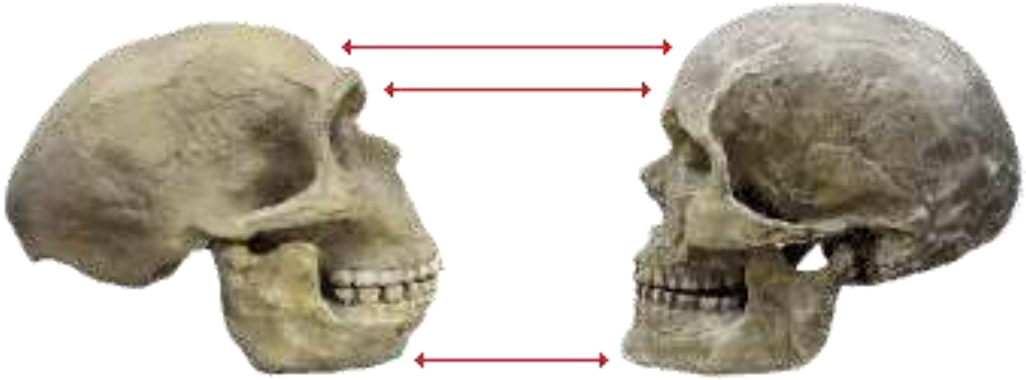
Neanderthals and Other Archaic *Homo sapiens*



Neandertal modern *Homo sapiens*

Homo erectus → Modern Humans

- The evolutionary dividing line between *Homo erectus* and modern humans was not sharp, but extended over several hundred thousand years.
- Some regions were ahead of others in the process of evolving into our species.
  - The evolutionary changes may have begun in Southern Europe and Northwest Africa by at least 600,000 years ago.
  - Elsewhere in the Old World, this change apparently began around 400,000 years ago.

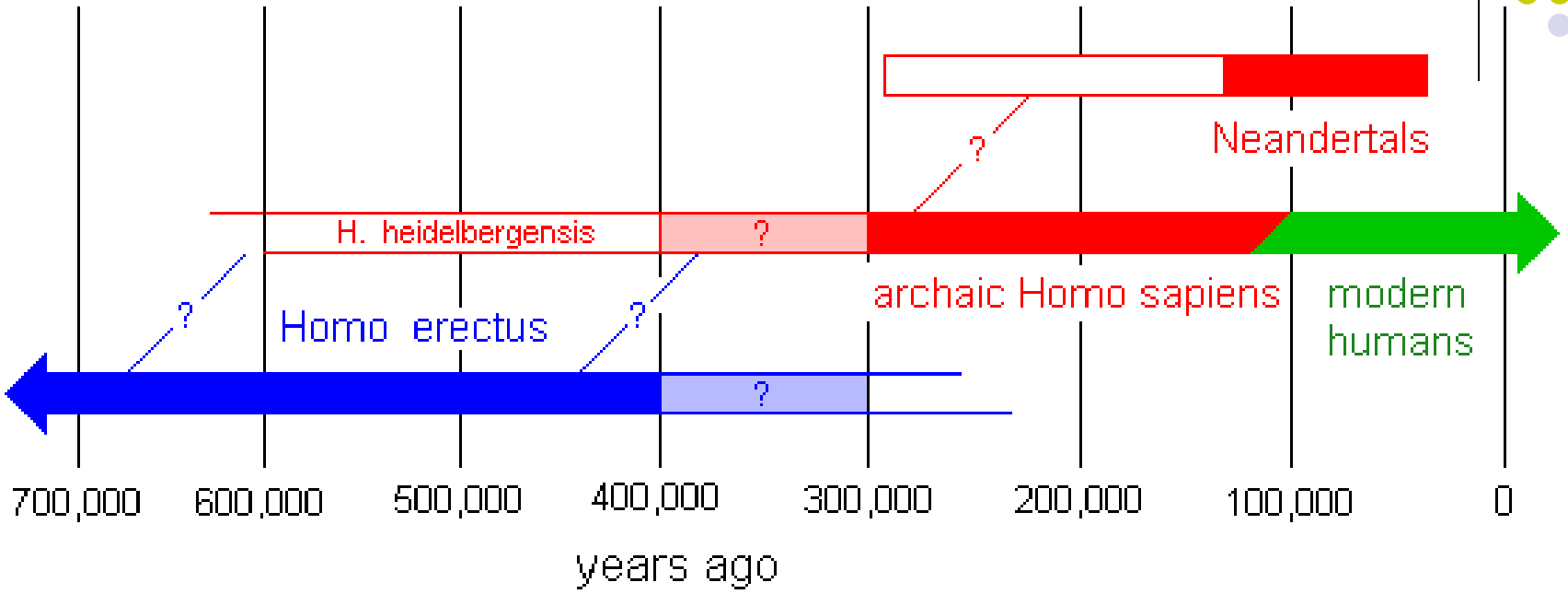
Early Archaic *Homo sapiens*

- The transition to *Homo sapiens* was not complete until around 100,000 years ago and even somewhat later in some regions.
- Early archaic forms show morphological changes compared with *H. erectus*:
  - brain expansion
  - increased parietal breadth
  - some decrease in the size of the molars
  - general decrease in cranial and postcranial robusticity

Early Archaic *Homo sapiens*

- Conservative taxonomy classifies all specimens as archaic forms within the species *Homo sapiens*.
- Other paleoanthropologists classify most specimens into other species of the genus *Homo*.
  - In this view, some earlier archaic forms could be ancestral to modern humans.

The Timeline

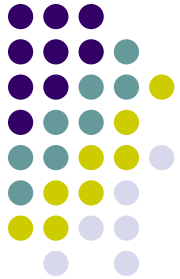


By 100,000 BP some of the later archaic *Homo sapiens* had evolved into modern *Homo sapiens*, and in at least one area of Southeast Asia, *Homo erectus* remained until around 60,000 years ago.

Archaic Homo sapiens Discoveries (Outside of Europe)

Site	Dates (ya)	Human Remains
Africa		
Bodo (Ethiopia)	Middle Pleistocene (600,000?)	Incomplete skull, part of braincase.
Broken Hill (Kabwe) (Zambia)	Late Middle Pleistocene; (130,000 or older)	Nearly complete cranium, cranial fragments, postcranial bones

Archaic Homo sapiens Discoveries (Outside of Europe)



Site	Dates (ya)	Human Remains
China		
Dali	Late Middle Pleistocene (230,000–180,000)	Nearly complete skull
Jinniushan	Late Middle Pleistocene (200,000)	Partial skeleton, including a cranium

Archaic Homo sapiens Discoveries in Europe

Site	Dates (y.a.)	Human Remains
Arago (Tautavel) (France)	400,000–300,000; date uncertain	Face; parietal perhaps from same person; cranial fragments; up to 23 individuals
Atapuerca Sima de los Huesos, northern Spain)	320,000–190,000, probably 300,000	Minimum of 32 individuals, including nearly complete crania

Archaic Homo sapiens Discoveries in Europe

Site	Dates (y.a.)	Human Remains
Steinheim (Germany)	Mindel-Riss Interglacial— 300,000–250,000; date uncertain	Nearly complete skull, lacking mandible
Swanscombe (England)	Mindel-Riss Interglacial— 300,000–250,000; date uncertain	Occipital and parietals

Review of Middle Pleistocene Evolution (400,000-125,000 ya)

- Like the *erects/sapiens* mix in Africa and China, fossils from Europe exhibit traits from both species.
- Fossils from each continent differ, but the physical differences are not extraordinary.
- There is a definite increase in brain size and a change in the shape of the skull.

Neanderthalensis

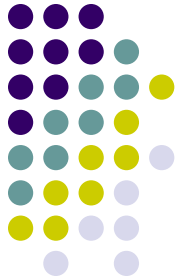
- The most well-known late archaic *Homo sapiens* were the Neandertals.
- More Neandertal skeletons have been found than any other ancient human species.
- They lived in Europe and Southwest Asia from about 130,000 years ago until at least 29,000 years ago.

Neanderthalensis

- It is likely that the Neandertals evolved from earlier archaic *Homo sapiens* or *Homo heidelbergensis* in Southern Europe.

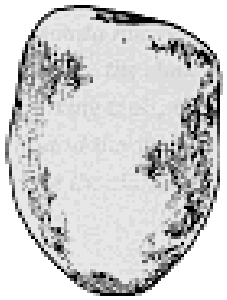
- Neandertal-like skull characteristics have been found in 300,000 year old fossils from Spain.

The Controversy

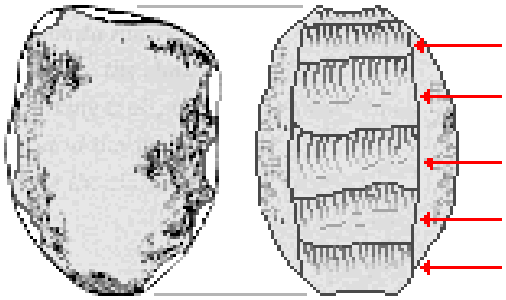


- No other ancient people have aroused more controversy and confusion than Neandertals.
- There is an on-going debate as to whether they should even be considered *Homo sapiens*.
- If they were members of our species, they were a different variety or race (*Homo sapiens neanderthalensis*).
- On the other hand, if they were dissimilar enough to be a distinct species, they should be called *Homo neanderthalensis*.

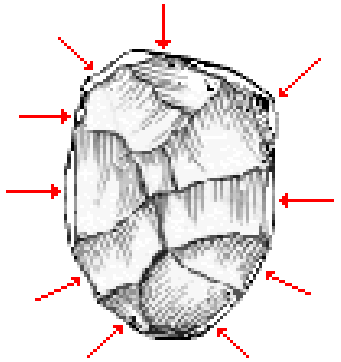
Middle Pleistocene Tools



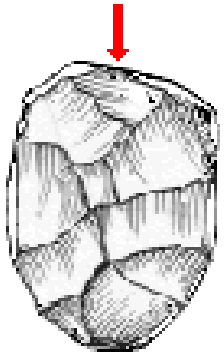
A large cobble of brittle fracturing rock (e.g., flint) is selected.



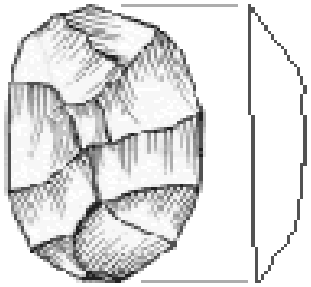
The cobble is percussion flaked around its perimiter to prepare the core.



One side is percussion flaked to produce a tortoise shell shape.

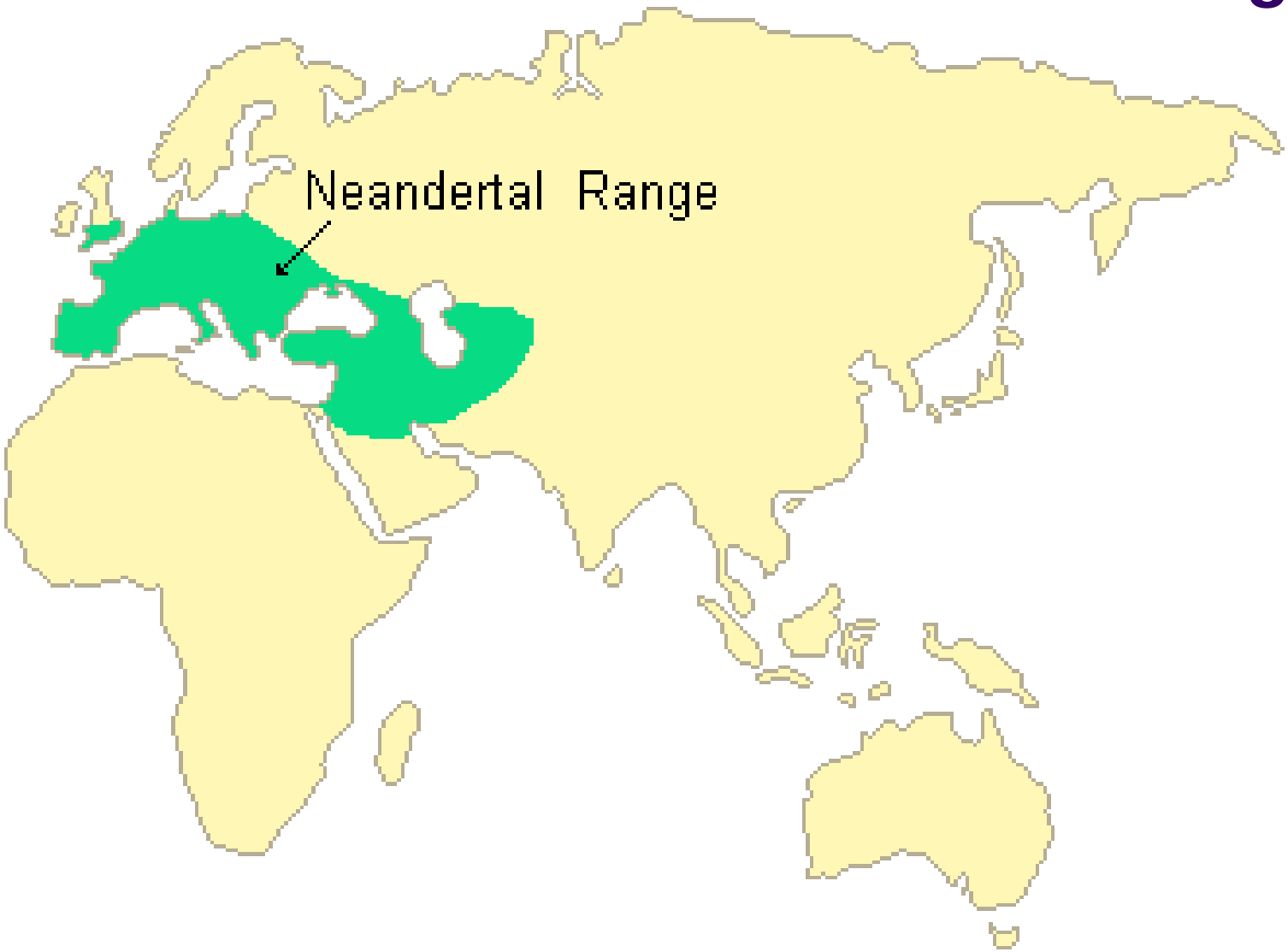


A heavy percussion blow at one end of the cobble removes a large flake that is convex on one side and flat on the other.



This Levallois flake is now ready to be used immediately for scraping and cutting or to be shaped into a specialized tool.

The Range

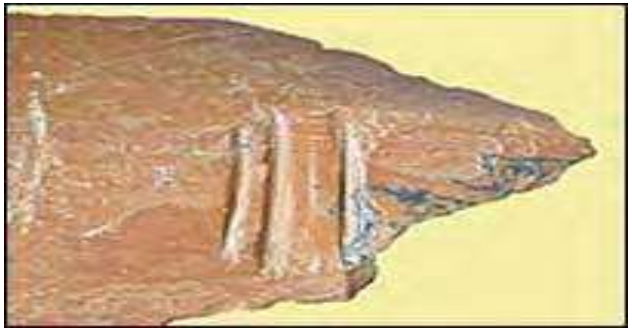


Settlements

- People lived in open sites, caves, and shelters.
- Windbreaks of poles and skin were placed at the cave opening for protection against severe weather.
- Fire was used for cooking, warmth, light, and keeping predators at bay.

Subsistence

- Remains of animal bones demonstrate that Neandertals were successful hunters.
- They used close-proximity spears for hunting (spear thrower and bow and arrow weren't invented until the Upper Paleolithic).
- Patterns of trauma in Neandertal remains match those of contemporary rodeo performers, indicating close proximity to prey.

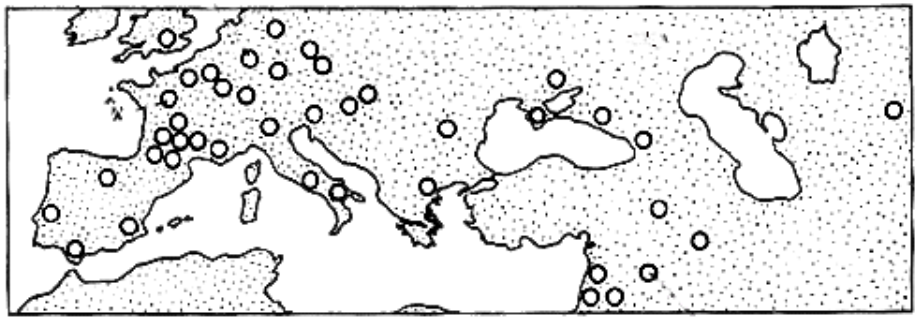


Symbolic Behavior

- Prevailing consensus has been that Neandertals were capable of articulate speech.
- Even if Neandertals did speak, they did not have the same language capabilities of modern *Homo sapiens*.
- The sense of cooperation and shared care-giving indicates a strong degree of communication within Neanderthal social groups.

Neanderthals Intentionally Buried Their Dead

- Burials included grave goods like animal bones and stone tools.
- The bodies of the dead were placed in flexed positions.



Neanderthal Discovery Sites

- In 1856 a discovery in Germany sparked the recognition that these bones were not just strange looking modern people.
- The discovery of a skull and other bones was made in a limestone cave deposit in the Neander Valley.
- That these bones were from an earlier variety of human was not yet conceivable to most of the scientific world in the 1850's.
- More than 400 Neandertal skeletons have since been discovered.

Chapelle-aux-Saints, France

In 1908 a nearly complete skeleton of an elderly man was recovered.

- The bones were analyzed by Marcellin Boule, who described the man as a dull-witted, brutish, ape-like creature who walked hunched over with a shuffling gait.
- This unfortunate mistaken view was universally accepted and applied to Neanderthals.
- It became the source of the popular images of cavemen that appear in cartoons.

Re-analysis of the La Chapelle-aux-Saints

- In the 1950's it became clear that a serious mistake had been made - this had been an atypical Neandertal.
- He was at least 40 years old with a somewhat hunched posture resulting from severe spinal arthritis.
- The bowing of his legs that may have resulted from rickets disease.
- He had lost most of his teeth and part of his jaw, resulting in a disharmonic looking face.
- Despite these deforming infirmities, it is now clear that the man was much more like us in appearance than had been believed.

Neanderthal Anatomy

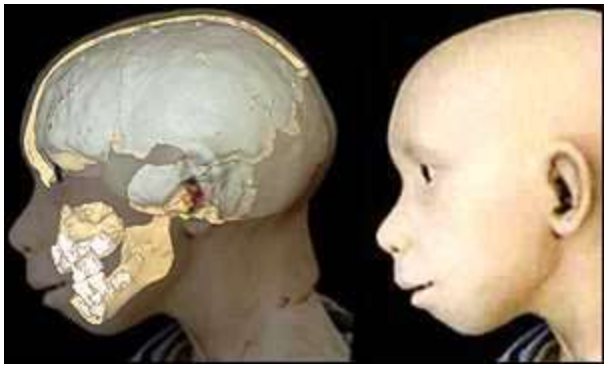
- The Neandertals were physically diverse, but generally larger boned and more heavily muscled than modern humans.
- Some of the Southwest Asian Neandertals were less robust in appearance.
- The thickness and high density of their leg bones suggests that they did a great deal of walking and running.
- These traits were likely adaptations to an aggressive hunting and gathering way of life, as well as to the cold climate.
- Adult skeletons frequently have multiple healed bone fractures.
- Some researchers believe the broken bones were the result of hunting large game animals.

- They were not only strong but quite flexible.
- The Neandertals were relatively short - adult males averaged just over 5 feet tall.
- They probably stood as erect as we do.
- Neandertal heads were long (from front to back) compared to ours.
- This resulted in low, sloping foreheads.
- They had relatively large brow ridges and noses.
- They lacked the pointed chin that is common in modern *Homo sapiens*.
- These traits give the Neandertal face and head an appearance more reminiscent of late *Homo erectus* than of modern people.

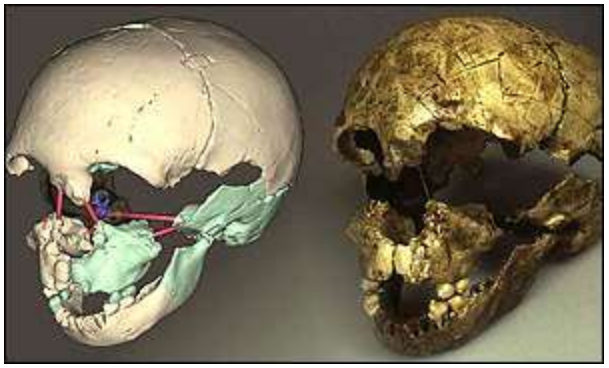
The brain size of Neandertals was larger on average than that of modern people.

- Larger brain and body sizes are metabolically more efficient in cold climates and are usually selected for.
- This trend has been observed among contemporary populations living in sub-arctic environments of North America.
- It is not surprising that the Neandertal, who were adapted to ice age conditions in Europe, also had large brains.

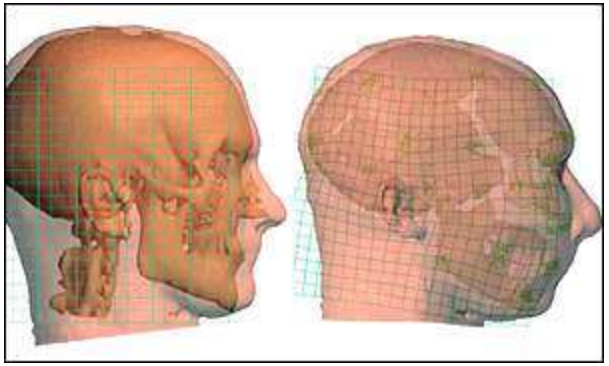
Reconstructing the Face of Neanderthal



Modelling the soft tissue.

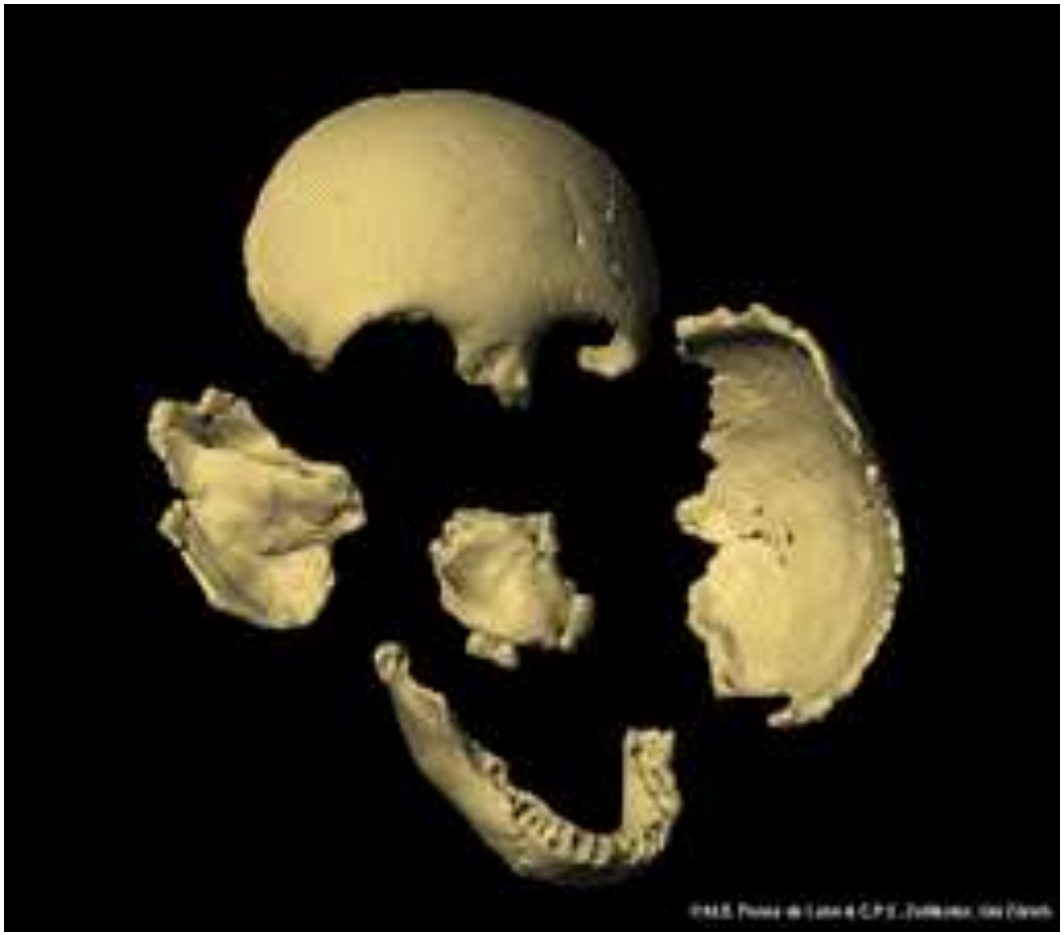


Virtual and stereolithographic reconstructions of a Neanderthal child.



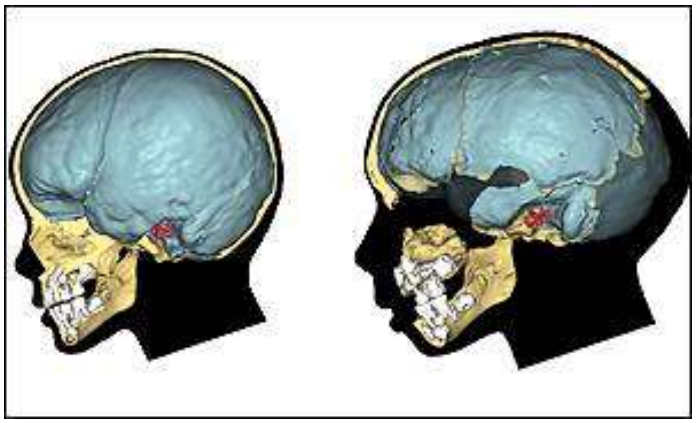
Clinical CT and MRI data (left) were used to construct the face of an adolescent Neanderthal.

Reconstructing Fragmented Remains



The model reconstruction of a Neanderthal child.

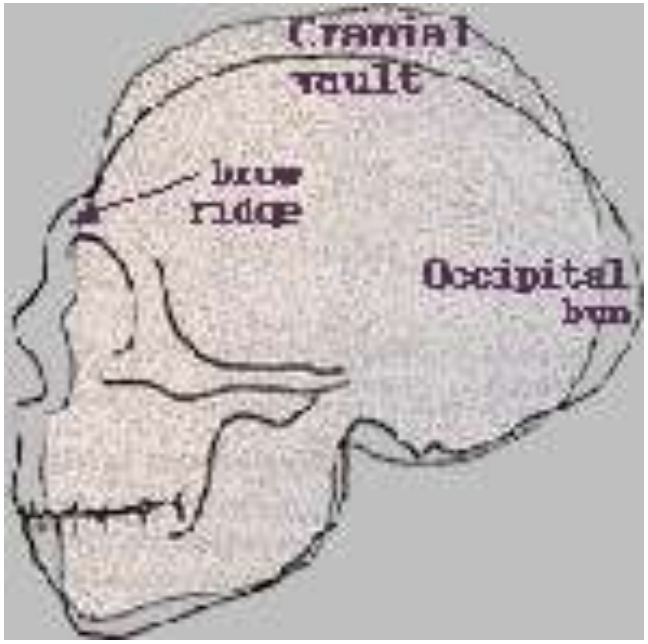
Comparison of Cranial Capacities



A modern human child (left) and a Neanderthal child (right)

	range (cm3)	**average** (cm3)
chimpanzees	300-500	----
australopithecines	400-530	----
Homo habilis	500-750	631
Homo erectus	800-1250	1000
Neandertals	1300-1750	1400
modern *Homo sapiens*	900-2300	1345

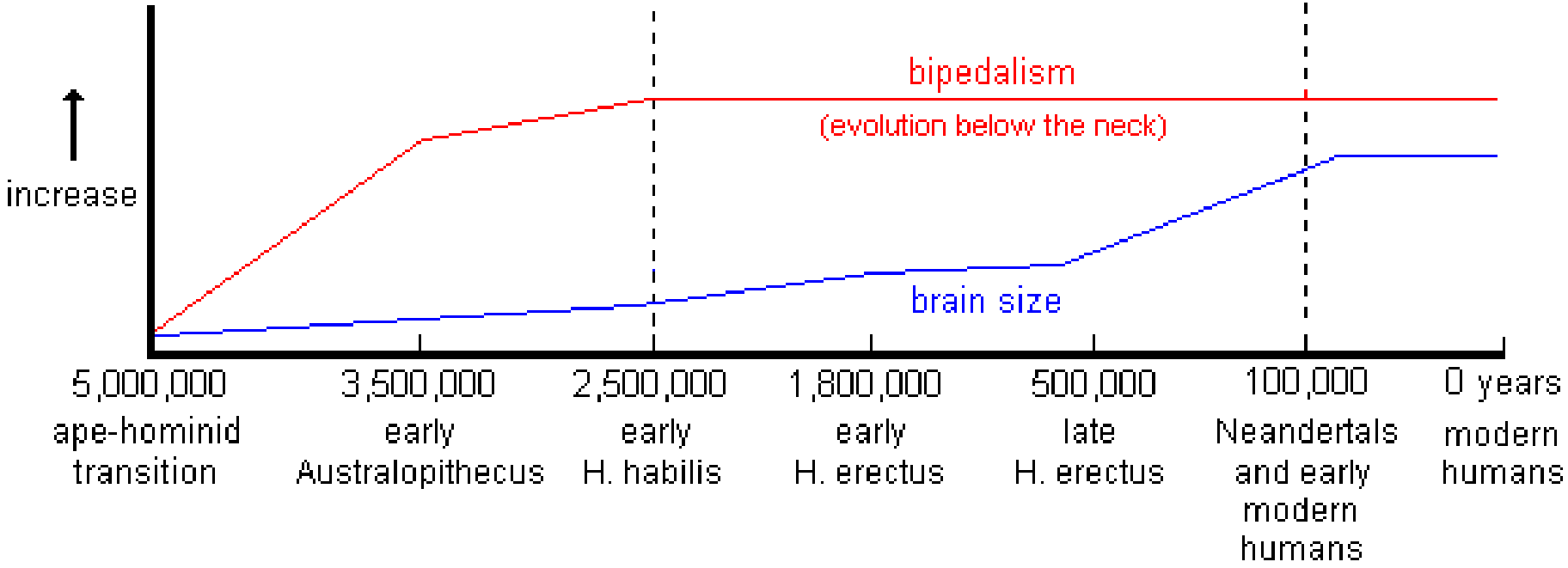
Intelligence

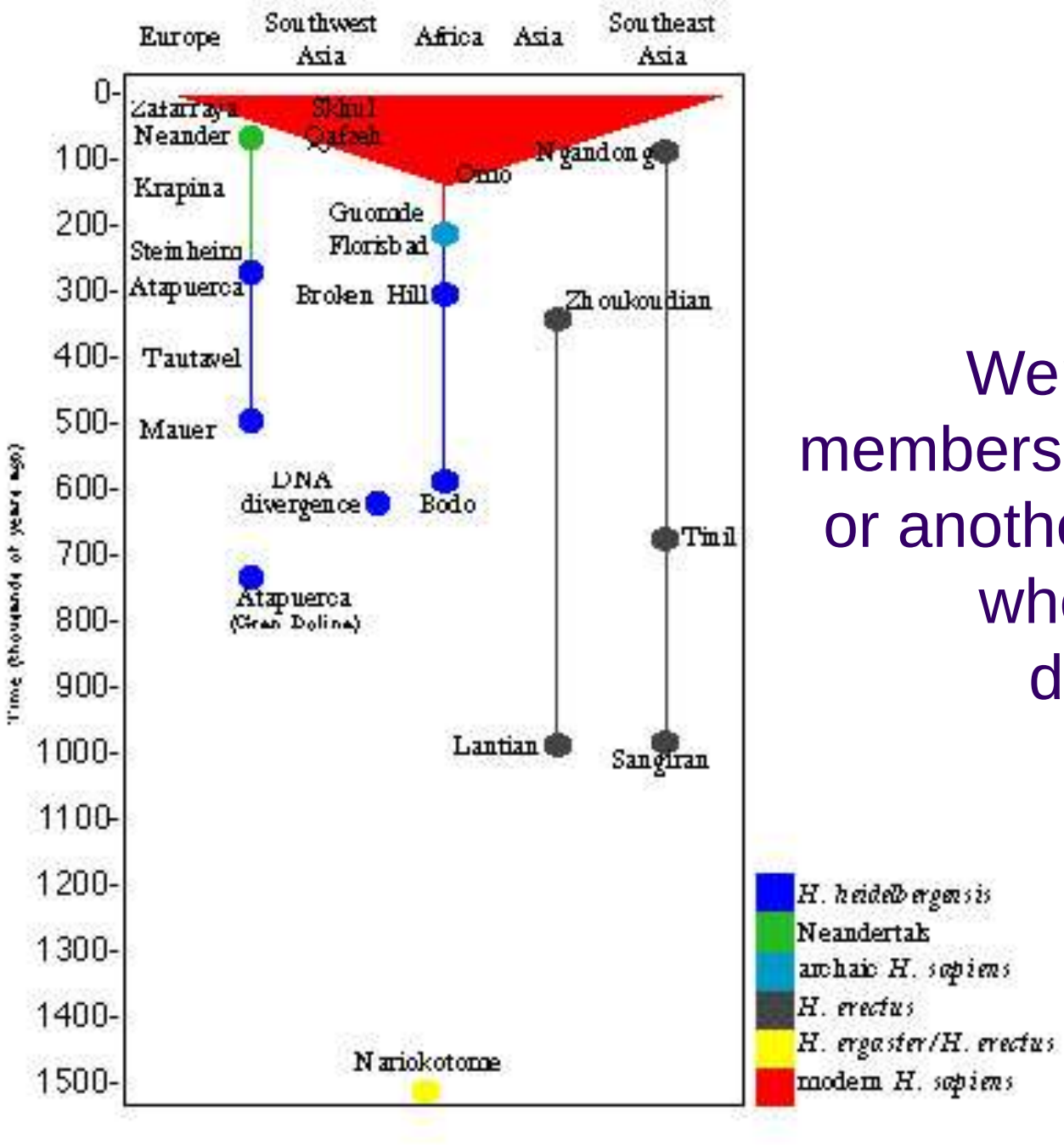


Brain size is not directly correlated with intelligence among modern people.

- The gross difference in cranial capacity between the earliest human species and recent *Homo sapiens* probably does reflect potential intelligence differences.
- In order to trace the development of intelligence, speech, and other mental capabilities, it is more useful to examine changes in specific brain regions.

It is now clear that the development of upright bodies and bipedal locomotion far preceded the evolution of the large human brain.



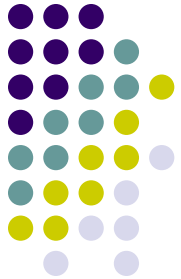


Were Neandertals members of our species or another species with whom we share a distant common ancestor?

No…Neanderthals Are Not Part of the Immediate Family

- A 3.5 gram bone sample from a 50,000-40,000 year old Neandertal from was tested for mtDNA.
- The researchers found 27 amino acid differences between this sample and random samples from modern humans and chimpanzees.
- This data suggested the common ancestor lived about 690,000-550,000 years ago.
- If these results are duplicated with similar tests from other Neandertals, it would strongly support the view that Neandertals were not a member of our species and were not our ancestors.
- This does not preclude occasional interbreeding between Neandertals and early modern humans.

Yes…Neanderthals Are Part of the Immediate Family

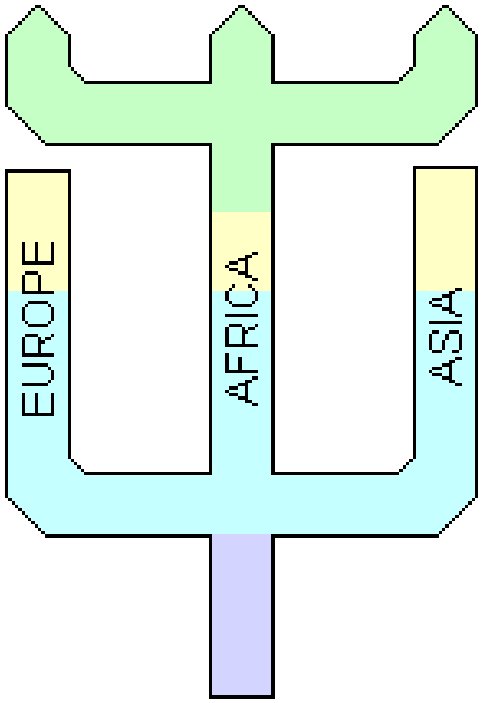


- The 1999 discovery of a child's skeleton dating to 24,500 years ago – exhibiting a mixture of Neandertal and modern human anatomical characteristics suggests he was a hybrid.
- This was 4-5,000 years after the last known Neandertal – with the implication that some Neandertals interbred with modern humans.
- If so, the genetic difference between the two groups must not have been as great as would be expected between two distinct species.
- This would suggest that Neandertals were a variety of *Homo sapiens* rather than a distinct species, and at least some people may share Neandertal genes.

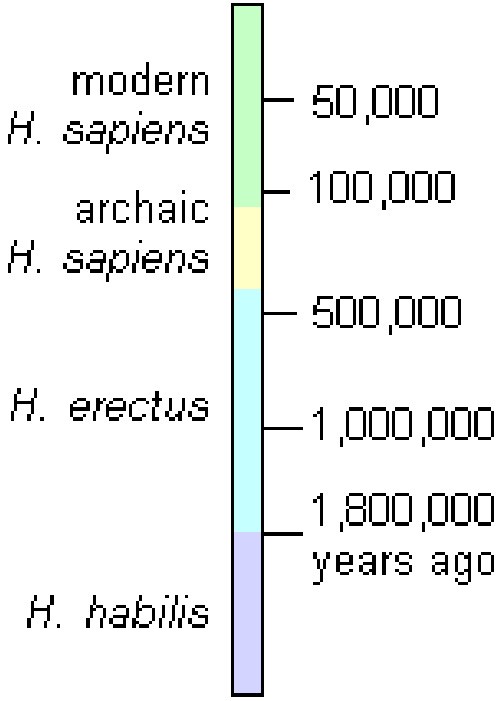
Regardless of the Family Lineage – this is a Successful Story of Adaptation

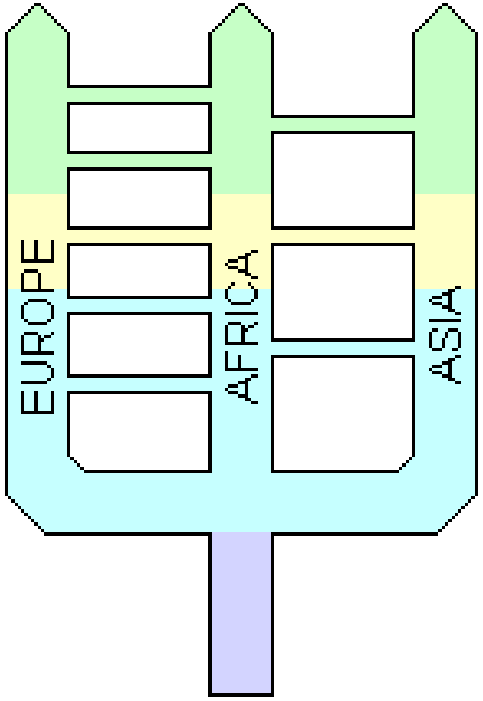
- Neandertals were the first humans to live successfully in sub-arctic environments during an ice age.
- They first appeared in Europe during an interglacial.
- With the onset of the ice age, some Neandertals migrated to Israel and Iraq where it was warmer.
- Others adapted to the increasingly severe climatic conditions of Southern and Central Europe – primarily with new cultural inventions.

Population Expansions



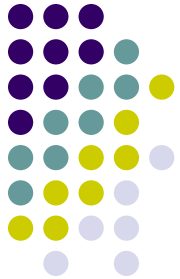
Replacement Model





Regional Continuity Model

Three Major Evolutionary Transitions



1. The transition from early *Homo* to *Homo erectus*.

   - Geographically limited to Africa and occurred rapidly.

2. The transition from *Homo erectus* to archaic *Homo sapiens*.

   - Not geographically limited, but occurred slowly and unevenly.

3. The transition from archaic *Homo sapiens* to anatomically modern *Homo sapiens*.