The Neandertals

Part II: Morphology:
The Bones of Neanderthal

by
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2020

1 or 2 species: very close anatomy

- The original interpretation of Neandertal anatomy was one of a primitive early human based on a flawed reconstruction of the nearly complete skeleton of an elderly Neandertal male found at La Chapelle-aux-Saints, France.

- However, Neandertals and modern humans (*Homo sapiens*) are very similar anatomically –
  - In 1964, it was proposed that Neandertals are not even a separate species from modern humans, but that the two forms represent two **subspecies**: *Homo sapiens Neandertalensis* and *Homo sapiens sapiens*.

- This classification was popular through the 1970's and 80's, although many authors today have returned to the previous two-species hypothesis.

- Either way, Neandertals represent a very close evolutionary relative of modern humans.

Some distinguishing physical characteristics of Modern Humans

Skull Features:

- Flat face
- Prominent Chin
- Smaller teeth
- Large brain case (~1350 cc)
- Reduced brow ridges
- Smaller cheek bones

Other skeletal features

- Smaller pelvis

Neandertal characteristics

Height:

about 1.50-1.70 cm (4’9” - 5’6” feet);

Klein: average 5’4” vs MH 5’8”;

Weight:

about 64-82 kg (141-181 lbs):

average weight of 26 specimens:

78 kg (171 lbs) for males

66 kg (146 lbs) for females

Early Neanderthals were taller on average than later Neanderthals, but their weight was about the same. Ns in Near East were taller.

The skeleton of Regourdou 1

Regourdou 1 was discovered in 1957 in a collapsed rock shelter near Lascaux in the Dordogne of southwestern France. In the deposits were remains of a partial skeleton along with fragmentary pedal remains of a second individual.
Associated with La Quina type Mousterian and considered to be from OIS 4, it is one of the oldest Neandertal skeletons from Western Europe.

Volpato V, Macchiarelli R, Guatelli-Steinberg D, Fiore I, et al. (2012) Hand to Mouth in a Neandertal: Right-Handedness in Regourdou 1. PLoS ONE 7(8): e43949. doi:10.1371/journal.pone.0043949
http://www.plosone.org/article/info:doi/10.1371/journal.pone.0043949

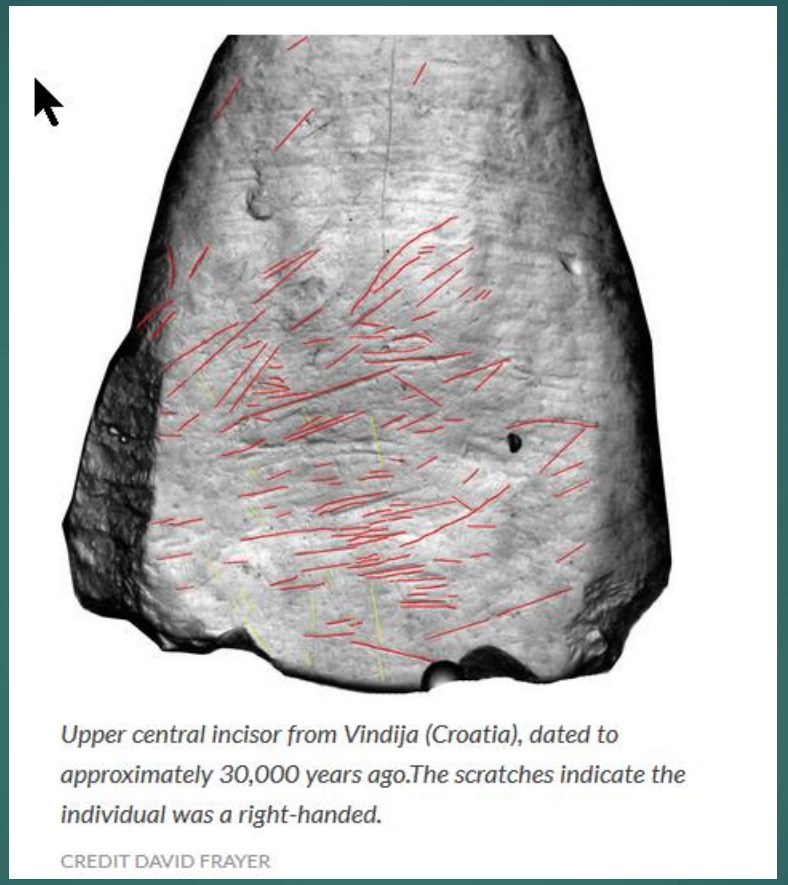
Ns = Right-handed

- Neanderthal stone tools from Germany: 85 percent of those tools were made for right-handers, while some appear to have been modified specifically for left-handers.

- Another line of evidence: skeletal asymmetry: Neanderthals seem to have had unusually strong right arms

- MHs have a 4–13 percent difference in muscle development between right and left arms.
- Neanderthals, on the other hand (pun intended), had up to 50 percent or more muscular asymmetry.

Hand to Mouth in a Neandertal: Right-Handedness in Regourdou 1



Upper central incisor from Vindija (Croatia), dated to approximately 30,000 years ago.The scratches indicate the individual was a right-handed.

CREDIT DAVID FRAYER

Sample of 35 Neandertals from 130,000-30,000 years ago with a ratio of 32 right : 3 left or greater than 90% right-handedness.

Labial scratches on Regourdou 1′s anterior teeth.

Various studies have identified striations on the labial (lip) face of Neandertal anterior teeth, beginning with Henri-Martin's initial observations on the upper incisors from La Quina 5.

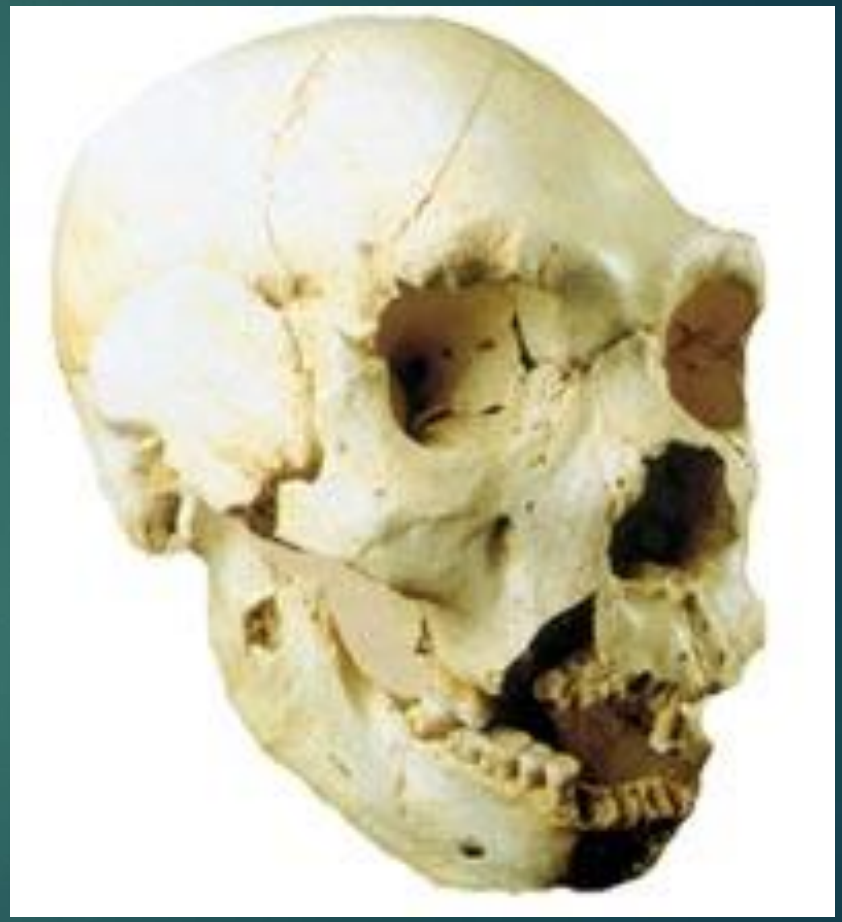
These scratches are commonly found in Neandertals from Europe and in their likely ancestors from Sima de los Huesos at Atapuerca and Mauer.

Except for two left-handed individuals, Krapina [KDP] 4 and Hortus 8, dated ~130,000 yrs and ~35,000 yrs, respectively, all specimens show a preponderance of right-handed striations. This yields a ratio of 27 right-handed & 2 left-handed (93%: 7%),

Volpato V, et al., 2012

Around 430 Ka, morphology of *H. heidelbergensis* in Europe began to change

- Site = Sima de los Huesos, Spain
- 2000 bones from > 24 individuals
- Unique Neandertal skull traits
  - Bulge in middle of face
  - Brow ridges arch over each eye
  - Skull with rounded back
  - Cranial capacity = 1390 cc
- Considerable variation in population



Neandertal morphology circa 100 - 30 Ka

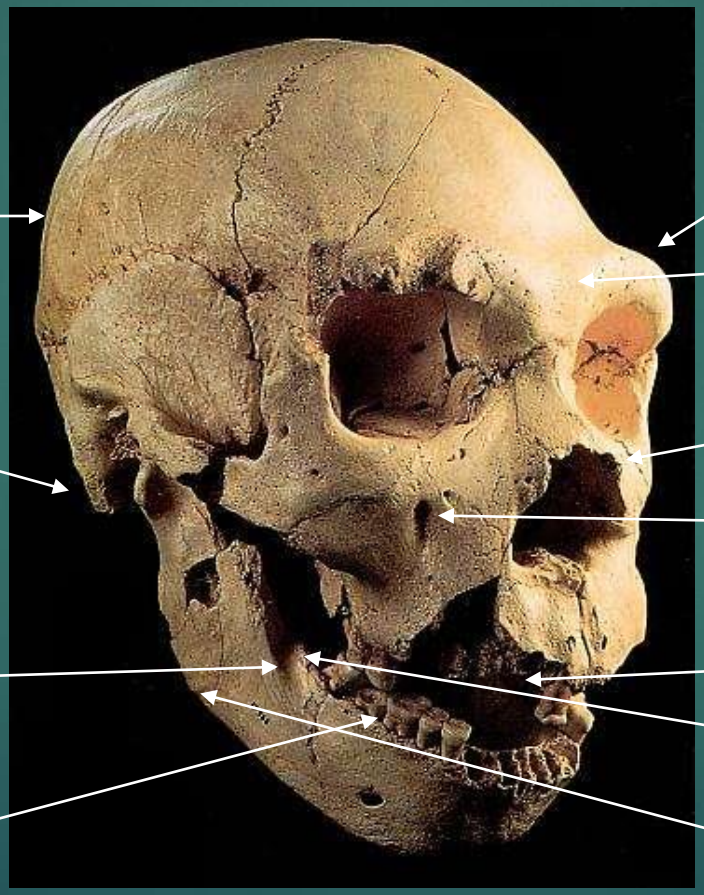
- The classic Ns are morphologically unique, best displayed in western European group.
- Full-blown N with all distinctive morphology:
  - thick, double-arched brow ridges over each eye
  - large nasal opening/broad nose
  - face that projects forward in midline
  - rounded orbits
  - laterally projecting and rounded parietal bones;
  - braincase widest lower down; rounded top and back of cranium;
  - rounded, posteriorly projecting occipital bone (i.e. an occipital ‘bun’).

Classic Ns

- Endocranial volume: Cranial cavity is on average larger (1450 cc) than that of modern humans (1350 cc)
- No chin
- Distinctive limb bones with thick shafts and large joint surfaces

- Essentially a European and Near East taxon (none in Africa or Scandinavia); but Eastern region has been less researched

SH5: Some primitive features, but mainly derived Neandertal features of face



Not “en bombe” like MH

Large mastoid

Molars don’t slope much

Molars not taurodont

Evenly circular supraorbital tori

Deep glabella

Nasal protrusion

Some midfacial protrusion

Maxillary sinus seems large

Retromolar space

Truncated jaw angle

The Neandertal features to look for

- Suprainiac fossa
- Increased occipital convexity
- Occipitomastoid crest
- Reduced mastoid
- “En bombe” braincase
- Laterally deepened ophryonic groove
- Evenly circular supraorbital tori
- Large round orbits
- Deeply depressed glabella

- Nasal protrusion
- Protruding midface
- Enlarged maxillary sinus / no canine fossa
- Malars slope to maxilla
- Taurodontism
- Retromolar space
- Truncated jaw angle
- Mental foramen further back, under M_1
- Subvertical mandibular symphysis

Diagnostic traits of *Homo neanderthalensis:* Cranium

- Long and low (platycephalic) skull: in profile, with retreating forehead and relatively flat cranial base

- Large but flatter cranium (N = football shape vs MH = soccer ball); globular when seen from behind (*en bombe* = subspheroid or oval)

- Browridges are large and double-arched (semicircular in shape (not continuous bar or shelf-like); characterized by extensive pneumatization

Conroy, 1997; Stringer and Gamble, 1993; Stringer et al., 1984; Tattersall, 1995b

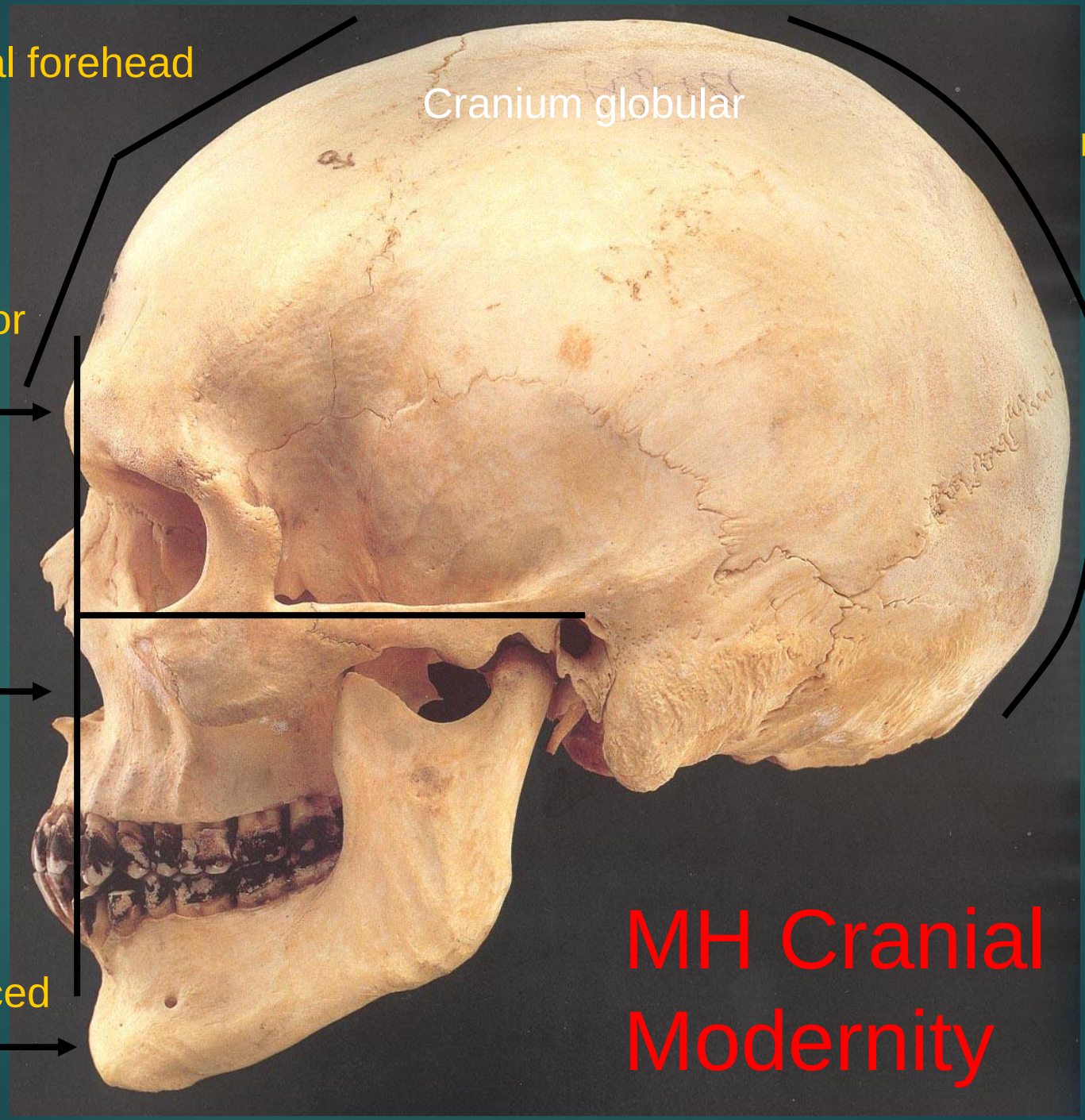
N features

- Massive facial skeleton:
  - midfacial prognathism
  - very large nasal opening; (very big nose that projects forward)
  - absence of canine fossa

- These features may have been an adaptation to living in colder, drier environments. The large internal volume of the nose would have acted to moisten and warm the air they breathed.

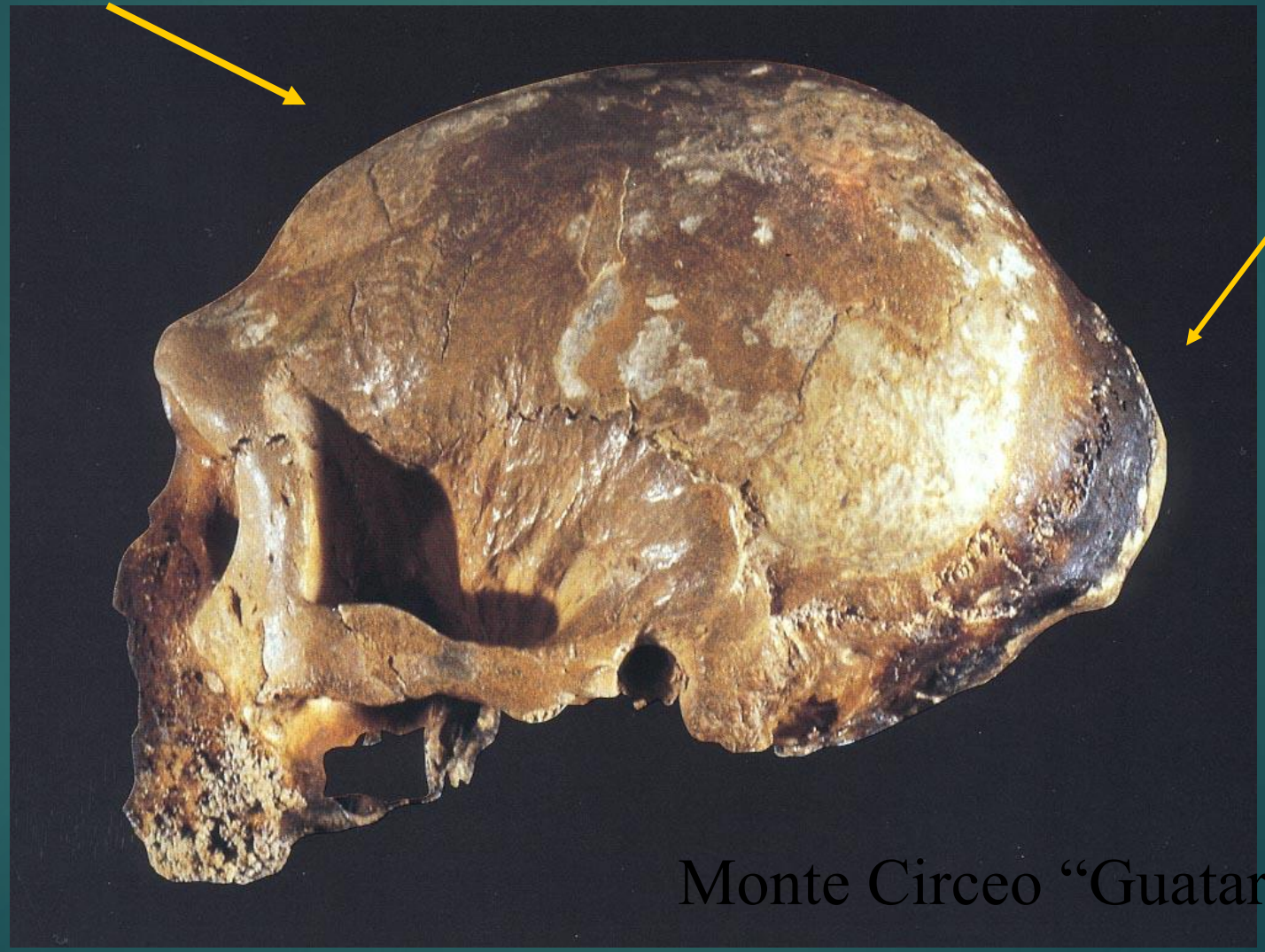
Neandertal anatomical specializations

- The specializations include
  - the extraordinary forward projection of the face along the midline,
  - the tendency for the braincase to bulge outwards at the sides,
  - a depressed elliptical area of roughened bone on the back of the skull (suprainiac fossa)
  - an array of bumps and crannies in the vicinity of the mastoid process.
  - singular configuration of the bony labyrinth of the inner ear.


Vertical forehead
Cranium globular
Rounded rear vault
Reduced or absent brow ridges
Reduced face
Pronounced chin
MH Cranial Modernity

Long cranium

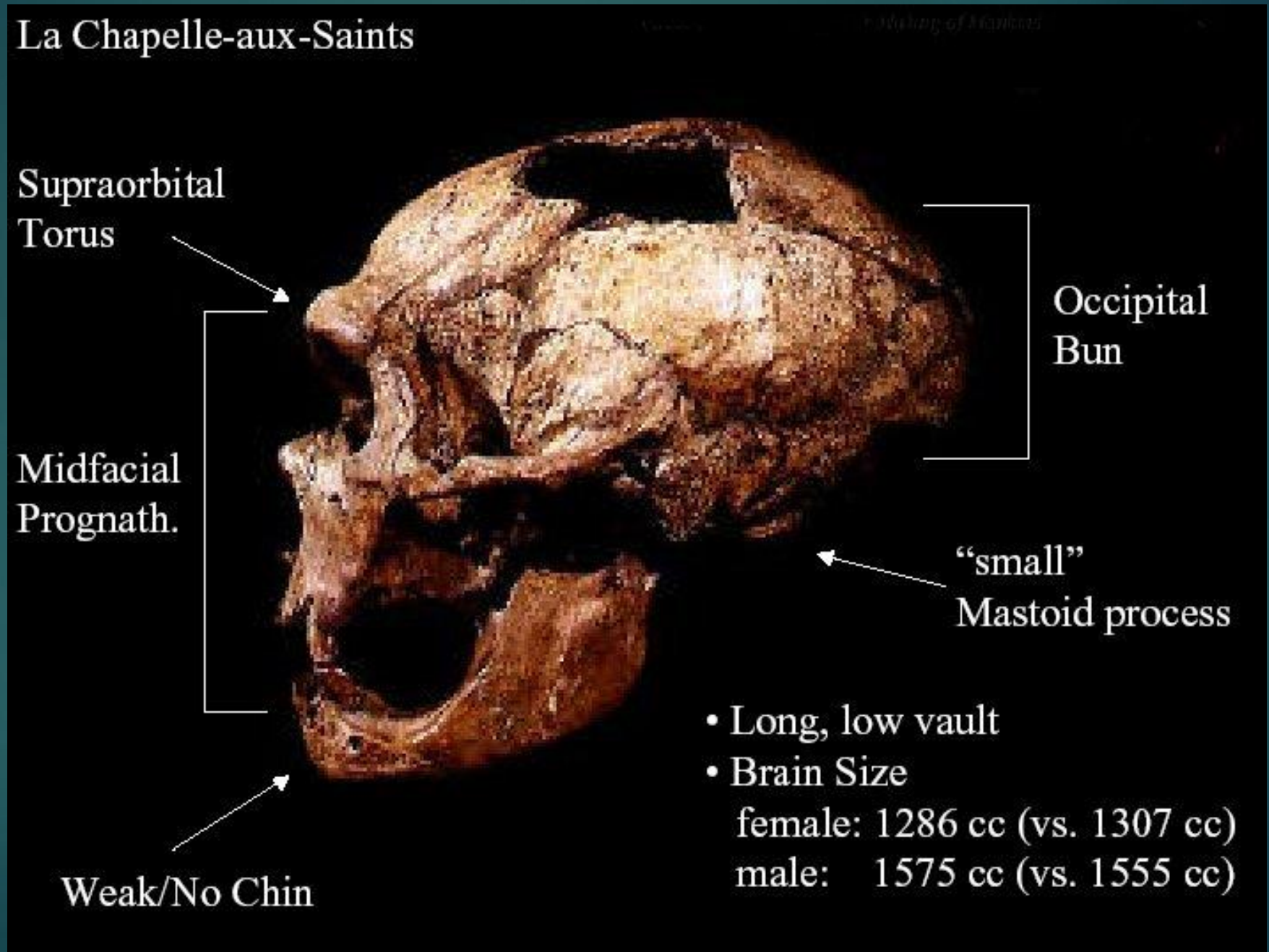
Low, sloping forehead

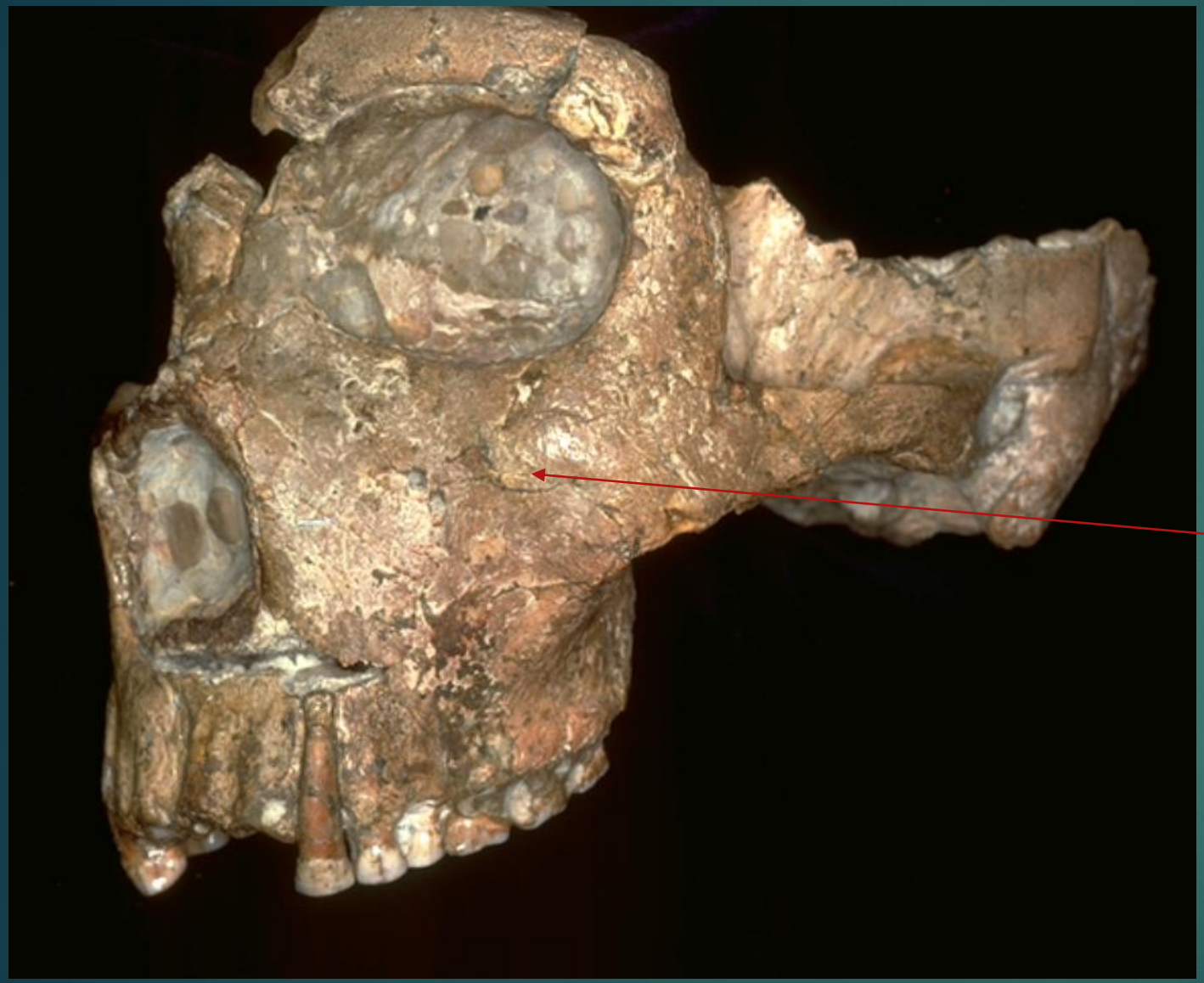


Occipital bun

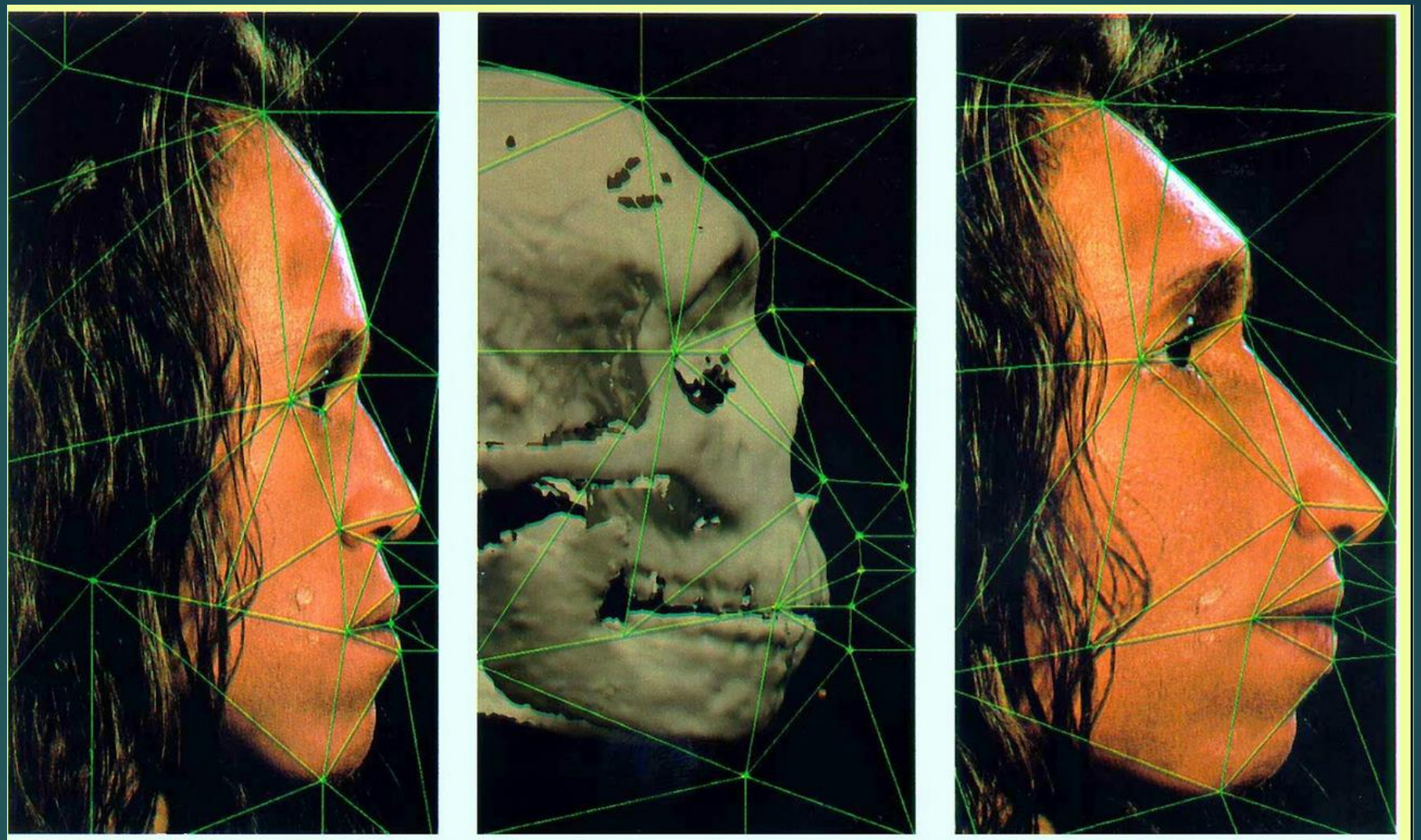
Monte Circeo “Guatarri”

Neandertal Features



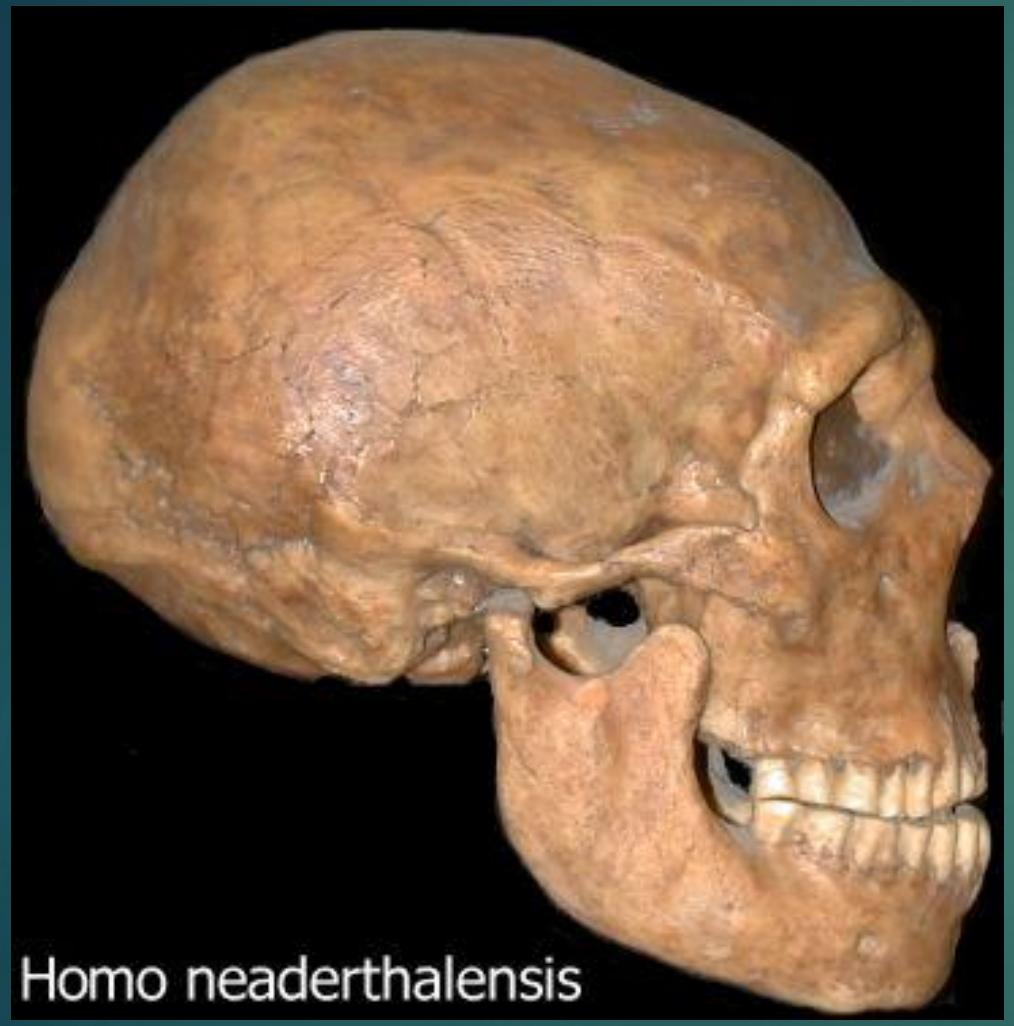


- Specimen is from the Italian site of Saccopastore and is a Neandertal.
- The large, projecting midface, including a large, well-bracketed nasal aperture, are all give-aways.
- The specimen also has a double-arched, prominent browridge, that narrows as it goes laterally.

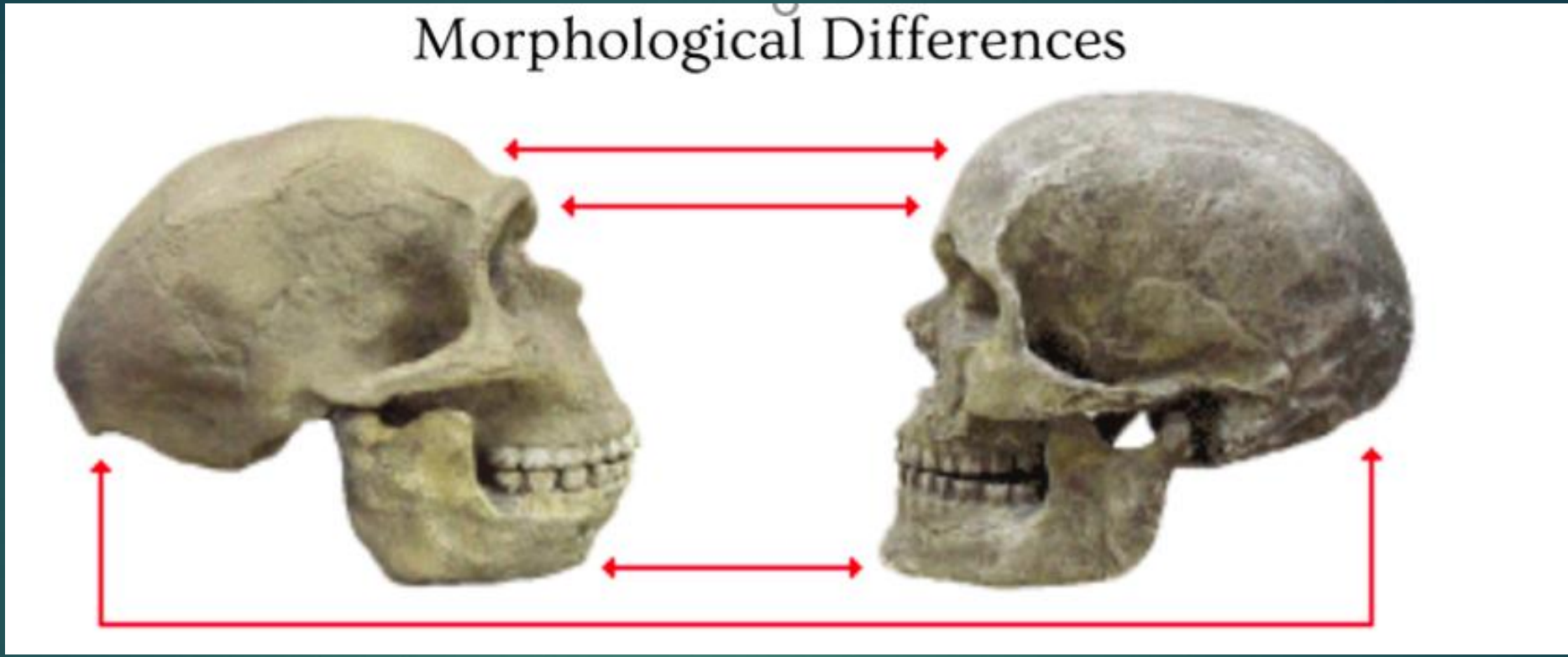


A computer illustration of the facial geometry of a Neanderthal compared to modern Homo Sapiens

Computer Neanderthalization: N midface projection


Homo neaderthalensis


Homo sapien



(*Science*, 12 February 2016, p. 648

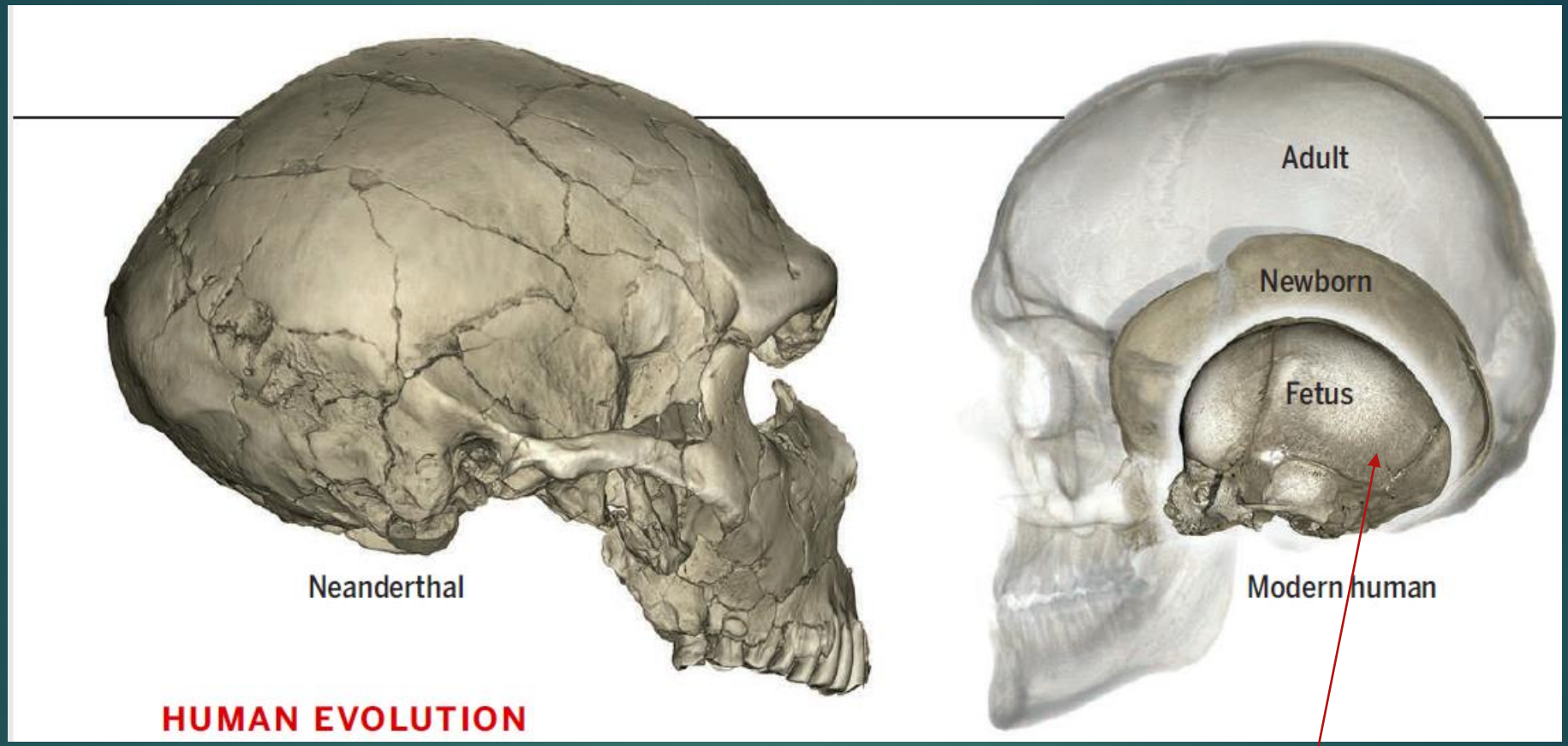
Homo neanderthalensis

Low forehead
Thick, continuous browridges
No chin
Occipital Bunning
Large Cranial Capacity (avg. 1450 cc)

Homo sapiens

High forehead
Reduced browridges
Chin
No Occipital Bunning
Smaller relative Cranial Capacity (avg. 1350 cc)

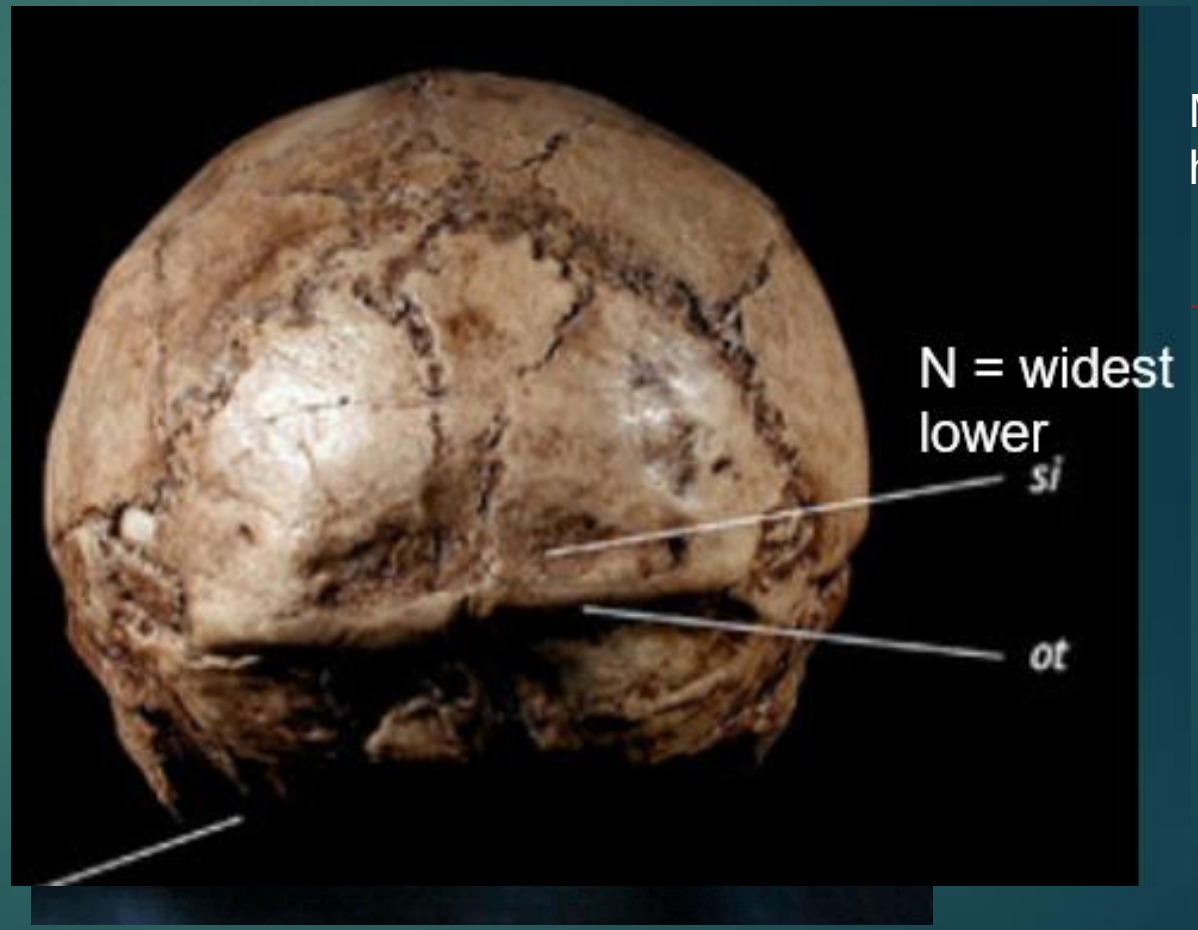
N vs MH skull shape



MHs start out
with football skull

Skull: Teardrop shape from top: wider, rounder in back, smaller front; circular, barrel shape seen from behind; widest at bottom in N, at top in MH

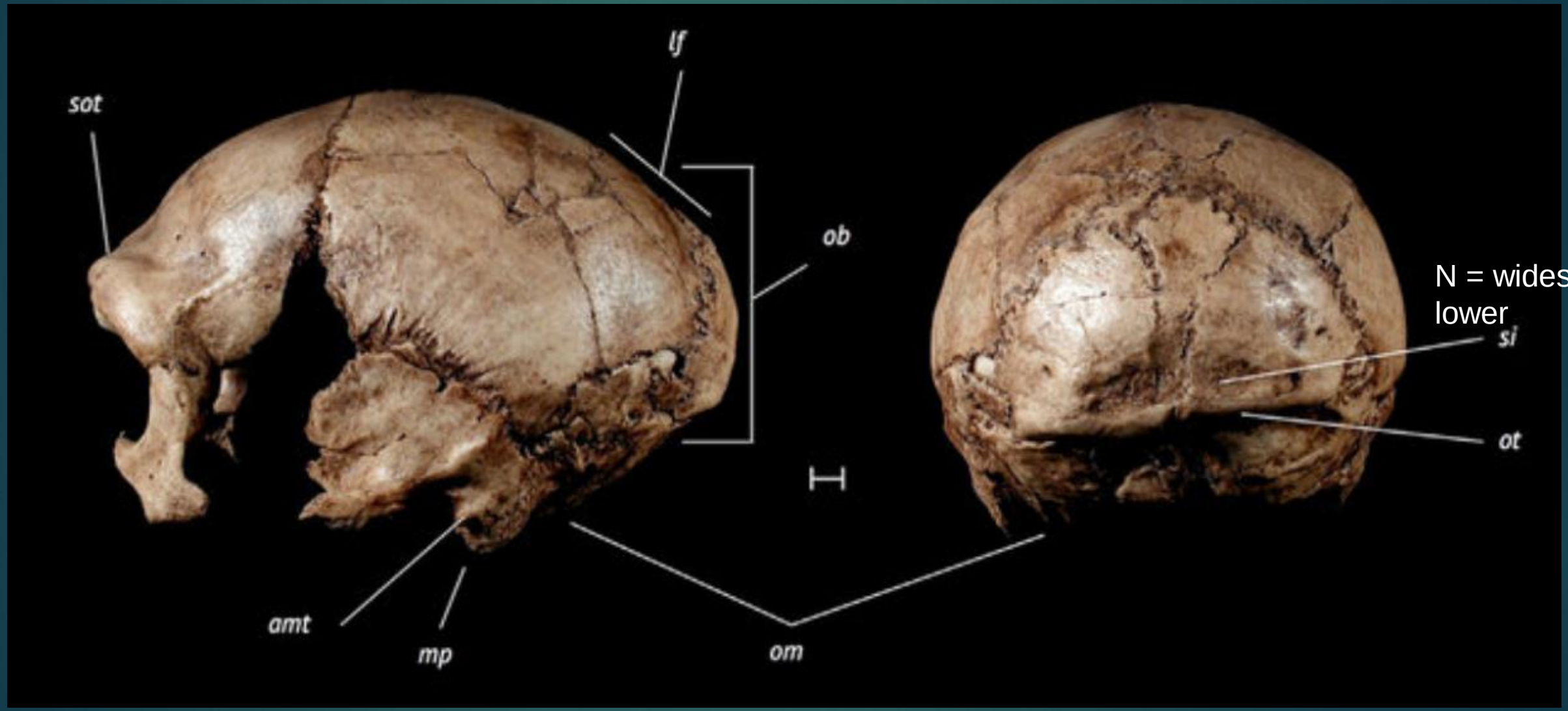
Neandertal



MH = Widest at high Parietals

Modern Human

La Quina N skull



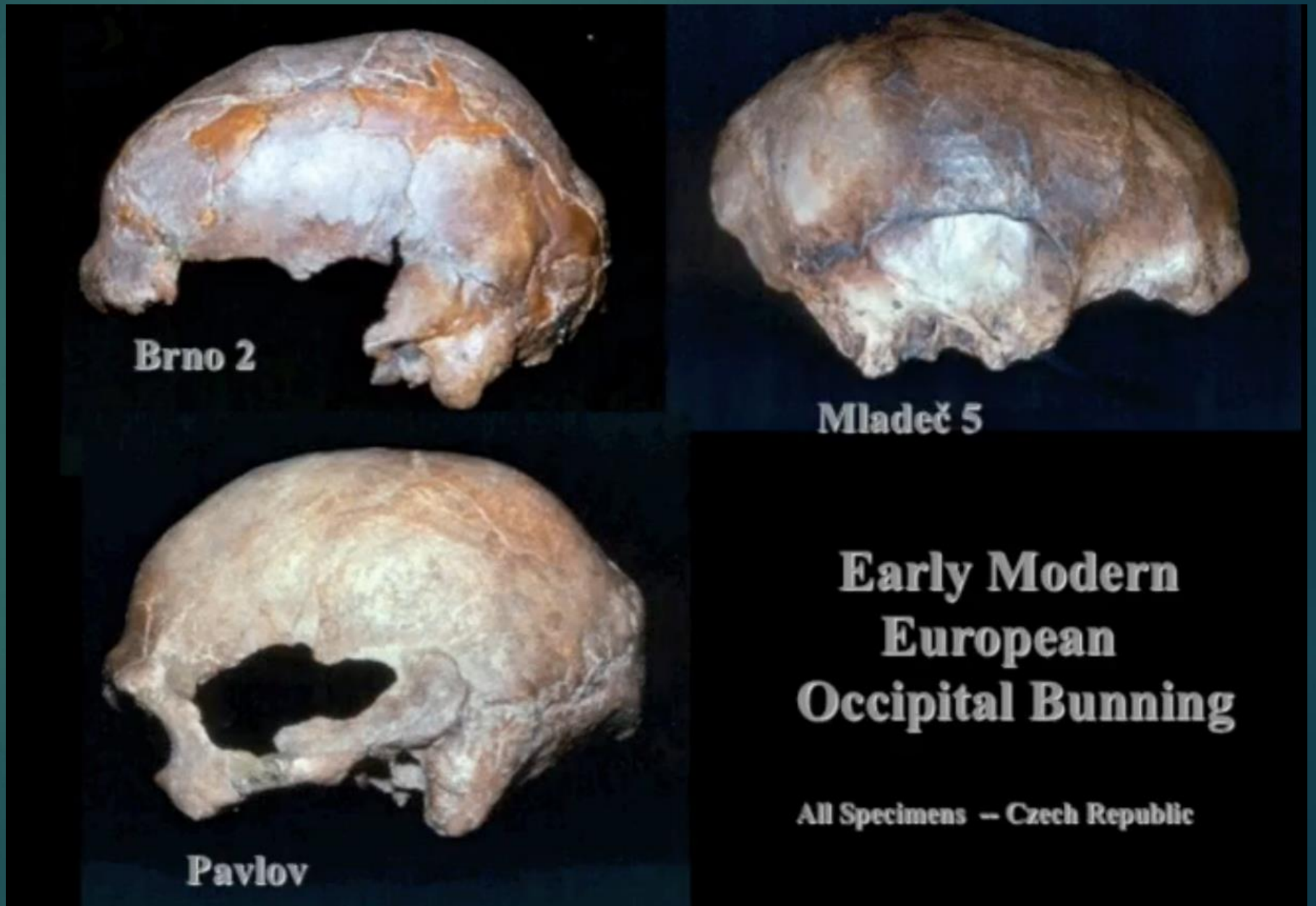
N = widest lower

Occipital Bun

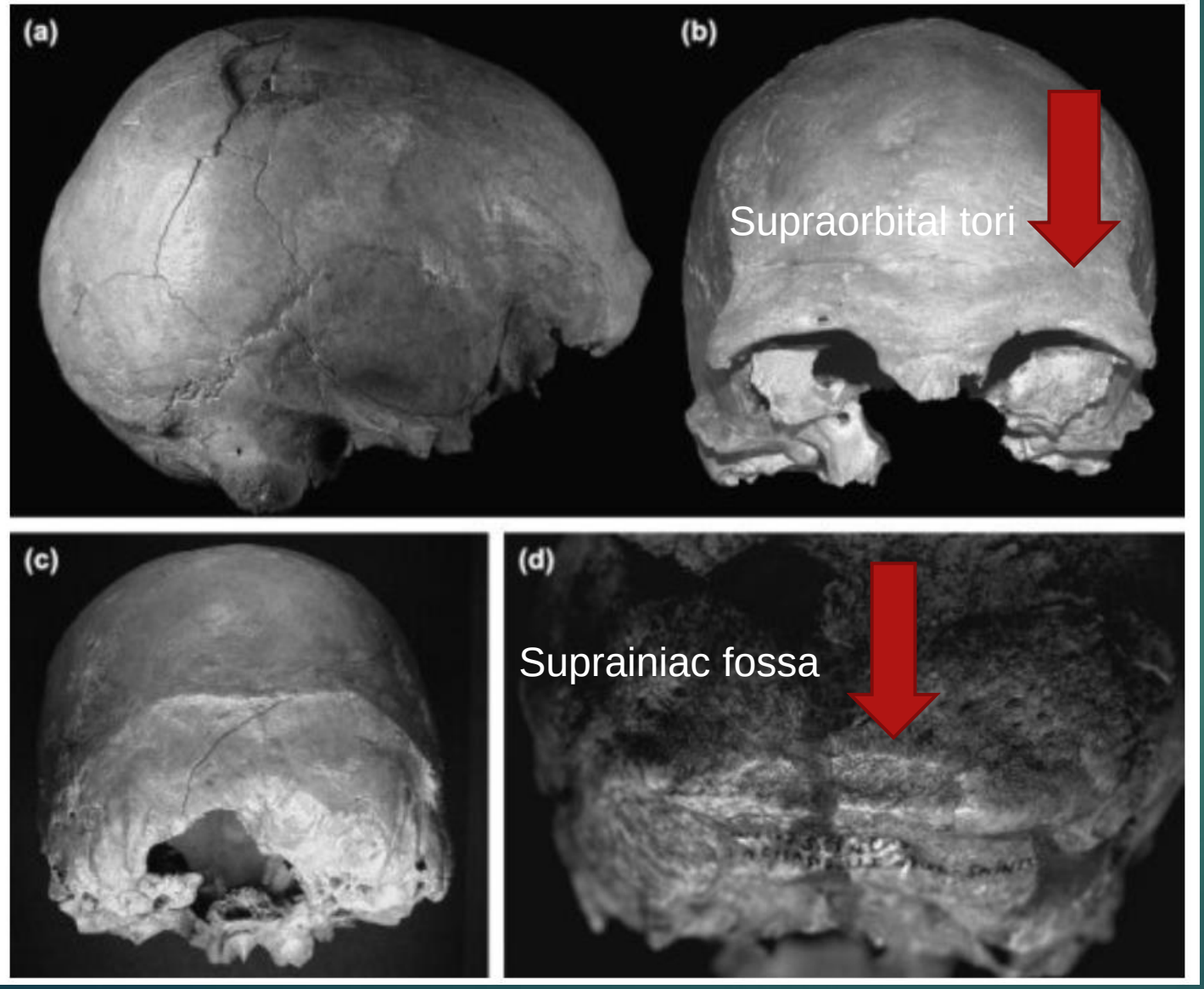
Neanderthal Occipital Bunning is brain growth driven

Endocast

Some Early MHs had Occipital Bunning from N admixture: Czech Republic



Cioclovina 1, Pestera Cioclovina Uscata, Romania, MH, 33 Ka



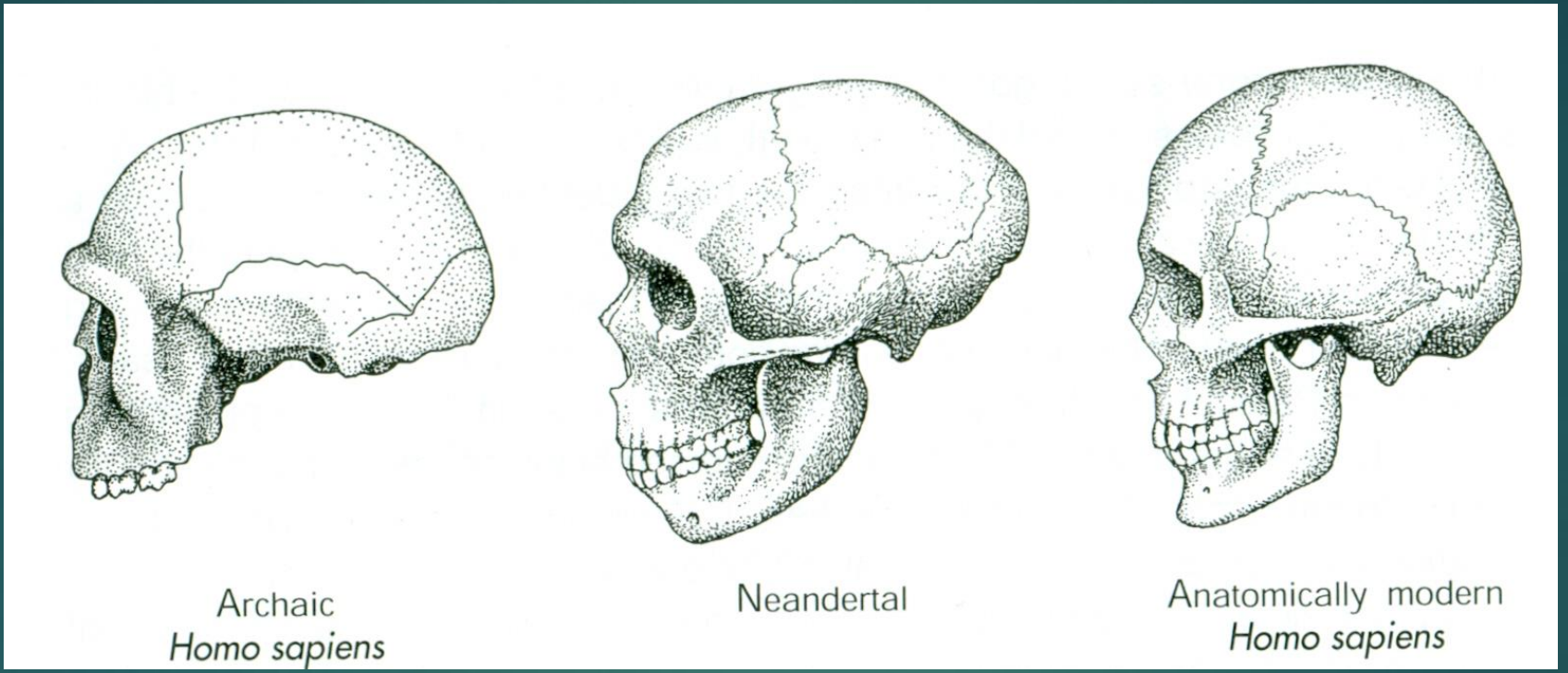
- 1942 Discovery: result of a modest level of admixture with Neanderthals
- The area above the neck muscles contains a distinctly Neanderthal feature, a suprainiac fossa –This feature implies some level of Neanderthal ancestry in this otherwise modern human fossil,
- Joins other early modern European fossils, from the sites of Oase and Muierii in Romania, Mlasdec in the Czech Republic, and Les Rois in France in indicating some degree of Neanderthal admixture occurred when modern humans spread across Europe starting around 40,000 years ago.

Andrei Soficaru, et al., 2007

Early Upper Paleolithic People of Europe

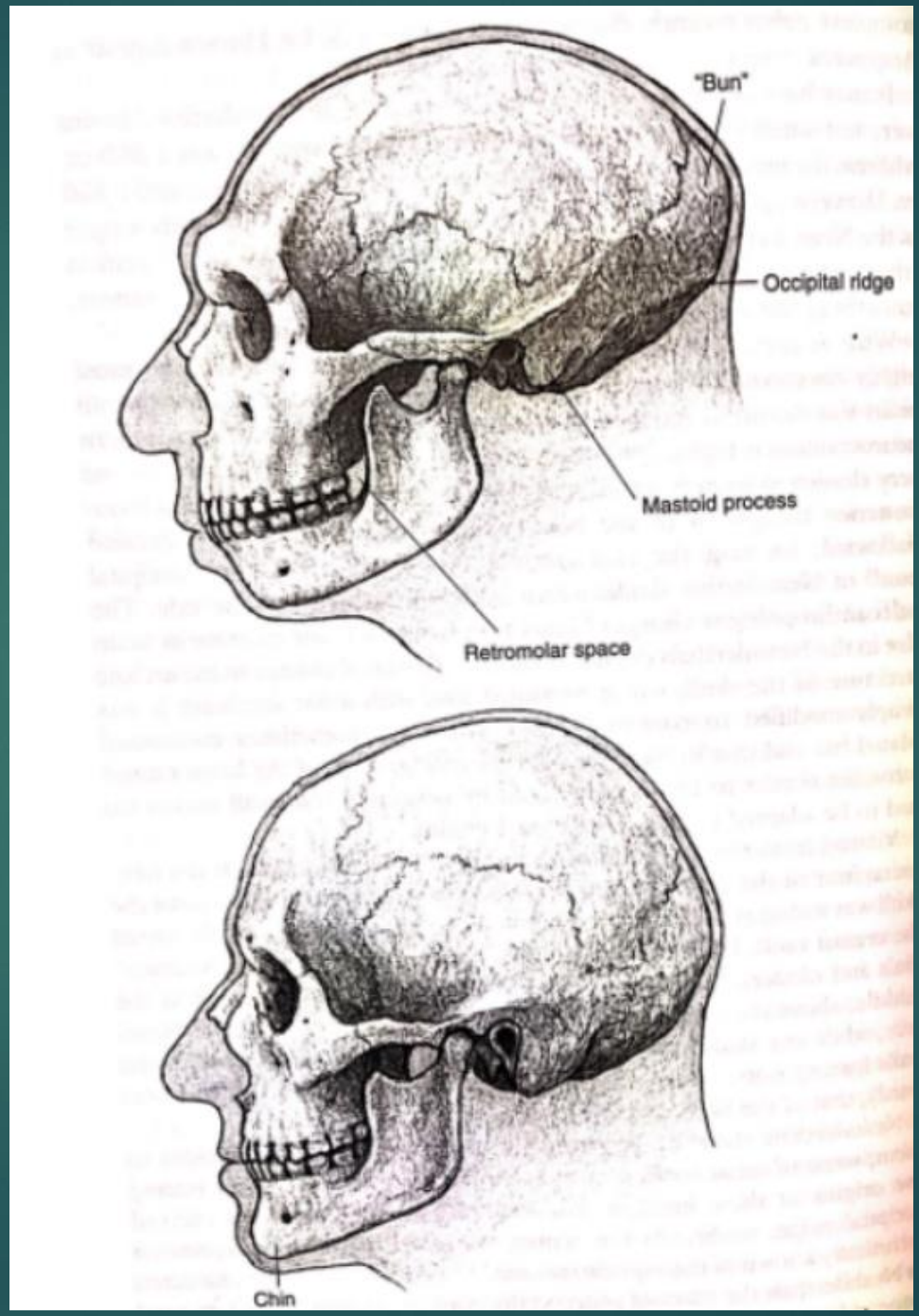
- First MHs to enter Europe
- First in Eastern & Central Europe
- First fossils in Romania: 35-36K
- Mladec in Czech Republic: >30K
  - Fossils lost in Nazi confiscation when castle burned
- David Frayer: N & MH mixtures at Mladec
  - MH with occipital bun or browridges
  - Imply genetic input from N into MH

Paleontological evidence



Neandertal

H. sapiens



The Neandertal Skull

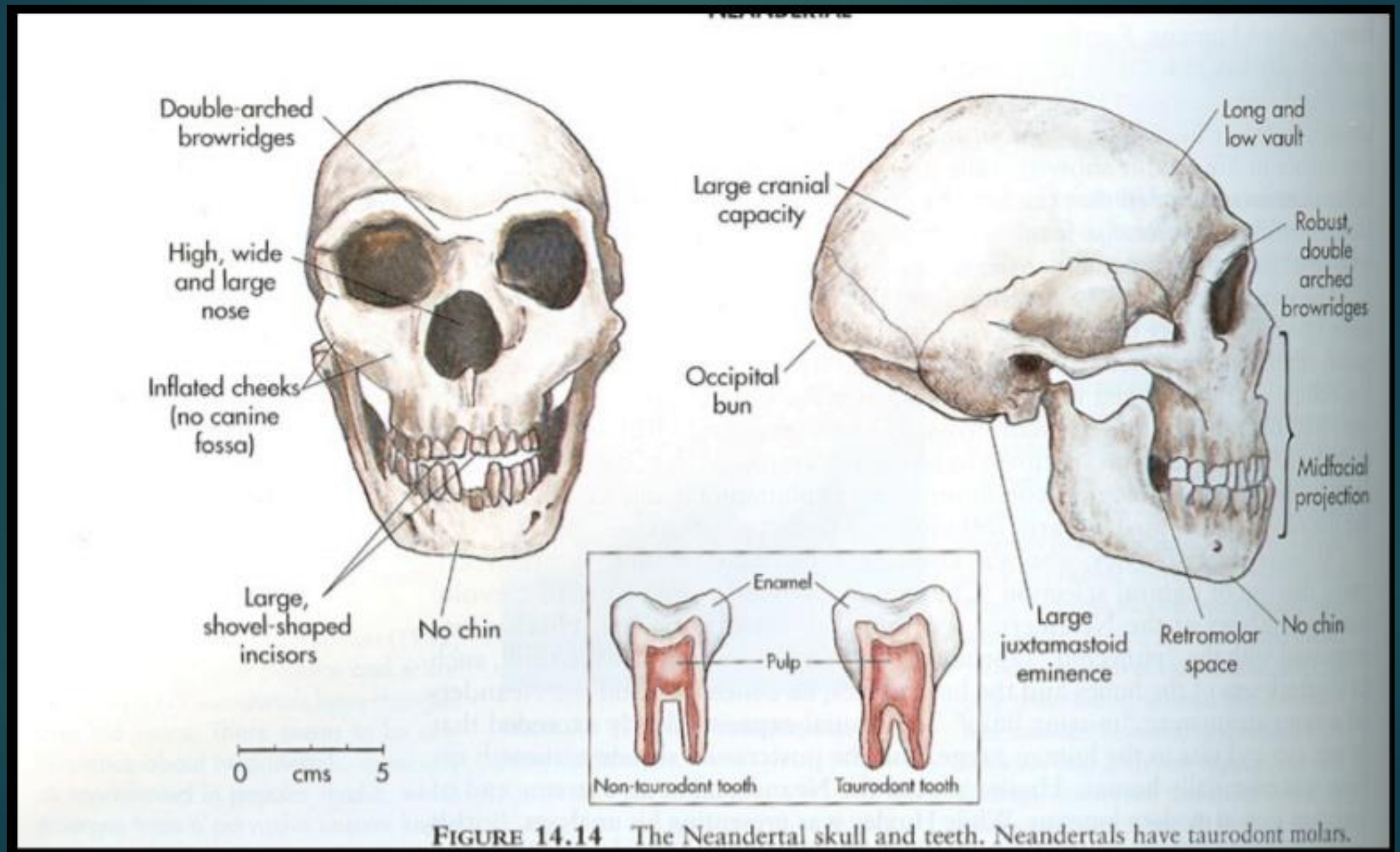
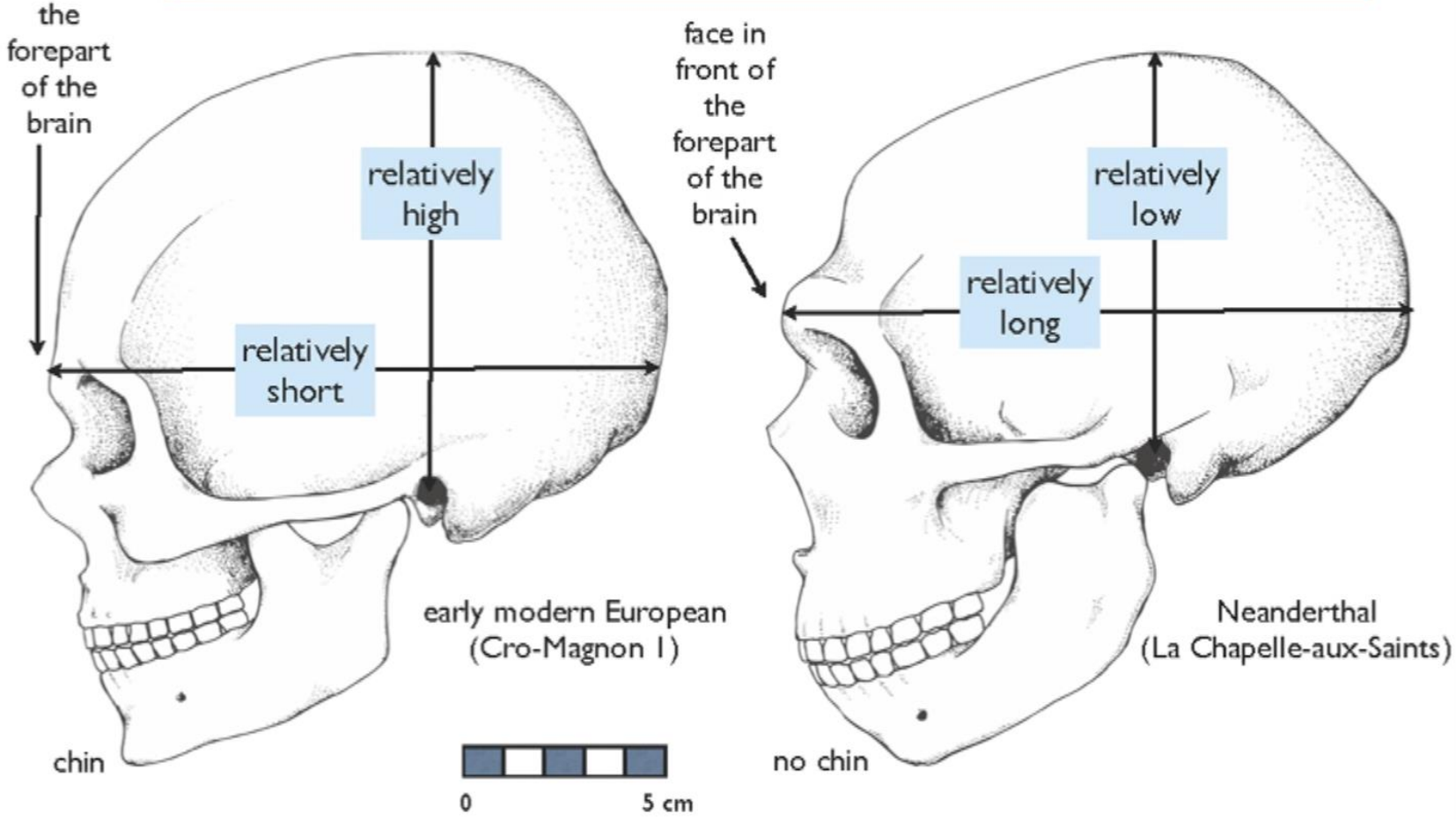


FIGURE 14.14 The Neandertal skull and teeth. Neandertals have taurodont molars.

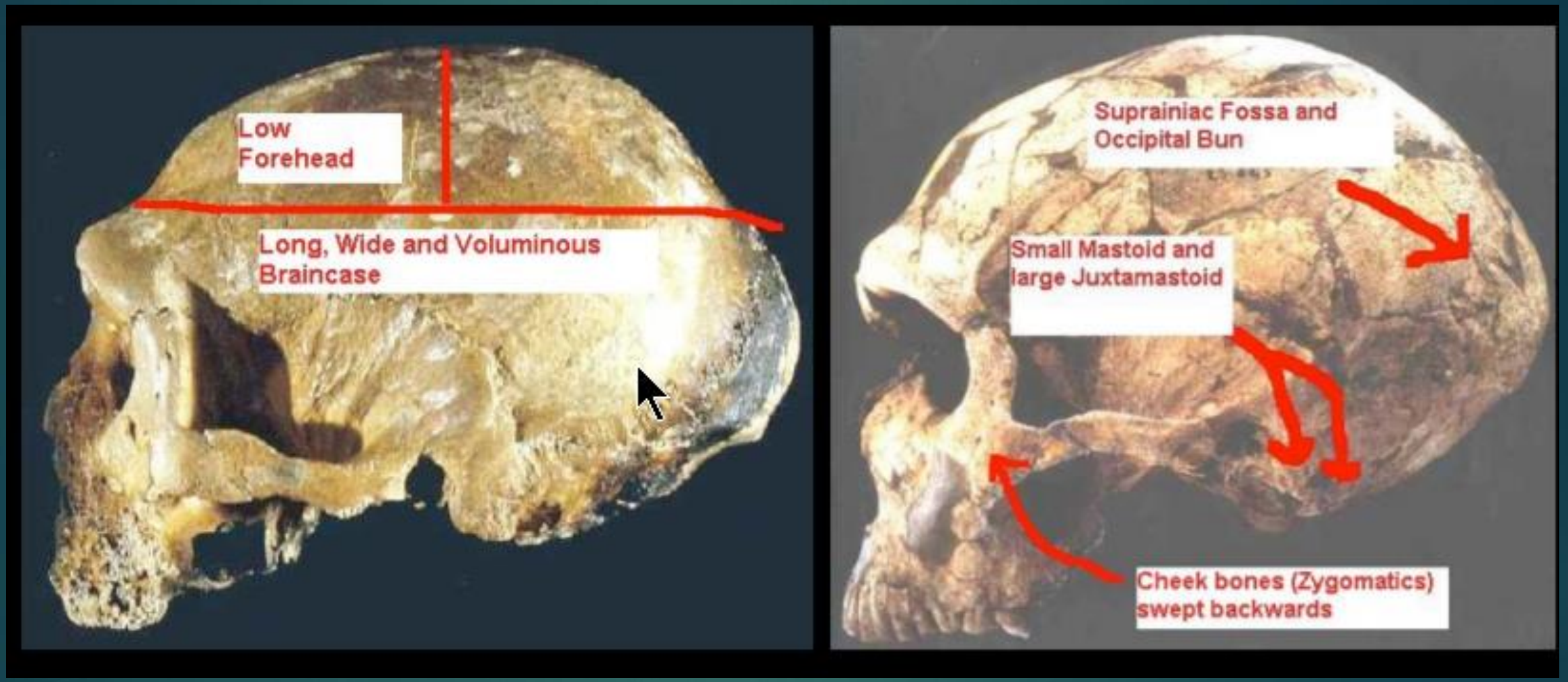
Modern humans differ from non-modern humans in their skulls and faces



30 Ka

70 Ka

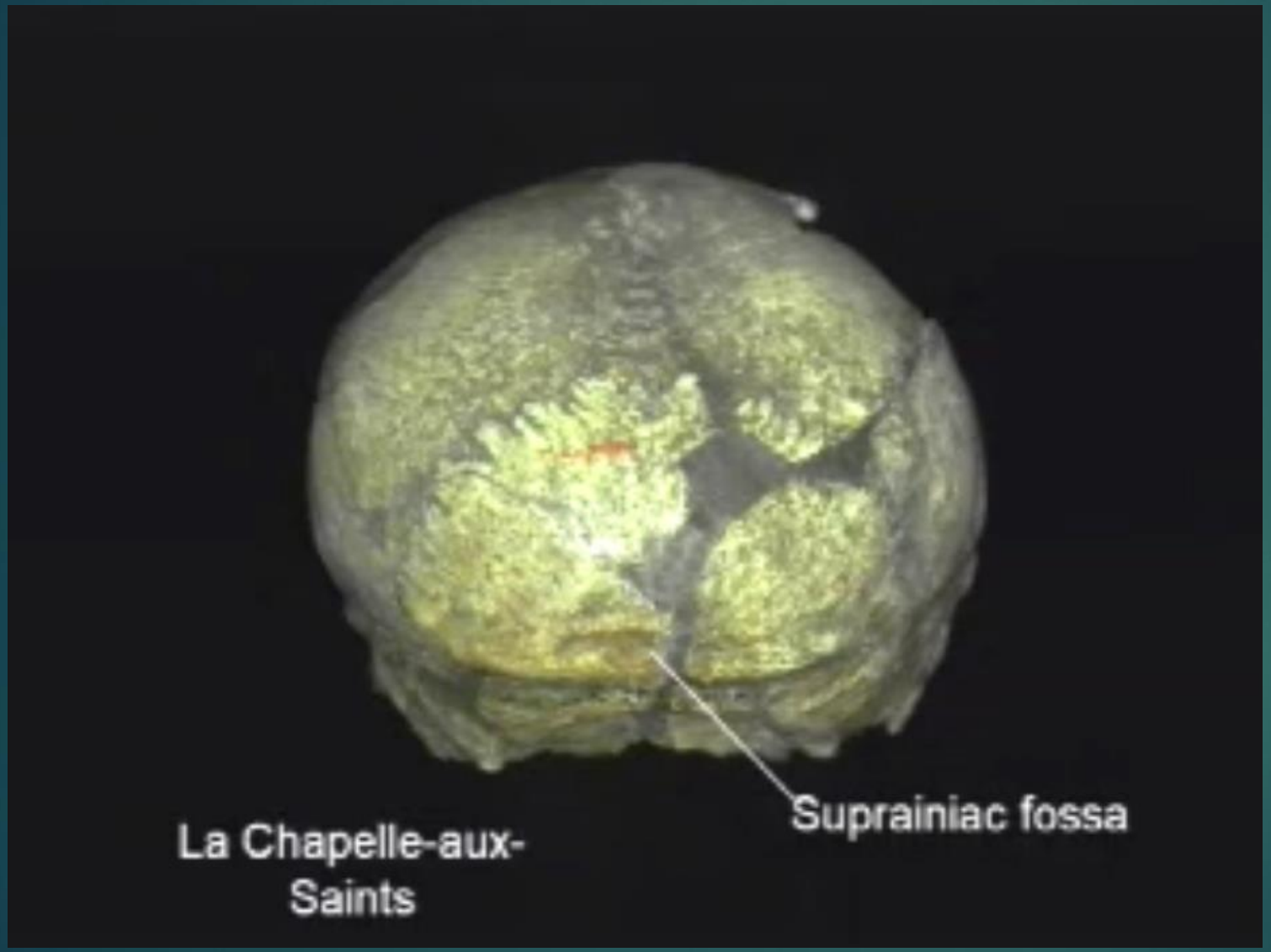
Neandertal Skull



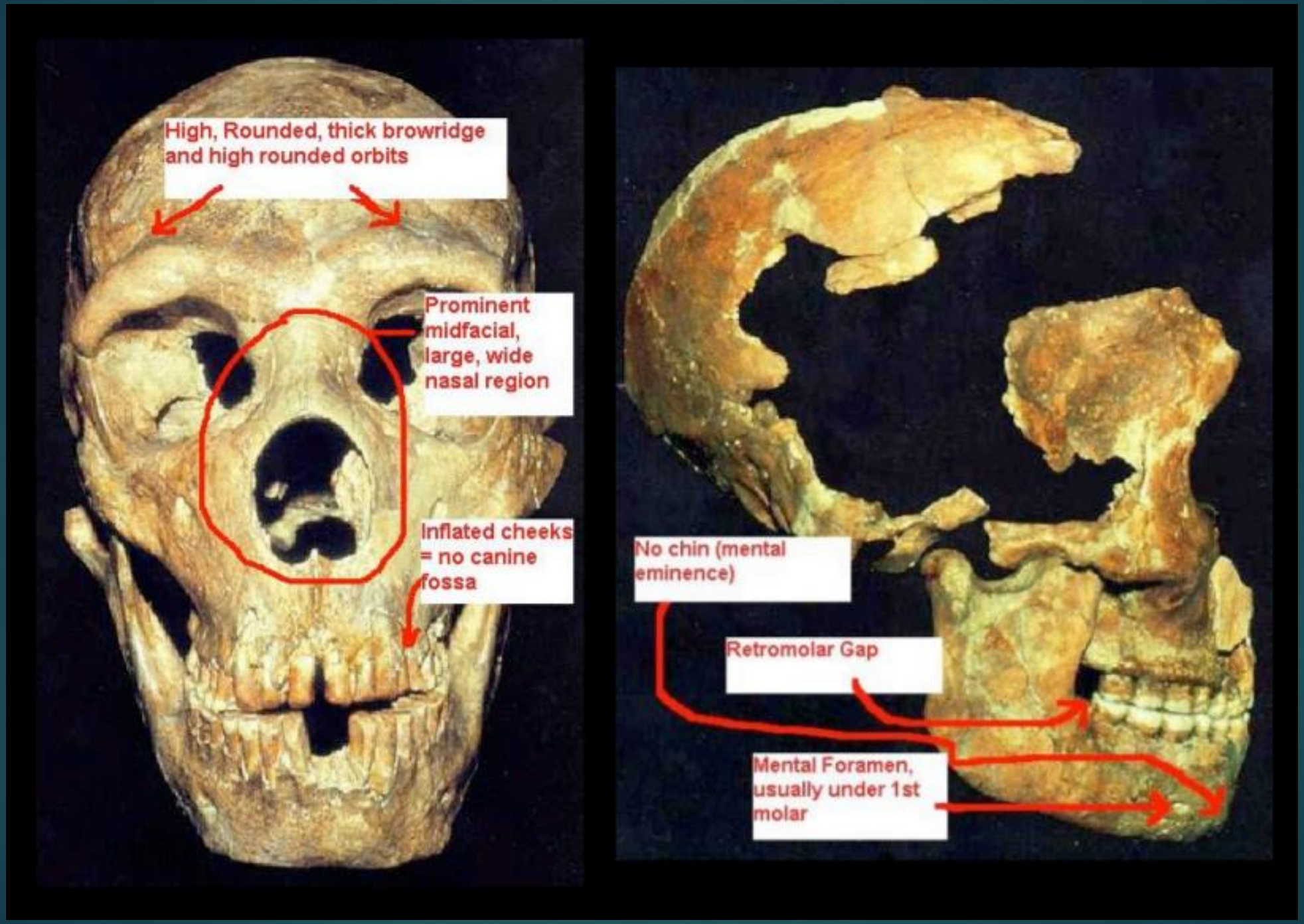
Suprainiac fossa: a derived characteristic (autapomorphic)
Neanderthal feature: 90%

Suprainiac fossa (protuberance with small pit)

Suprainiac fossa



- A horizontal oval-shaped depression located on the occipital plane above nuchal musculature
- a Neandertal autapomorphy, present in 90% of Ns
- But present in 17% of MH circa 20 Ka and then declines

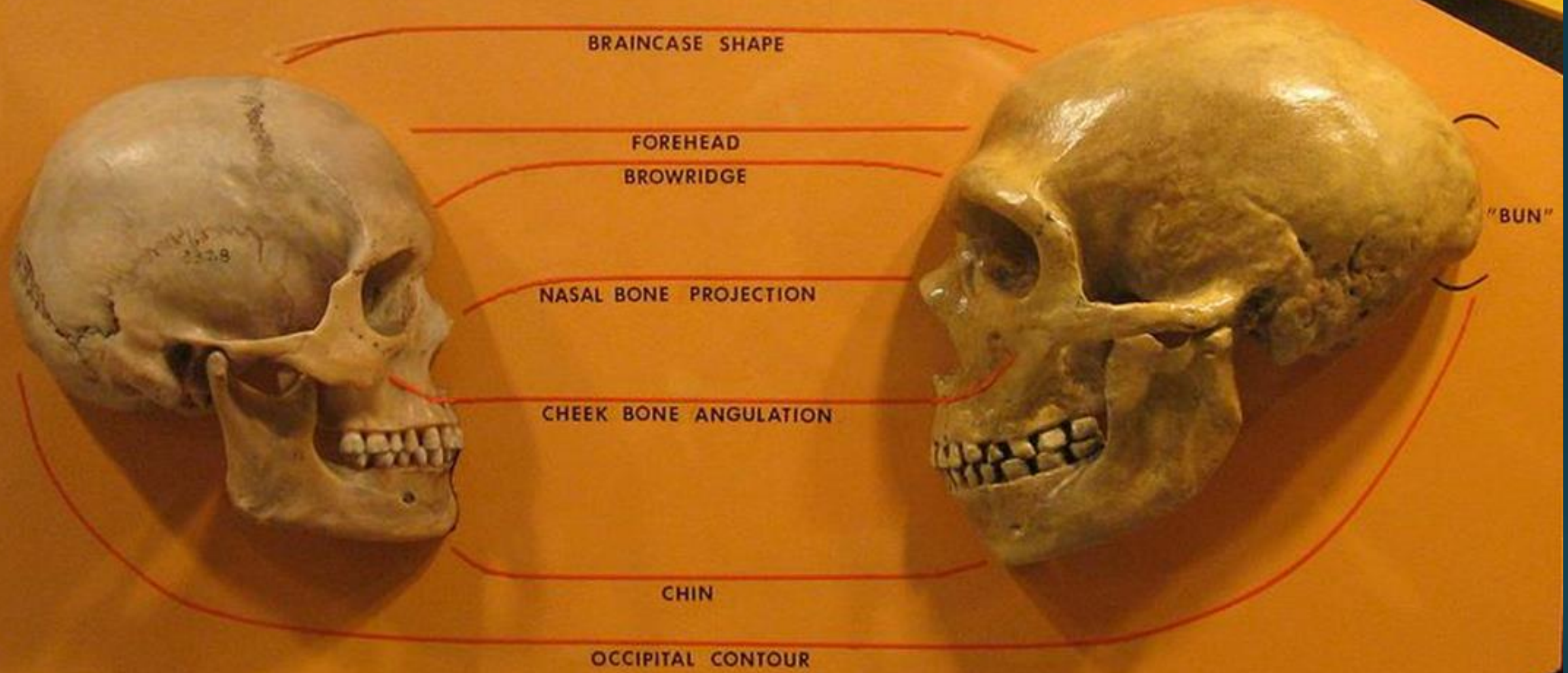

High, Rounded, thick browridge and high rounded orbits
Prominent midfacial, large, wide nasal region
Inflated cheeks = no canine fossa
No chin (mental eminence)
Retromolar Gap
Mental Foramen, usually under 1st molar

La Ferrassie N

Cro-Magnon MH

Original theory that modern Europeans descended from this group of Cro-Magnon MHs

Cranial features of Modern Man and Neanderthal compared



La Ferrassie

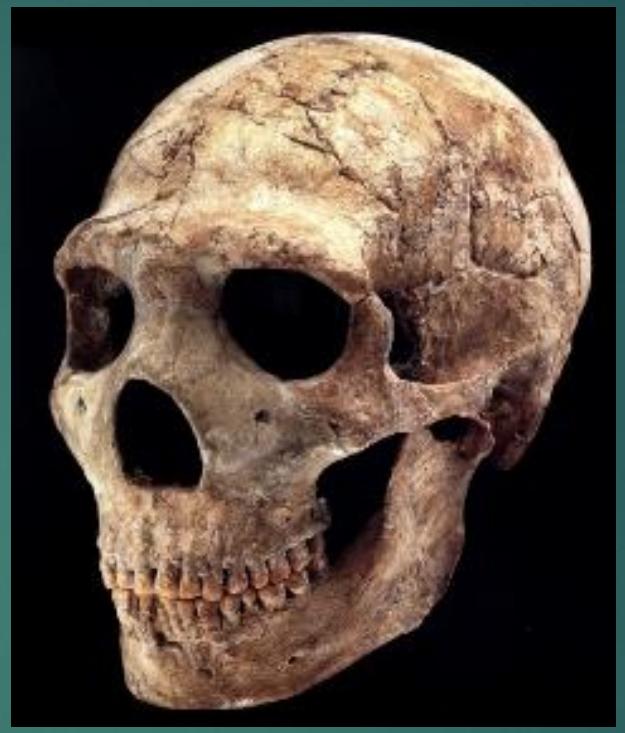
- SH early N (430 Ka) vs Late N (La Ferrassie)

Late Neandertals

St.Césaire, S.W. France
36.3 ka

Compared to La Ferrassie

Classic Western vs. Levantine Neandertals



Levantine Ns were younger;
Younger also than MHs in same area

Amud 1:
Tallest (1.8 m) & largest
Fossil hominin brain (1740 cc)
Date: 53 K

Shanidar 1

Later Classic Traits: Vandermeersch, 2007

- Majority of "Classic"' traits - although not all to the same "degree of development"

- Several features are "entering the range of modern human variation"
  - Higher skull
  - Transverse contour less oval; less facial prognathism

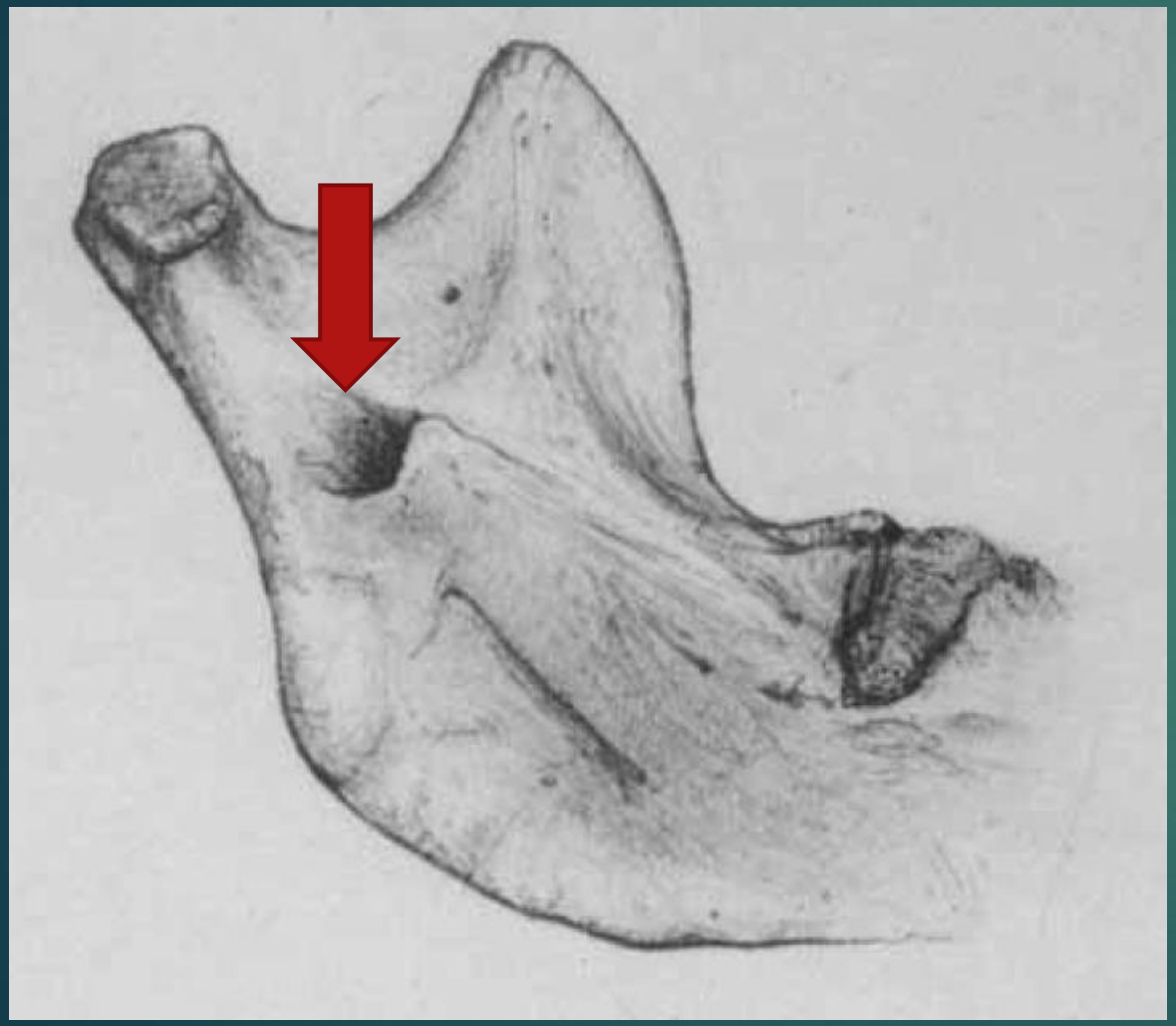
- Suprainiac fossa larger, less deep;

- Less occipital bunning than "Classical“

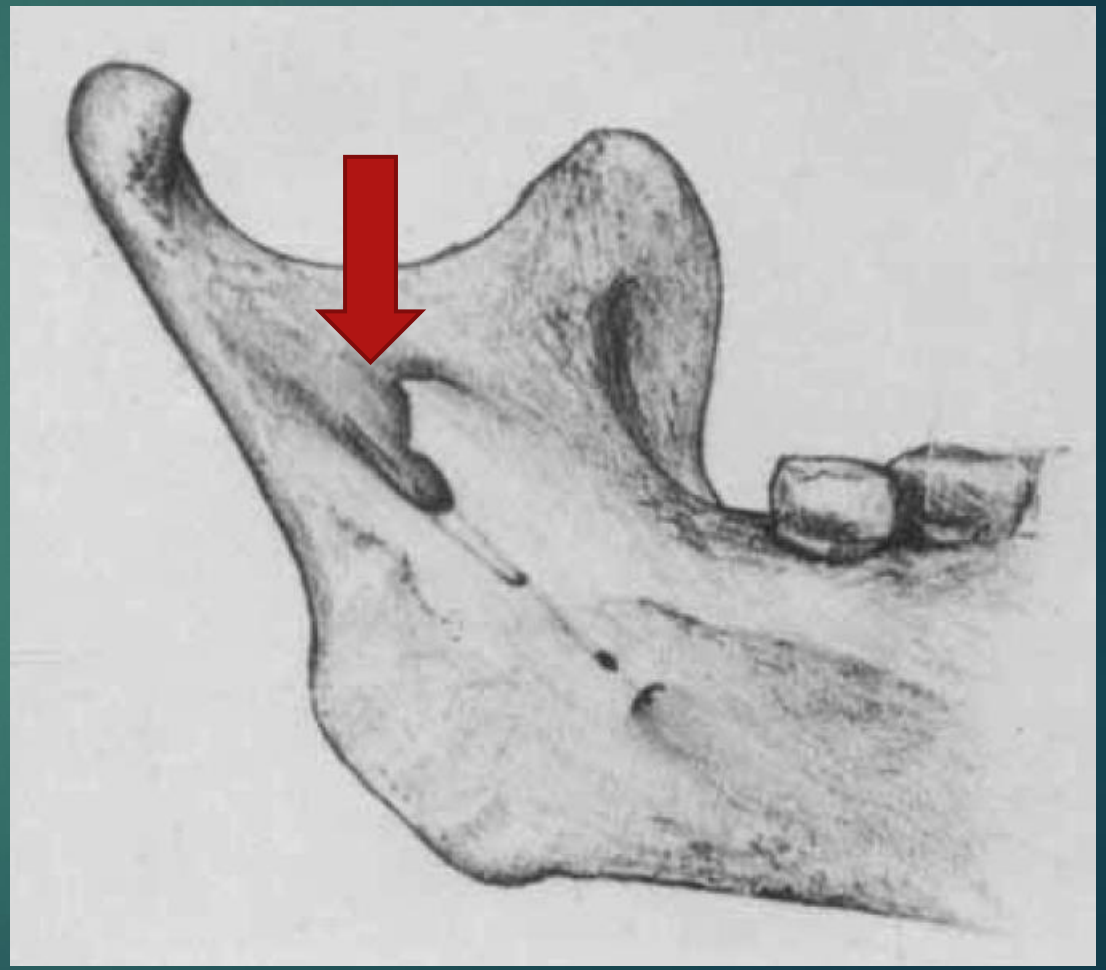
- Less occipital, less convex and occipital torus less prominent
  - Overall skull "less stretched"

Mandibular Foramen: N vs MH

N: oval-horizontal shape



MH: V shape



Different characteristics, different origins

Some of the later Ns had a chin

But is it same chin as in MH; is it homologous

Morphologists have difficulty with these issues

Diagnostic traits of *Homo neanderthalensis*: Cranium

- From behind, the brain case is oval shaped, with the greatest breadth in the middle of the parietal.
- Foramen magnum (spinal hole in brain) is elongated or oval
- Mandibular dentition is forwardly positioned producing a retromolar gap between M_3 and the ramus
- Mental foramen (nerve hole) under M1
- The mastoid processes are small and juxtamastoid eminences large.
- Neandertals have no chin.

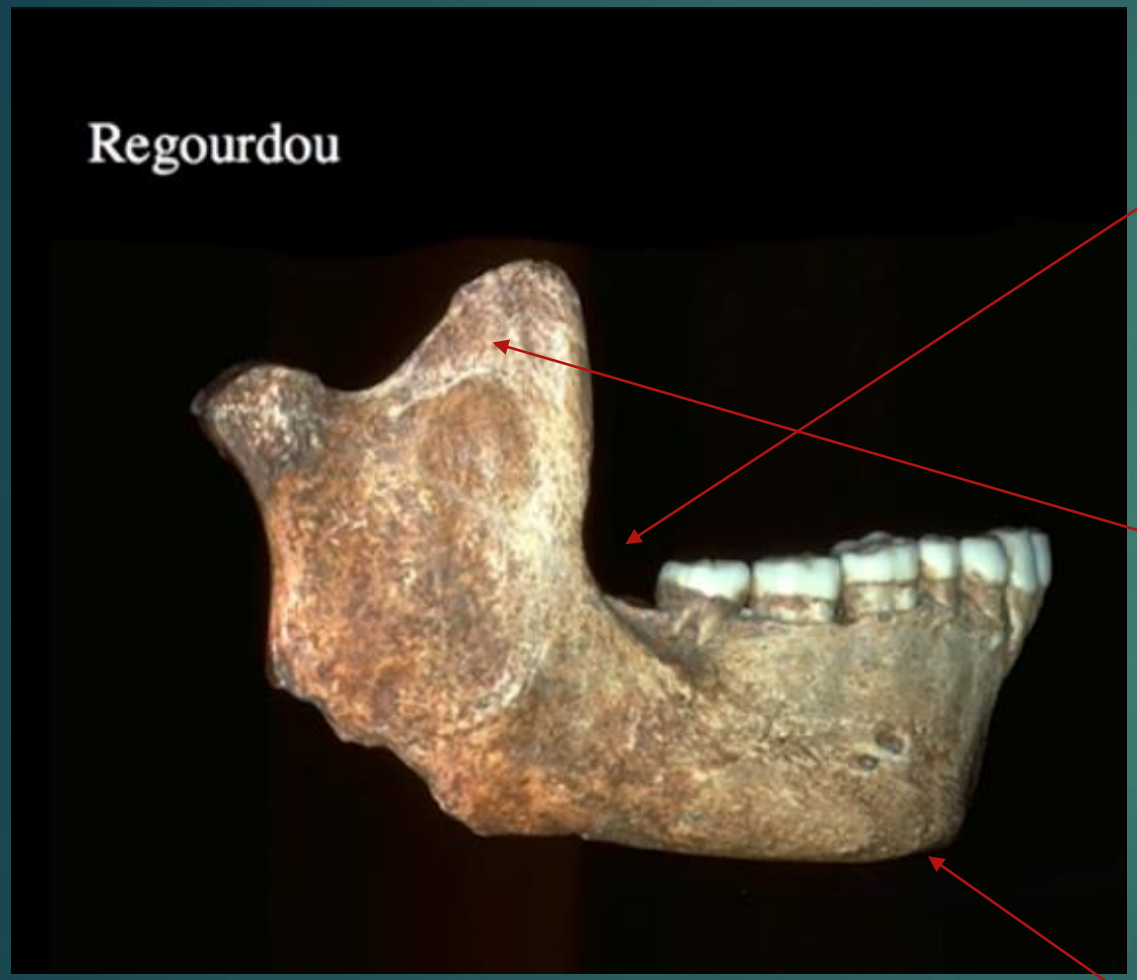
N v MH Parietals: 3D shape analysis of the parietal lobes in Neandertals and modern humans

- Neanderthals and modern humans have similar cranial capacities but different brain shapes.
- The study sample included 52 modern humans, from diverse geographical origins, and 8 Neanderthals, namely Amud 1, Feldhofer 1, La Chapelle-aux-Saints 1, La Ferrassie 1, Guattari 1, Saccopastore 1, Spy 1 and Spy 2.
- MHs: globular braincase and vertically bulging parietal regions,
- Neanderthals: elongated endocrania and flatter parietal regions.

N parietals

- 2020 geometrical study: the whole endocranial surface, to obtain a comprehensive analysis of modern human and Neanderthal anatomical differences in shape and size of the parietal cortex and its subregions.
- In general, when compared to Neanderthals, the parietal lobes of modern humans are located in a more superior position and are larger and more expanded: dorsally rounder, longitudinally more extended, and vertically stretched.
- Nonetheless, Neanderthal and modern human morphological ranges overlap, suggesting that species-specific differences might be only by grade (morphological similarity not phylogeny).

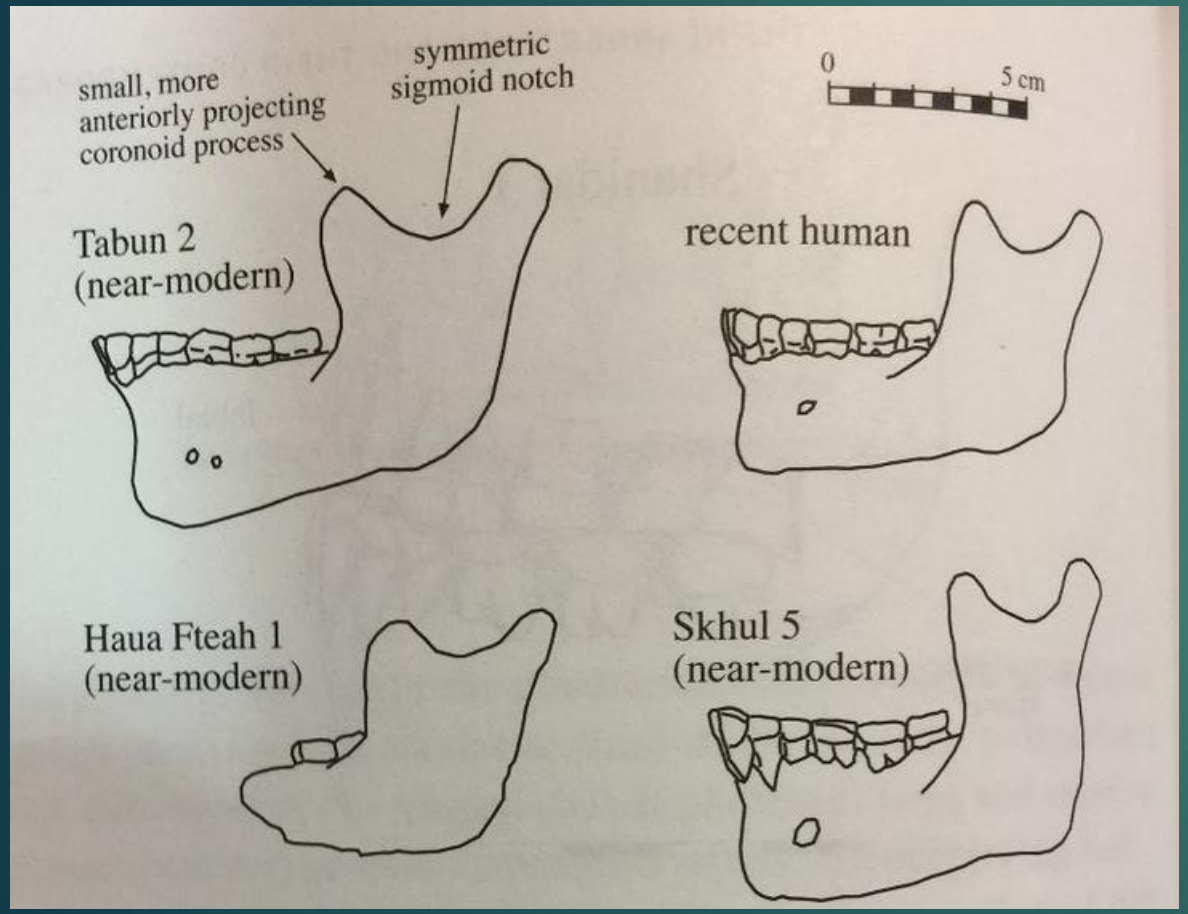
Distinctive N mandibles



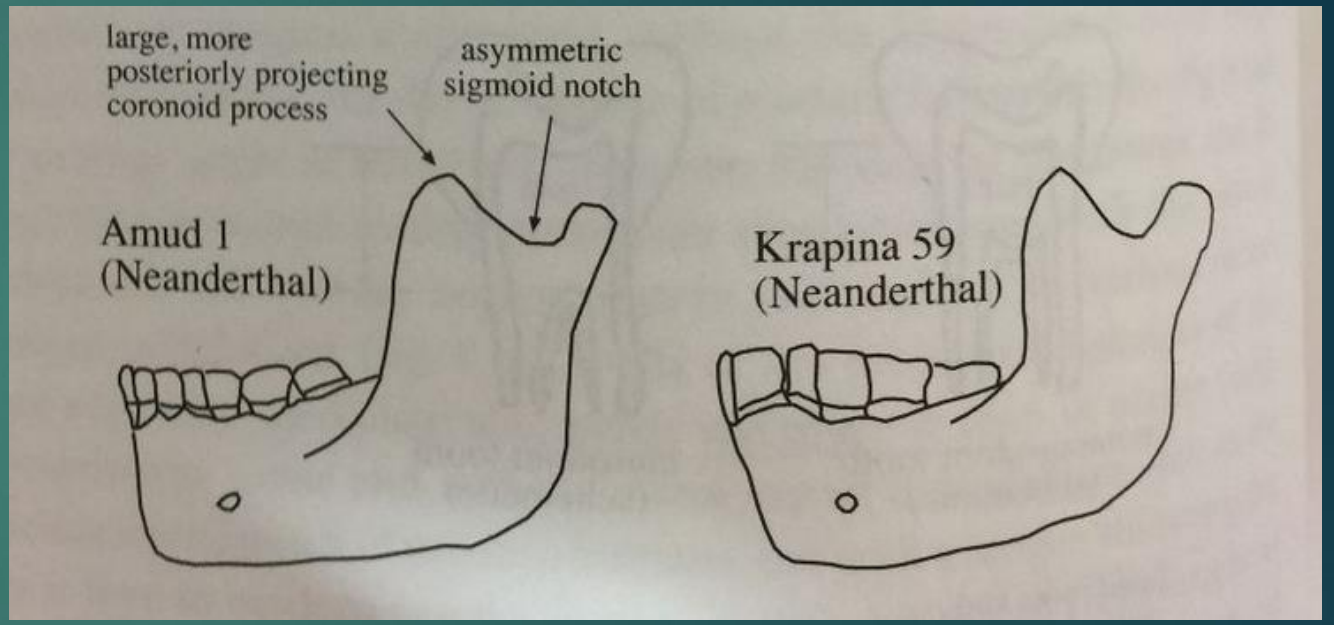
- Retromolar space - gap between teeth & ramus (associated with projecting midface); maxillary dentition is drawn out anteriorly, as do mandibular dentition which helps create this space behind the teeth
- Mandibular condyle and coronoid process tend to be at the same height in MHs.
  - In Neanderthals, the ascending process or the coronoid process is much more vertical than the mandibular condyle. This in turn makes the curvature of this coronoid process and the low point of it much more posteriorly on the specimen.

Ramus: non symmetric notch

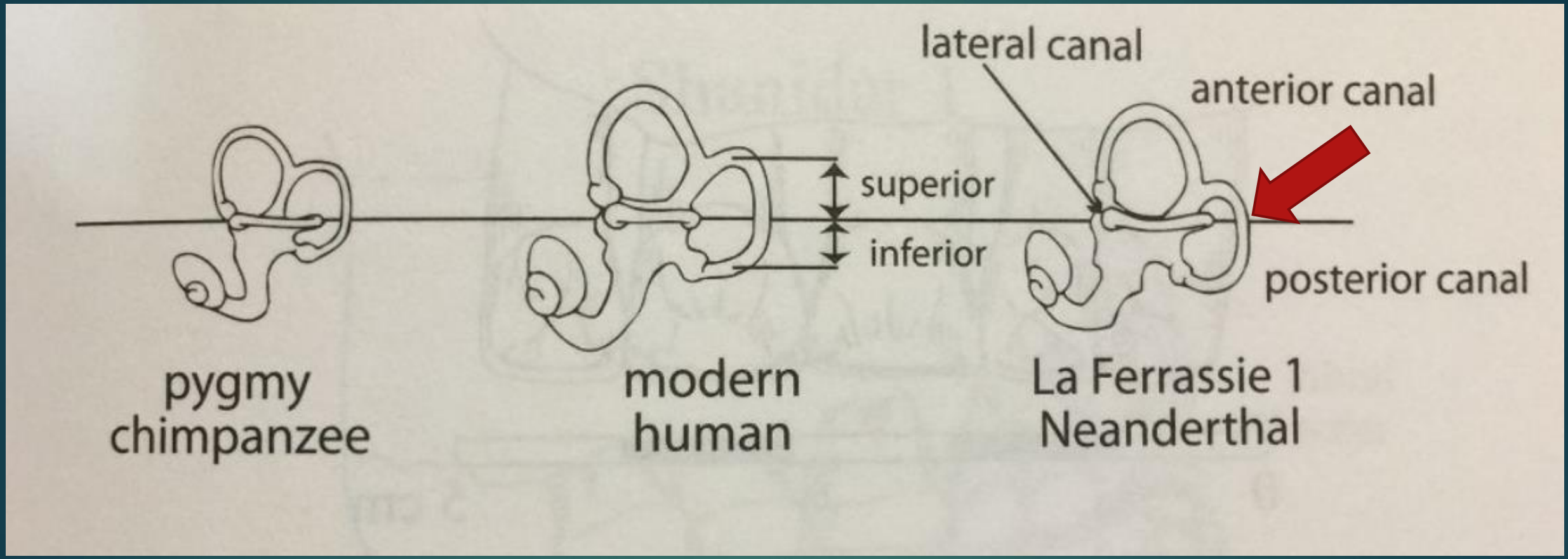
MH



Neandertal

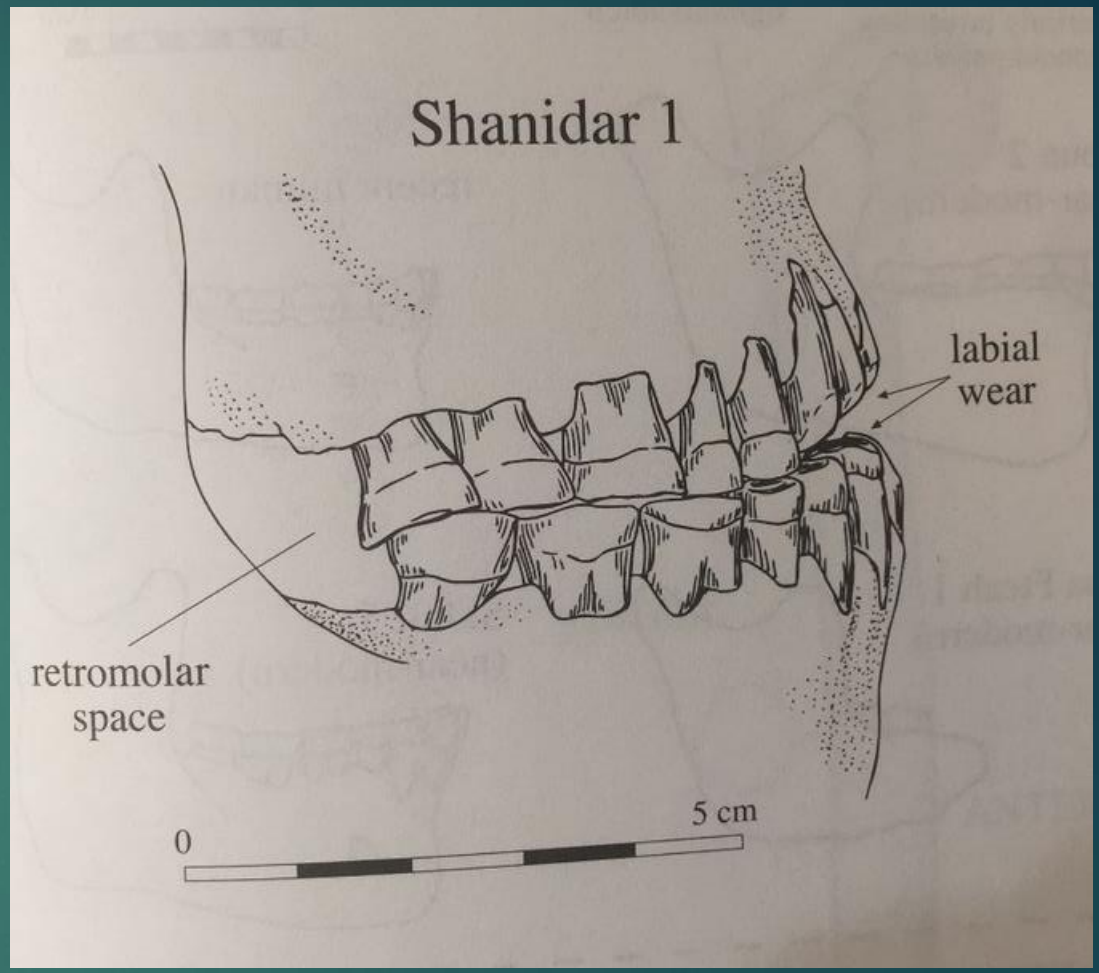


Inner ear: smaller anterior and posterior semicircular canals; uniquely low posterior canal



In animals, larger size of canals correlates with agility: Fred Spoor – Ns did less jumping & running; these morphological differences do not affect the functional properties of the ossicles, potentially indicating consistent aspects of vocal communication in Neandertals and AMHs.

Retromolar gap & teeth damage



High frequency of enamel chipping; microfractures on incisors; microscopic striations on incisor crowns; Peculiar, rounded wear on incisors of elderly Ns; Inuits, who also use teeth as clamps show similar damage

N Dentition

- Large, heavily worn incisors, indicating use as vise-like tool
- Much larger anterior teeth, reduced molars

Shovel-shaped incisors

Taurodont molars (large pulp cavities, short roots)(Taurodontism)

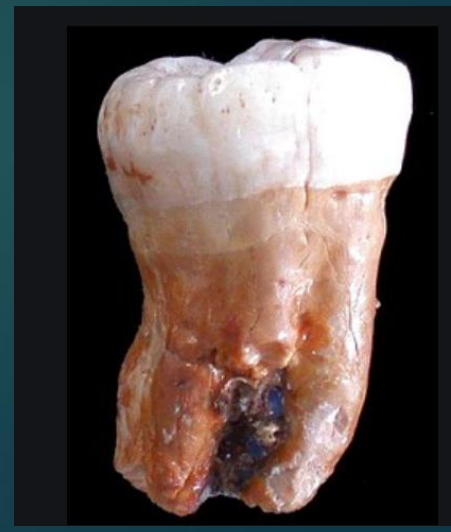


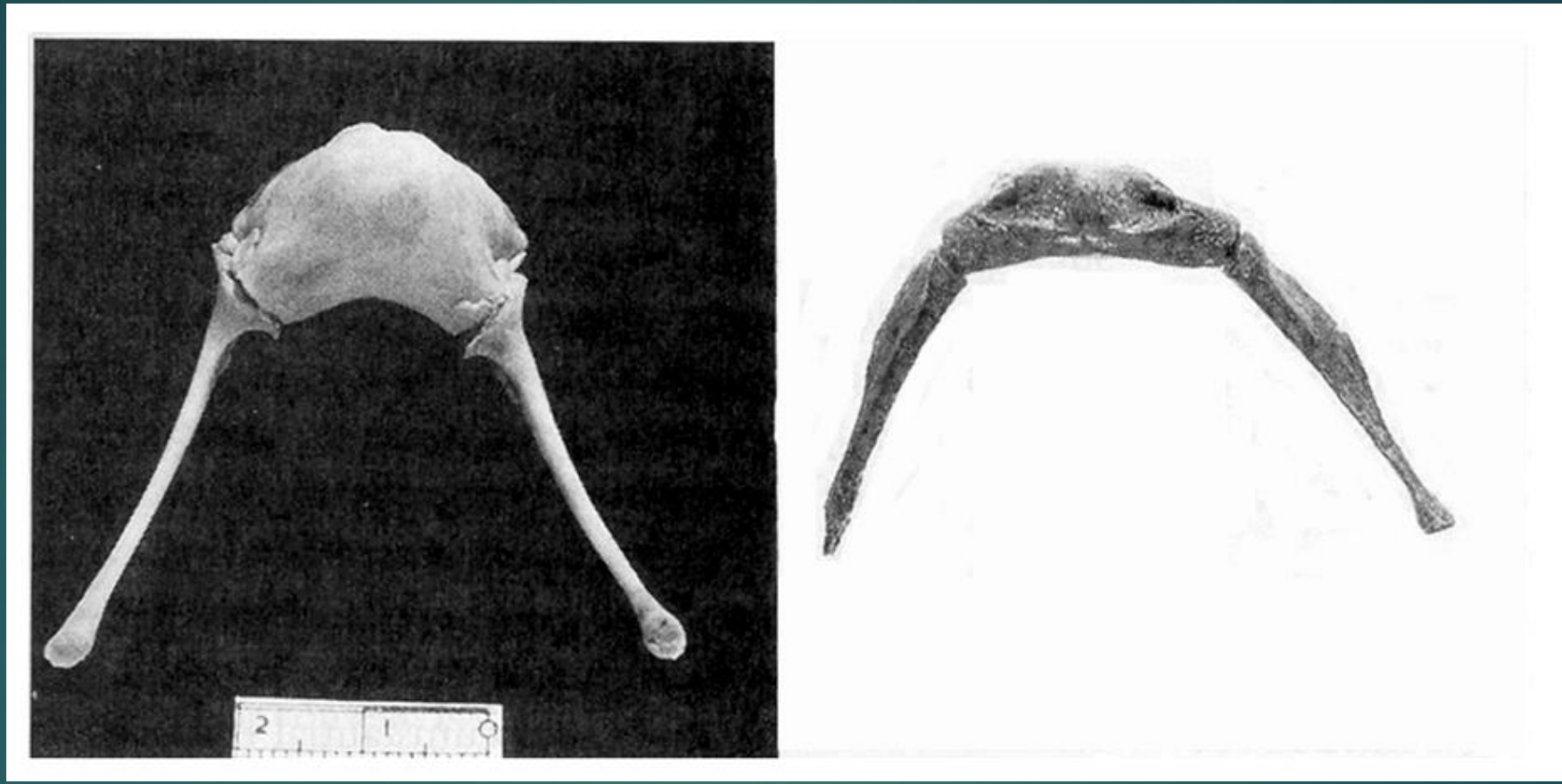
Figure 1: Lower first molar of a Neanderthal.
Lower first molar of a Neanderthal exhibiting a middle trigonid crest (orientation: crest is towards the front of the mouth).

- The middle trigonid crest, a particular morphological character of the lower molar teeth, is present in only 11% of *Homo sapiens* individuals, but this character is present in nearly 100% of Neanderthals (Bailey *et al*. 2011).

Diagnostic traits of *Homo neanderthalensis: Post cranials*

- Postcranially: they are robust, heavily muscled, and stocky with ‘hyper-polar’ adapted bodies (quite wide for height, short distal limb segments, barrel-shaped chests).
- Hyoid bone like MH
- broad scapula with strong muscle attachments
- lateral bowing of the radius in arm; Neanderthal lower arm morphology reflects a strong cold-adapted short forearm.
- massive head of humerus in arm

HYOID BONES CLOSELY RESEMBLE MODERN HUMANS



Chimpanzee **Neandertal**

Most likely position for the Neanderthal hyoid was slightly forward from where the modern human hyoid bone sits

Diagnostic traits of *Homo neanderthalensis: Postcranials*

- Ribs extraordinarily thick and weakly curved; broad, thick chest
- Pectoral muscles twice as thick as MHs; 80% more upper body strength
- femur and tibia robust and thick walled; bowed
- forearm and lower leg shortened
- Distal phalanx of the thumb as long as the proximal one (distal is much shorter in MH); large & rounded fingertips

N radius

Neanderthal 1

The Cova Negra radius (CN 42165) in (left to right) posterior, medial, anterior, and lateral views. Scale 1⁄4 5 cm.

Diagnostic traits of *Homo neanderthalensis: Postcranials*

- Thin and elongated superior pubic ramus (larger birth canals?)
- Broader pelvis with more dorsally rotated ilia: less long-distance capability, easier birth?
- Femurs with massive, cortically thick cylindrical shafts that lack a distinct pilaster; low femoral neck-shaft angle
- Large & thick kneecaps
- Low brachial and crural indices

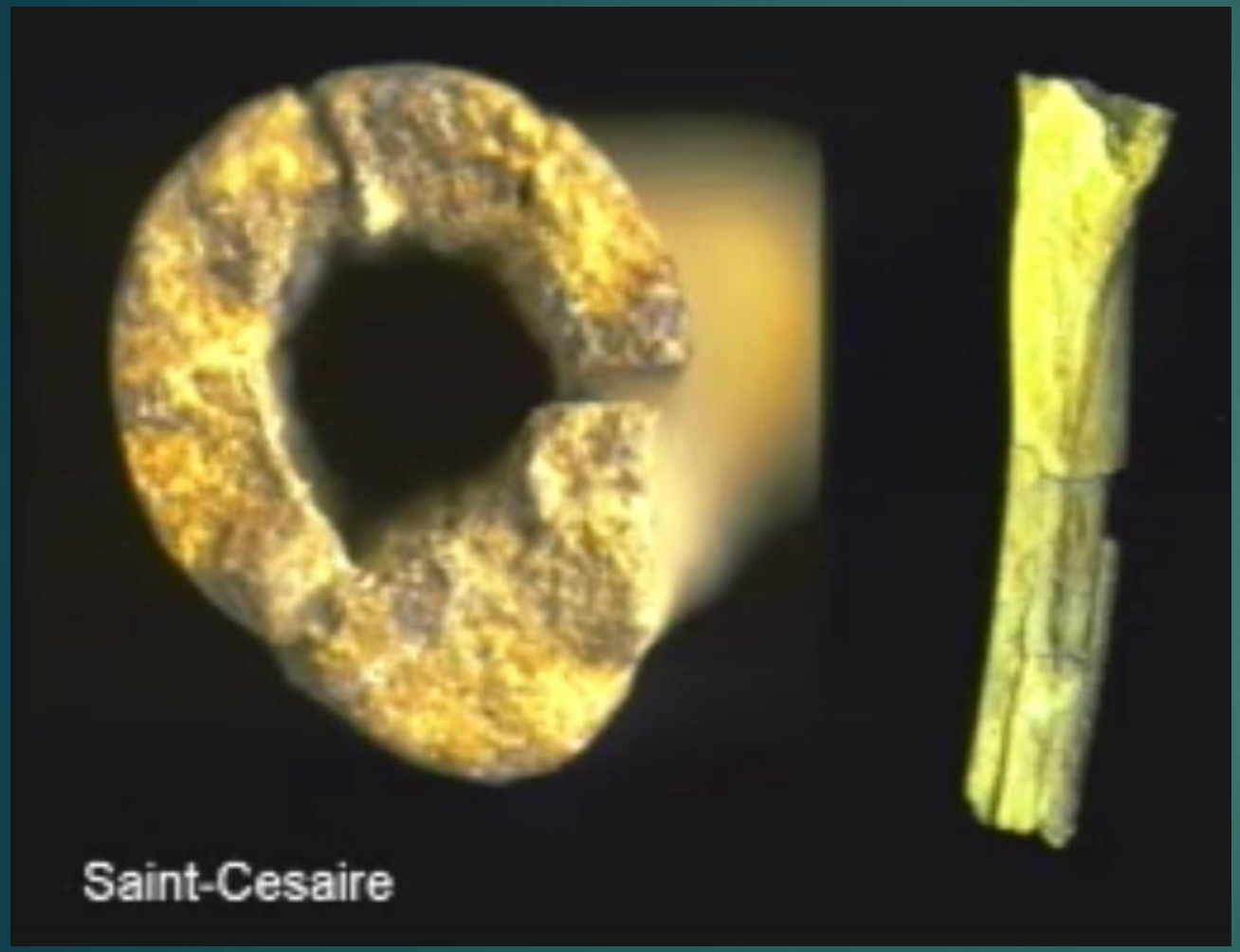
Bone density

MH weight lifter

Neandertal

N: increased thigh bone robusticity (compared with MH weightlifter);
but with greater mass & shorter limbs, have increased energetic cost of transport;
spent 215 kilocalories per day more than MHs in foraging

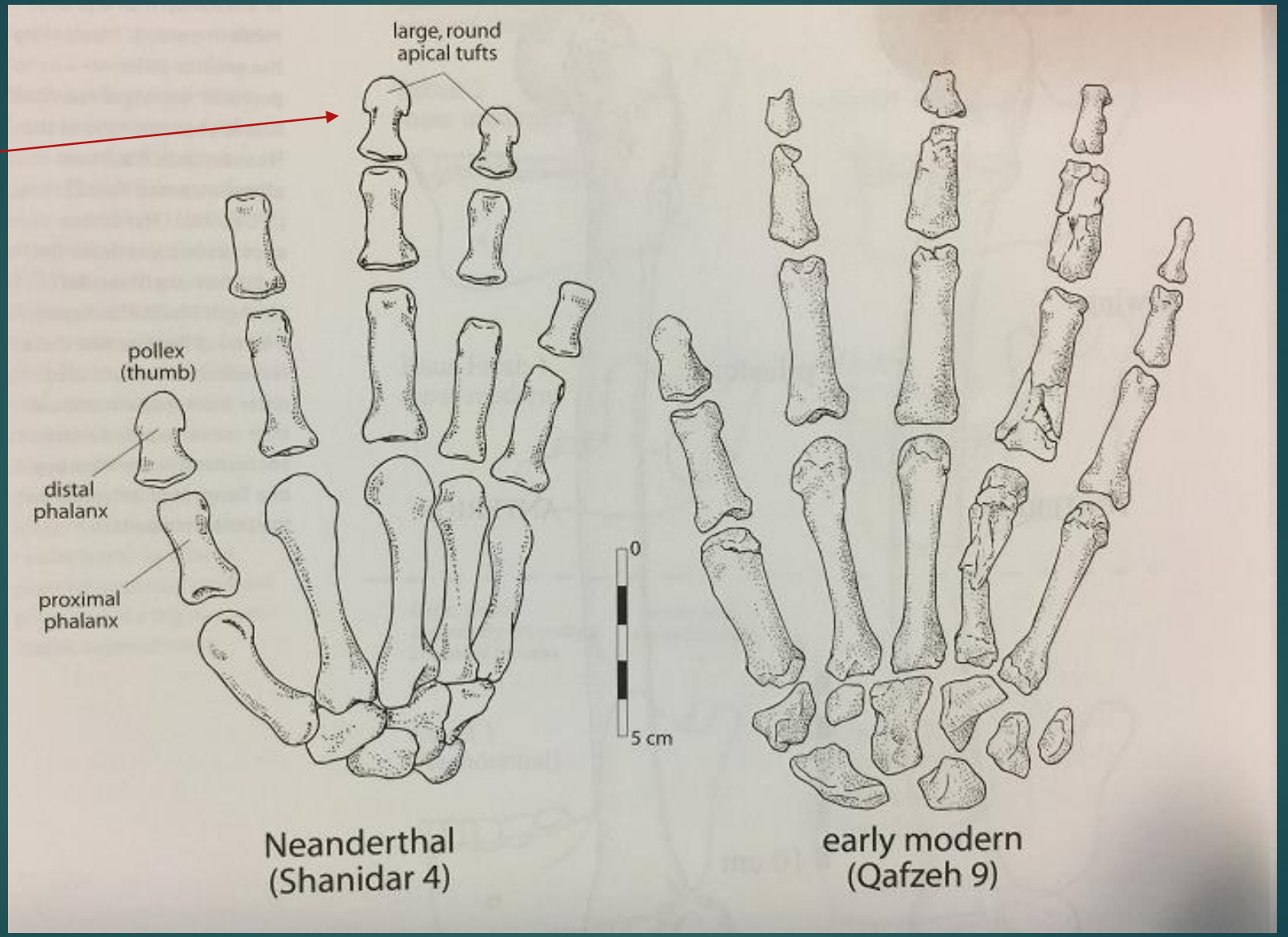
Bones



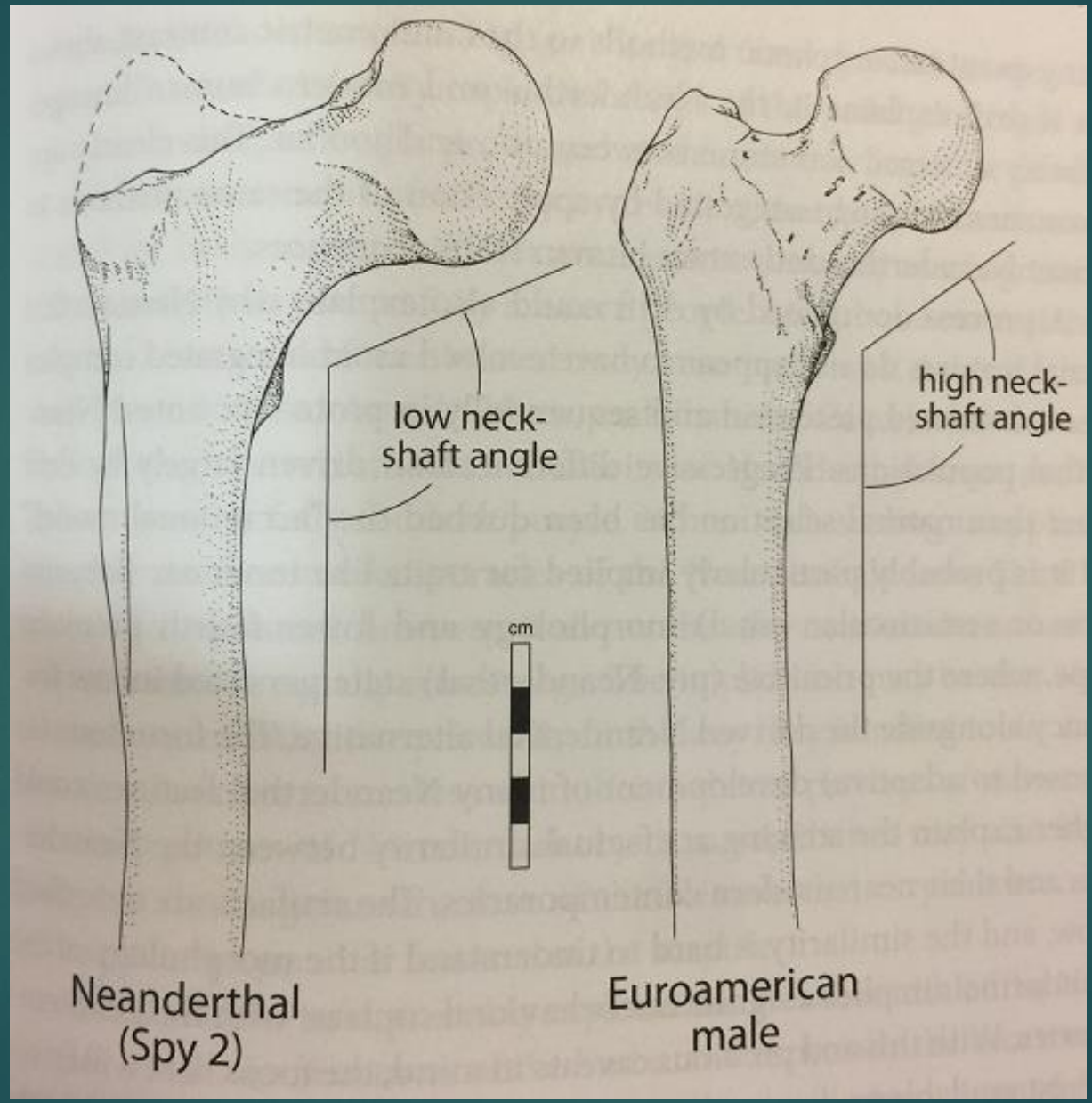
Saint-Cesaire does not have robusticity or curvature of earlier Ns

Is this N variation or incipient MH characteristic

Thicker apic tufts



Femur head


low neck-shaft angle
high neck-shaft angle
cm
Neanderthal (Spy 2)
Euroamerican male

N Rib Cage; barrel chested

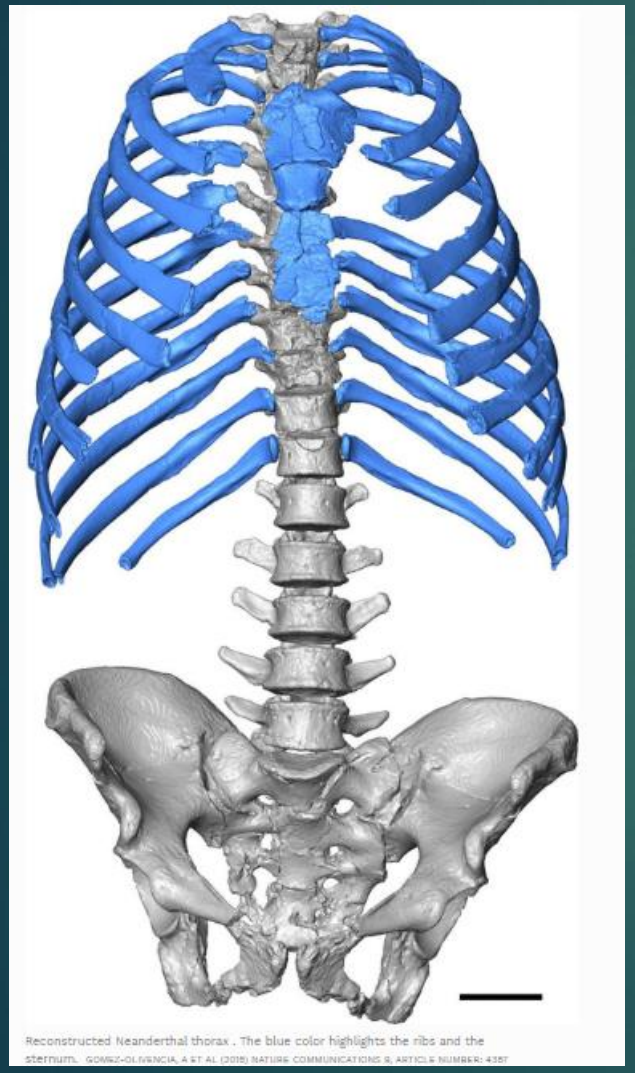
3-D model of Neandertal rib cage busts myth of ‘hunched-over cavemen’

- Neanderthals walked upright, had spines straighter than those of modern man, would have been strong and sturdy, and breathed deeply from their belly, not barrel-shaped ribcages
- Based on completed 3D virtual reconstruction of the ribcage of the Kebara 2 skeleton — aka “Moshe” — the headless but almost complete Neanderthal remains unearthed in 1983 in a northern Israel cave.
- Before his death at age 32 some 59,000-64,000 years ago, the 170-centimeter tall, 75 kilogram (5 foot 7, 165 pound) Moshe would have had great posture as he breathed deeply from his diaphragm.

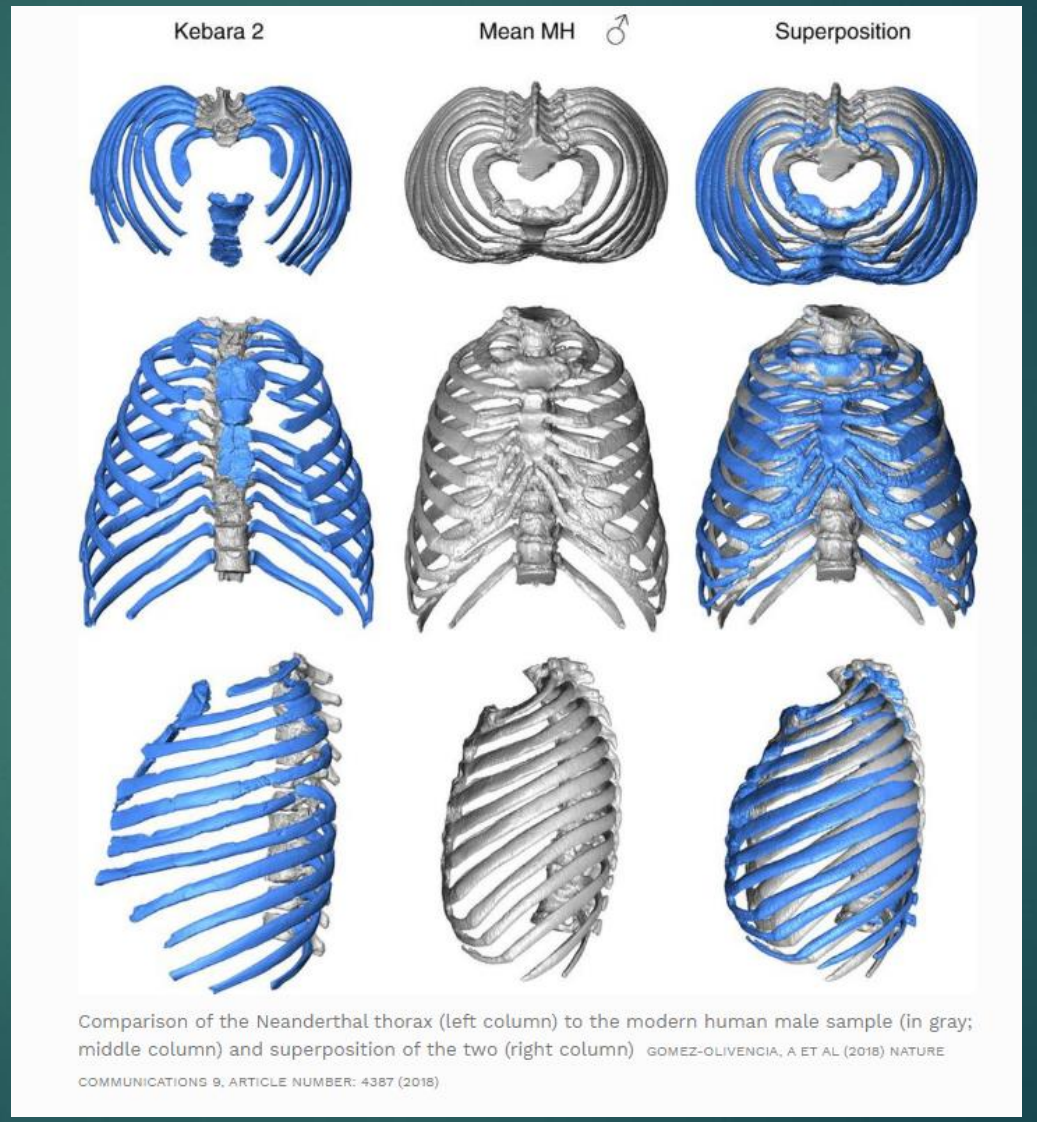
Neanderthals Had Straighter Spines And Took Deeper Breaths

- Neanderthals possessed an upright posture, and a straighter spine than modern humans.
- The Neanderthal thorax did not have a larger volume than that of modern humans,
- Wider at the bottom than the modern human thorax, suggesting a slightly different breathing mechanism compared to our own, as it would have provided greater respiratory capacity during inspiration (breathing in).
- The wide lower thorax of Neanderthals and the horizontal orientation of the ribs suggest that Neanderthals relied more on their diaphragm for breathing
- The Neanderthal spine is located more inside the thorax, which provides more stability

Virtual 3D reconstruction of thorax of the adult male Kebara 2 Neandertal.



Reconstructed Neanderthal thorax . The blue color highlights the ribs and the sternum. GÓMEZ-OLIVENCIA, A ET AL (2018) NATURE COMMUNICATIONS 9, ARTICLE NUMBER: 4387

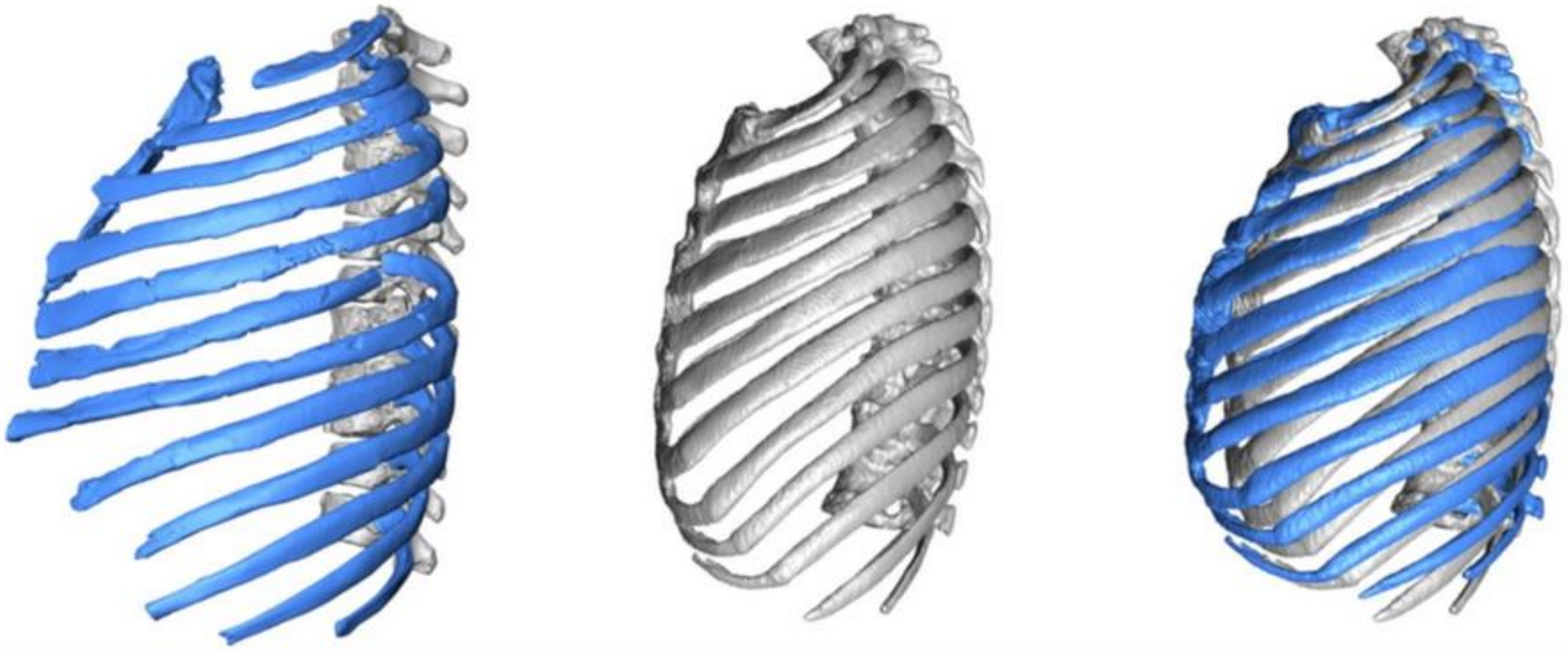


Comparison of the Neanderthal thorax (left column) to the modern human male sample (in gray; middle column) and superposition of the two (right column) GÓMEZ-OLIVENCIA, A ET AL (2018) NATURE COMMUNICATIONS 9, ARTICLE NUMBER: 4387 (2018)

Neanderthals, it seems, did not have as much of a lumbar curve as modern humans have.

Asier Gómez-Olivencia, et al., 2018

N and MH thorax comparison



Comparison of the Kebara 2 (K2) thorax to the modern human male sample (in gray; middle column) and superposition of the two morphologies (in blue, Kebara 2; in gray, the modern human sample male mean; right column). (A. Gómez-Olivencia, A. Barash and E. Been)

Visually, one clearly sees how the Neanderthal rib cage was broader at its base, with horizontal ribs, versus modern man's angled ribs. Likewise, one can see that the spine is attached more deeply inside the thorax than modern man's is.

N body

- Ns were 20% as wide as they were tall
- N bones are bigger, wider diameters, muscle ridges are larger;
- Right arm thicker bone; thicker and stronger right arms for heavy wooden spear thrusting vs fur work;
- Right arm tibia bowed, indicating more muscle strength;
- Even pinkies were as strong as other fingers

N characteristics and genetic drift

- Most researchers: random genetic drift, not selection, caused morphological differences

- Klein:
  - Recurrent glacial conditions precipitated repeated population crashes during which overall genetic and morphological variability declined
  - distinctive N characteristics could then have become fixed by random drift (chance) alone

- Hublin: Genetic drift accounts for accretion model of facial characteristics

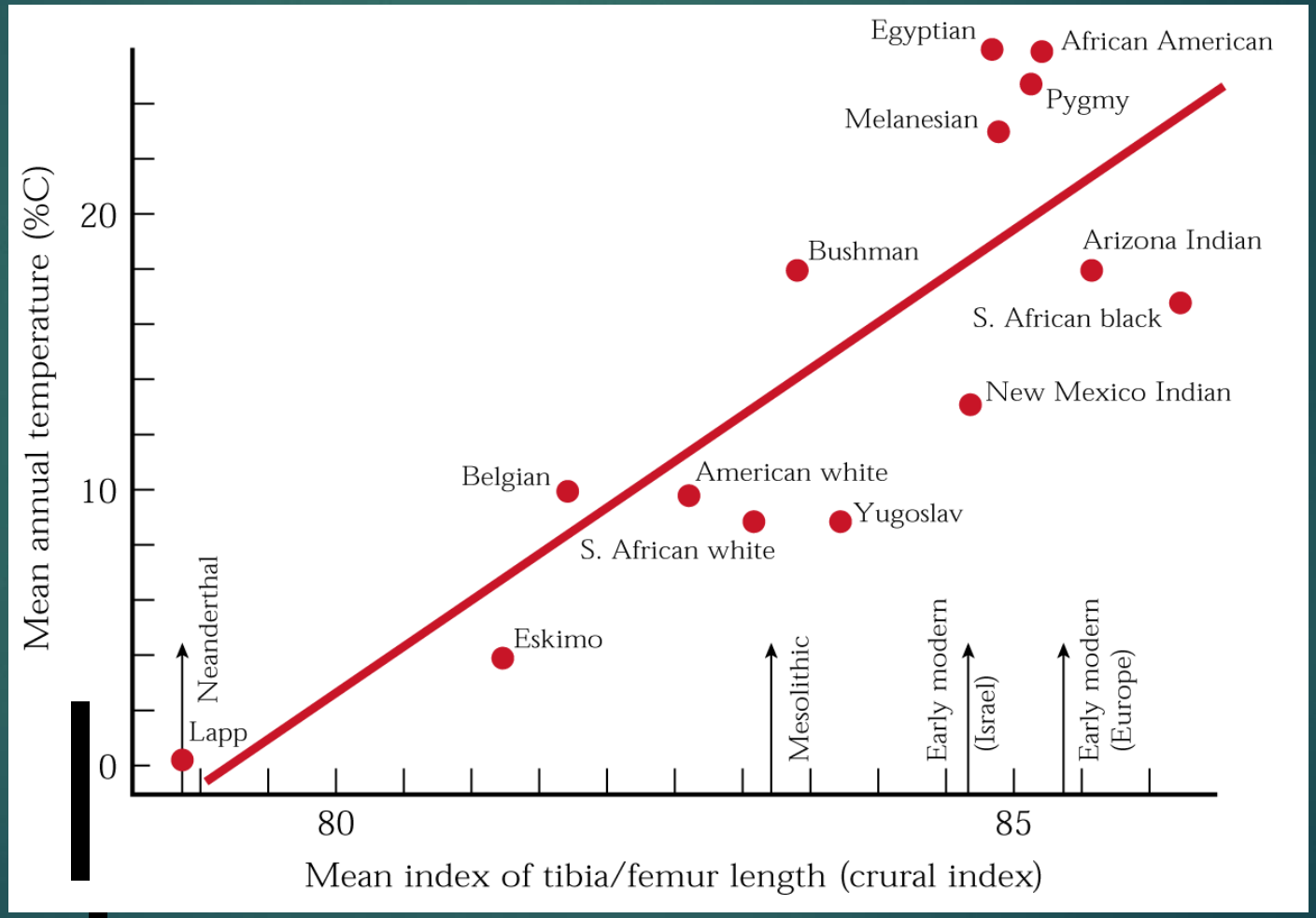
N body

- Their short, stocky physiques were suited to cold environments.
- The bulky trunk, in addition to their short lower leg and lower arm bones, gave Neanderthals proportions that would have minimized the skin's surface area, presumably to conserve heat under the predominantly colder conditions of the last 200,000 years.
- They did have a similar vocal anatomy and their ear bones suggest they had a similar range of hearing to us.

Cold Adaptation

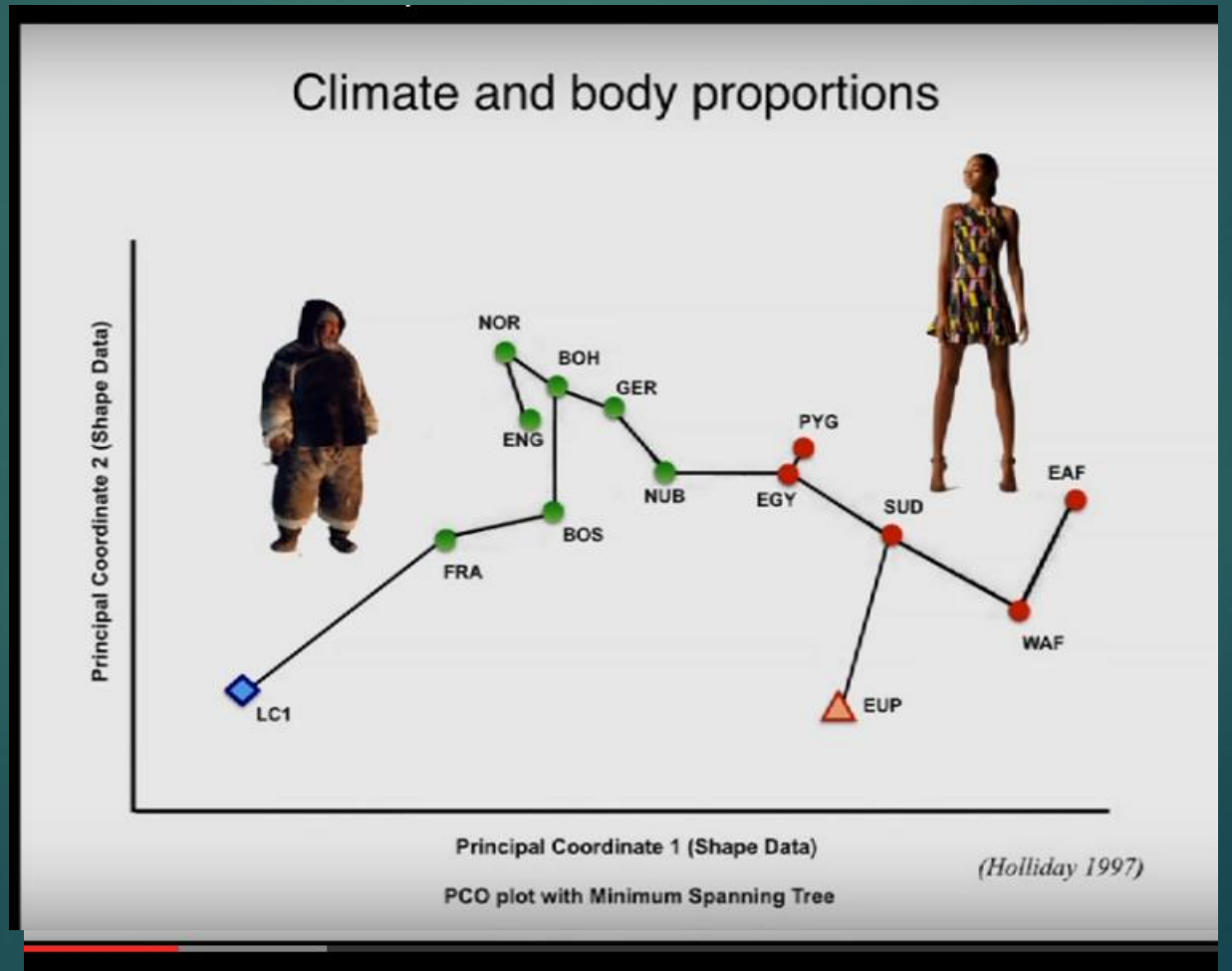
- Neandertal bodies are cold-adapted, following both Bergmann's and Allen's rules.
- Archaeological hearths indicate that Neandertals routinely used fire.
- Animal skins and hides were probably also used for protective shelters and cloaks.
- Neandertals migrated seasonally, and during long-lasting glacial events, their range seems to extend further south and not so far north

People in warm climates tend to have long limbs in proportion to height



Climate and body shape: proportion of limbs, shape of trunk; in hot areas, need to cool, have thinner bodies, narrow trunks, longer arms, taller; in colder, stockier bodies, shorter limbs, wider trunks

Don’t find N
In artic regions



If you plot Russian N, far stockier than modern Inuits; if plot MH from 50 K, look like modern Sudanese

Allen's Rule: body form or shape is linear in warm climates and more rounded and compact in cold climates

Bergmann's Rule: body size is large in cold climates and small in warm climates. Large bodies have a smaller surface area to volume ratios.

In warm climates where you need to expel heat, so bodies are smaller and more linear

Ns in Woodlands: body adopted for woodland hunting not cold

- Neanderthals have been viewed as cold adapted and that this has been used to explain their body form.

- Under such conditions, encounter and ambush (rather than pursuit) hunting – favored muscular power and sprint (rather than endurance) capacity

- B. Woods hypothesized that the highly muscular Neanderthal body form reflects an adaptation to hunting conditions rather than cold; alternative view where their body form is well-suited to power locomotion / sprinting, which is optimal in woodlands environments.
-

Neanderthals were better sprinters than runners.

- One piece of bodily evidence for this is that Neanderthals had shorter legs than we do, particularly in the tibia and fibula, the two leg bones below the knee.
- Study of modern runners found that sprinters tend to have shorter lower legs and longer toes than non-athletes.
- The shorter lower legs allow them to generate more accelerating force, and the longer toes allow their feet to stay in contact with the ground for longer, creating a more powerful push.
- Neanderthals, it turns out, also had long toes.

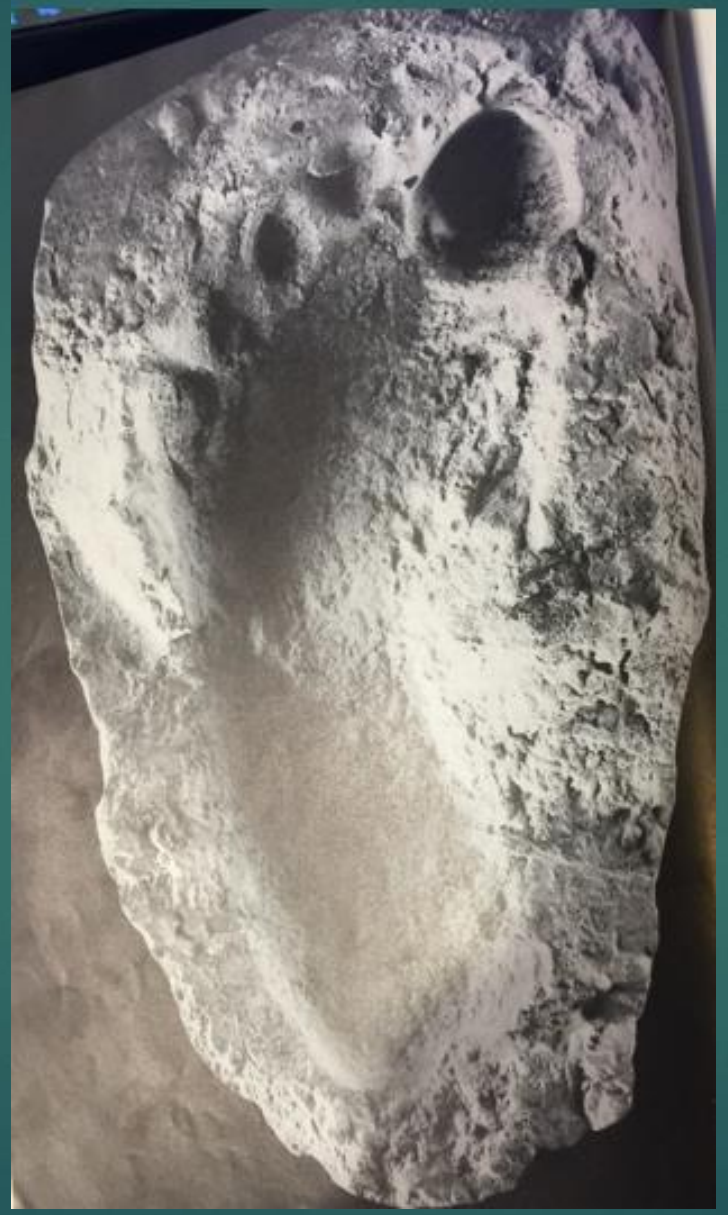
N = sprinters

- N heel bones are consistently longer than *H. sapiens*' heels; Neanderthal Achilles tendon would have been longer and less efficient at storing energy for long-distance running.

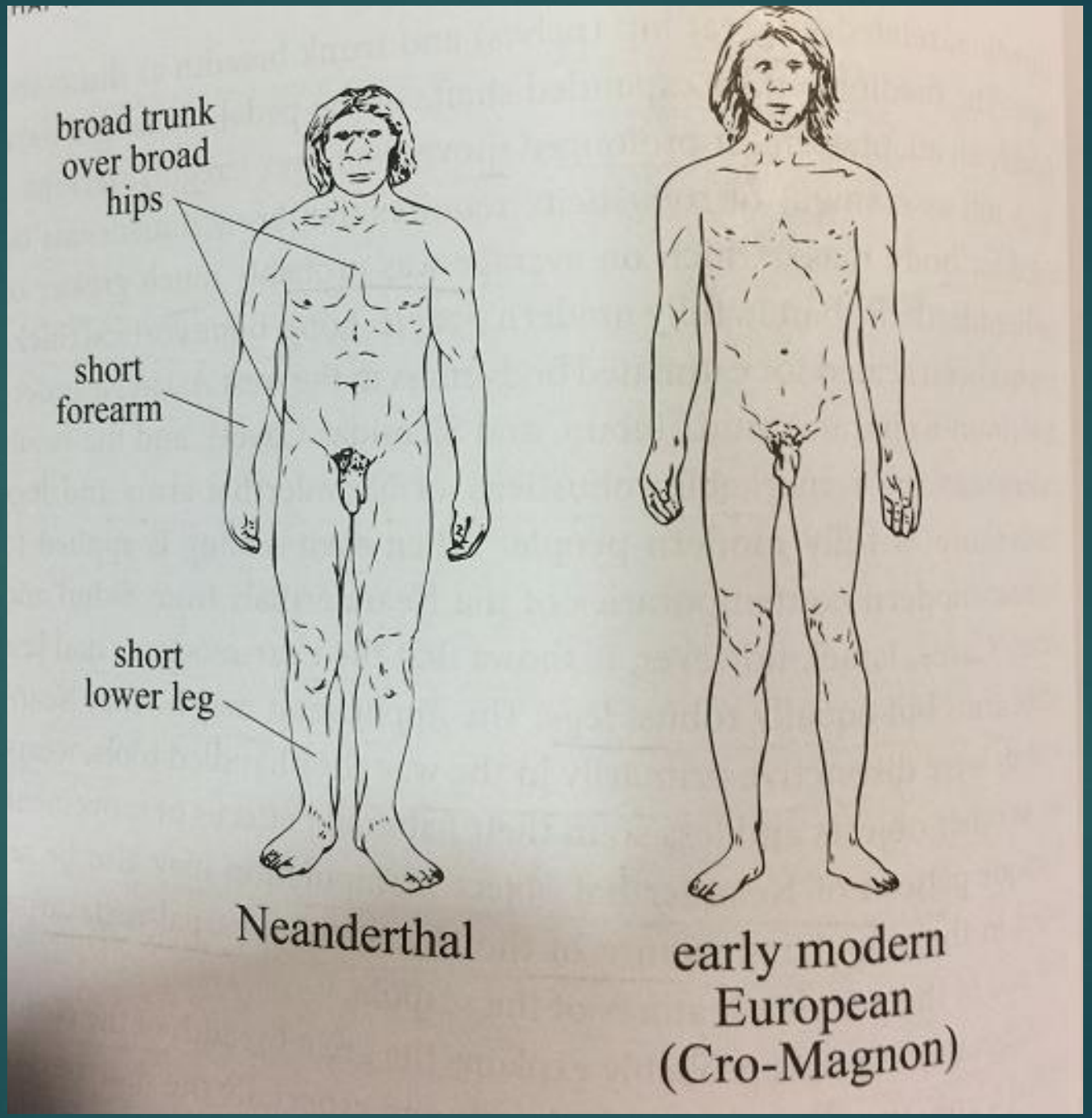
- Neanderthal genome contains a high proportion of variants of genes that, today, have been linked to high-level athletic performance in power sports.

- In other words, Neanderthals were genetically programmed for bulkier, more powerful muscles that made them suited for short bursts of activity, while modern human muscles were designed for endurance.

Neandertal foot



A preserved footprint from a Neanderthal in an Italian cave helps to show foot proportions.


broad trunk over broad hips
short forearm
short lower leg
Neanderthal
early modern European (Cro-Magnon)

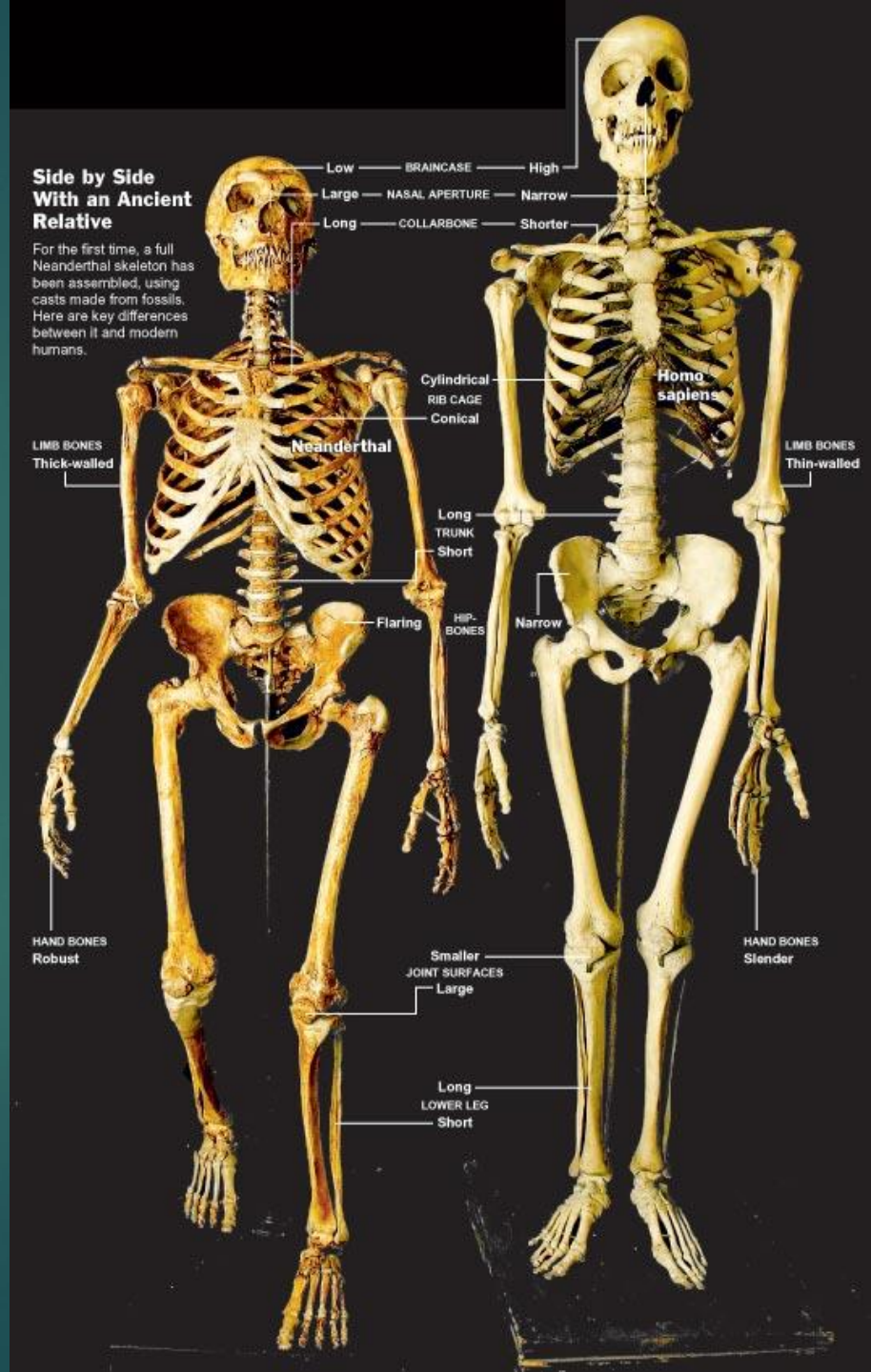
Reconstructed N Skeleton

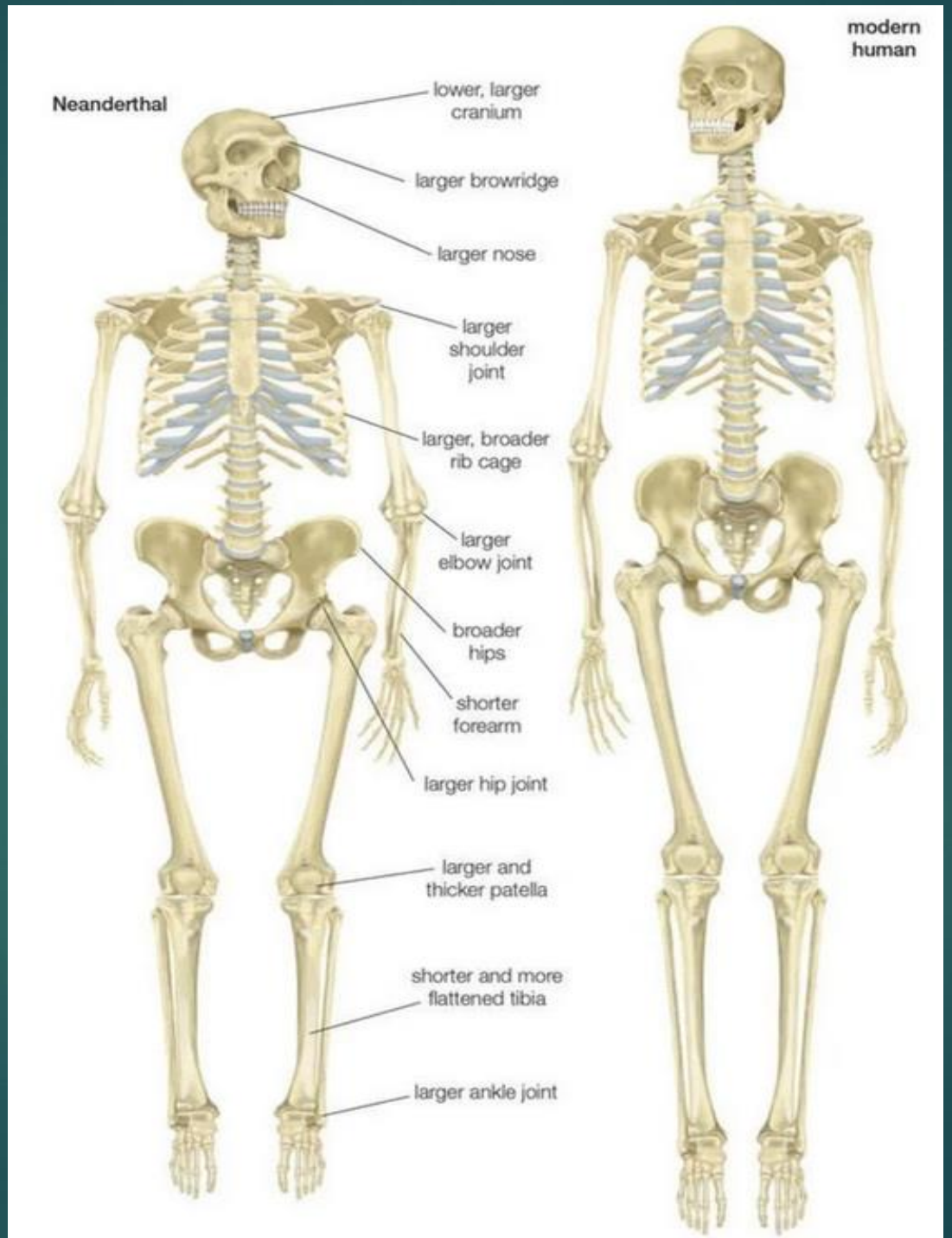
- Relative to MHs, stockier & shorter
- Lower limbs relatively shorter (classic adaptation to climate)
- Limb bones tend to be flexed due to strong muscular action during development; extremely muscular and strong, but led hard lives, suffering frequent injuries.
- Barrel-shaped chests

- But later Ns and more non-European Ns include different features
- Ns and Denisovans have contributed to MH features

** A Skeletal Comparison:
Neandertal vs MH

Brain case:	low	high
Nasal opening:	large	narrow
Collarbone:	long	shorter
Rib cage:	conical	cylindrical
Limb bones:	thick	thin-walled
Hand bones:	robust	slender
Trunk:	short	long
Hips:	flaring	narrow
Joint surfaces:	large	smaller
Lower leg:	shorter	longer
	Bowed limbs	straight limbs




Neanderthal
modern human
lower, larger cranium
larger browridge
larger nose
larger shoulder joint
larger, broader rib cage
larger elbow joint
broader hips
shorter forearm
larger hip joint
larger and thicker patella
shorter and more flattened tibia
larger ankle joint

G.J. Sawyer & Blaine Maley, 2005

KEY: FIGURES 1 & 2 -COLOR CODED ACCORDING TO SOURCE SPECIMEN

LA FERRASSIE 1

KEBARA 2

SACCOPASTORE 1

SPY 1

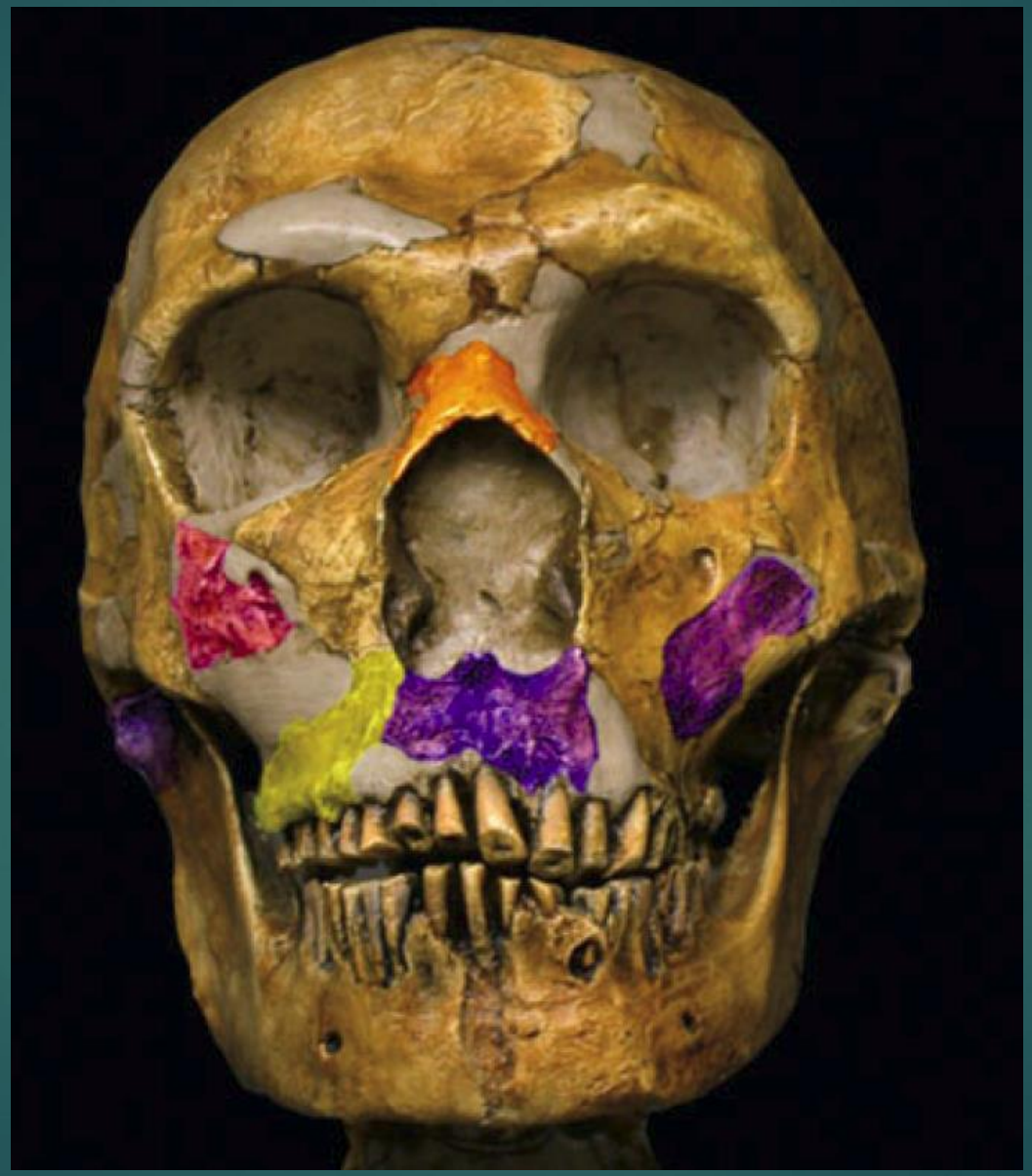
SHANIDAR 5

LA CHAPELLE

FELDHOFFER 1

RECONSTRUCTED AND MODERN HUMAN

Figure 1. Neanderthal reconstruction with color coding for specimen identification.



N skeleton reconstruction: La Ferrassie 1 specimen

G.J. Sawyer & Blaine Maley, 2005

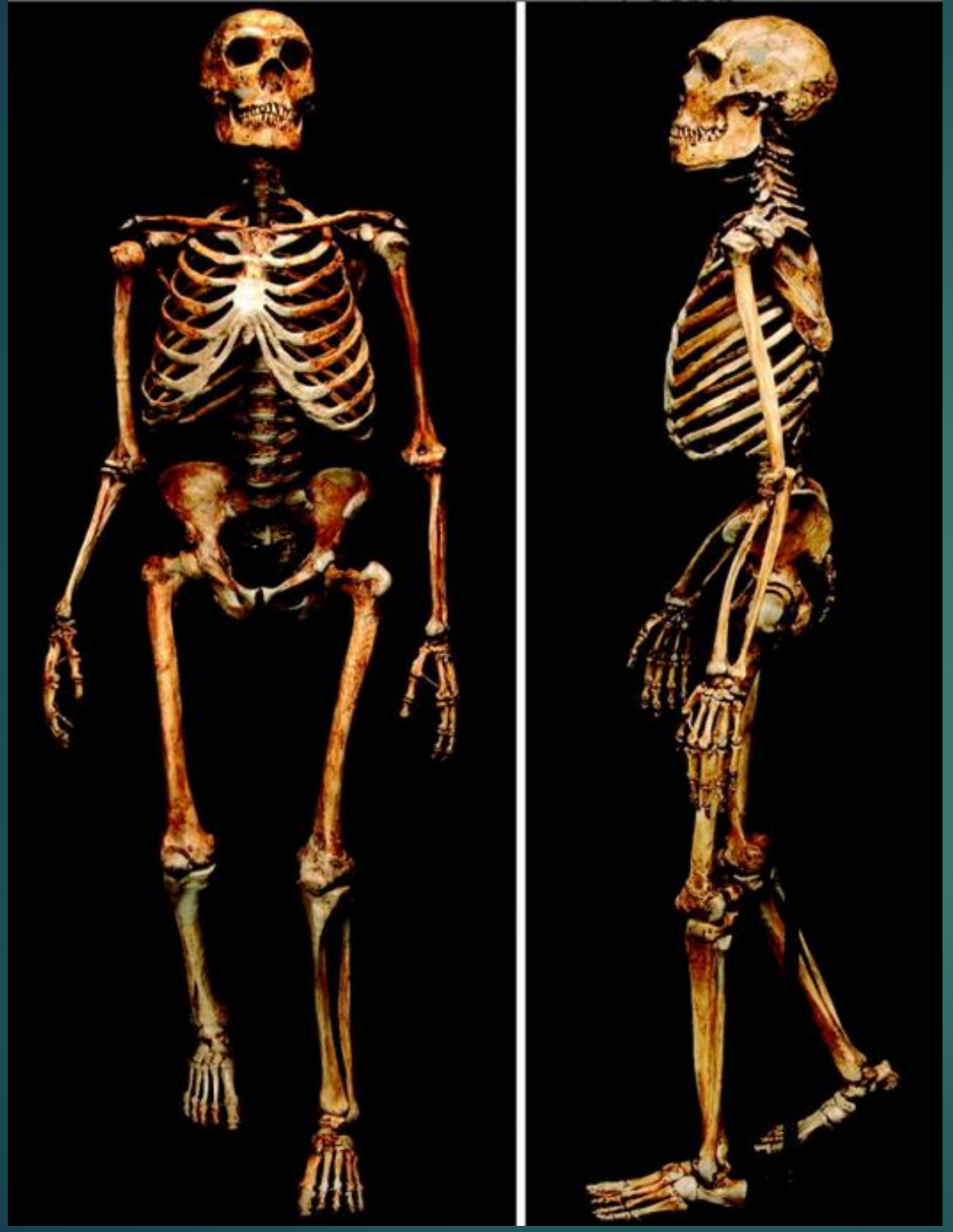
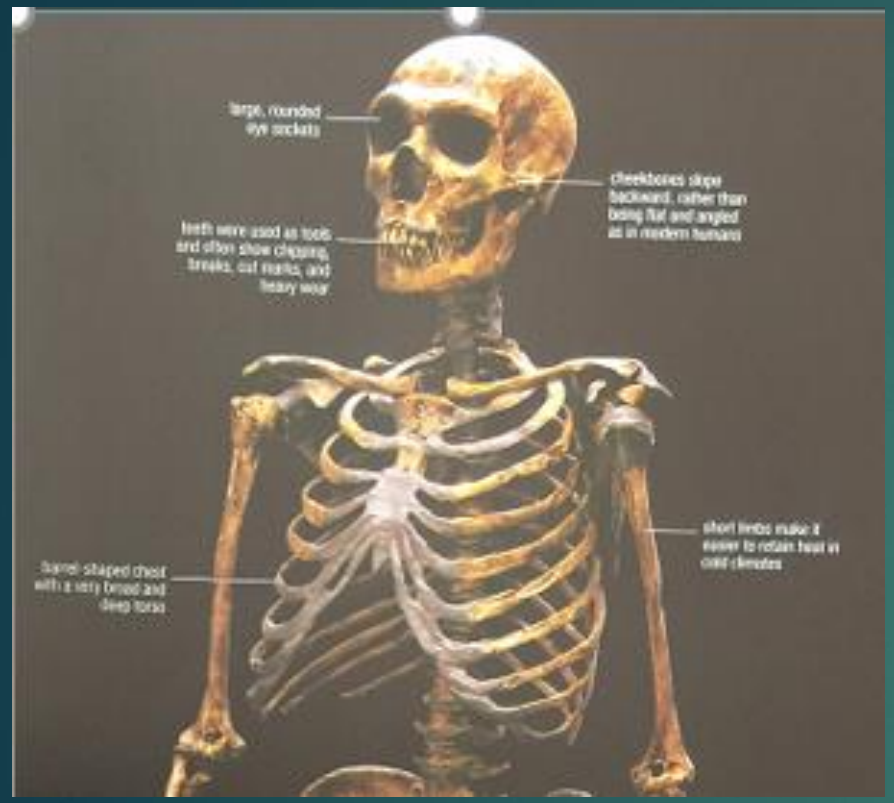
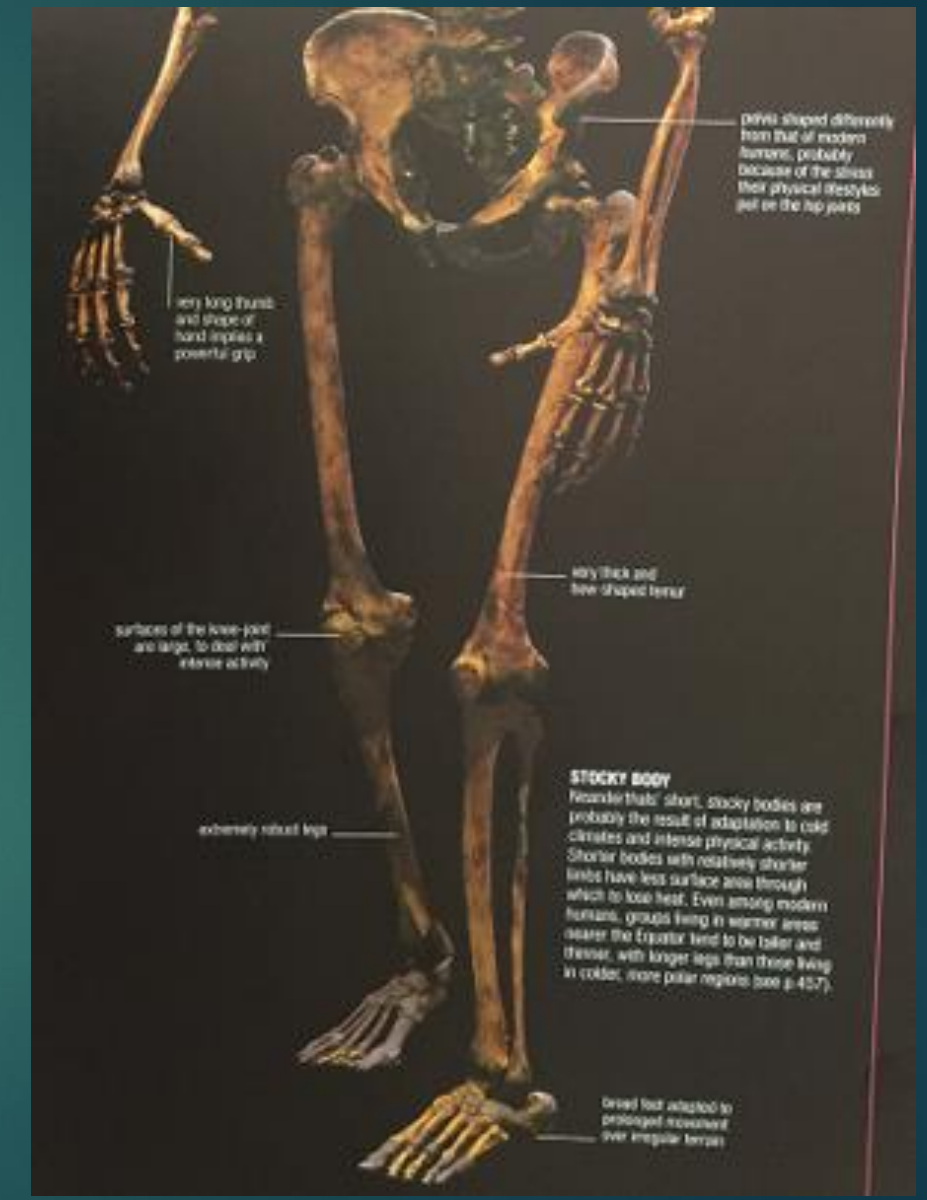


Figure 4. Neanderthal reconstruction (left) next to a modern human skeleton for comparison.

Kebara reconstruction





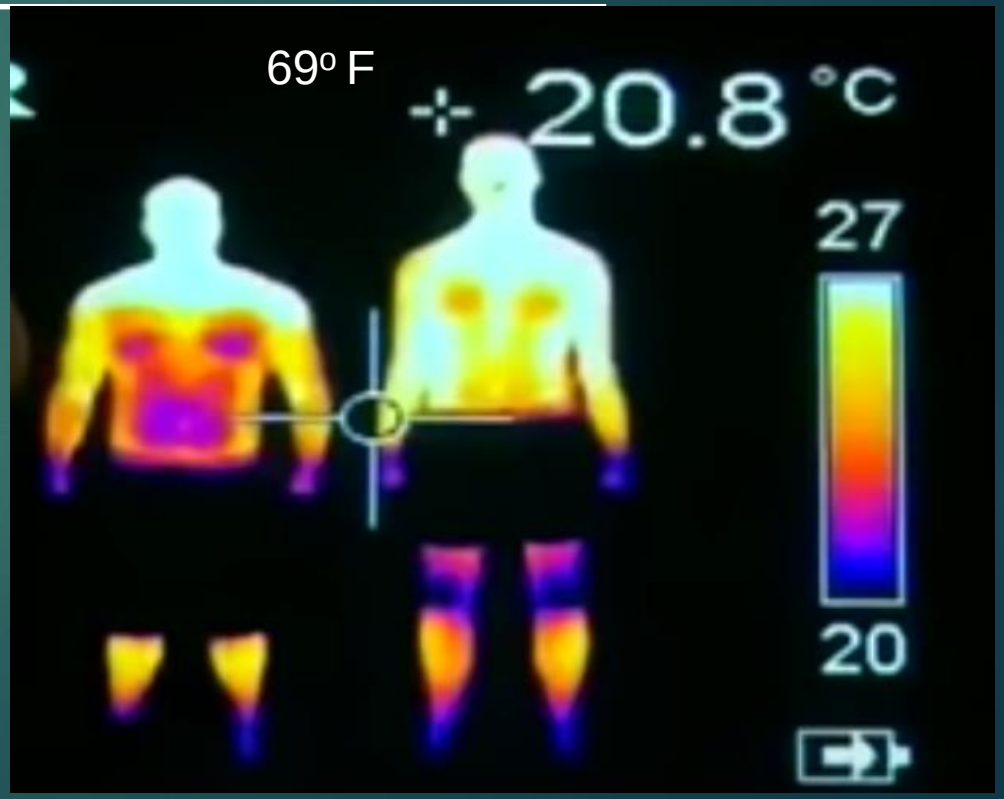
Short & stocky = better adaptation to cold -- much faster reheating after cold exposure

Blue = colder
Red = warmer

3 minutes in cryo chamber at -166 degrees: 95 degrees F before;
Immediately after exit: 51 degrees for MH, 66 degrees for N: higher skin and internal temperature;
More muscular warms much more rapidly after exit due to muscle vascularity;

Heat retention in short wide body

- Ice bath experiment: MH began to become hypothermic at 25 minutes
- Heavy muscles act as insulation to body core temperature
- N had deep wide splay to rib cage: supported thick muscles
- Cost: increased caloric intake
- Ns needed 1 red deer every 2 days



Giving Birth: N and MH

- Giving birth is more difficult--and dangerous--for modern humans than for any other primate

- Fossil female pelvises (a 1.2 Ma *Homo erectus*, a 3.1 Ma australopithecine, and a 500 Ka archaic MH): all contain oval birth canals that are widest transversely--from side to side

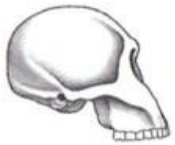
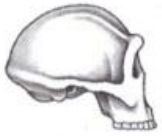
- MH infants have to rotate to fit their heads through the narrow birth canal, which is oval, but widest front to back.

Giving Birth: N pelvis

- Virtual reconstruction of the pelvis of a Neandertal woman suggests that Neandertal mothers also had a tough time giving birth to their big-headed infants--but the babies, at least, didn't have to rotate to get out.

- Only known female pelvis of a Neandertal, discovered in 1929 near Tabun, Israel, is fragmentary. Reconstruction suggests that the pelvis was widest from side to side all the way down the birth canal, more like that of *Homo erectus* or australopithecines than modern humans. And that means that although Neandertal mothers still had difficult births because of their babies' large heads, their babies did not rotate in the womb,

- Figure 9.4(d) is an excerpt from Conroy's Reconstructing Human Origins (2005), depicting the several species from the genus Homo.
- Included in this is Homo *habilis* (small and large), as well as Homo *erectus*, archaic Homo *sapiens*, Neandertals, and early modern Homo *sapiens.*
- The excerpt includes information on height and body type, brain size, skull form, jaws and teeth, the area that the species lived, and the time range in which is was around (2005).


	Homo habilis (small)	*Homo habilis* (large)	*Homo erectus*	Archaic *Homo sapiens*	Neandertals	Early Modern *Homo sapiens*
Height (m) Physique	1 Relatively long arms	c 1.5 Robust but "human" skeleton	1.3–1.5 Robust but "human" skeleton	? Robust but "human" skeleton	1.5–1.7 As 'archaic *H. sapiens*,' but adapted for cold	1.6–1.85 Modern skeleton; ?adapted for warmth
Brain size (cc)	500–650	600–800	750–1,250	1,100–1,400	1,200–1,750	1,200–1,700
Skull form	Relatively small face; nose developed	Larger, flatter face	Flat, thick skull with large occipital and brow ridge	Higher skull; face less protruding	Reduced brow ridge; thinner skull; large nose; midface projection	Small or no brow ridge; shorter, high skull
Jaws/teeth	Thinner jaw; smaller, narrow molars	Robust jaw; large narrow molars	Robust jaw in larger individuals; smaller teeth than *H. habilis*	Similar to *H. erectus* but teeth may be smaller	Similar to 'archaic' *H. sapiens*; teeth smaller except for incisors; chin development in some	Shorter jaws than Neandertals; chin developed; teeth may be smaller
Distribution	Eastern (and southern?) Africa	Eastern Africa	Africa, Asia, and Indonesia (and Europe?)	Africa, Asia and Europe	Europe and western Asia	Africa and western Asia
Known date (years ago)	2–1.6 million	2.4–1.6 million	1.8–0.3 million	400,000–100,000	150,000–30,000	130,000–60,000

Neandertal Reconstructions

Sculptures de Louis Mascré (1871-1929)
d˚ après Aimé Rutot (1847-1933), 1909 et 1914

La femme de la Quina (Charente) par
Dr Léon Henri-Martin et Charles Bousquet, 1913

La Chapelle-aux-Saints (Corrèze),
par le criminologue Fasciano
et Norbetto Montecucco, 1909

Homme du Moustier (Dordogne) par
Maurice Faure et Yvonne Parvillée, 1925

Anonyme, 1921

Erna Engel-Baiersdorf, 1924

REPRÉSENTATIONS DES ANNÉES 1980 À AUJOURD'HUI

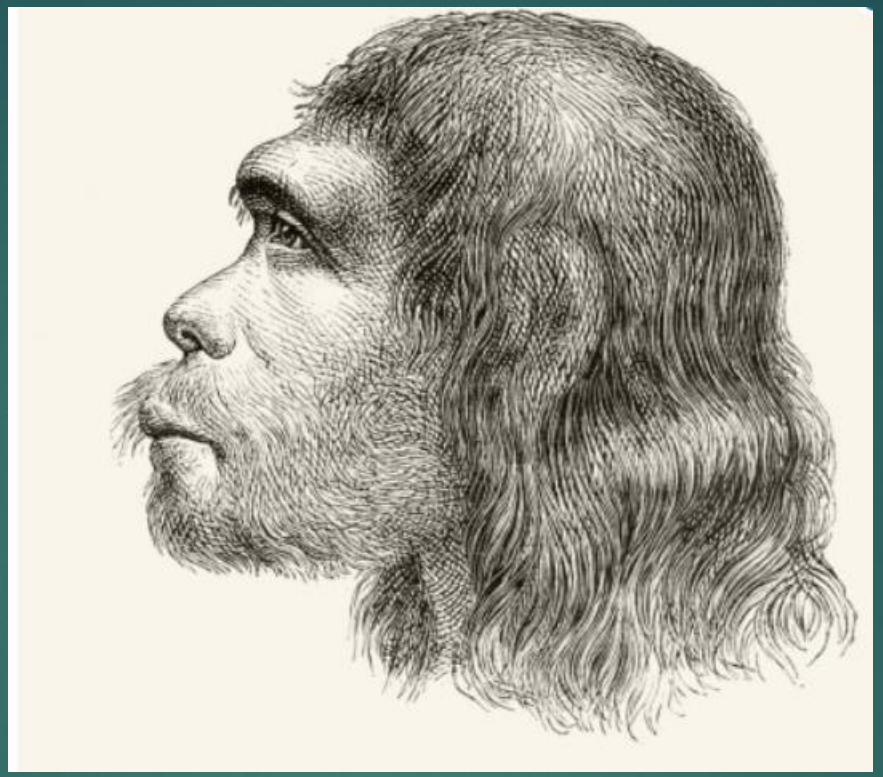
Guarnaschelli, 1986

Emmanuel Roudier

« Kinga », dermoplastie de Elisabeth Daynes

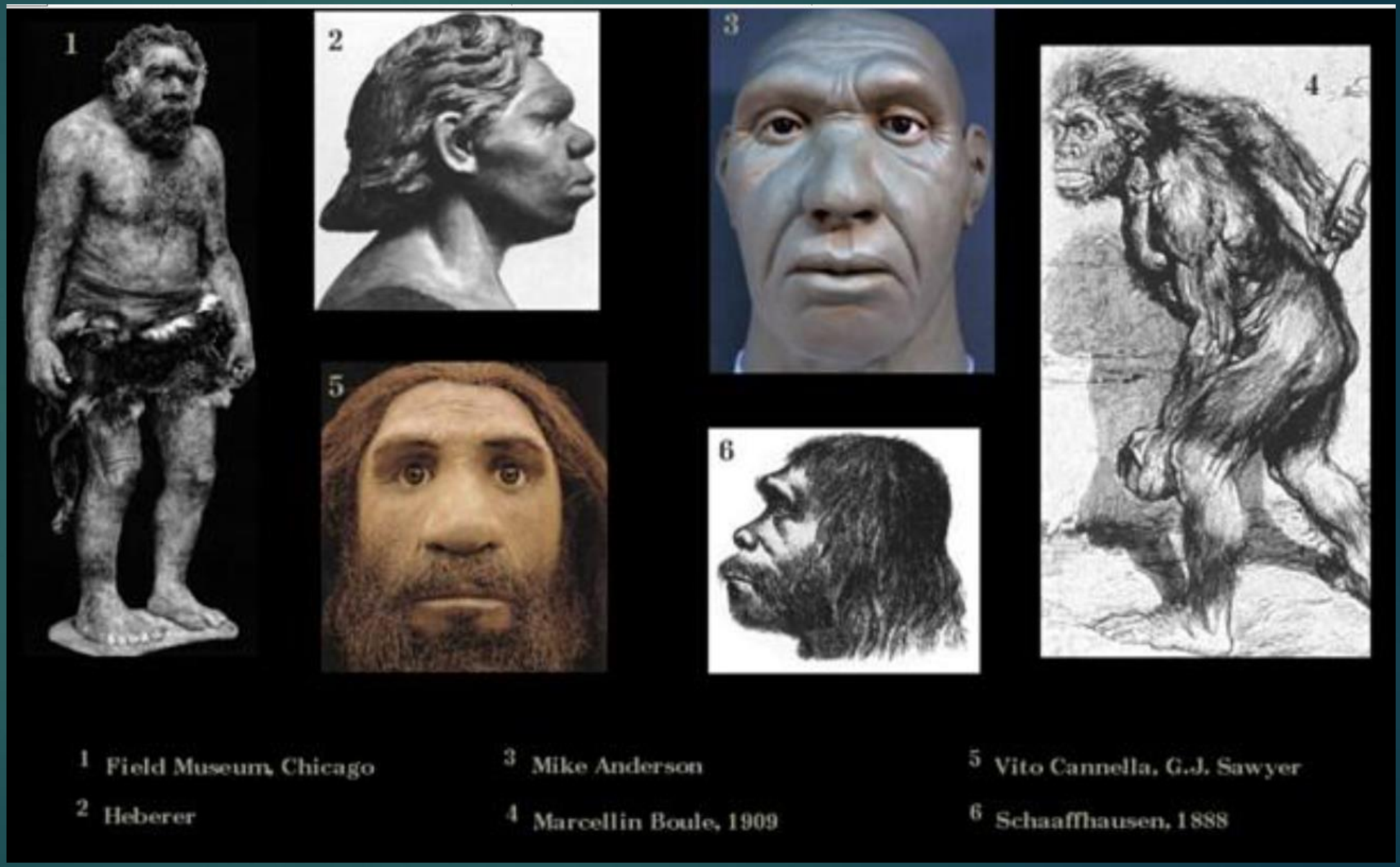
Peintures de Z. Burian

1883



Head Of A Neanderthal Man Illustration From a 19Th Century Reconstruction. From Nuestro Siglo Published Barcelona 1883
Most portrayals of Neanderthals are lumbering, unkempt retards with facial hair and no body ornamentation,

Neandertal Reconstructions



A reproduction of a Neanderthal family on display at the Field Museum of Natural History at Chicago, Illinois (Credit: Getty Images)

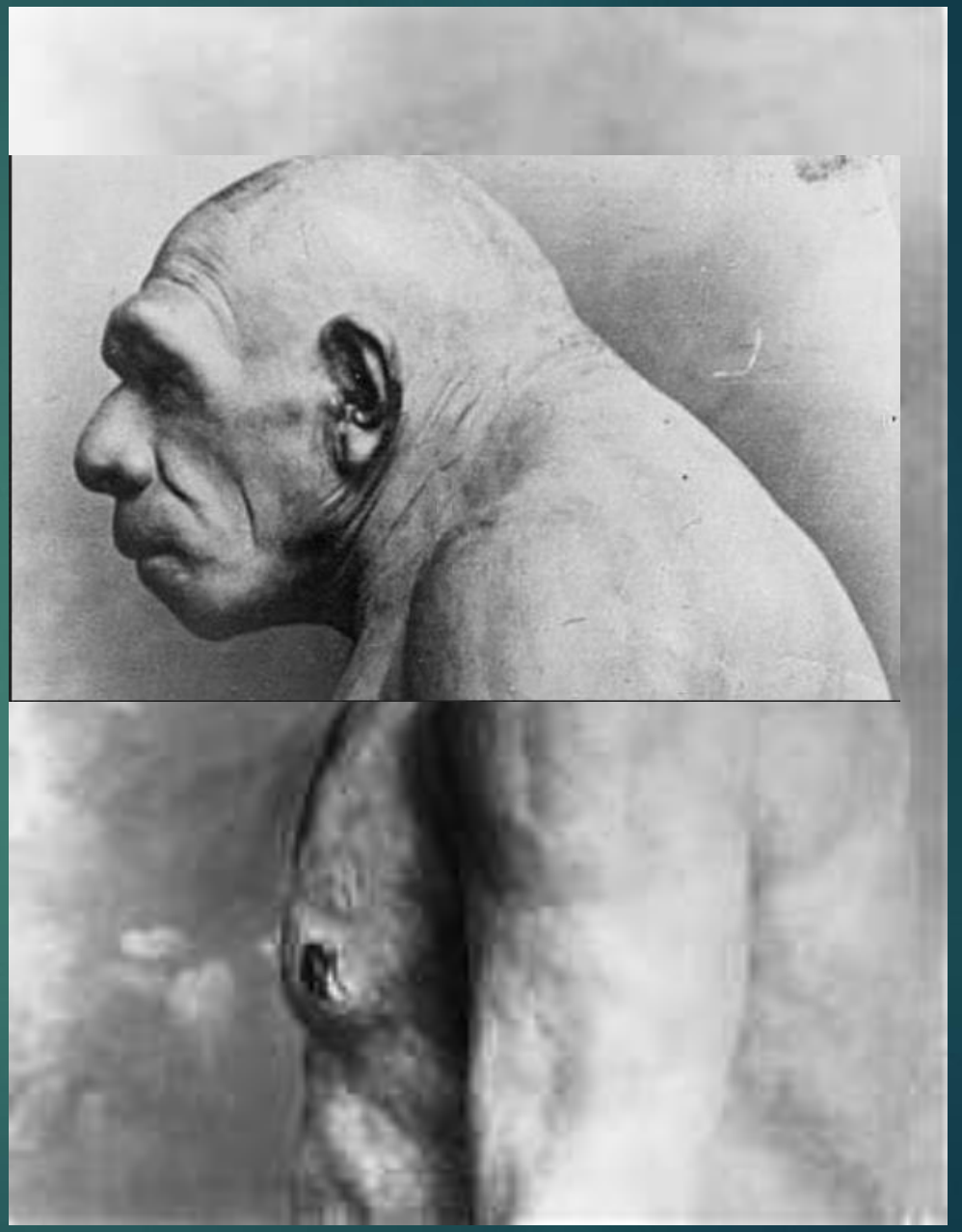
1910

Prehistorian Aimé Rutot and the sculptor Louis Mascré

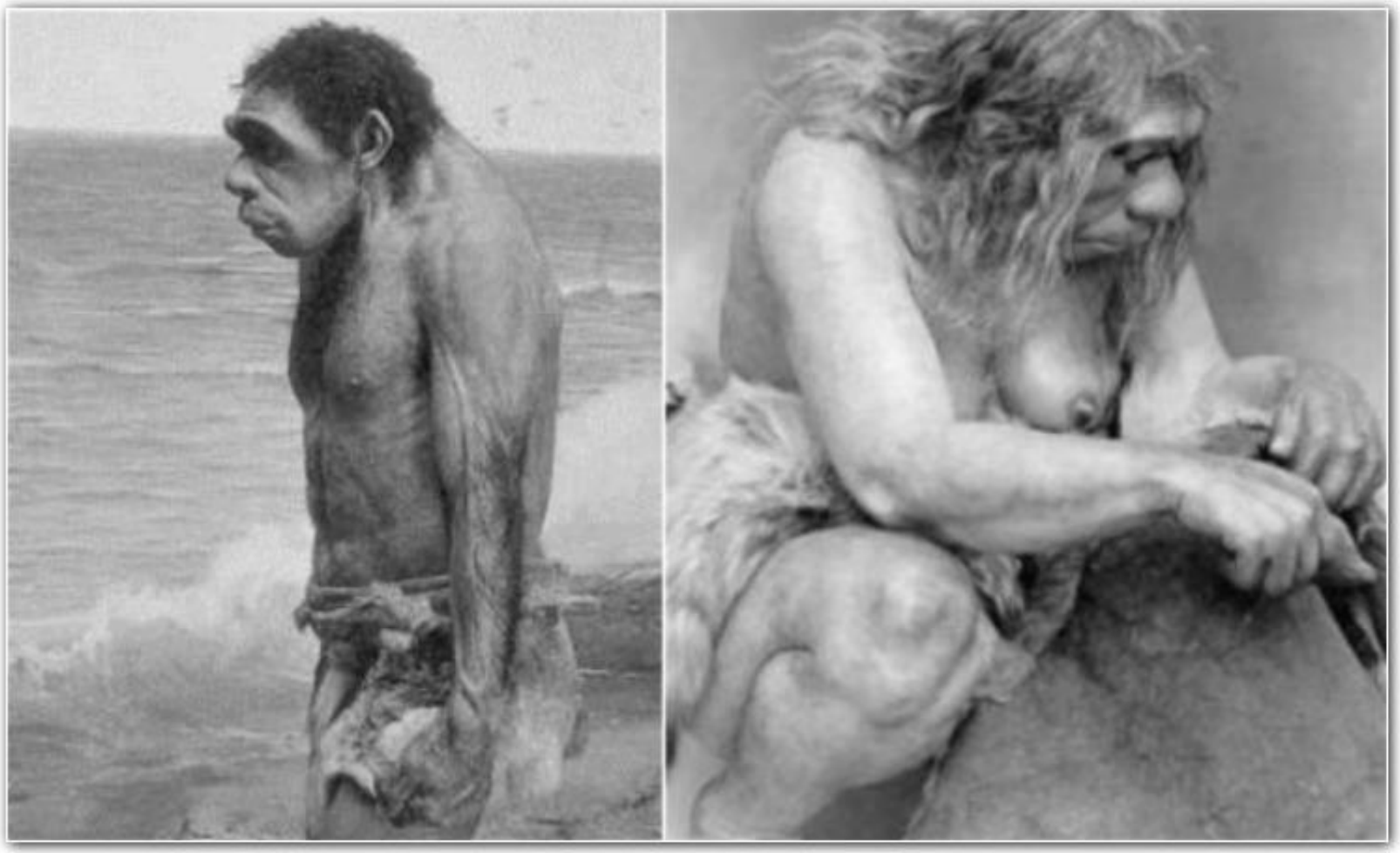
Frederick Blaschke, exhibited in the Field Museum of Natural History in Chicago in the 1920s and 30s,

The ‘evolution’ of Neanderthals over the last 100 years says more about us than them.

by Lee Rimmer for Ancestry - Genealogy & DNA



The Field, MNH, Chicago



1930s – Lumpen

The Field, MNH, Chicago

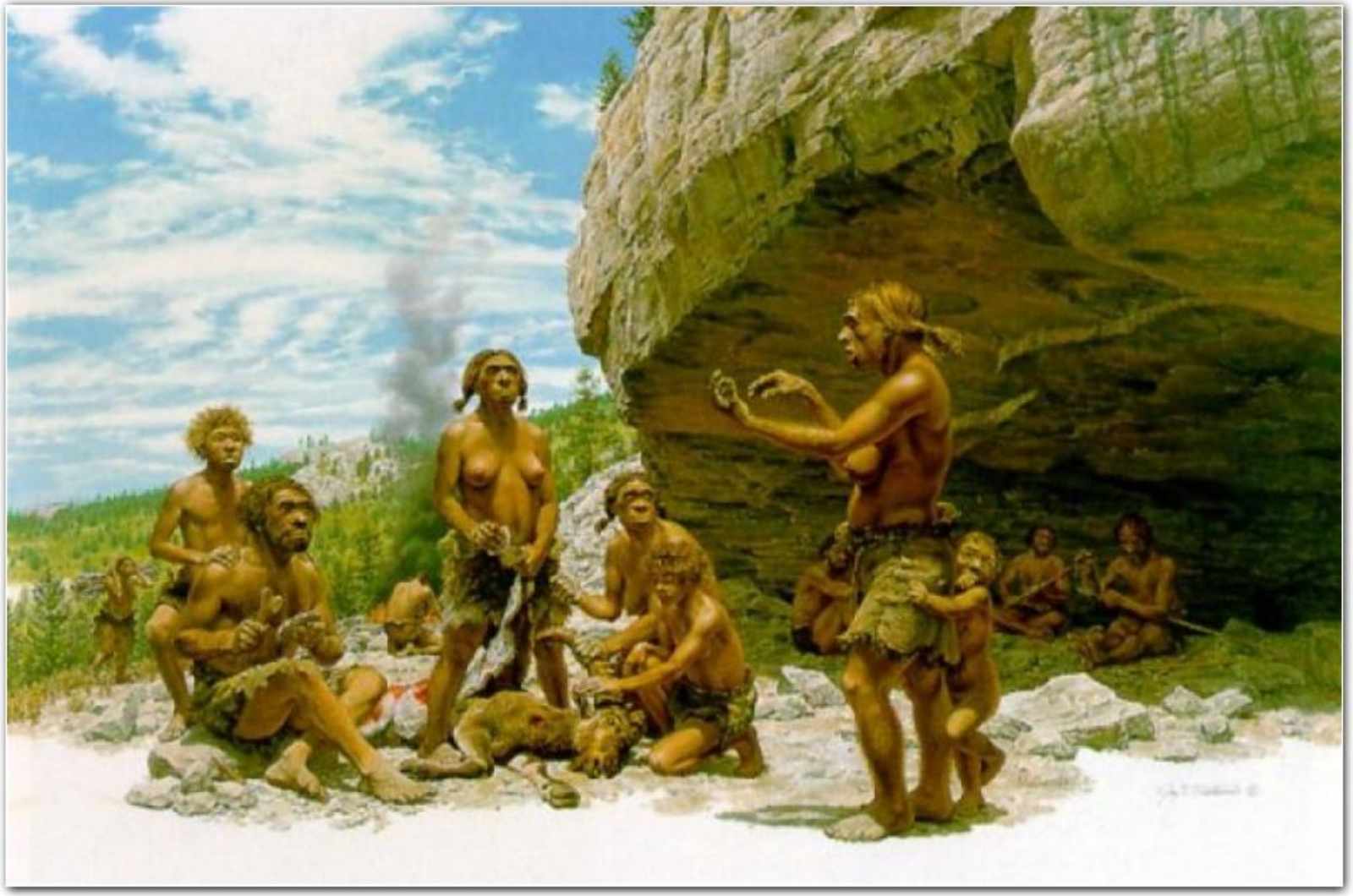
AT THE BEACH: The 1933 Field Museum diorama "Mousterian Group" showed a Neanderthal family in Gibraltar. This image is taken from the museums' visitors guide.

Field, H. & Laufer, B. *Prehistoric Man, Hall of the Stone Age of the Old World* Field Museum of Natural History, Chicago

One diorama called "The Mousterian" showed a group of five life-size Neanderthal figures in front of a rock shelter.

1960s – Hirsute

The great illustrator Zdeněk Burian, in the 1960 book *Prehistoric Man*



1980s – Communicative

image – jay-matternes.com

AMNH

1990s – Functional

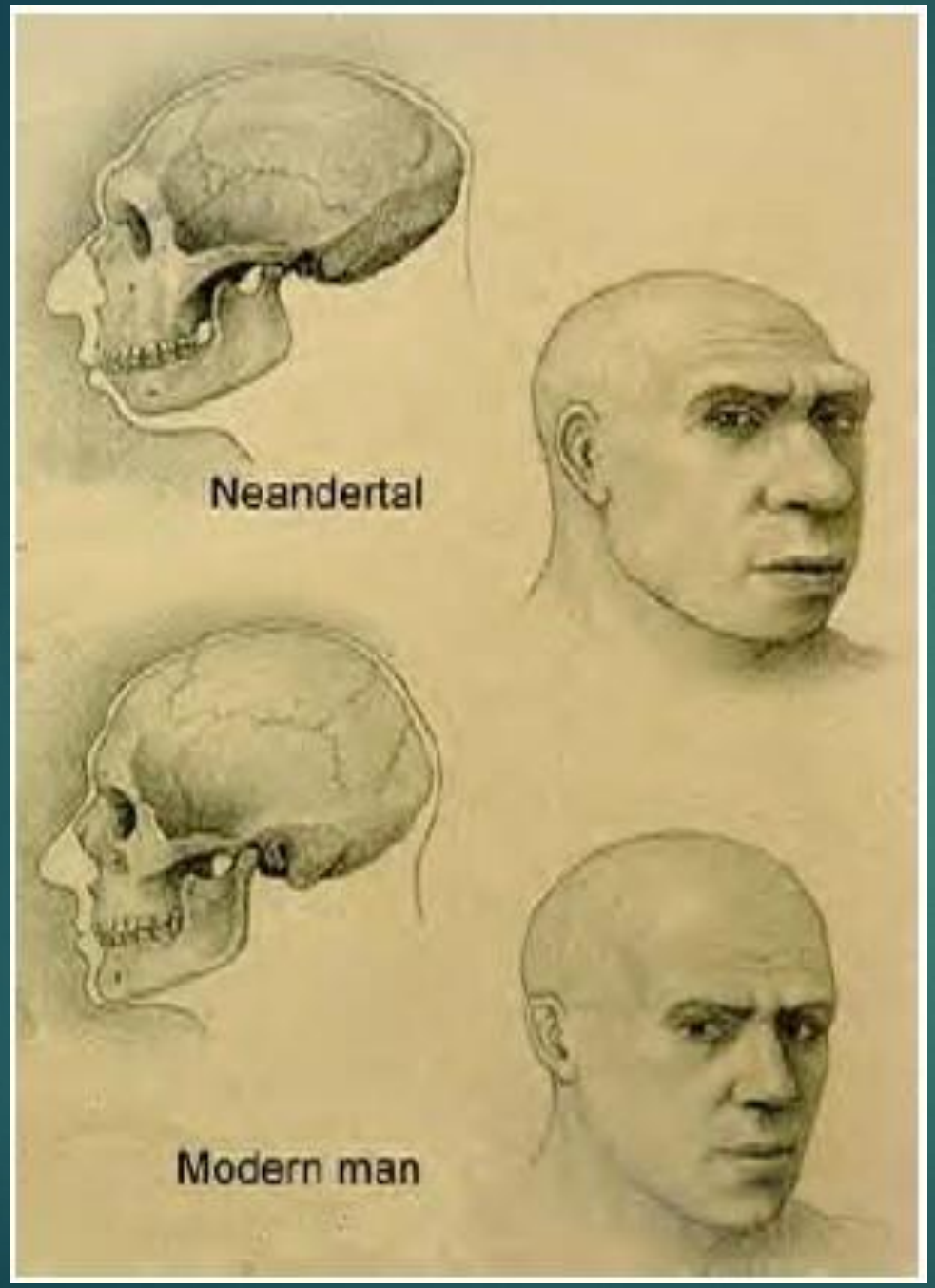
image – American Museum of Natural History, New York

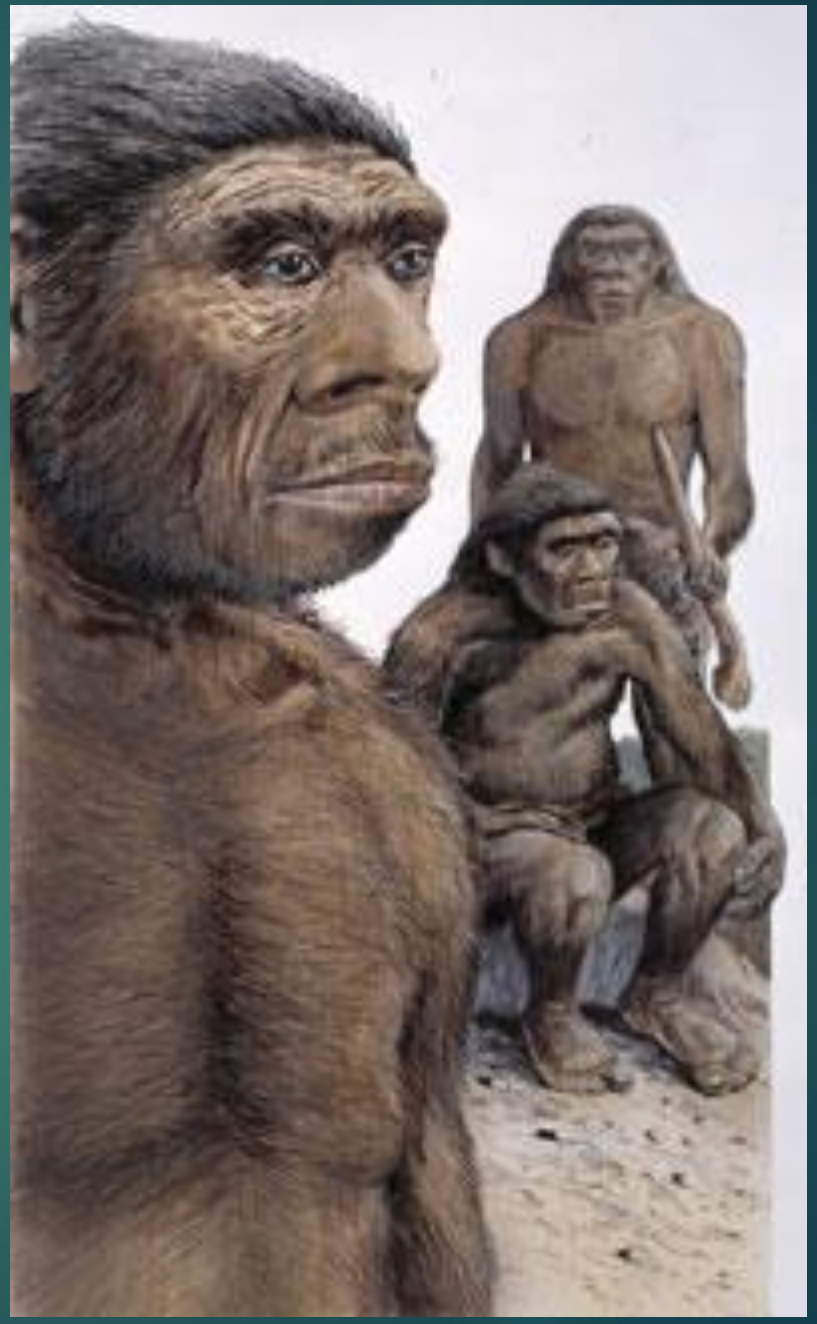
2000 – Robust

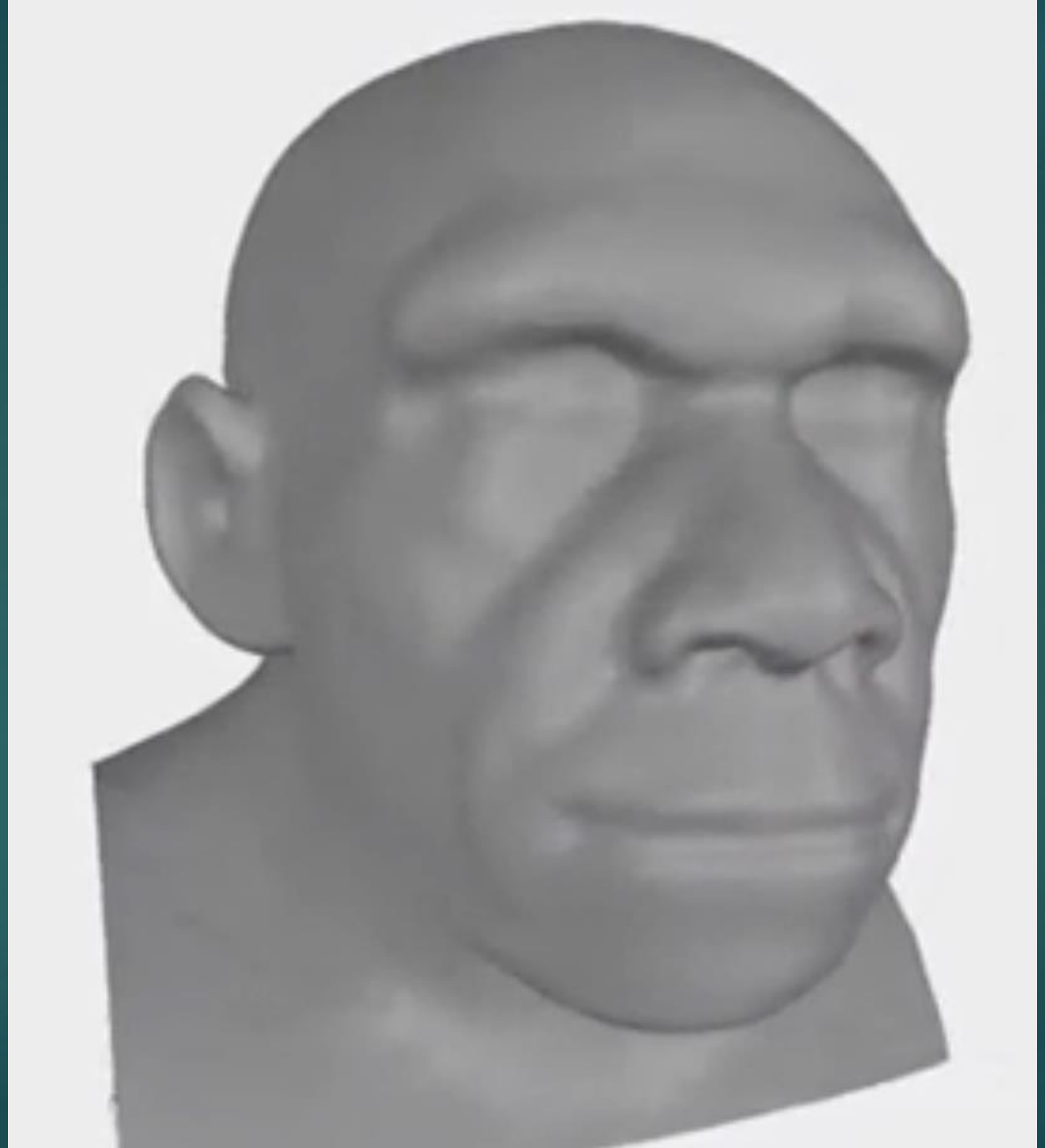

GEICO.COM's
SO EASY A CAVEMAN CAN DO IT : OFFENSIVE ?

2004 – Thoughtful

images – BBC Horizon and SODA fx


Neandertal
Modern man





2006 male Neanderthal reconstruction
in the Mettmann Neanderthal Museum in Germany

Model of a Neanderthal at
American Museum of Natural History, D.C.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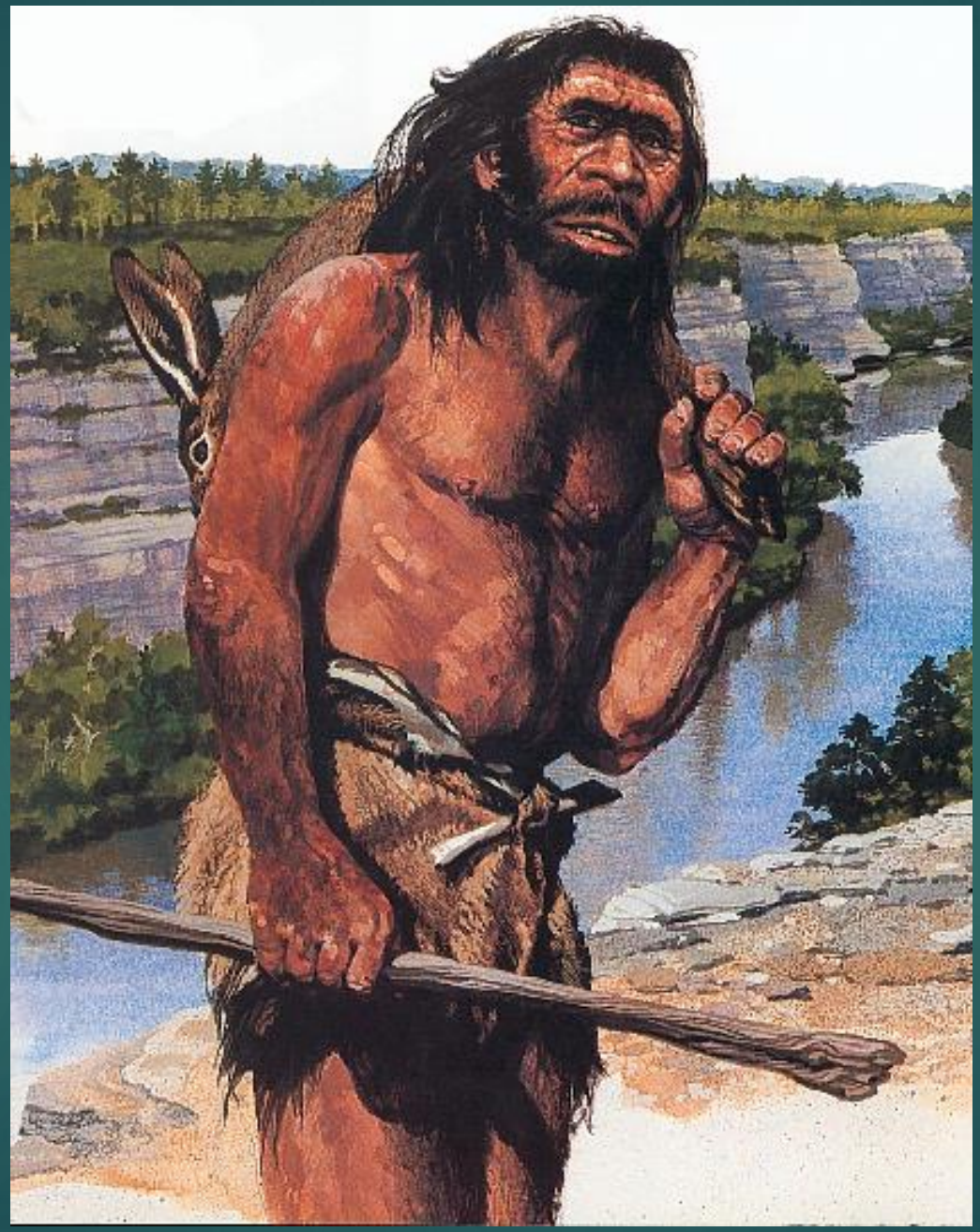
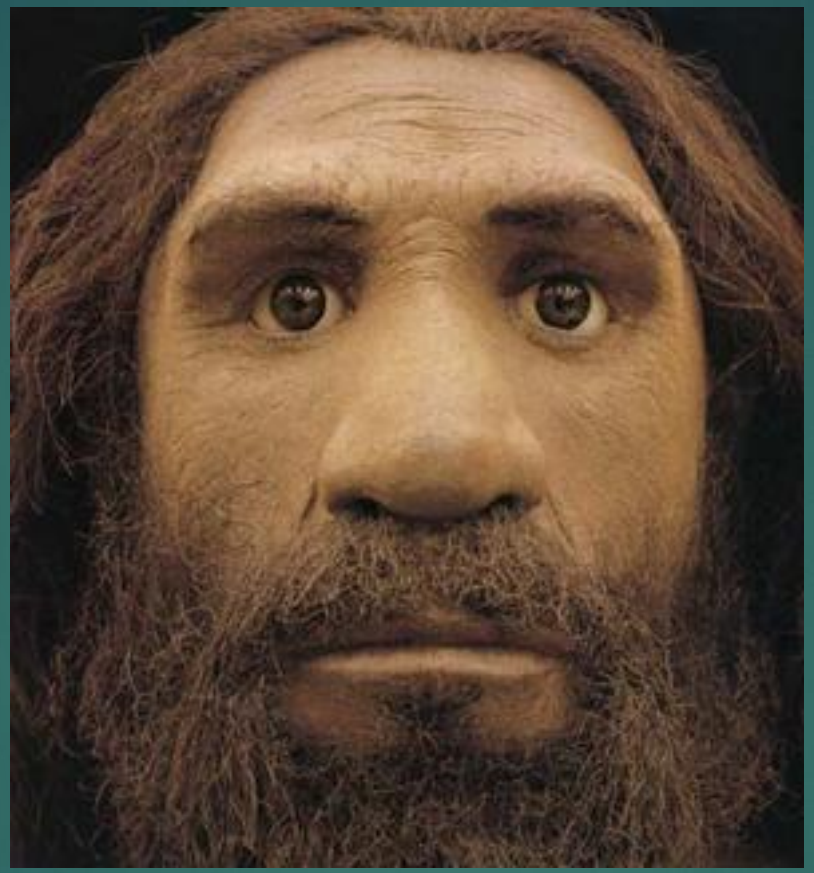


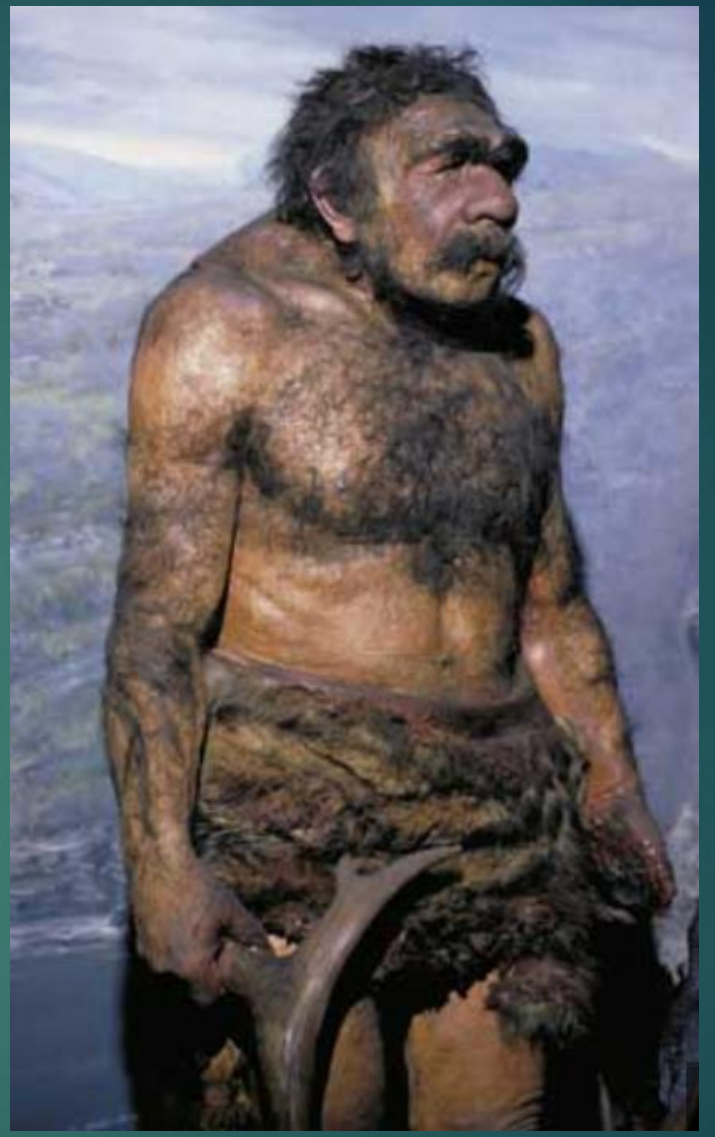
http://www.naturalhistorymag.com/master.html?http://www.naturalhistorymag.com/0207/0207_feature.html



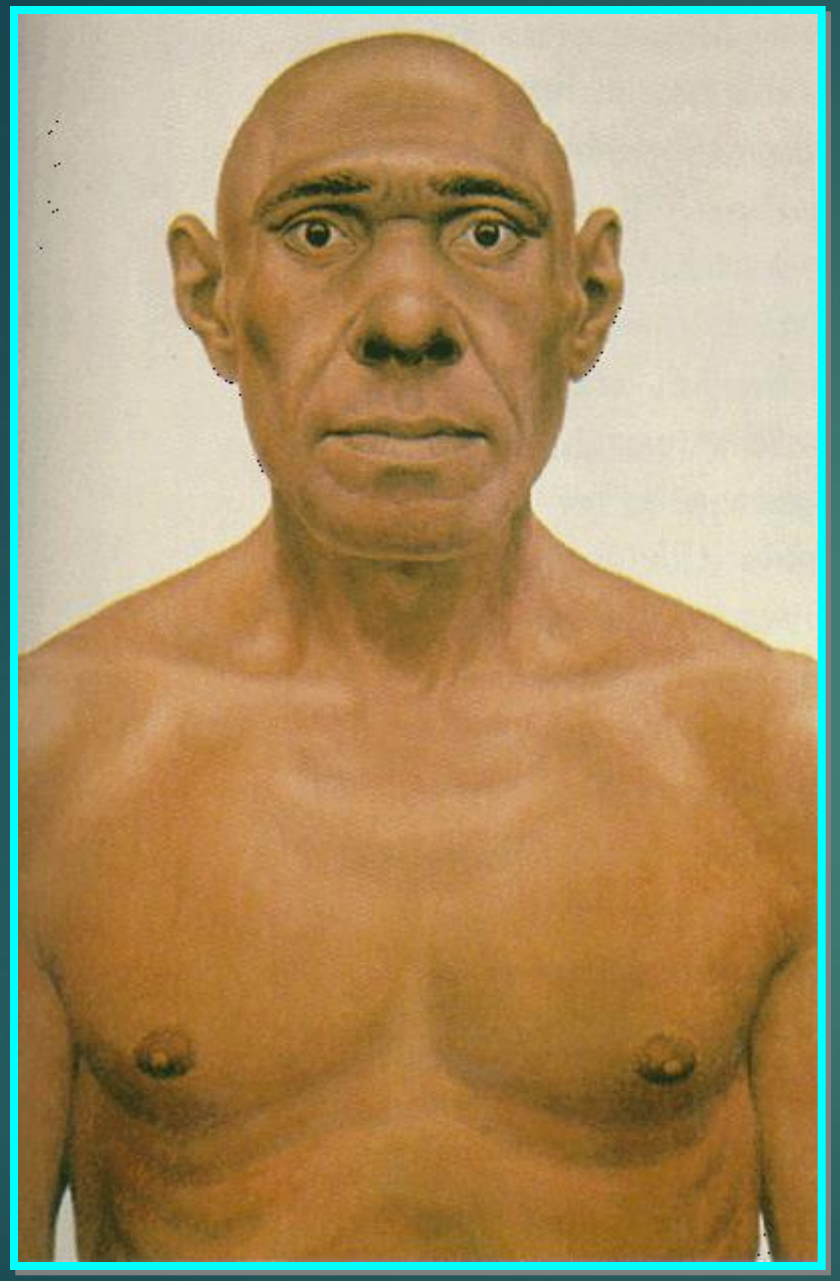
http://www.sciencemusings.com/2005/09/rewriting-history.html

http://www.aulis.com/twothirds.htm

http://www.answers.com/topic/neandertal?cat=technology



Tom McHugh—The Field Museum, Chicago/



Reconstruction based on skulls from SHANIDAR CAVE IN IRAQ

- Prominent brow ridge
- Large bulbous nose
- Sloping forehead
- Powerful build
- Possible advanced culture: sophisticated tools, burials, language?

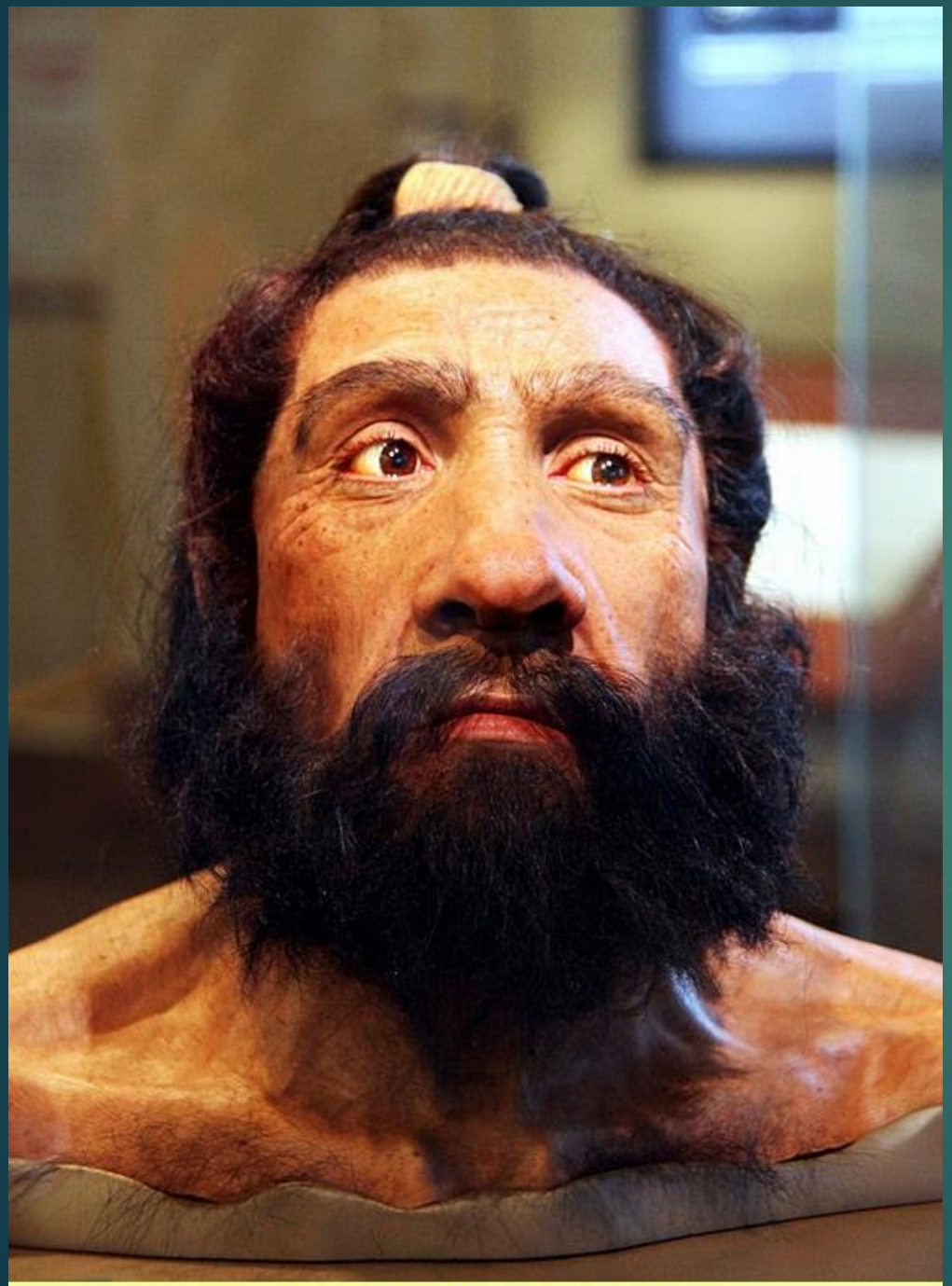
Neandertal

La Chapelle (France) skull and reconstruction

N at the Beach: Gibraltar

N families


Subscribe

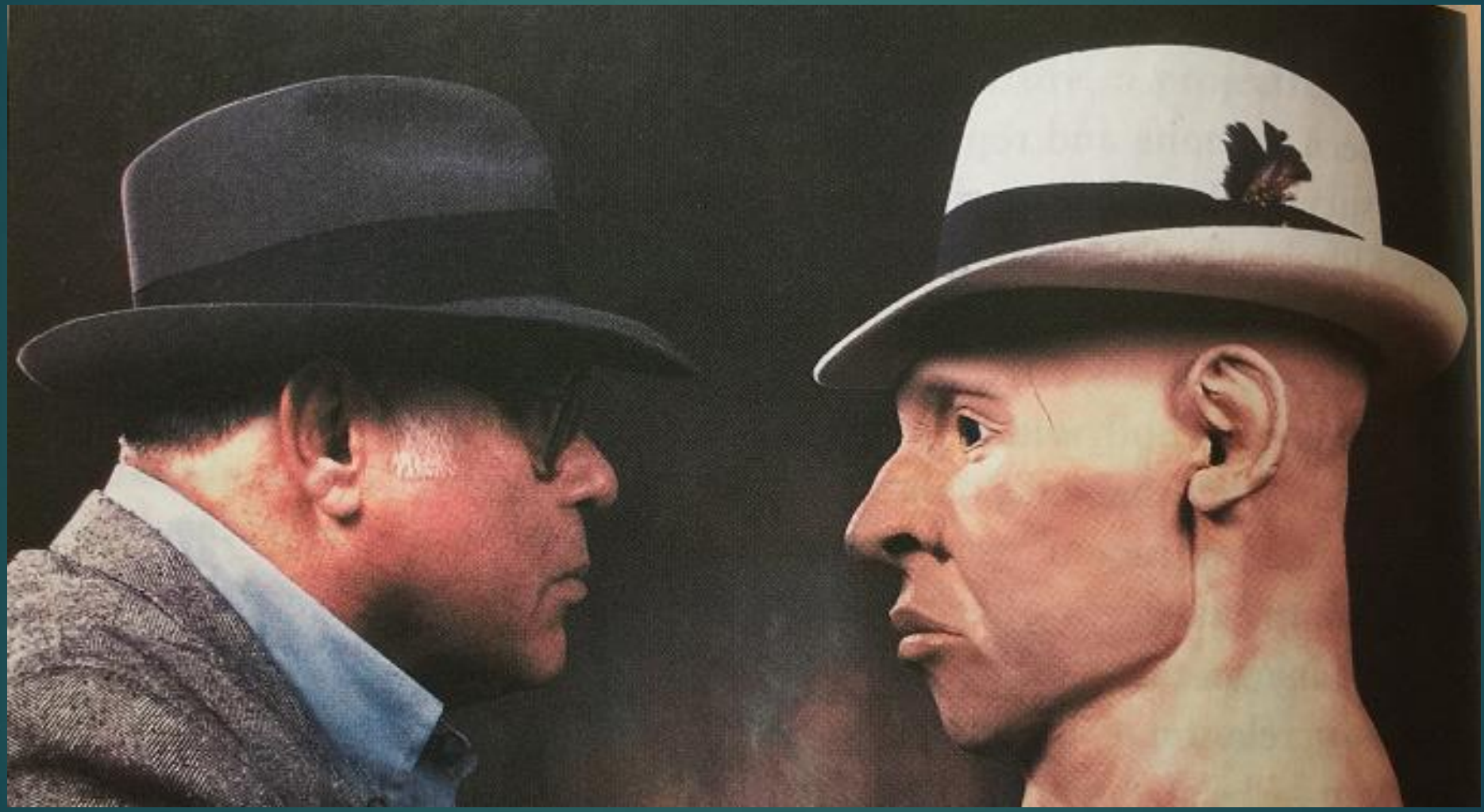


A reconstruction of Shanidar 1, by paleoartist John Gurche

The Man Who Was Mistaken for a *Homo sapiens* in a Hat

- In 1939, anthropologist Carleton Coon used an artist's reconstruction of the Neanderthal specimen La Chapelle aux Saints in a hat to argue that people's impressions of differences between groups of humans depend in part on superficial features such as clothing and facial hair. J. Howard MacGregor
- In the winter 1957 issue of the *Quarterly Review of Biology*, William Strauss and A.J.E. Cave wrote of the Neanderthal, "If he could be reincarnated and placed in a New York subway—provided that he were bathed, shaved, and dressed in modern clothing—it is doubtful whether he would attract any more attention than some of its other denizens."
- Modernized Neanderthal, based on Prof. J. Howard McGregor's classic reconstruction of "Old Man of la Chapelle's" skull, the bust of which was created for display in the American Museum of Natural History around 1918. Originally published in Carleton Coon's (1939) The Races of Europe. Although often attributed to Coon, it is not clear whether the drawing is by Coon or McGregor.

Milford Wolpoff and Modernized Neandertal



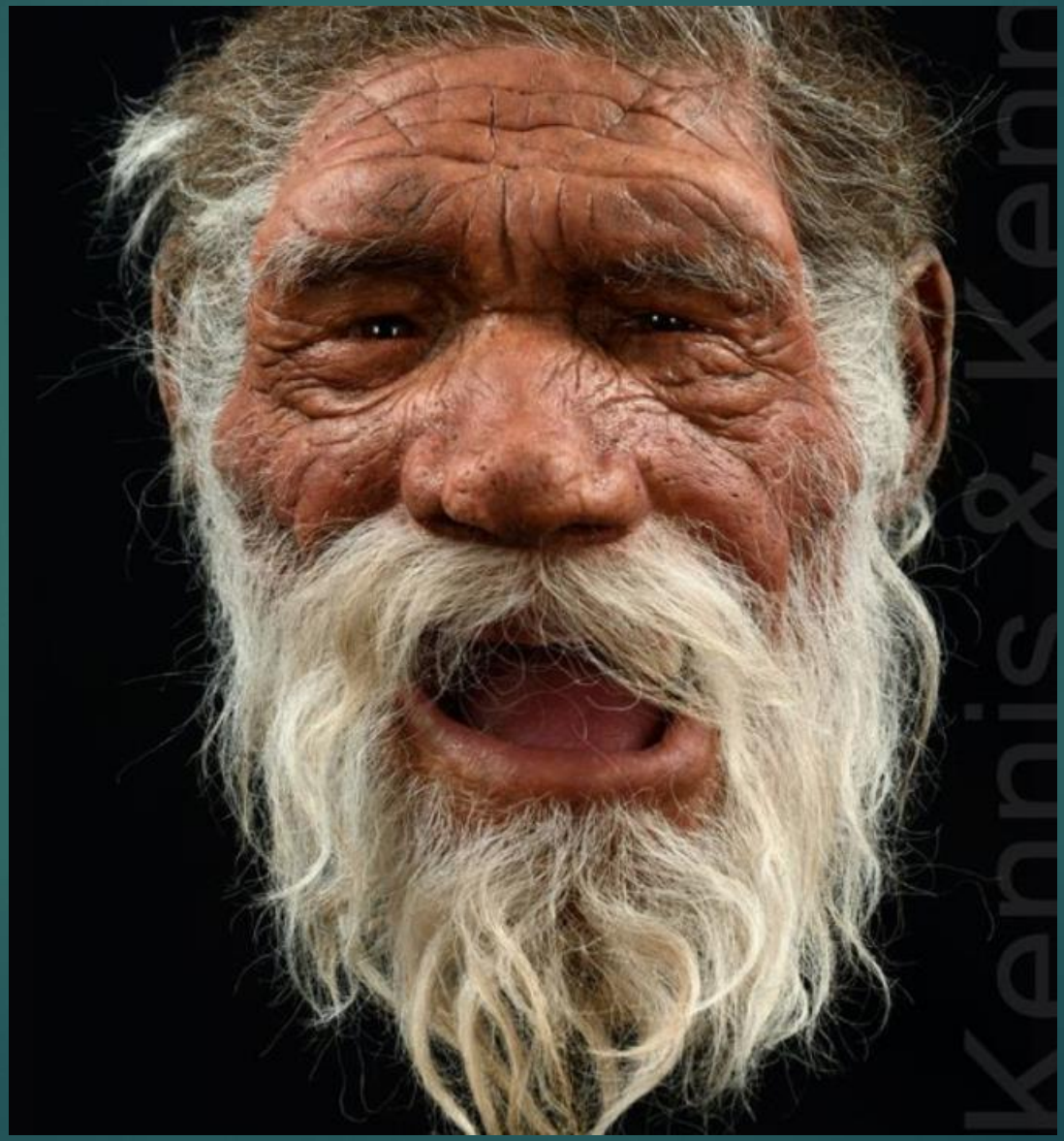
Yale Peabody Museum: Preparator Michael Anderson's reconstruction of the facial features of a male Neanderthal

Neandertal Museum in Germany: Stone Age Clooney

Many of MHs carry N DNA

Many of us carry DNA inherited from Neanderthals
DPA Picture Alliance Archive / Alamy Stock Photo

Neanderthalensis La Chapelle aux Saints



Newer reconstructions by Kennis brothers

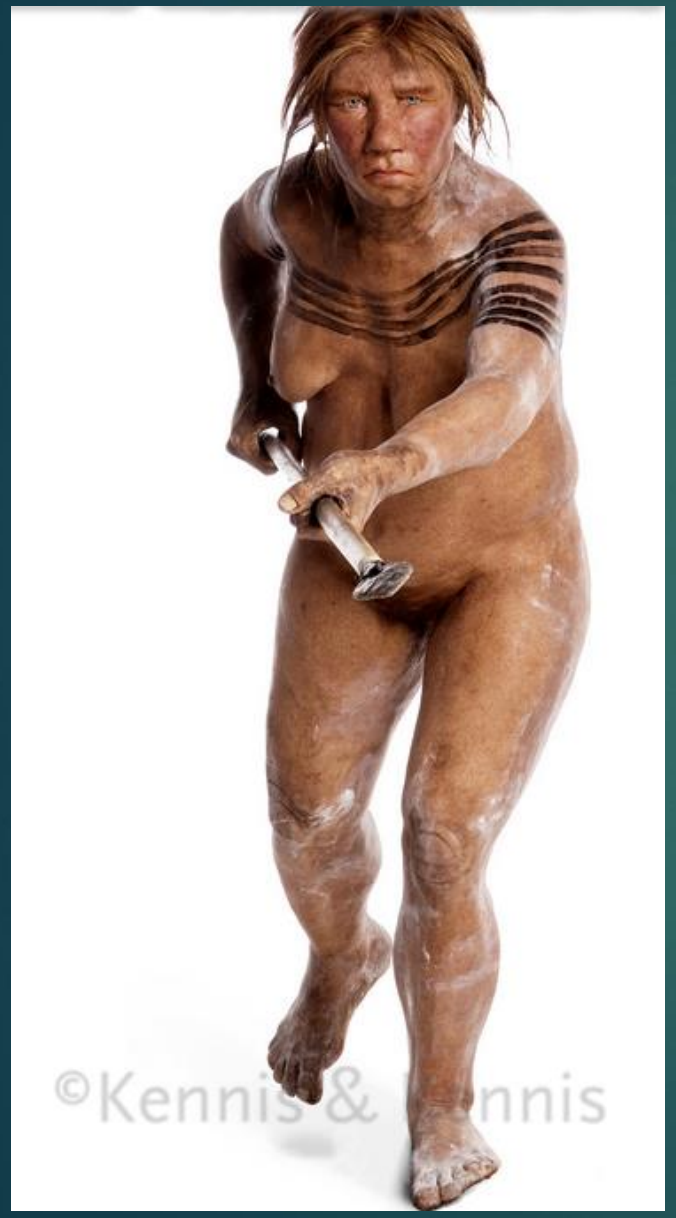
Neanderthal
(National Geographic,
by A. Kennis & A. Kennis, photo Joel McNaulty)

Neandertal became part of us

Felderhofer


Subscribe

Wilma



Kennis & Kennis

E. Daynes

2008 – Human

Sebastien Plailly & Elisabeth Daynes/Science Source

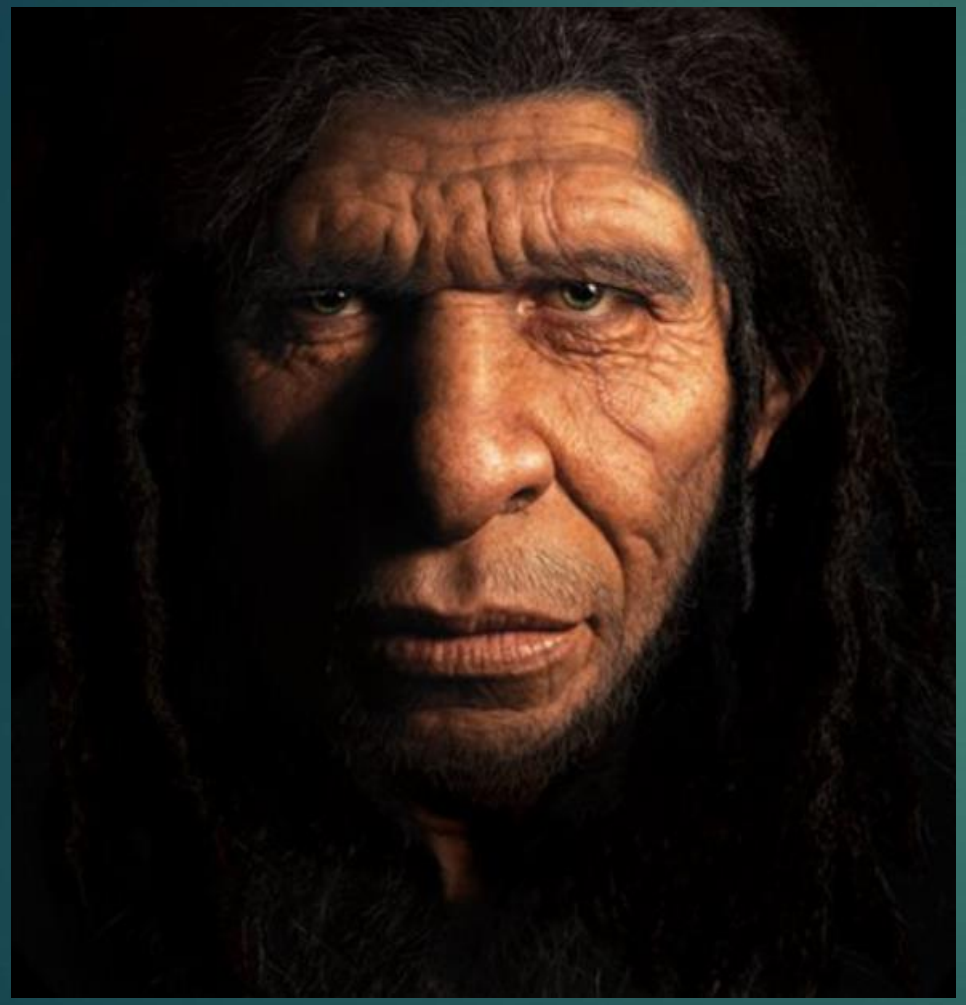
Post-coital Neanderthals?

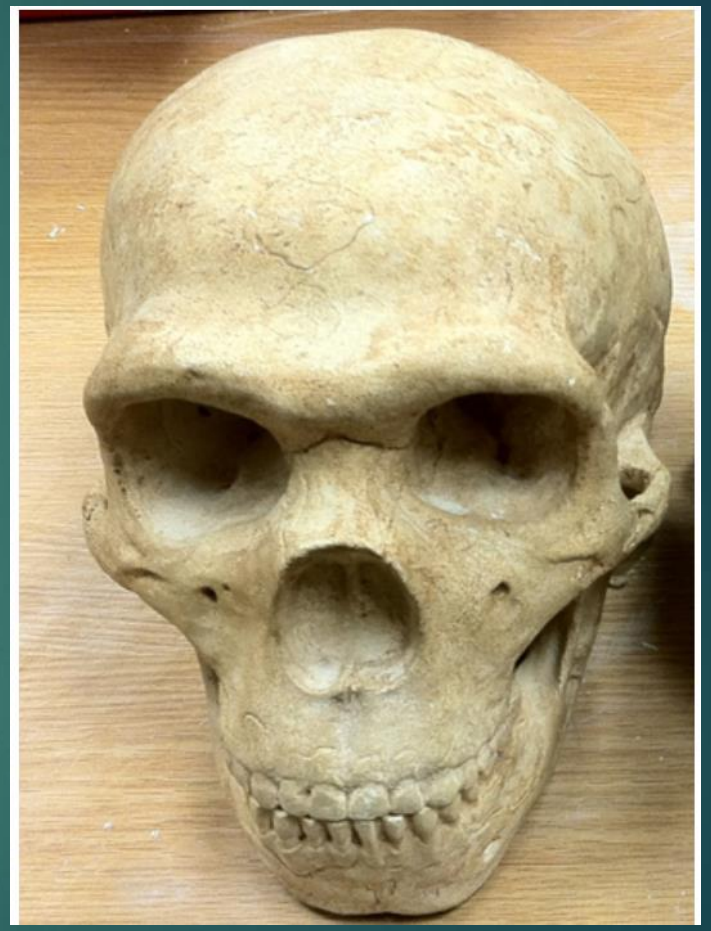
Spanish N reconstruction

Juan Luis Arsuaga and Ignacio Martínez

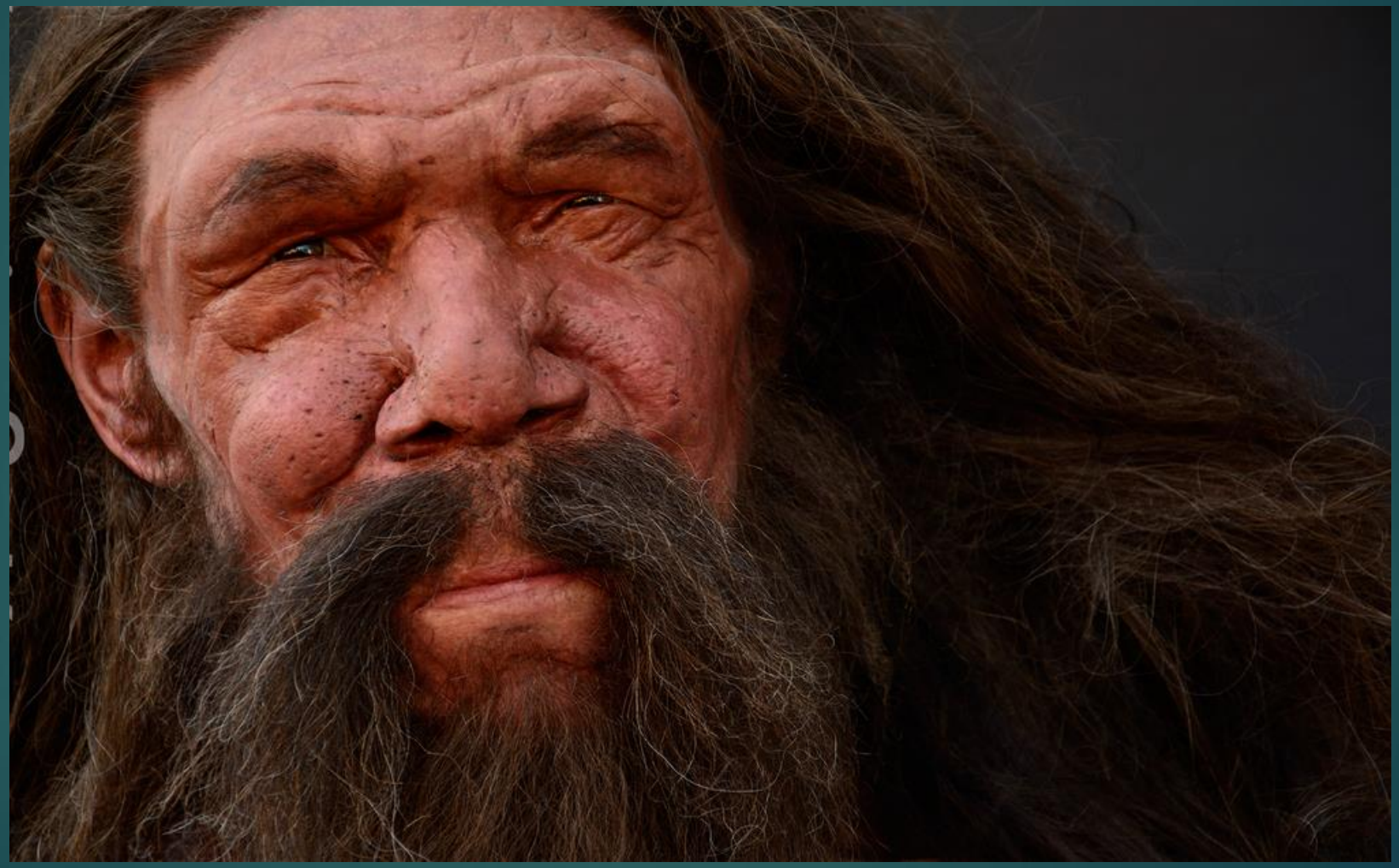
NHM - London

Doug Henderson



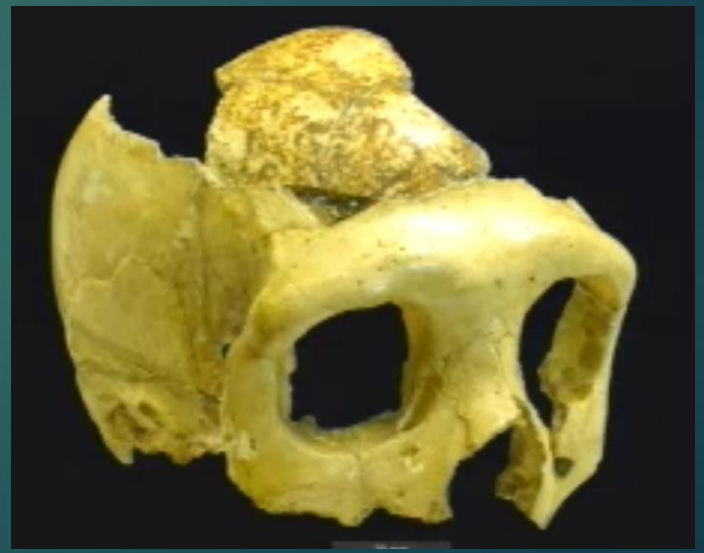


Kennis & Kennis: Altamura



A reconstruction of a Neanderthal woman from the Saint Césaire site in France. (Photo: S. Entressangle/ E. Daynès – Reconstruction Atelier Daynès Paris).

N women



Based on Krapina 3

Spy (Sp-ee)

La Quina

Gibraltar: Nana and Flint

Evidence of black corvid feather use

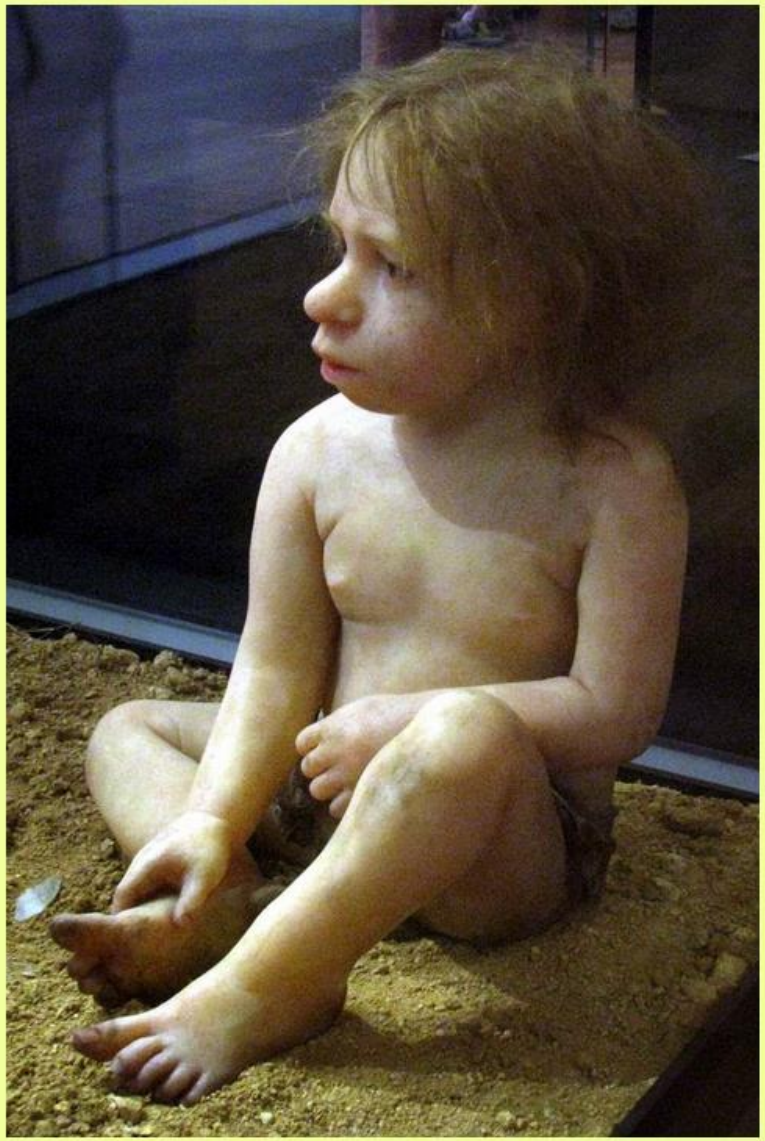

Subscribe

A striking reconstruction of a Neanderthal wearing an animal pelt head covering. "Neanderthal Female Reconstruction" by Viktor Deak

Elisabeth Daynès

BBC2: CGI generated N, based on Shanidar Cave skull

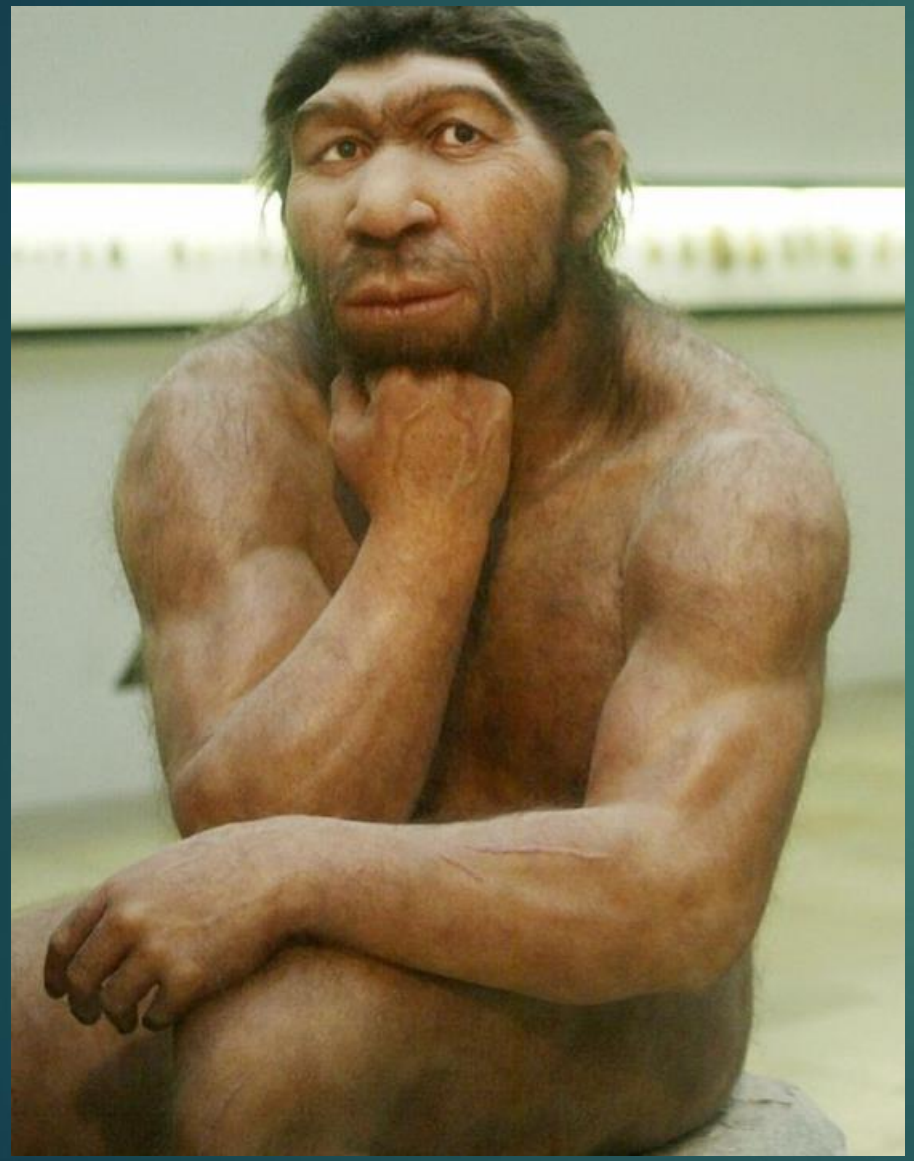
Suffered a major injury 20 years before he died, which fractured his skull, injured his brain and probably blinded him in one eye.



Model of a Neanderthal child by Elizabeth Daynes, at the National Museum of Prehistory at Les Eyzies

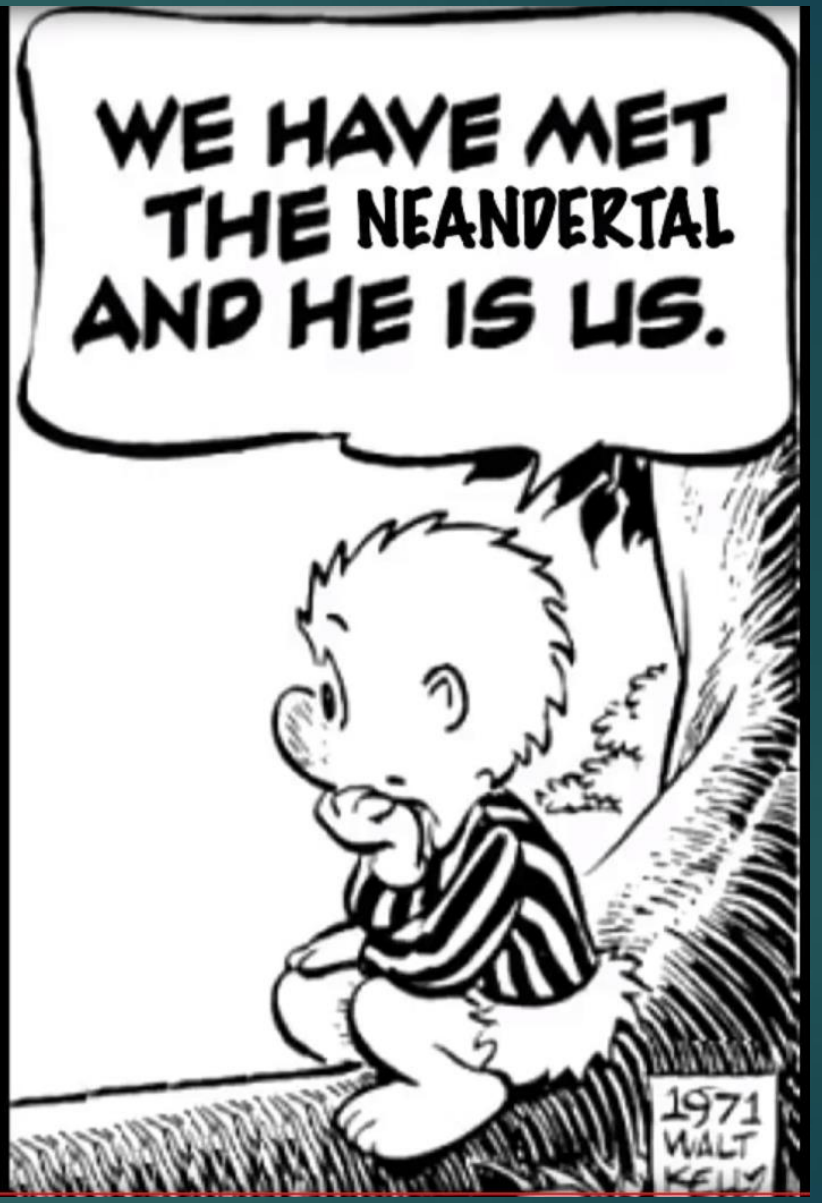
At Krapina Museum

N the Thinker



Sebastian Willnow/Getty Images

OR TAKE IT FROM POGO…
(with apologies)



Wolpoff: “I am proud to be a Neandertal”

Neandertal in fiction: Novels

J. H. Rosny-Aine – *La Guerre du feu*, 1911

J. Darnton - *Neanderthal: Their Time Has Come*

H.G. Wells – The Grisly Folk

Edison Marshall - *Dian of the Lost Land*

Philip K Dick – *The Simulacra*

Michael Crichton – *Eaters of the Dead*

Isaac Asimov - *Ugly Little Boy*

Robert Silverberg – *Child of Time*

Clifford Simak – *The Goblin Reservation*

William Golding - *The Inheritors*

William Shatner - Quest for Tomorrow

Jean M. Auel – *The Clan of the Cave Bear*

Robert J. Sawyer – *Neanderthal Parallax* trilogy: *hominins, Humans, Hybrids*

Jasper Fforde - *Thursday Next* series

Bjorn Kurten – *Dance of the Tiger*

Pat Jordan - Neanderthal

Michael Stewart – *Birthright*

Paul Levinson – *The Silk Code*

Stephen Baxter – *Evolution*

Harry Turtledove – *Down in the Bottomlands*

Terrence Hawkins - *American Neolithic*

Claire Cameron - *The Last Neanderthal*

Neandertal Films

- *Quest for Fire*, 1981
- *Ice Man*, 1984
- *The Clan of the Cave Bear*, 1986
- *Walking with Cavemen*, 2003
- *Clash of the Cavemen*, 2008
- *13th Warrior,* 1999
- *Neanderthal*, 2001
- The Croods, 2013

Documentaries about Ns

- Neanderthals Human Extinction BBC Documentary, 2008
  - https://www.youtube.com/watch?v=dWKCdChaLn0
- Neanderthal Apocalypse, 2015:
  - https://www.youtube.com/watch?v=ex4bc0RYNIE
- Decoding Neanderthals, Nova, 2013
- Are we the last neandertals? John Hawks
  - https://www.youtube.com/watch?v=0uRCVyJ7-0c

Neandertal Tourism

- Visitor centers and museums:
  - La Chapelle-aux-Saints
  - Le Moustier, France & Tursac Prhisto Parc & La Roque Saint-Christophe
  - Atapuerca, Spain
  - Krapina, Croatia
  - Neander Valley, Germany
  - Neanderthal Museum in Mettmann, Germany
  - Zagros Mountains, Iran
  - Dordogne region of France: Les Eyzies has National Museum of Prehistory
  - AMNH in NY – Hall of Human Origins
  - Smithsonian NMNH in DC – Hall of Human Origins (John Gurche reconstructions)

Neandertal Bibliography

- The Smart Neanderthal - C. Finlayson, 2019
- The Invaders: How Humans and Their Dogs Drove Neanderthals to Extinction – Pat Shipman, 2017
- *Neanderthals Rediscovered* - D. Papagianni & M. Morse, 2015
- *Neanderthal Man - In Search of Lost Genomes* – P. Svante, 2014
- *Thin on the Ground: Neandertal Biology, Archeology and Ecology* - Steven E. Churchill, 2014
- *How to Think Like A Neanderthal* – T. Wynn & F. Coolidge, 2012
- Katerina Harvati, *Neanderthals*, Evo Edu Outreach, 2010
- *The Humans Who Went Extinct* - C. Finlayson, 2009
- *The Neanderthals* - Friedemann Schrenk, Stephanie Müller, Christine Hemm, 2009
- *Neanderthals and Modern Humans* – C. Finlayson, 2004

Neandertal Bibliography

Neanderthal's Necklace – Juan Luis Arsuaga, 2004

The Last Neanderthal – I. Tattersall, 1999

Neandertals & Modern Humans in Western Asia – (Eds) T. Akazawa, K. Aoki, & O. Bar-Yosef, 1998

The Neandertal Enigma – James Shreeve, 1996

In Search of the Neanderthals - C. Stringer & C. Gamble, 1993

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The Neanderthals – E. Trinkaus & P Shipman, 1992

The Shanidar Neanderthals – E. Trinkaus, 1983

Neandertal Demise: An Archaeological Analysis of the Modern Human Superiority Complex. Villa P, Roebroeks W (2014), PLoS One 9(4)

Neandertals revised, Wil Roebroeks & Marie Soressi (2016), *PNAS*

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- Stringer, C., and W. Davies. 2001. Those elusive Neandertals. *Nature*. **413**:791-792.
- Tattersall, I., and J. H. Schwartz. 1999. Hominins and hybrids: The place of Neandertals in human evolution. *Proc. Natl. Acad. Sci*. **96**:7117-7119.
- Wolff, H., and A. D. Greenwood. 2010. Did viral disease of humans wipe out Neandertals?. *Medical Hypotheses*. **75**:99-105.

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