

# HOMO NEANDERTHALENSIS



## Homo neanderthalensis

- Lived about 200,000-300,000ya
- The most recent pre-modern human.
- First discovered in Neanderthal valley in Germany.
- Since then fossils have been found throughout Europe and Western Asia
- Cave-dwelling hunter-gatherer's
- They were able to build shelters from hides.
- Lived in bands of 8-15 individuals.
- Females were believed to move between different groups.
- Groups were territorial –range 50Km<sup>2</sup>
- Cared for injured and aged.
- Decorated and buried the dead.

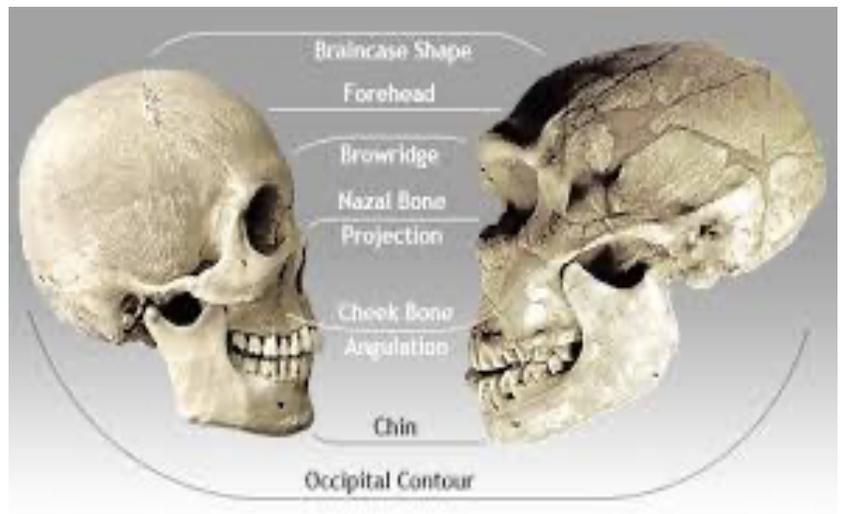
## CHANGE IN STATURE

The change in stature to the robust body form is likely to have been a response to selection pressures from a colder climate, especially during ice ages.

The reduced surface area:volume ratio which results in reduction of heat loss from the surface of the body

## Physical Characteristics

- Robust (heavily built) skeletons with a barrel chest.
- The limb bones were thicker, with prominent ridges suggesting the attachment of powerful muscles.
- Males Height 1.64-1.68 Weight 65Kg
- Females 1.52 – 1.56 Weight 54Kg
- Mean brain size 1,500cm<sup>3</sup> compared with 1,375 of modern humans.
- A Broca's area present; evidence of language.
- Genome analysis shows presence of FOXP2 gene, present in modern humans and involved in speech production.
- Skull lower and longer and bulged out at the sides.
- There was a prominent 'bun' at the rear of the skull.
- The teeth and jaws were more strongly developed, the protruding chin of modern humans was absent .
- The incisors were especially large and wear patterns suggest they may have been used as 'pliers' in the working of hides.
- There were prominent brow ridges, indicative of strong jaw muscles.
- A significantly large nose- likely to have been an adaptation for humidifying and warming cold, dry air.
- Size of holes in the skull and vertebrae through which nerves pass provide evidence that neanderthals had neural connections to the tongue, diaphragm and chest muscles that would have allowed for articulation of intricate sounds and the control of breathing for speech.



## NEANDERTHAL GENOME

- In 2008, scientists published the full sequence of Neanderthal mtDNA.
- The genome was released in 2010
- Genome analysis indicates that Neanderthals may have interbred with co-existing early *H.sapiens*.
- Researchers compared the Neanderthal genome with that of current humans in France, China, sub-Sahara Africa, Papua New Guinea and found about 1-4% of the genes of non-Africans came from Neanderthals.
- This indicates gene flow from Neanderthals to *H.sapiens* must have occurred early in the migration of modern humans out of Africa, as the same proportion of Neanderthal genes, occur in people of France, China and Papua New Guinea.
- No evidence of reverse gene flow exists
- Dating indicates interbreeding occurred between 86,000 and 37,000ya. With the most likely period between 65,000 – 47,000ya.
- Comparisons of mtDNA (together with fossil evidence) indicate that *H. sapiens* and *H. neanderthalensis* shared a common ancestor about 500,000 – 400,000ya.
- This common ancestor may have been *H. Heidelbergensis*, who ranged across Europe and Africa about a half a million years ago.
- About 350,000 ya, their ranges became allopatric; *H. heidelbergensis* living in Europe evolved into *H. neanderthalensis*, while *H. heidelbergensis* living in Africa evolved into *H. sapiens*, who left Africa about 70,000 -60,000ya to subsequently cover the world.

**Some scientists maintain that genes common to Neanderthals and Homo sapiens are derived from a common ancestor and not interbreeding.**

Within the Neanderthal genome there have been discovered:

1. a gene for red hair and fair skin
2. FOXP2 gene – occurs in modern humans and is essential for forming complex motor neurons involved in speech.
3. There is the possibility that some neanderthals had type O blood produced in modern humans by a homozygous recessive genotype.



## EXTINCTION

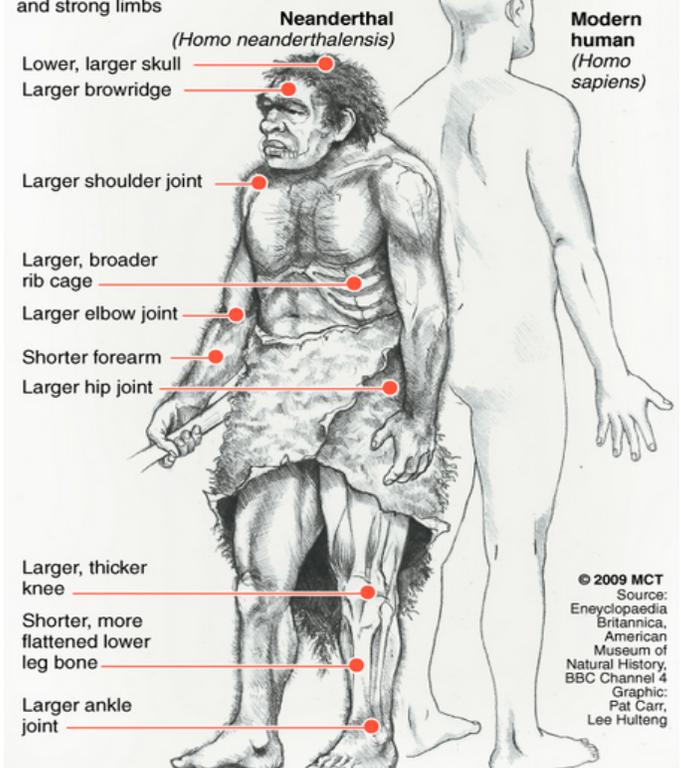
- Lived between 300,000 and 30,000 ya –Middle Paleolithic. This period included the most recent Pleistocene ice ages and Neanderthal survival.
- This period must have demanded physical toughness and resourcefulness.
- Neanderthals were an 'evolutionary dead end'.
- The reason for their extinction is still debated and could be a combination of:
  - i. End of ice age and increased temperatures could have exceeded the tolerance of Neanderthals.
  - ii. Rising temp could have turned forests to grasslands - habitat change could have reduced the hunting success of neanderthals.
  - iii. Rising temps – extinction of Neanderthals food source.
  - iv. Niche overlap with *H. sapiens* – as *H.sapiens* infiltrated Neanderthals' range about 80,000ya. The more sophisticated social structure, language and tools enabled *H.sapiens* to outcompete *H.neanderthalensis*

## Neanderthals and humans

Anthropologists announced they have created a complete Neanderthal genome using ancient DNA samples. Neanderthals, the closest ancestor to modern humans, became extinct over 30,000 years ago.

### How they compare to us

Fossil evidence suggests that Neanderthals were muscular, with broad shoulders and strong limbs

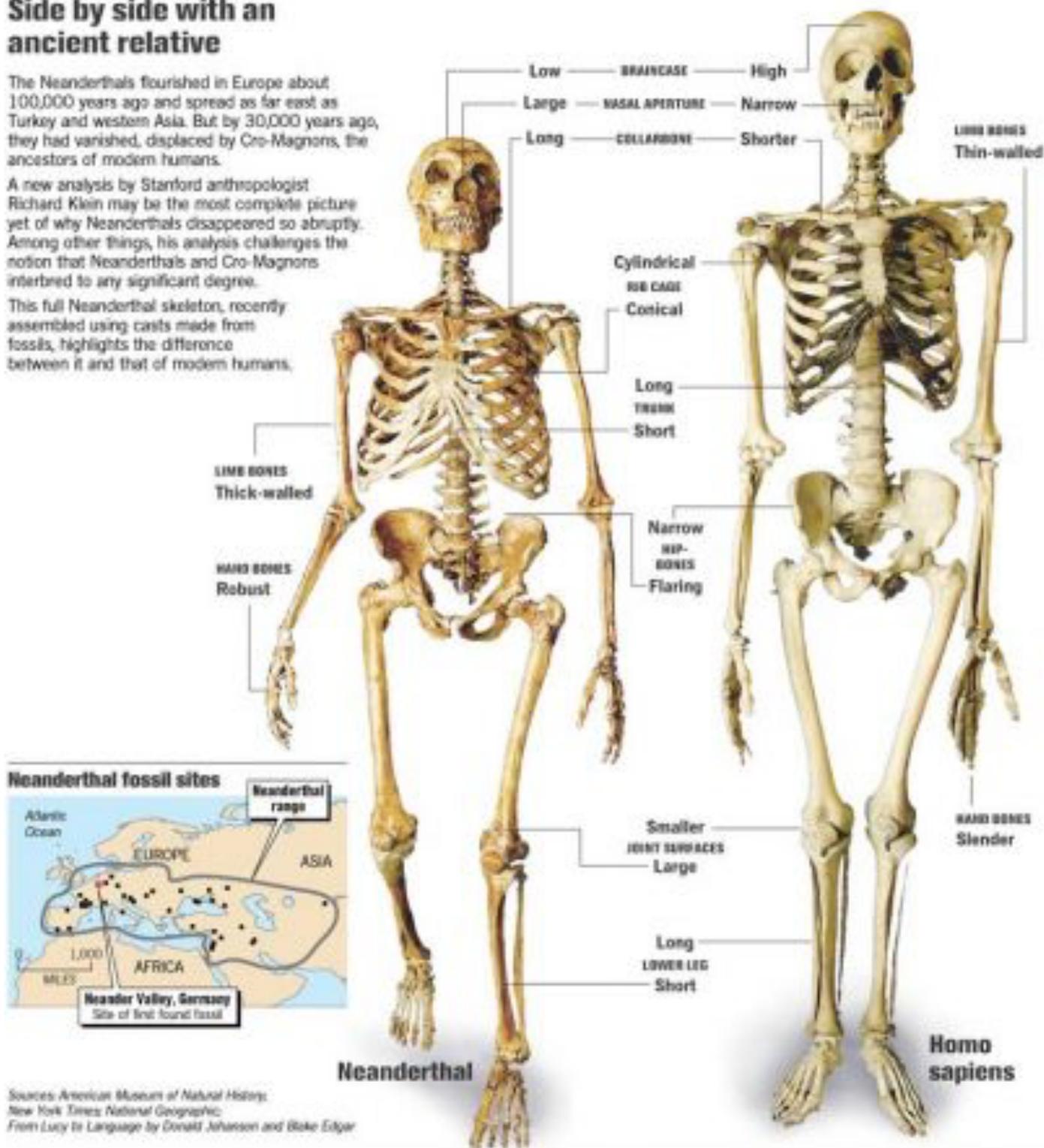


## Side by side with an ancient relative

The Neanderthals flourished in Europe about 100,000 years ago and spread as far east as Turkey and western Asia. But by 30,000 years ago, they had vanished, displaced by Cro-Magnons, the ancestors of modern humans.

A new analysis by Stanford anthropologist Richard Klein may be the most complete picture yet of why Neanderthals disappeared so abruptly. Among other things, his analysis challenges the notion that Neanderthals and Cro-Magnons interbred to any significant degree.

This full Neanderthal skeleton, recently assembled using casts made from fossils, highlights the difference between it and that of modern humans.



Sources: American Museum of Natural History; New York Times; National Geographic; From Lucy to Language by Donald Johanson and Blake Edgar

## MtDNA ANALYSIS

## PHYLOGENETIC TREES FROM RESTRICTION MAPS

## CALIBRATING THE TREE