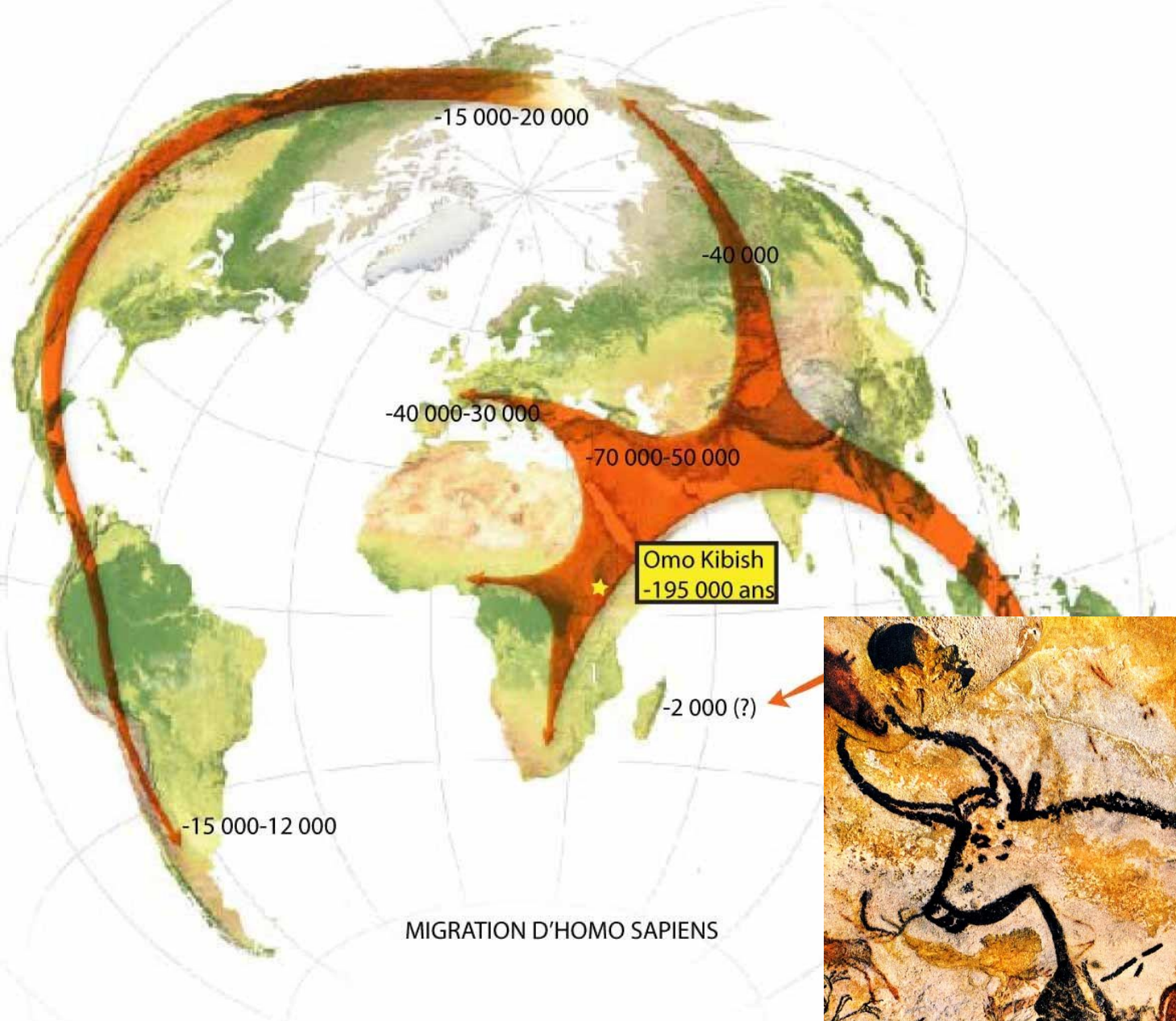


Gibraltar 2 : Cranio e
ricostruzione



Estinzione



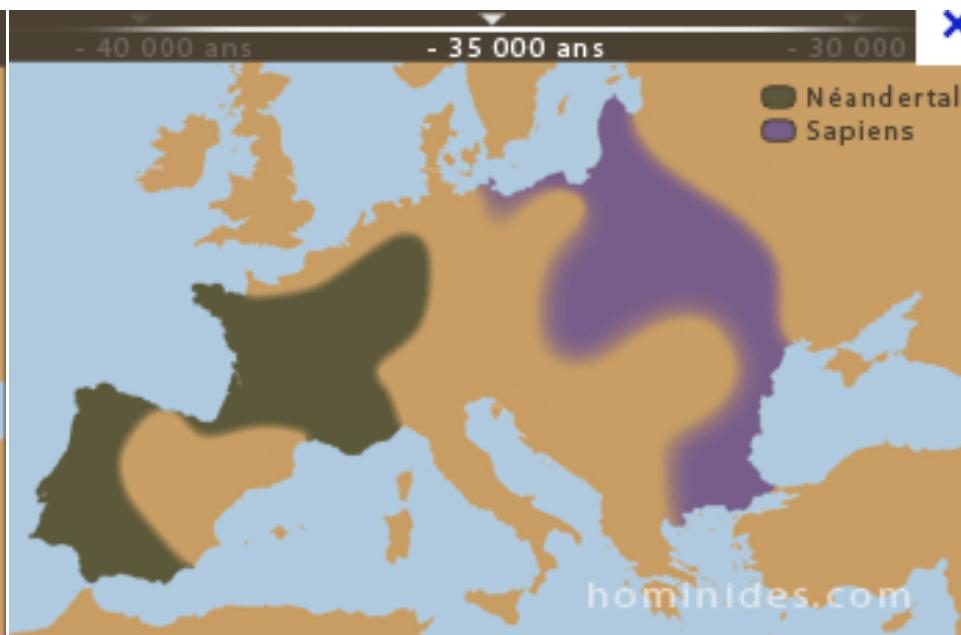


MIGRATION D'HOMO SAPIENS

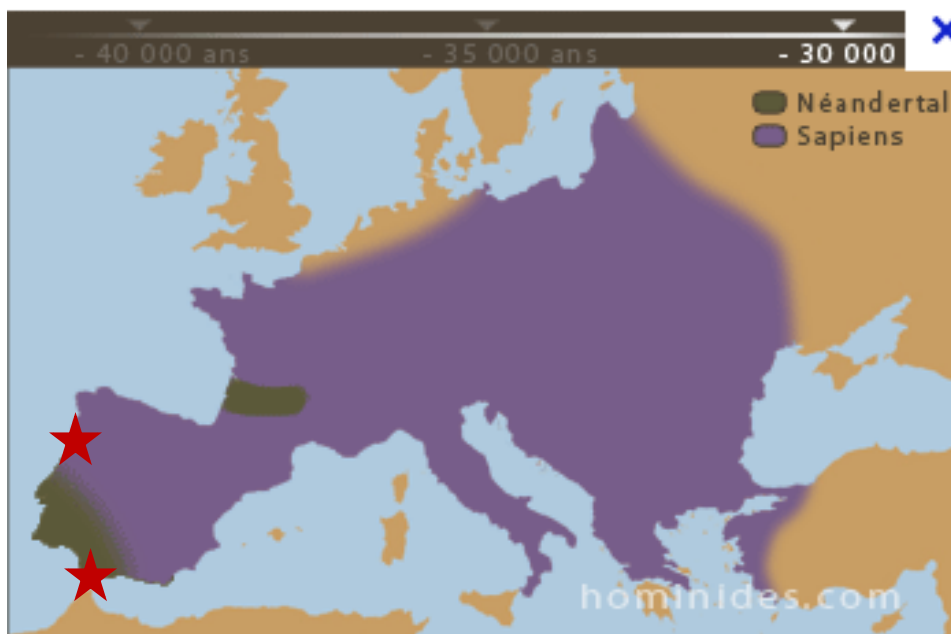




Répartition Néandertaliens et Sapiens



Répartition Néandertaliens et Sapiens



Répartition Néandertaliens et Sapiens



Enlène's Cave
(40,000 ans, Pyrénées, Espagne)

Ipotesi...

Concorrenza con *Homo sapiens* che ha conquistato tutte le nicchie ecologiche.
The competition with Homo sapiens who has colonized all the ecological niche.

Homo sapiens è riuscito a estendere la caccia a vari tipi di prede
Homo sapiens was able to extend the hunting to various types of prey..

Combattimento tra *H.sapiens* e *H.neandertalensis* che si indeboliva.
Fight between H. sapiens and H.neanderthalensis who get weaker.

Genocidi dei Neandertaliani da parte dei *sapiens*.
Genocide of the Neandertal from the sapiens.

Fuga dei Neandertaliani che rifiutavano il confronto con i Cro-Magnon. Questa cultura pacifica e la mortalità infantile elevata sarebbe all'origine della loro scomparsa.
Escape of the Neandertal who refused the confrontation with the Cro-Magnon. This pacific culture and the child mortality could have been the reason to their extinction.

Malattie *Deseases*



Bibliografia

Carbonell E., J. M. Bermudez de Castro, et al. (2008). "The first hominin of Europe." Nature **452: 465-470.**

Facchini F. and Belcastro M.G. (2009). La lunga storia di Neandertal: Biologia e comportamento. Milano.

Green R.E. et al. (2010) – “A draft sequence of the Neandertal genome.” Science **328**

Hodgson, J. A., C. M. Bergey, et al. (2010). "Neandertal Genome: The Ins and Outs of African Genetic Diversity." Current Biology **20(12): R517-R519.**

Hublin J.J (2009). "The origin of Neandertals." PNAS **106(38): 16022-16027.**

Vandermeersch B. and Hublin J.J (2007). Les derniers néandertaliens. Les Néandertaliens. Biologie et cultures. CTHS. Paris, Documents préhistoriques. **23: 109-115.**

Weaver T.D. (2009). "The meaning of Neandertal skeletal morphology." PNAS **106(38): 16028-16033.**

