

Human Evolution

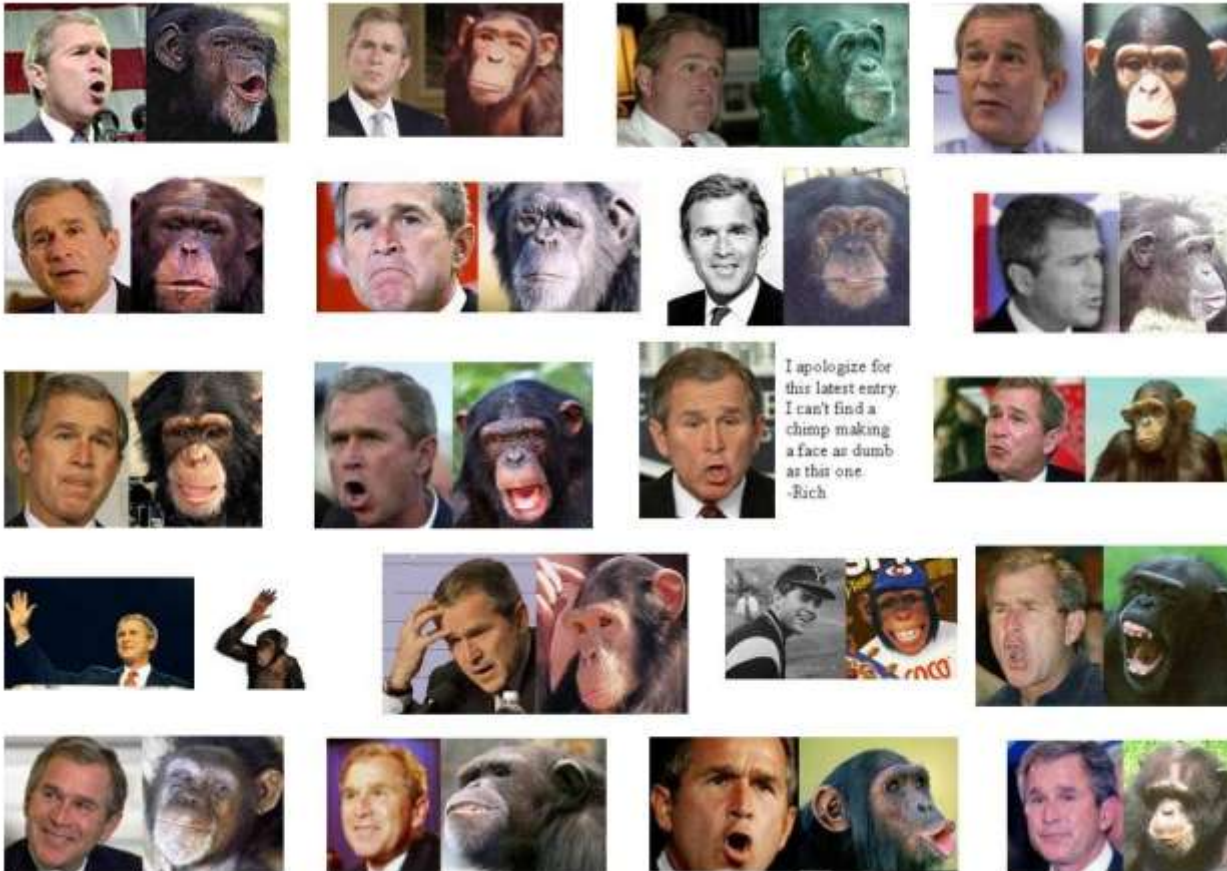
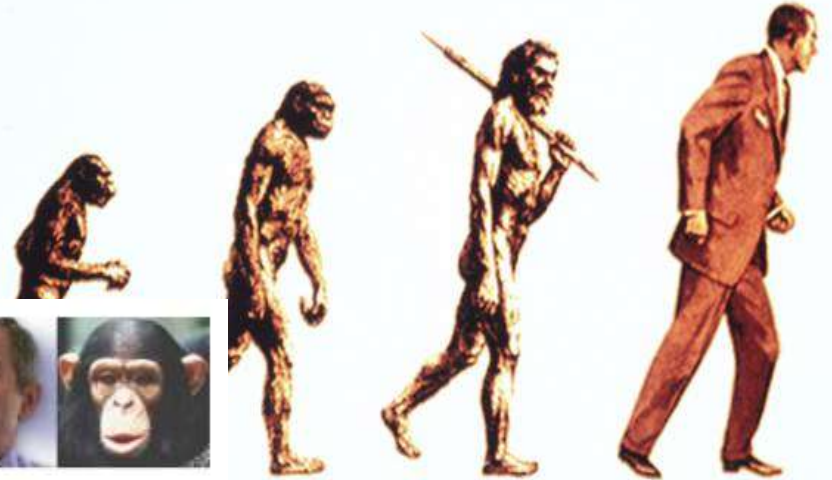
Chris Stringer

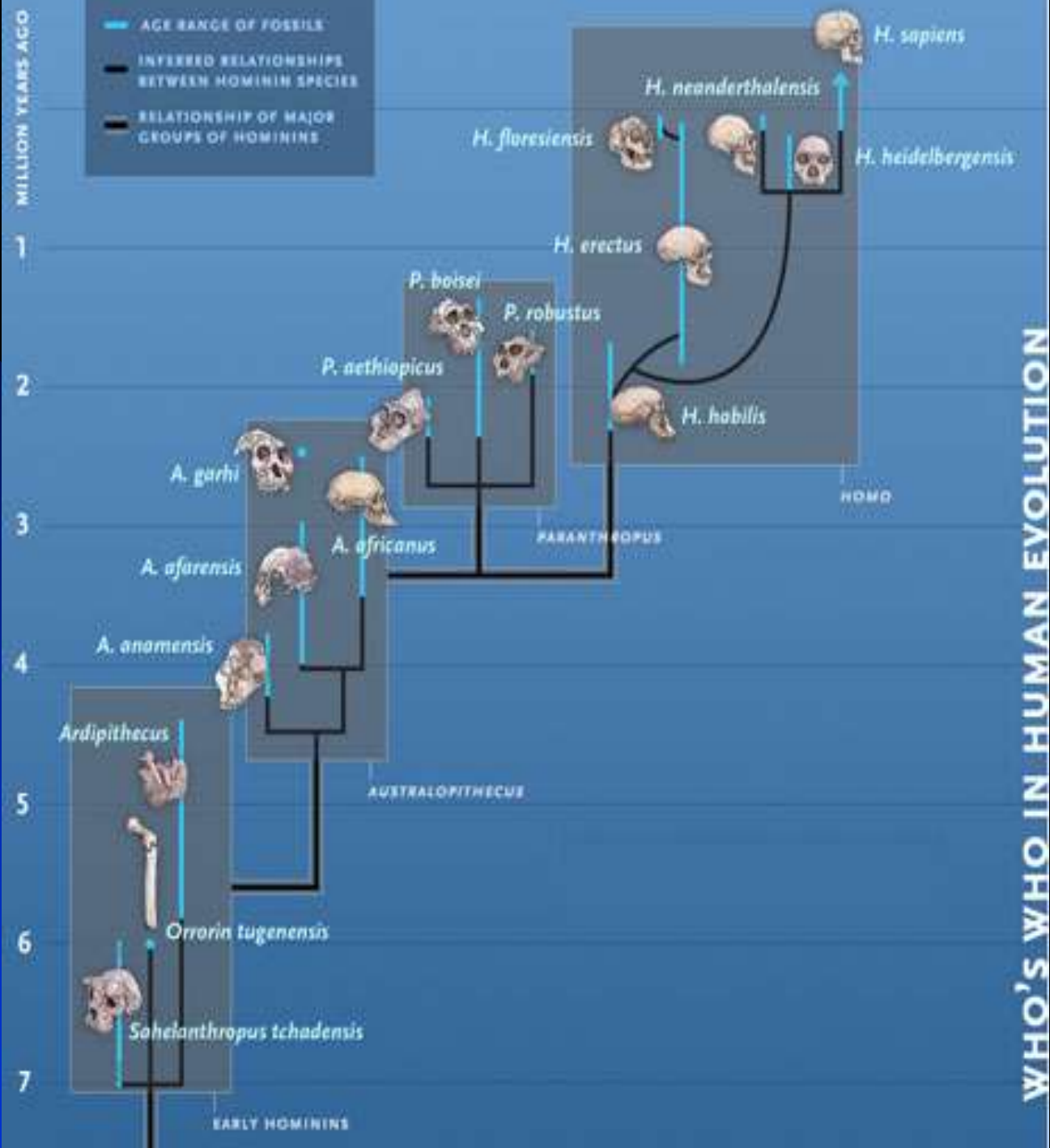
The Natural History Museum

London

Are we nearly there yet?

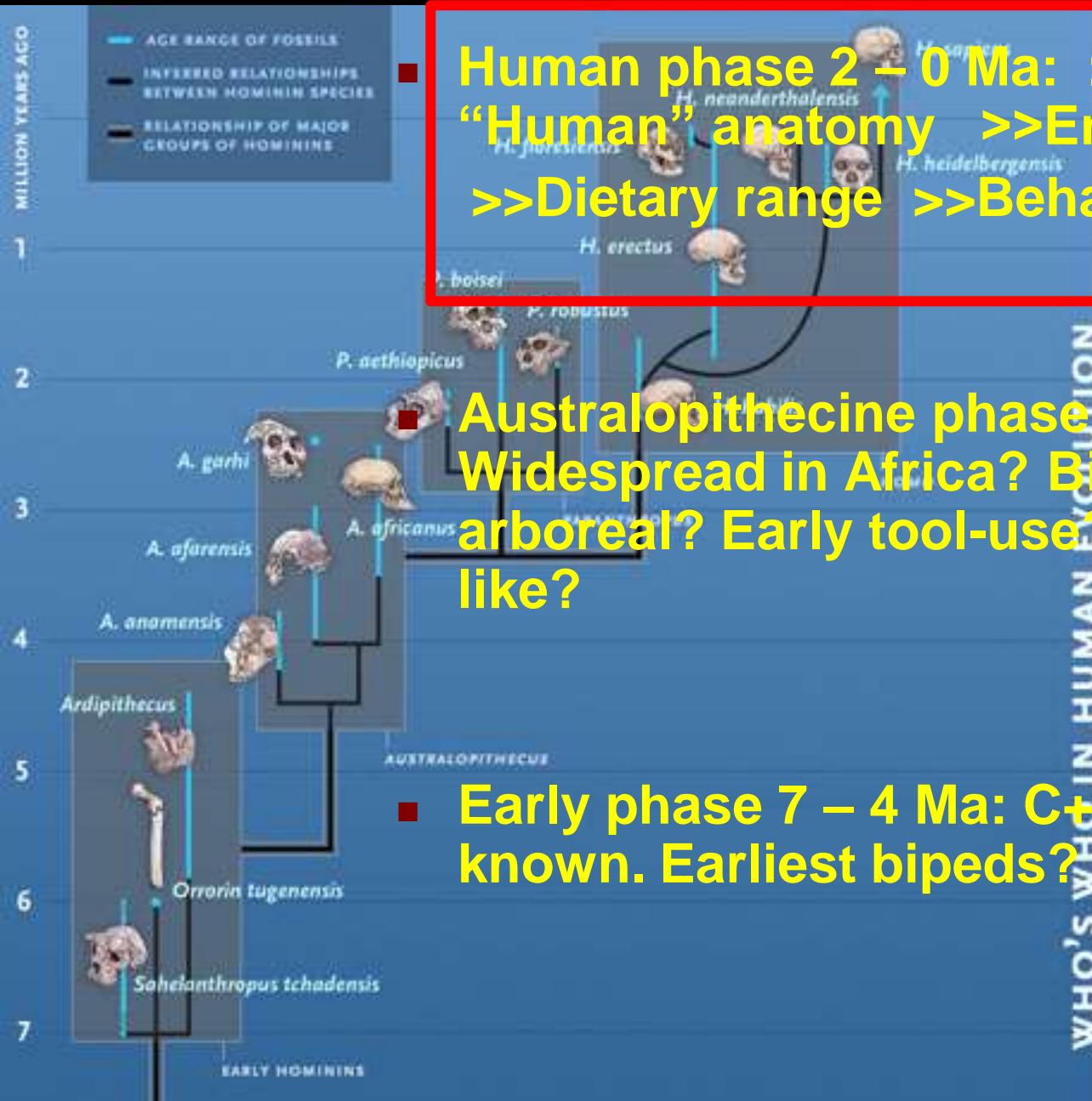
Are we nearly there yet?





WHO'S WHO IN HUMAN EVOLUTION

“Phases” of human evolution



■ Human phase 2 – 0 Ma: >>Global spread
“Human” anatomy >>Encephalised
>>Dietary range >>Behavioural complexity

■ Australopithecine phase 4 – 2 Ma:
Widespread in Africa? Bipedal but still partly
arboreal? Early tool-use? Predom. still ape-
like?

■ Early phase 7 – 4 Ma: C + E. Africa. Still poorly
known. Earliest bipeds? Largely ape-like?

Neanderthals and “Hobbit” extinct
Homo sapiens Out of Africa 2
Homo sapiens in Africa

Early Neanderthals in Europe

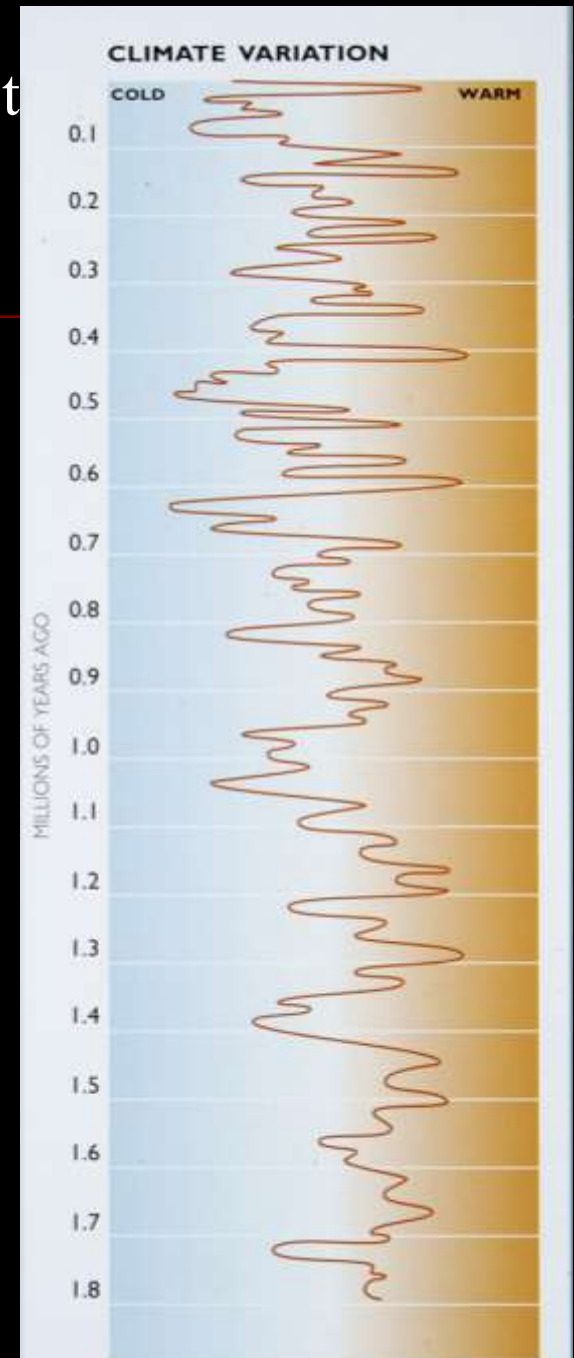
Changes in glacial intensity

First humans in N. Europe/Britain?

Some “recent” events in human evolution

First humans in S. Europe?

First humans in Far East?
Out of Africa 1?



Homo heidelbergensis
Homo antecessor

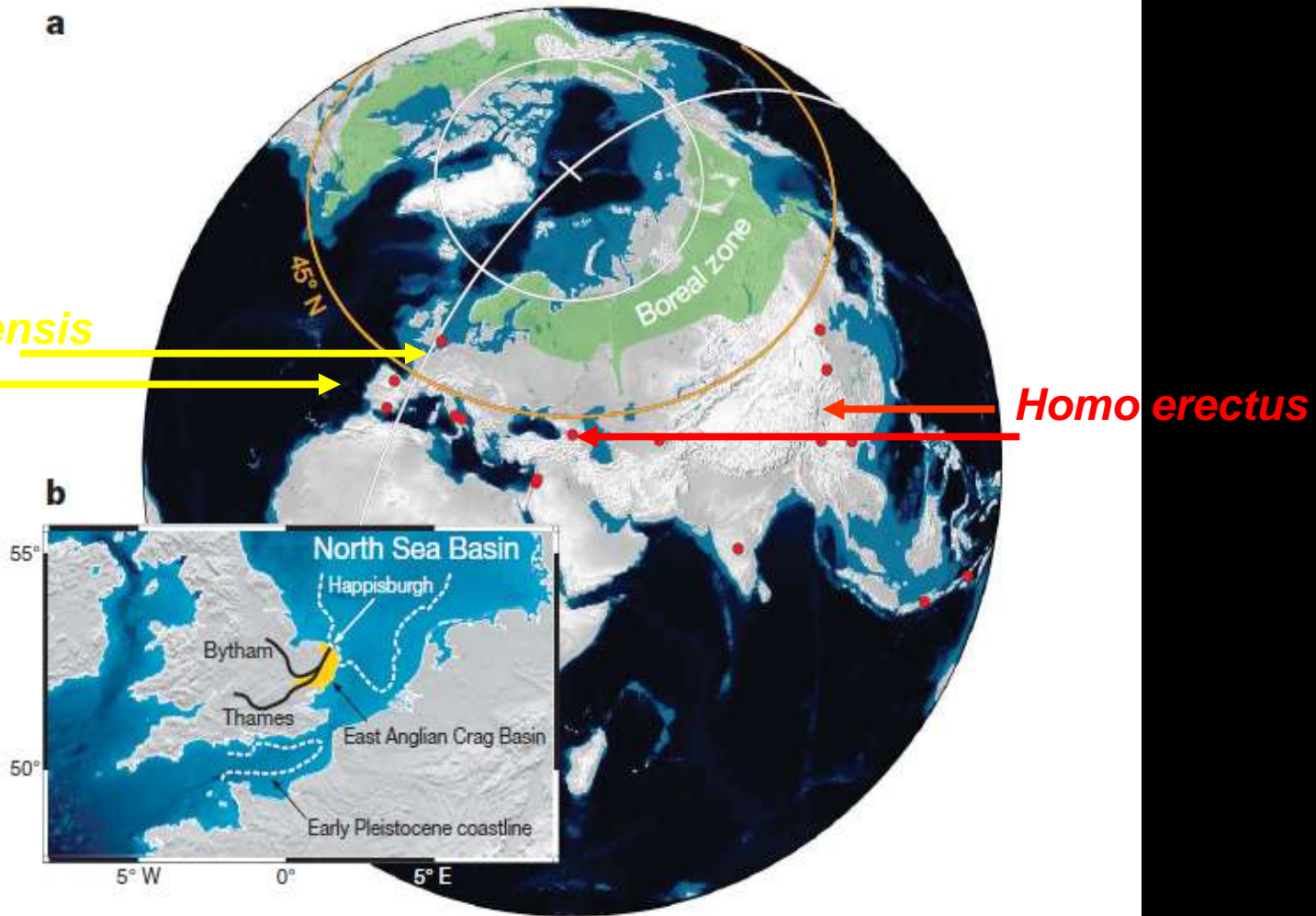
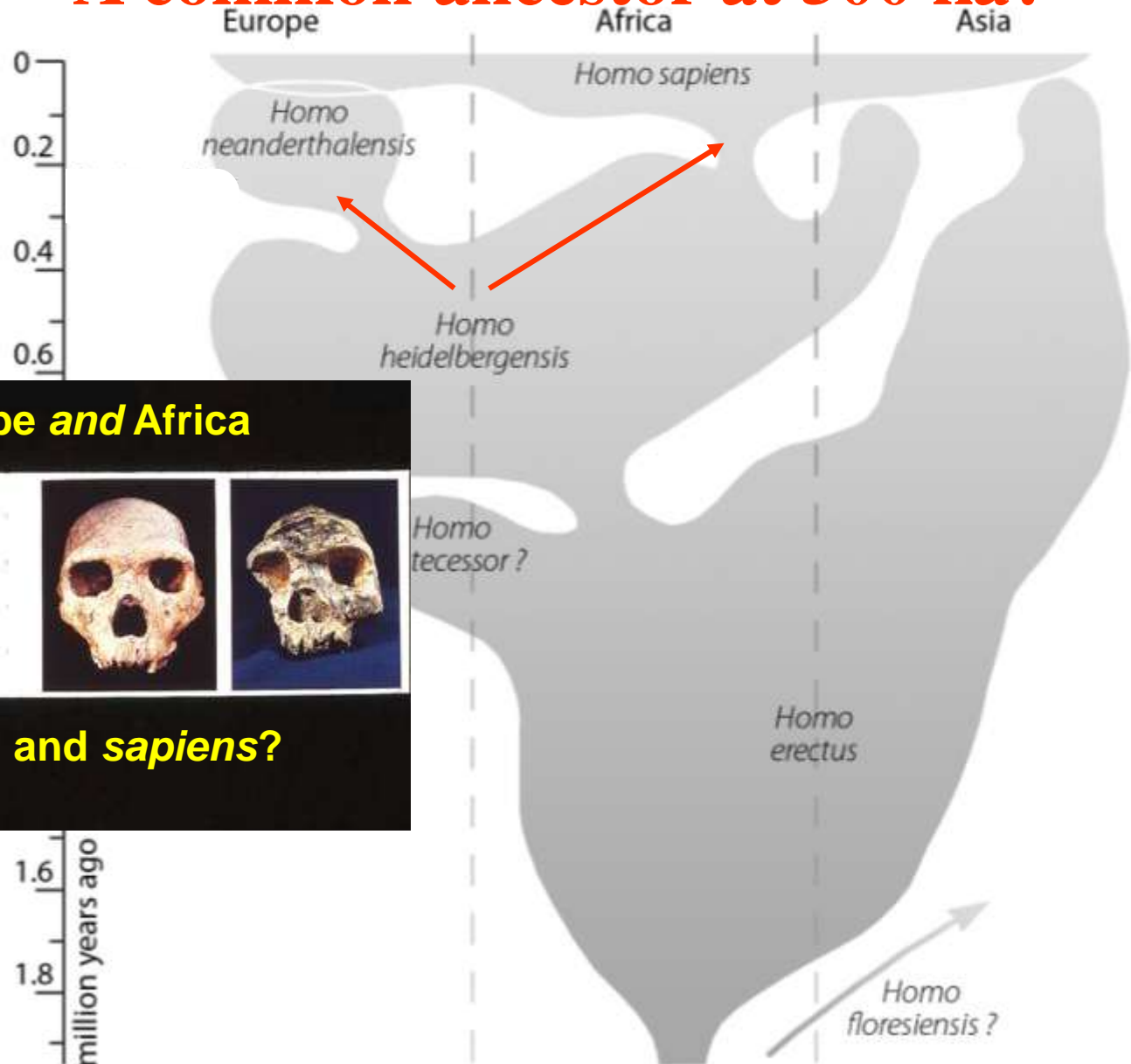


Figure 1 | Location of Happpisburgh and other Early Pleistocene archaeological sites in Eurasia. **a**, Key Early Pleistocene archaeological sites (red dots) in relation to 45° N and the present-day boreal zone. **b**, Reconstruction of the palaeogeography of northwest Europe at the time of the human occupation at Happpisburgh, showing the Thames draining into the North Sea ~ 150 km to the north of its present-day estuary.

Homo heidelbergensis Mauer ~600ka?



A common ancestor at 500 ka?



H. heid. in Europe and Africa



LCA of Nea. and sapiens?

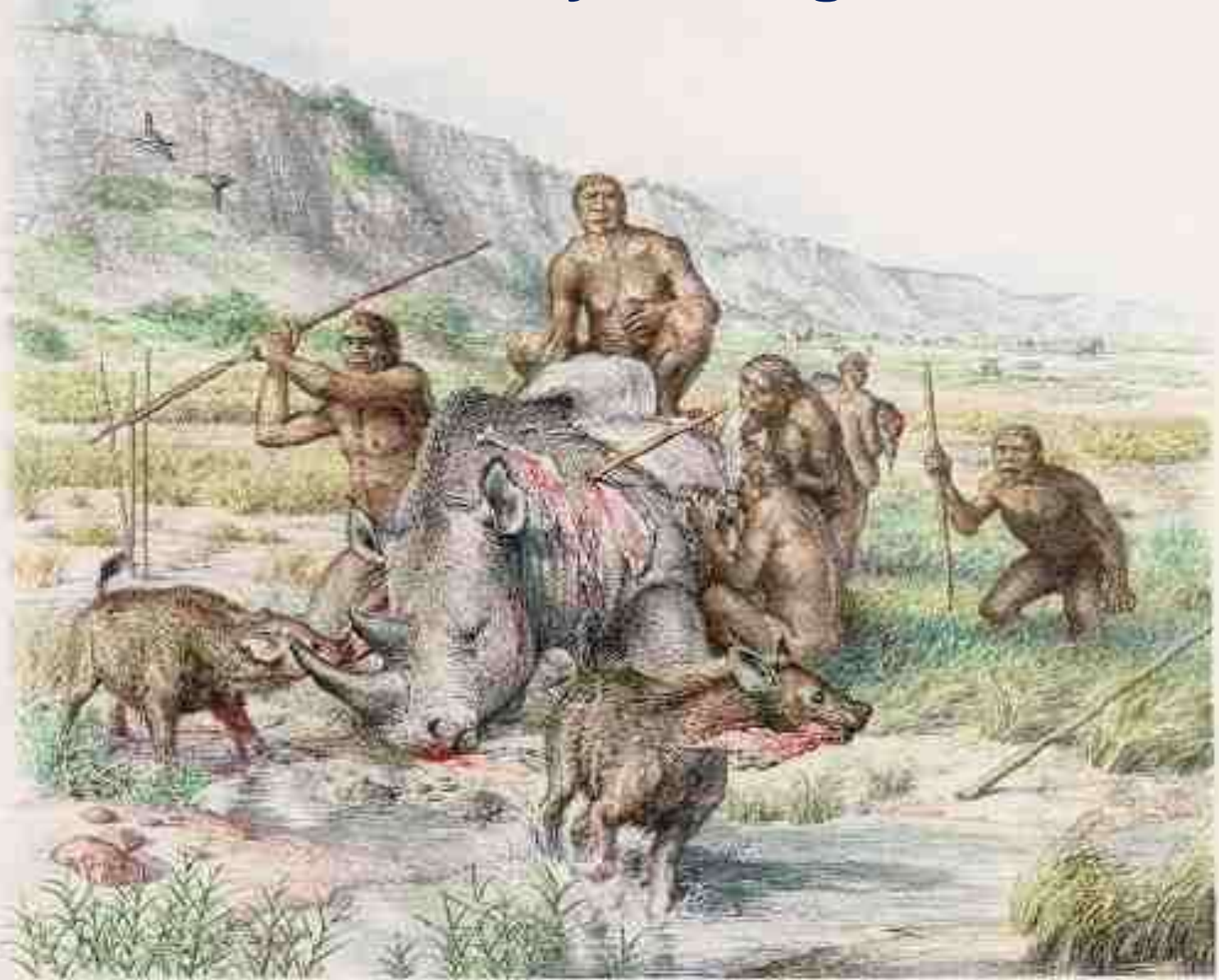
The Boxgrove Quarry



Boxgrove



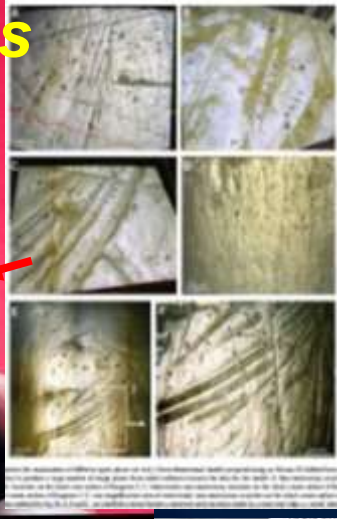
Sussex 500,000 years ago



**Boxgrove
~500ka**

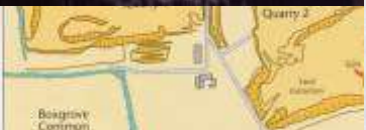
Homo heidelbergensis

Site
(Right) This reconstruction of a male individual from Boxgrove is based on the large



People were also drawn by the presence of flint in the chalk cliffs – an excellent source of raw material from which they could produce the most characteristic stone tool found at Boxgrove – the handaxe, of which over 300 examples have been excavated. Because the hard surfaces at Boxgrove were repeatedly covered over by gently flowing water, covering them with a fine silt, these ancient surfaces have been preserved with only minimal disturbance. The preservation is so good that the exact places where people crouched down to make their stone tools have been preserved, as every flake of flint they struck off is still lying where it fell some half a million years ago. Not only that, but the bones of the animals they ate are also there, surrounded by tools, and often covered in butchery marks.

The handaxes, which are predomi-



The Boxgrove Project

Why does *heidelbergensis* need such a big brain?



H. erectus (Sangiran)

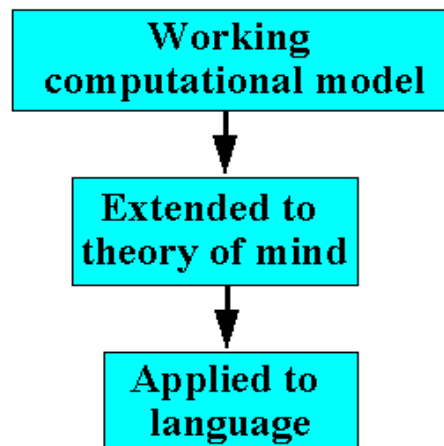
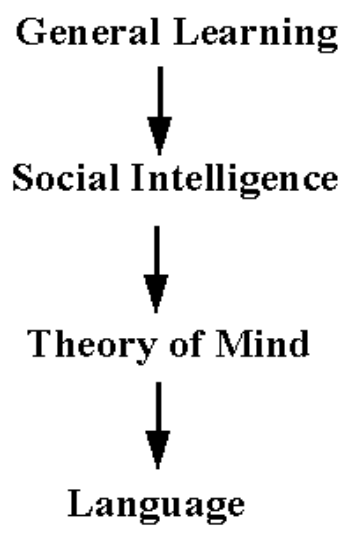
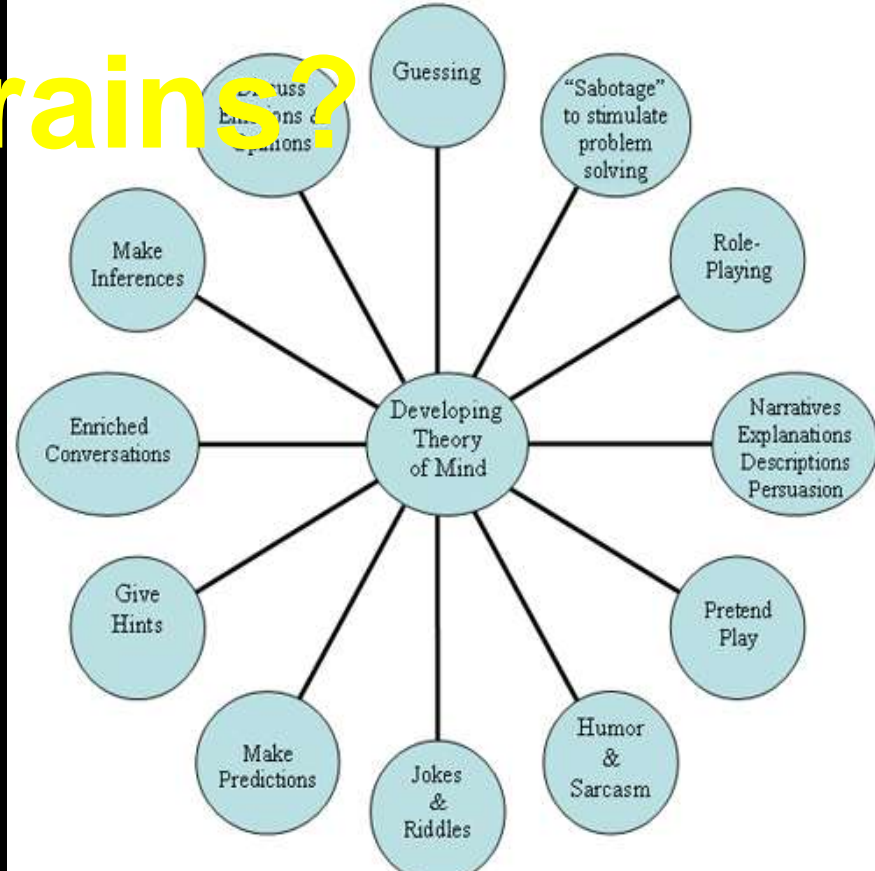


H. heidelbergensis (Broken Hill)

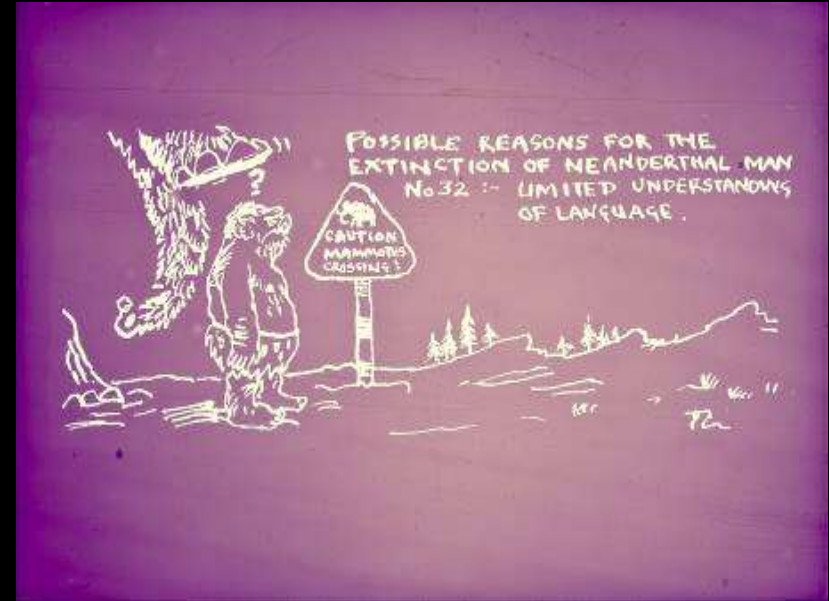
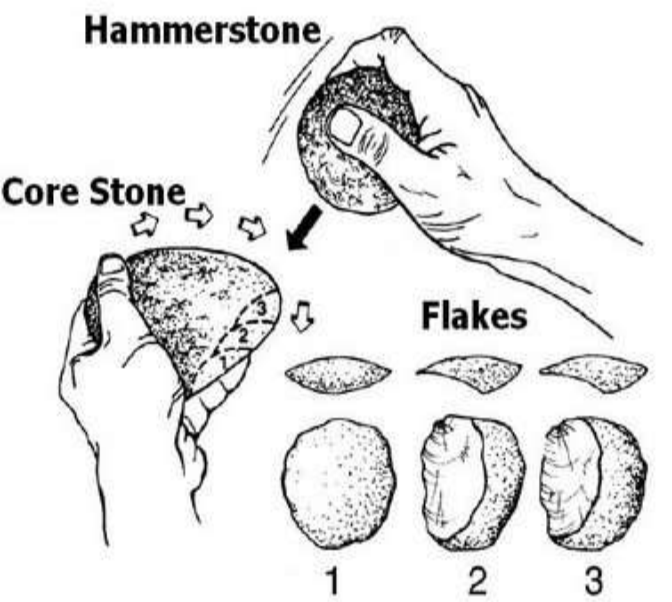
Social brains?

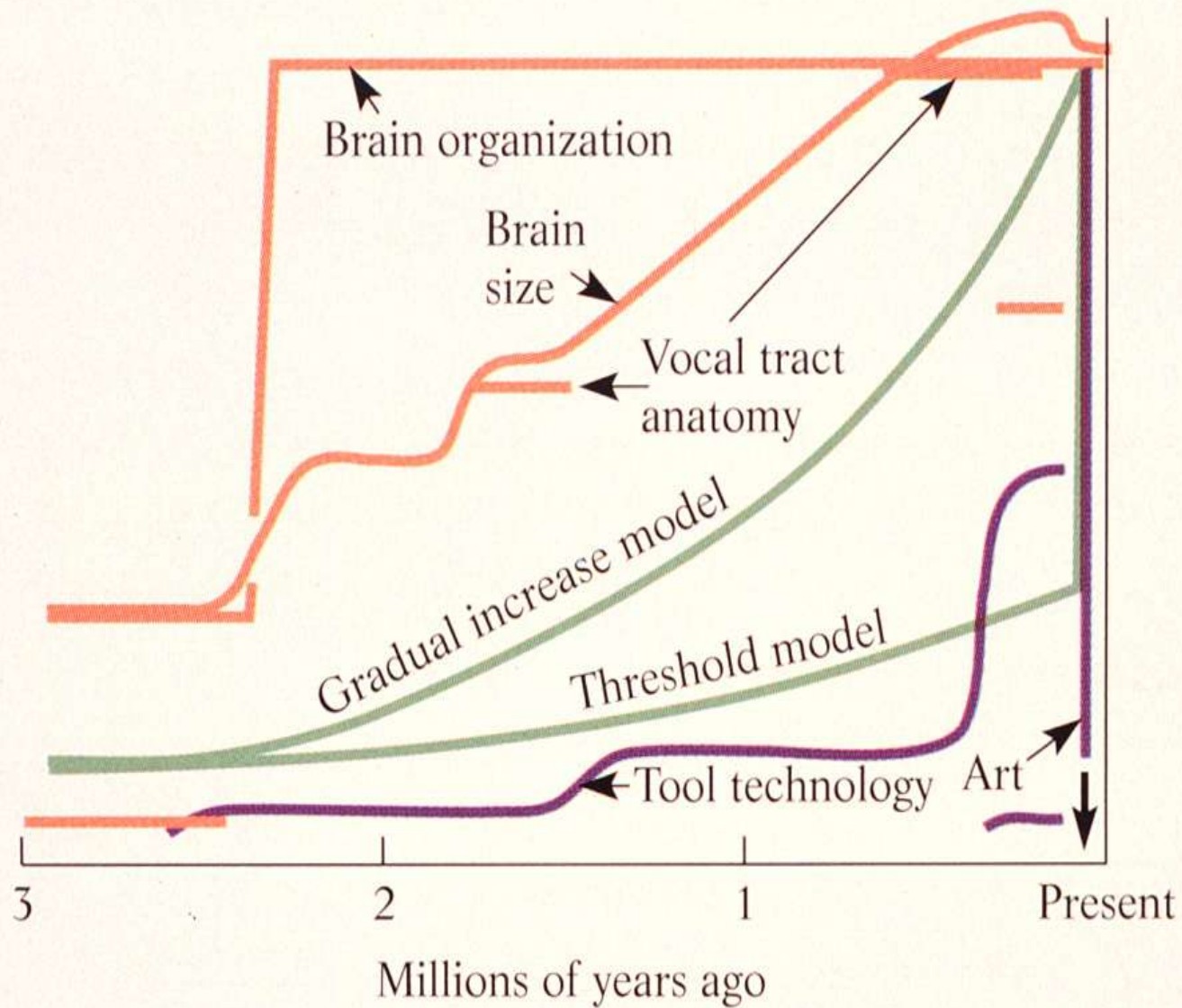


- Mammals
- Primates
- Great Apes
- Mankind



Language?





- Models of language emergence
- Archeological evidence
- Paleontological evidence

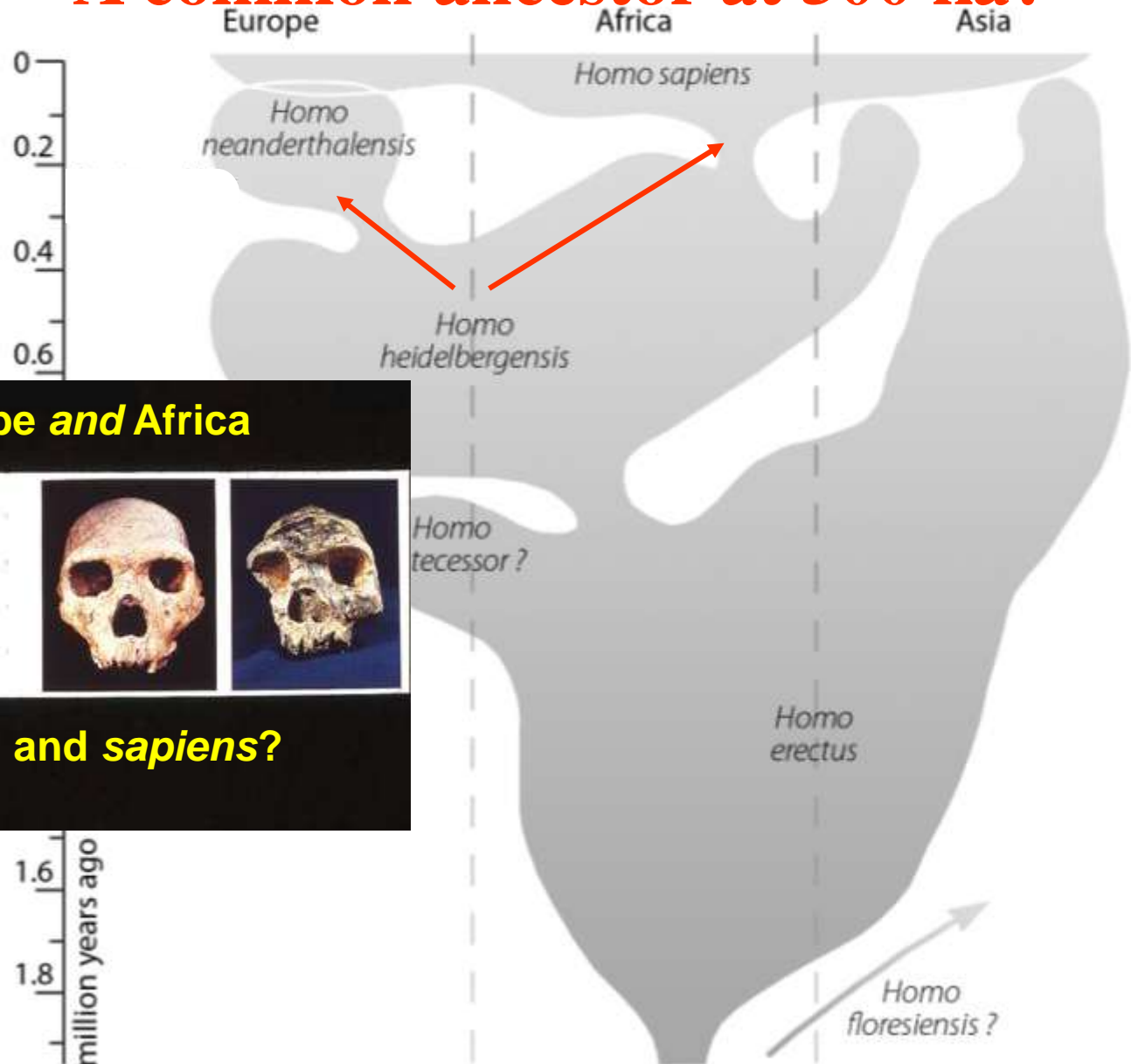
The Enigma of the Handaxe

and spears.....



If they were talking to each other, they were saying the same thing, over and over and over...
Desmond Clark

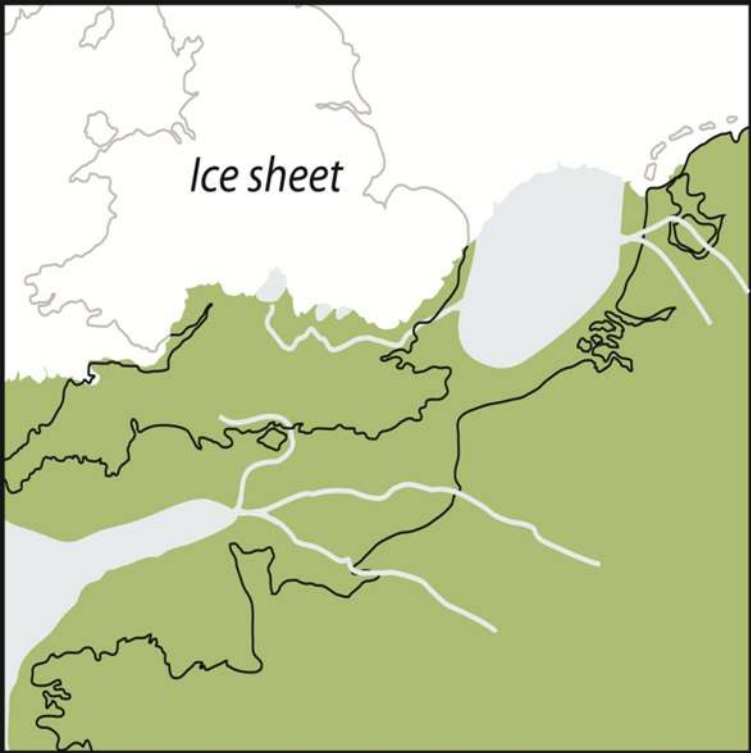
A common ancestor at 500 ka?



H. heid. in Europe and Africa



LCA of Nea. and sapiens?



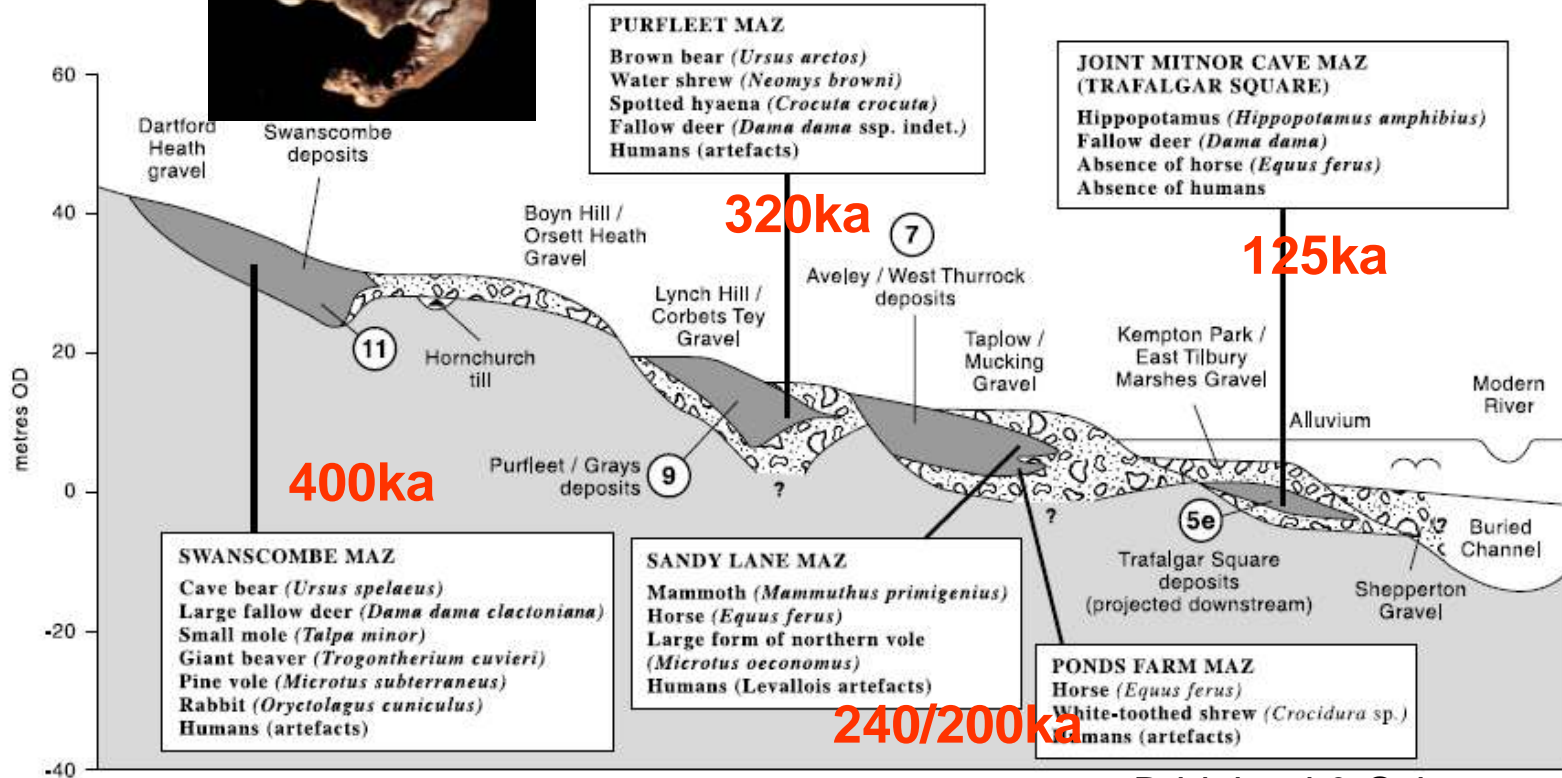
**Britain
450,000 years ago**

The Swanscombe fossil is about 400,000 yrs old, and shows some possible Neanderthal features...

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D.R. BRIDGLAND ET AL.

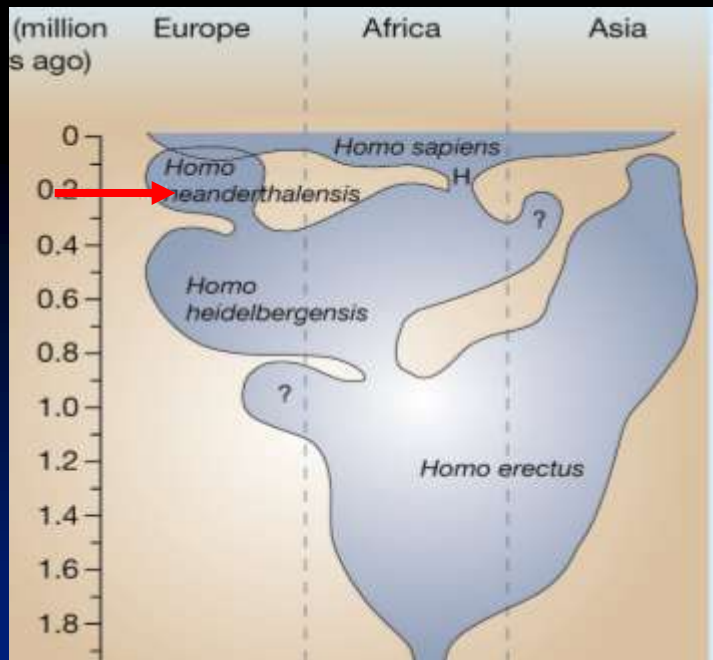


11 Numbers indicate the oxygen isotope stages to which these have been attributed

Bridgland & Schreve

The Sima de los Huesos, Atapuerca





MIS7 ~ 230 ka



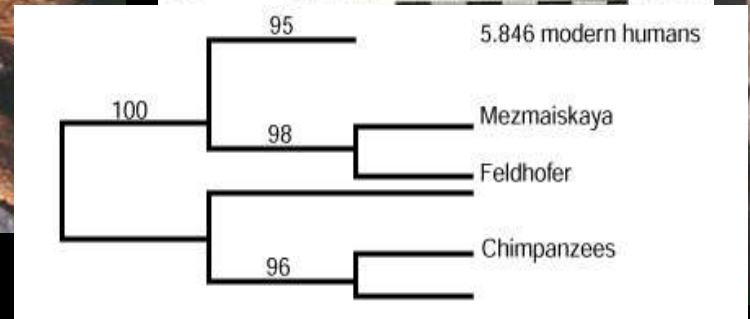
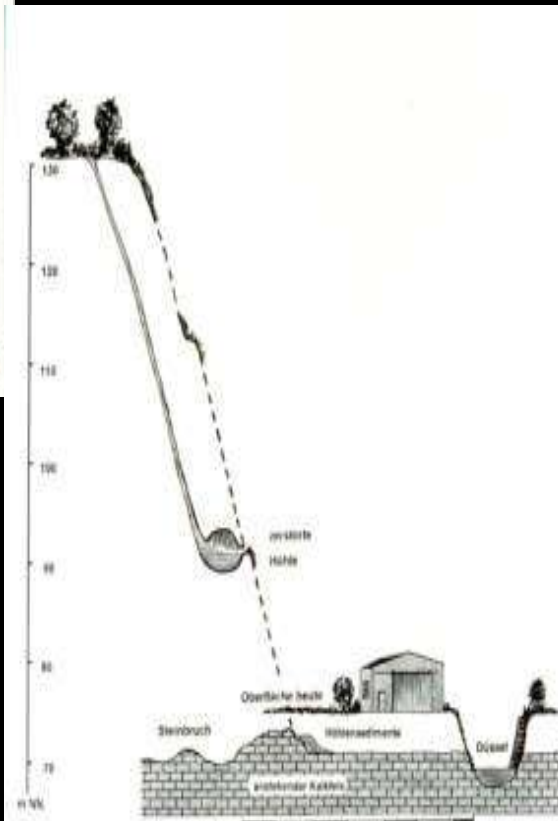
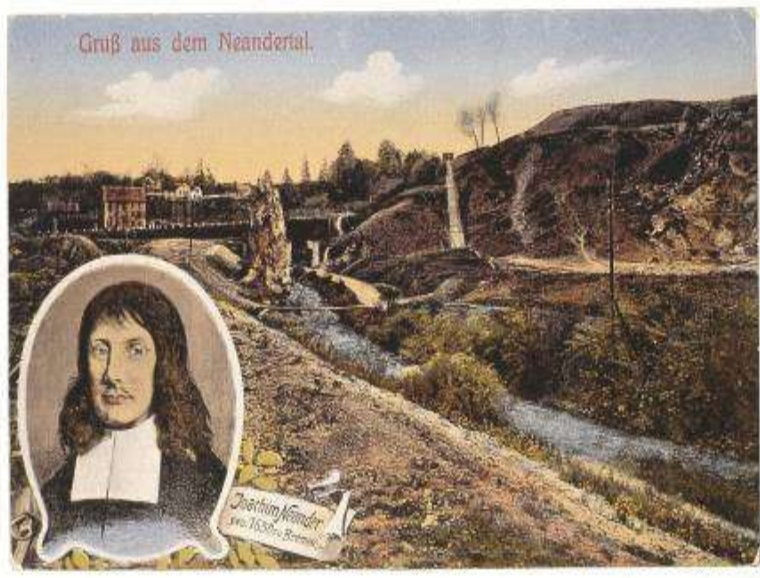
Pontnewydd 4 upper jaw



Ehringsdorf



Happy Birthday Neanderthal! 1856-2006



Neanderthals Were Not Our Ancestors

1971: My PhD trip measuring fossil skulls in Europe - washing day in Yugoslavia



Morris 1000 car



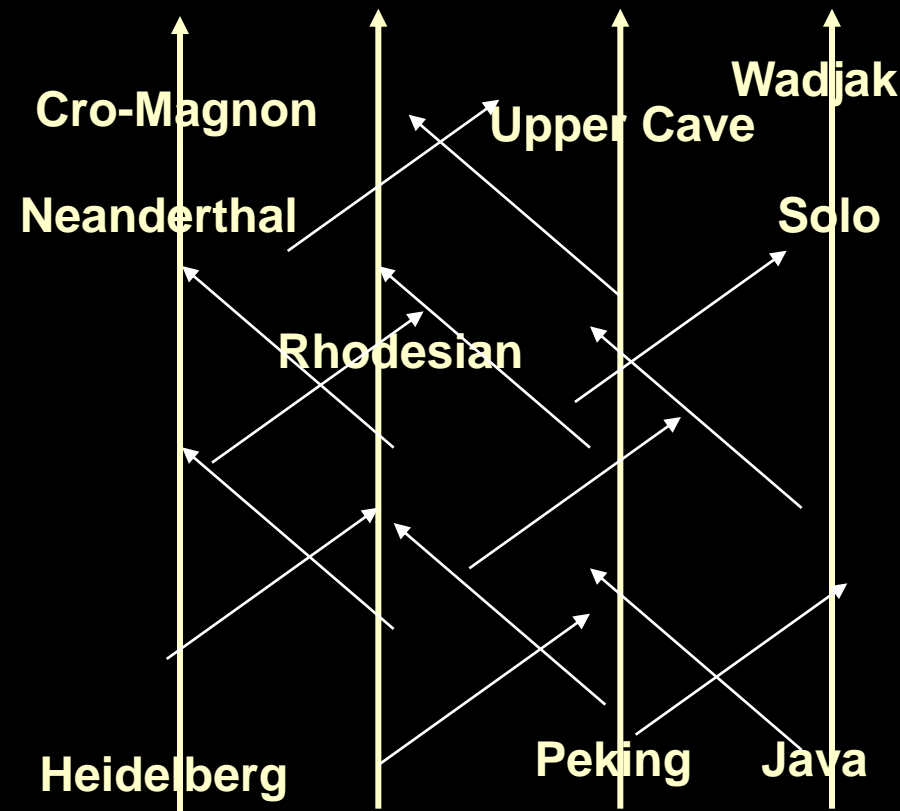
5000 mile drive

**Standard ♂
look ca 1971**

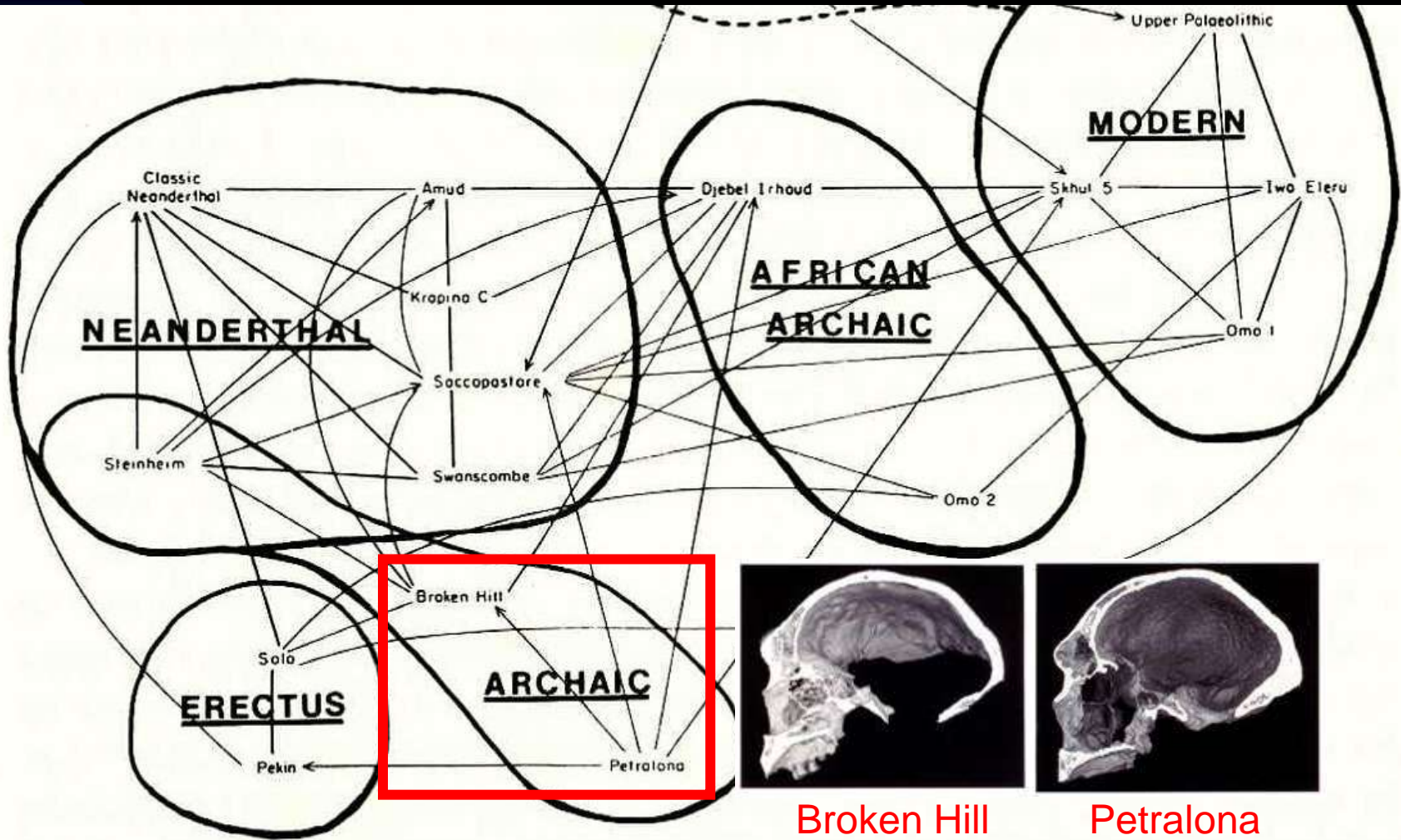
Neanderthals as ancestors....

**Multiregional
(Weidenreich)**

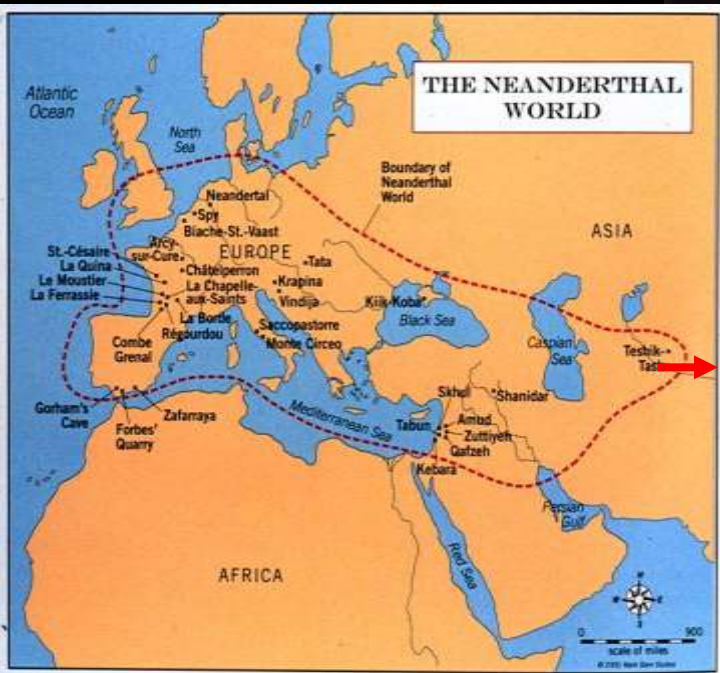
H o m o s a p i e n s



Stringer 1974: cranial shape suggests Neanderthals don't make good ancestors



The Neanderthals



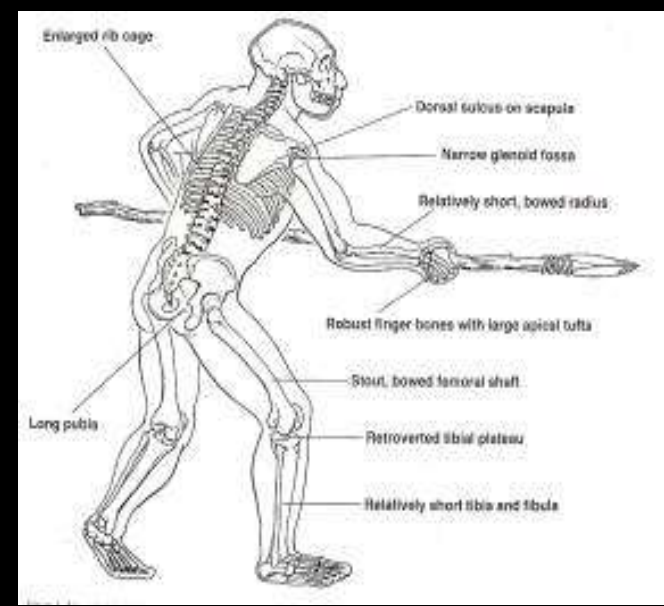
NEANDERTHAL?

GET FAST RELIEF WITH **NEW! NEO-LOTION**

BEFORE AFTER

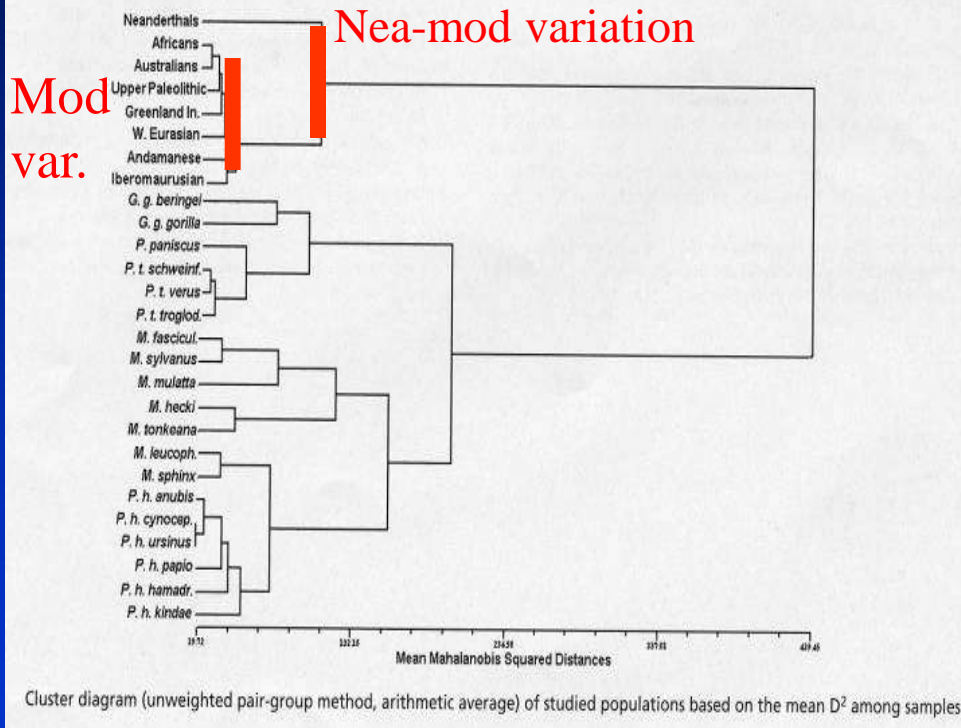
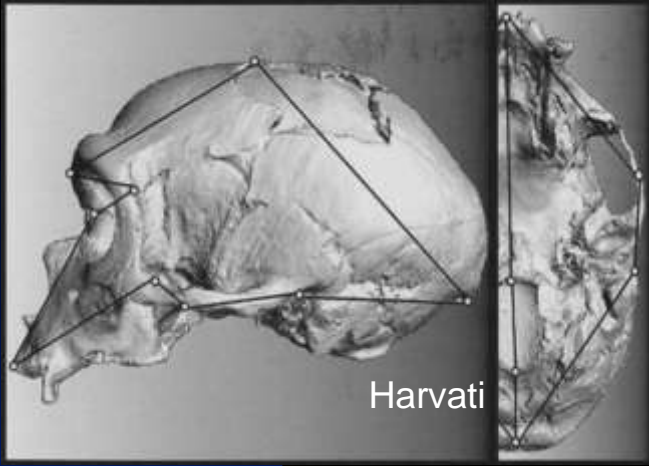
AVAILABLE IN TUBE, BOTTLE OR STONE JAR

This is a parody advertisement. At the top, it asks 'NEANDERTHAL?' in a stylized font. Below is a large, detailed illustration of a Neanderthal's face, showing its prominent brow, nose, and beard. The text 'GET FAST RELIEF WITH' is followed by 'NEW! NEO-LOTION' in large, bold letters. Below this, there are two small circular images labeled 'BEFORE' and 'AFTER', showing a man's face before and after using the product. At the bottom, it says 'AVAILABLE IN TUBE, BOTTLE OR STONE JAR'.



Neanderthals:

a different species?



Harvati

NEANDERTHIN

EAT LIKE
A CAVEMAN
TO ACHIEVE A
LEAN, STRONG,
HEALTHY BODY

RAY AUDETTE
WITH TROY GILCHRIST
Foreword by
MICHAEL R. EADES, M.D.,
Coauthor of PROTEIN POWER

Neanderthal diets

10 News

Neanderthals dined on own kind in France

By NILES HAWKES
SCIENCE EDITOR

NEW evidence that Neanderthals were cannibals has been found in a cave in France, where they lived more than 50,000 years ago.

Carefully butchered human bones bear exactly the same marks as deer bones found in the cave, on the banks of the Rhéze at Mouchy-Guyon in the Ardèche region.

A total of 28 bones, from at least six individuals, are described by a team of French and American archaeologists in Science. They came from two adults, two teenagers and two children of about seven.

The bones bear witness to a grisly scene in which both were all parts of the bodies were carefully removed. Marks across the face, ankle and other joints show how the victims were cut, while other marks show how the deer's muscle and cartilage was cut from one of the younger victims. The leg bones of an adult were placed on an axel and smashed with a hammerstone to get at the marrow inside. Skulls were halved long.

There is no evidence so far whether the meat was cooked. This is not the first evidence



A butchered femur indicates cannibalism

of cannibalism that the animal remains are the leftovers from a meal, we are obliged to expand that conclusion to include humans.

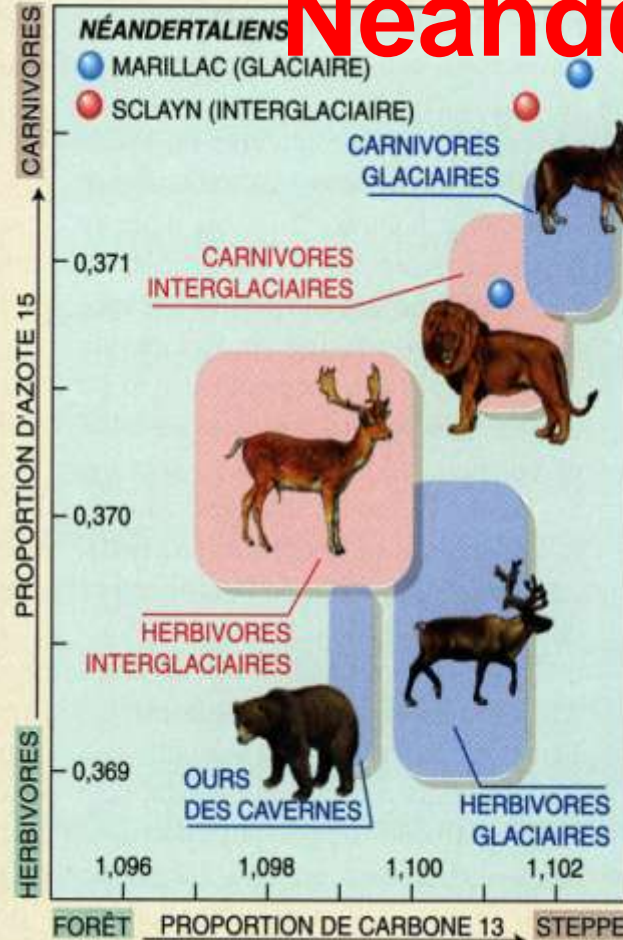
Canadian Tim White of the University of California at Berkeley, says that the evidence did not prove that all Neanderthals were cannibals, simply that some were.

In other cases, they buried their dead carefully. Some anthropologists say that this shows the sophistication of cultural variations.

It is not clear whether the victims at Mouchy-Guyon were merely defecated in haste or actually killed and eaten in a ritual. Their behaviour does not show Neanderthals as have been any more brutal than modern man.

The most recent evidence comes from David Discosto, of Berkeley, who reports in American Journal of Physical Anthropology that bones from an ancient midden on the island of Vila Nova in Fiji show patterns of breaks, cuts and burn marks similar to those of animal bones in the same midden. By contrast, human bones buried nearby show no such marks.

Leading article page 28



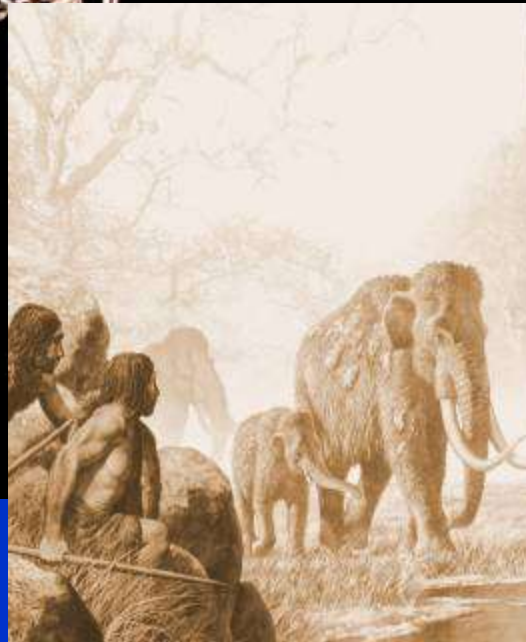
Scientists find medicinal plants caught in Neanderthal teeth....



The Neanderthals occupy southern Britain



Lynford Norfolk ~ 60 kya



The Neanderthal enigma



Neanderthal creativity

or.....

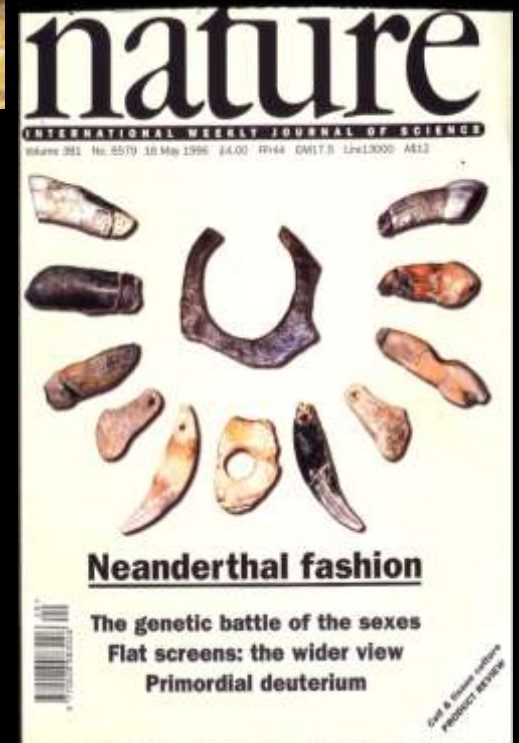


Dvje babe 1 “flute”

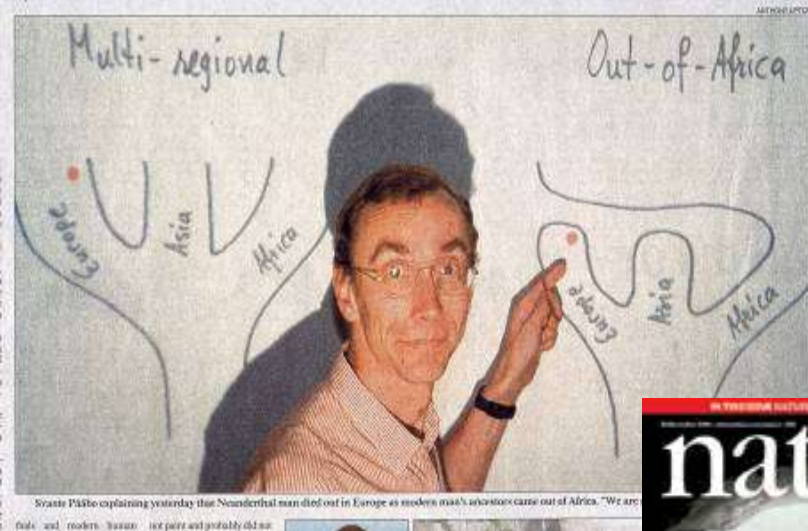
Shanidar 4 “flower burial”



But Arcy....



Neanderthal man is no relation to us



Svante Pääbo explaining yesterday that Neanderthal man died out in Europe as modern man's ancestors came out of Africa. "We are only one modern human - not two and probably didn't

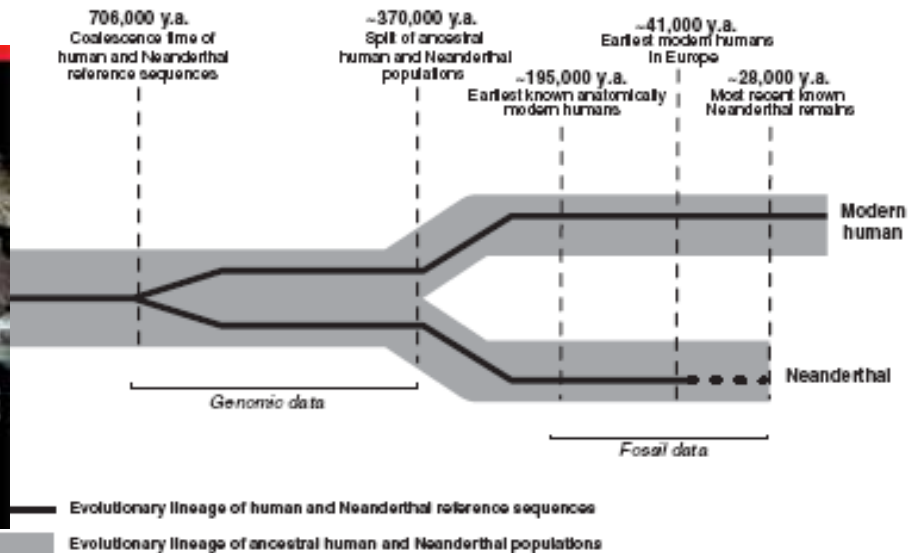
Building a Neanderthal genome....

Analysis of one million base pairs of Neanderthal DNA

Richard E. Green¹, Johannes Krause¹, Susan E. Ptak¹, Adrian W. Briggs¹, Michael T. Ronan², Jan F. Simons², Lei Du², Michael Egholm², Jonathan M. Rothberg², Maja Paunovic^{3,†} & Svante Pääbo¹

Sequencing and Analysis of Neanderthal Genomic DNA

James P. Noonan,^{1,2} Graham Coop,³ Sridhar Kudaravalli,³ Doug Smith,¹ Johannes Krause,⁴ Joe Alessi,¹ Feng Chen,¹ Darren Platt,¹ Svante Pääbo,⁴ Jonathan K. Pritchard,³ Edward M. Rubin^{1,2*}



DNA reveals some Neanderthals were ginger

By Natalie Paris
Last updated: 11:01am BST 26/10/2012

DNA evidence has revealed some Neanderthals probably had red hair after scientists discovered a pigmentation gene in ancient remains.

• Top ten ginger celebrities

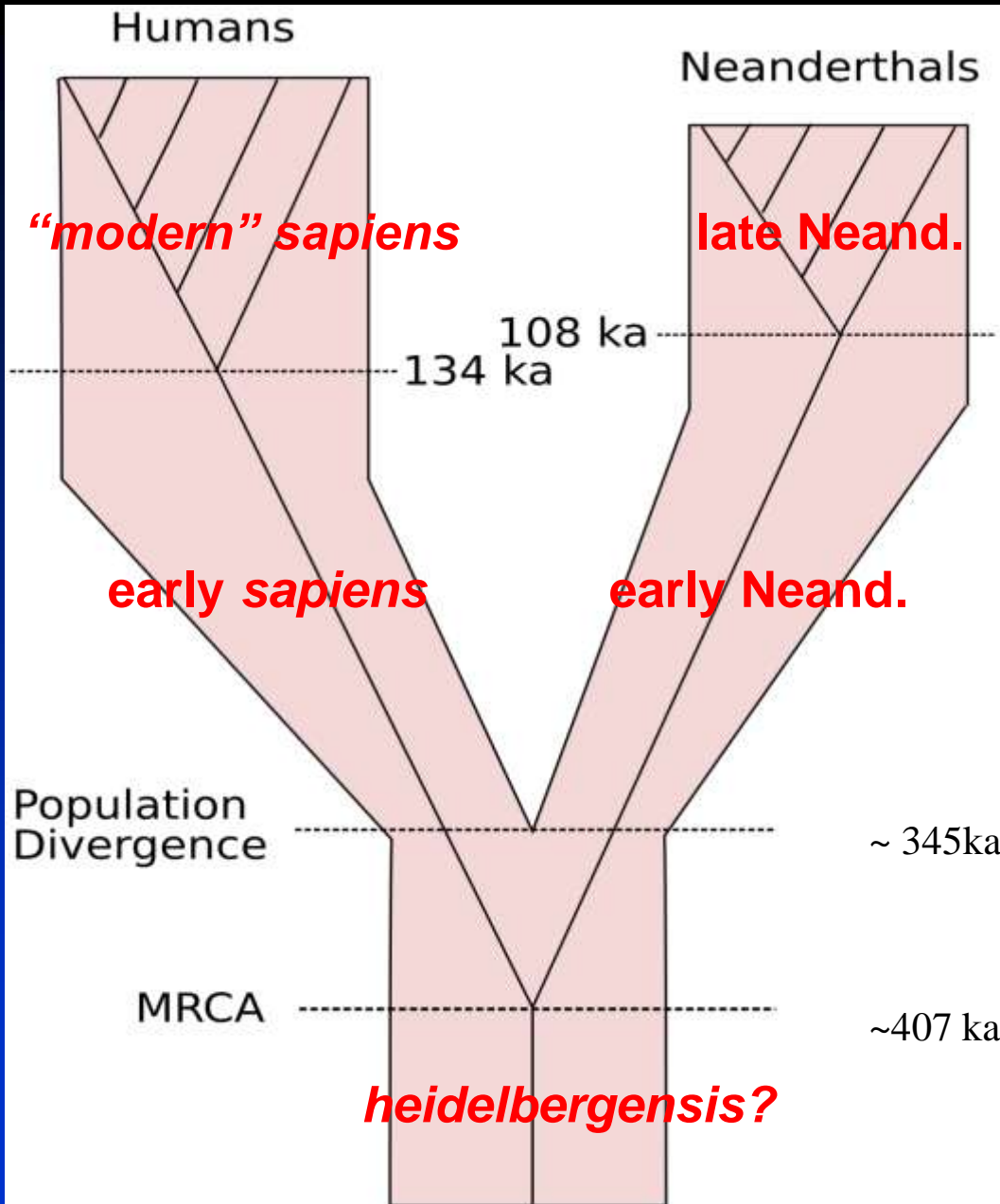
Neanderthals, who lived around 400,000 to 28,000 years ago, are typically portrayed as dark skinned and dark-haired but some may have more closely resembled Europeans.

An international study of the bones of two cave men found a gene that affects the production of melanin, associated with fair skin and fiery hair.

This indicates that some Neanderthals had pale skin and red hair, much like modern day humans.



Latest genetic calibration (5 complete Nea, 54 complete modern mtDNA sequences)

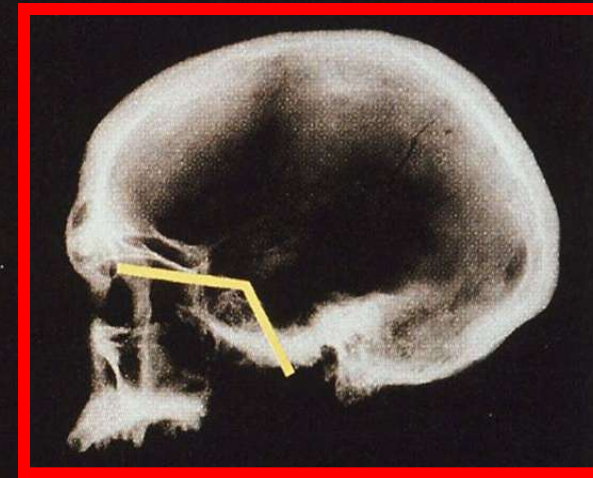
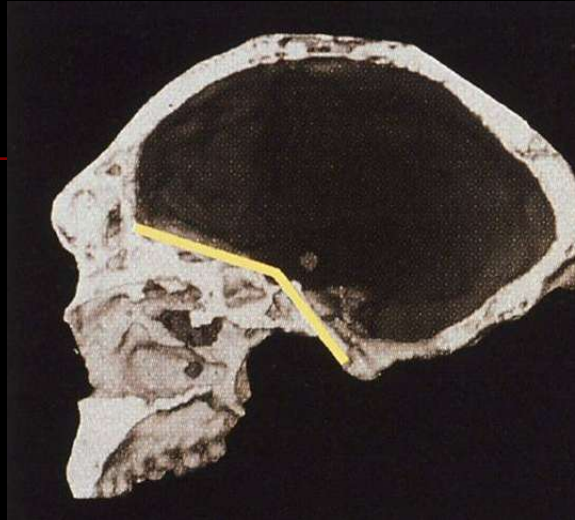


The Neanderthal and modern humans lines began to split about 400,000 years ago

The origin of *our* species (*H. sapiens*)

TWO origins to explain:

1. The shared
(species) features



2. Non-shared
(regional/racial)
features



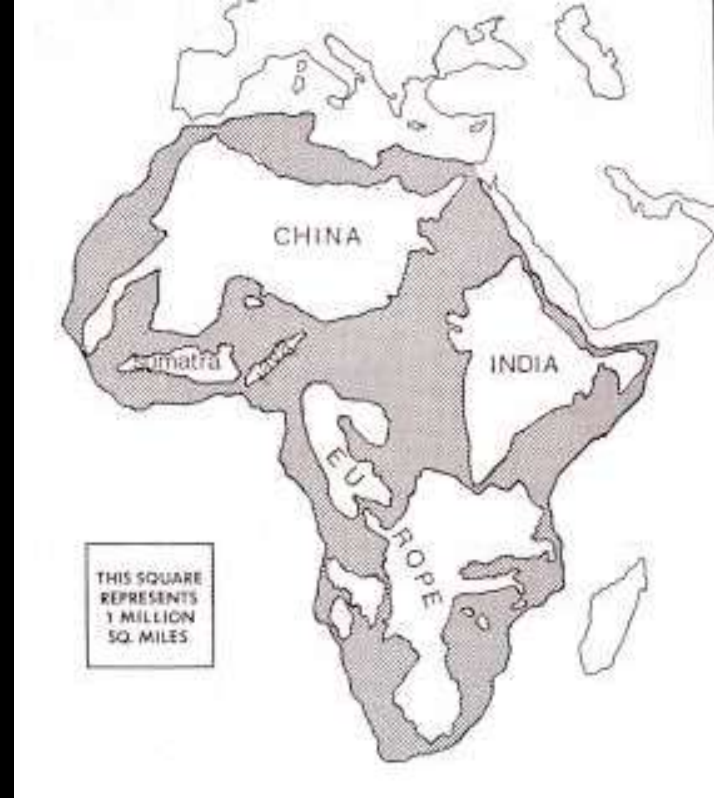
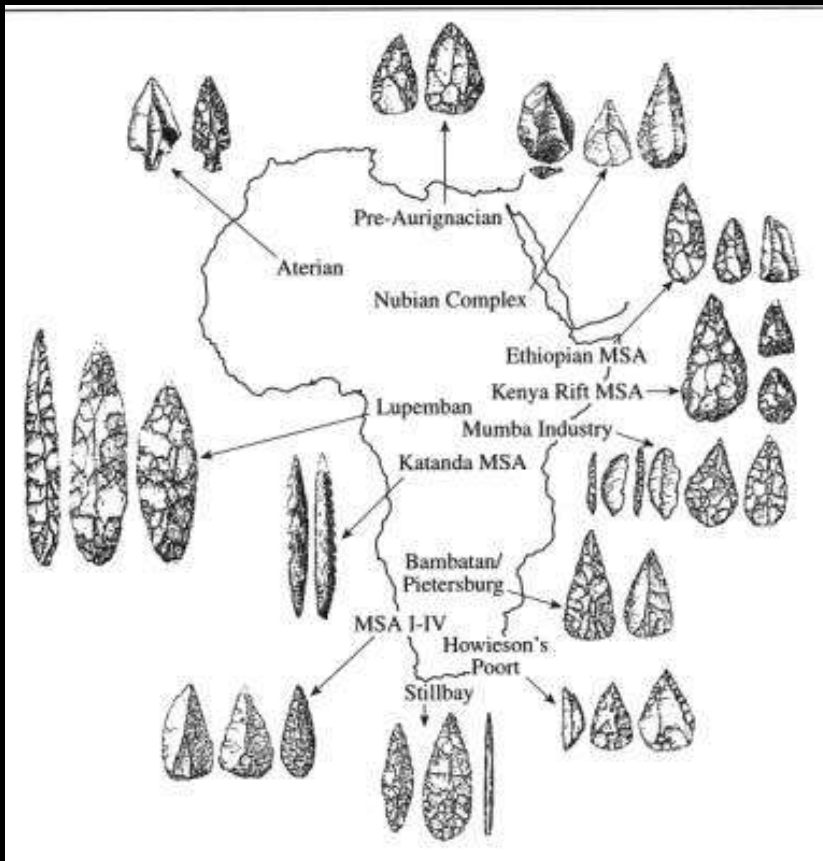
Broken Hill, Zambia 1921



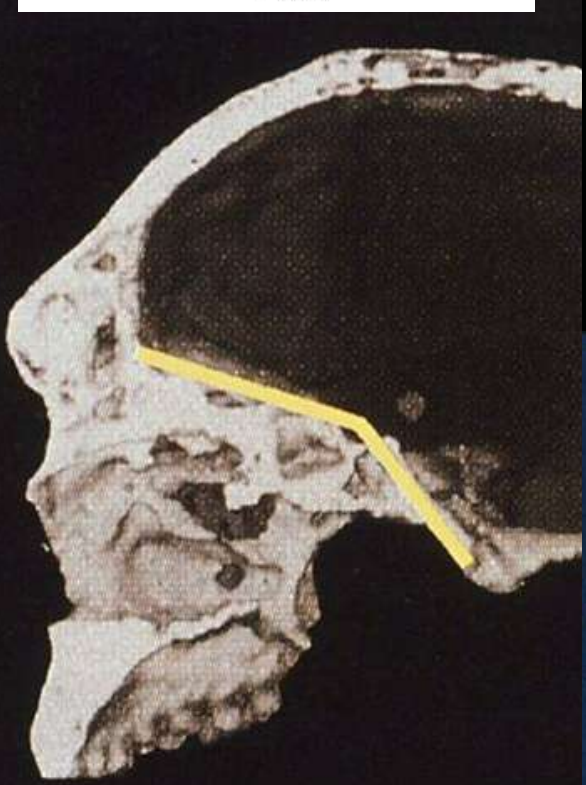
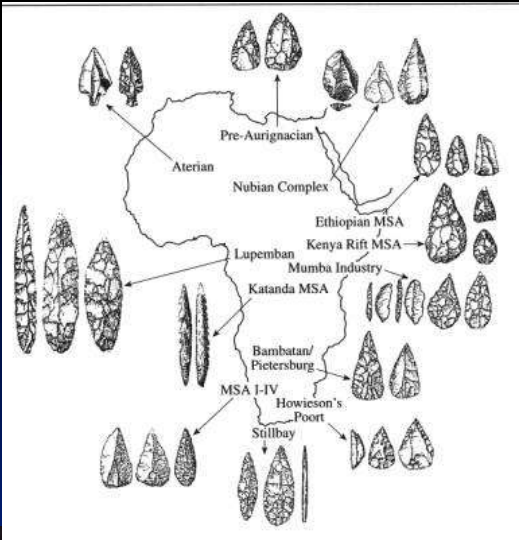
Mr. Zwiglman, the discoverer of the Rhodesian skull, etc.
(Photograph given Hrdlička by Mr. Zwiglman)



The African record



H. sapiens: fossils suggest an African origin for the modern pattern ~ 150-200ka?



Tim White



Lieberman

Henshilwood & Marean's list (2003)

8 | CURRENT ANTHROPOLOGY Volume 44, Number 5, December 2003

TABLE 1
Traits Used to Identify Modern Human Behavior

Trait	References
Burial of the dead as an indicator of ritual Art, ornamentation, and decoration	Chase and Dibble (1987), Gargett (1999), Klein (1995), Mellars (1989b), Ambrose (1998), Chase and Dibble (1990), Deacon (2001), Klein (1995), Mellars (1989a, b), Milo (1998), Renfrew (1996), Thackeray (1992)
Symbolic use of ochre	Chase and Dibble (1987), Clark (1989), Deacon (2001), Klein (1995), Knight, Powers, and Watts (1995), Mellars (1989a, 1996), Watts (1999), Thackeray (1992)
Worked bone and antler	Ambrose (1998), Clark (1989), Deacon (1989, 2001), Gibson (1996), Klein (1995), Knight, Powers, and Watts (1995), Mellars (1989a, b, 1996), Milo (1998), Thackeray (1992)
Blade technology	Ambrose and Lorenz (1990), Clark (1989), Deacon (2001), Deacon and Wurz (1996), Foley and Lahr (1997), Mellars (1989a, b), Thackeray (1992)
Standardization of artifact types Artifact diversity	Klein (1995), Mellars (1989b, 1996) Ambrose (1998), Ambrose and Lorenz (1990), Deacon (2001), Klein (1995), Knight, Powers, and Watts (1995), Mellars (1989a, b, 1996), Milo (1998), Thackeray (1992)
Complex hearth construction	Ambrose (1998), Barham (1996), Deacon (1989, 2001), Deacon and Deacon (1999), Gamble (1994), Klein (1995), Mellars (1989a)
Organized use of domestic space Expanded exchange networks	Ambrose (1998), Deacon (2001), Klein (1995), Mellars (1989a) Ambrose (1998), Ambrose and Lorenz (1990), Deacon (1989, 2001), Deacon and Wurz (1996), Klein (1995)
Effective large-mammal exploitation	Binford (1984, 1985), Klein (2001), Marean (1998), Marean and Assefa (1999), Mellars (1989a), Milo (1998), Thackeray (1992)
Seasonally focused mobility strategies	Klein (1994, 1995), Klein, Cruz-Uribe, and Skinner (1999), Milo (1998), Soffer (1989)
Use of harsh environments	Ambrose (1998), Ambrose and Lorenz (1990), Deacon (1989), Foley (1998), Gamble (1994), Klein (1994, 1995), Mellars (1989a)
Fishing and fowling	Deacon (1989), Klein (1995), Milo (1998), Thackeray (1992)

A Human Revolution?



iced back far beyond the
e that many more people
at the stage for this tipping

Microliths



Twin Rivers



Pinnacle Point



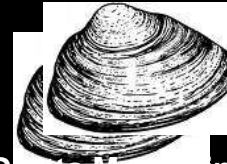
Mumba



Enkapune ya Muto

Howiesons poort

Shellfishing



Grotta Moscerini

Klasies

Ochre



Kaphurin



Twin Rivers



Klasies Qafzeh



Blombos

300 ka

200

150

100

Taforalt

50

0

Shell beads



Skhul



Blombos



Enkapune ya Muto

Early *H. sapiens* fossils



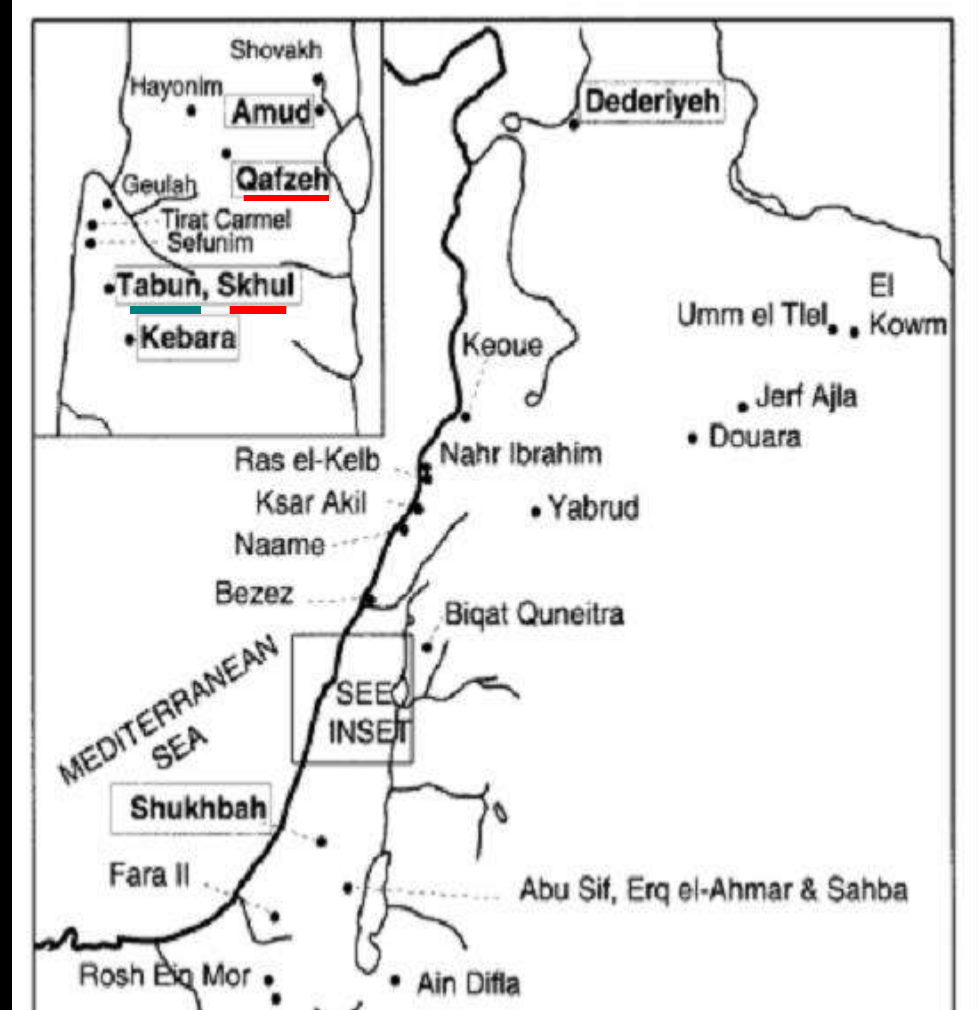
Omo Kibish



Herto

“Modern” anatomy and behaviour have deep roots in Africa...

Early modern humans and Neanderthal burials in Israel : Skhul+Qafzeh vs Tabun 90-130ka



Skhul Cave

Middle Paleolithic Shell Beads in Israel and Algeria

Marian Vanhaeren,^{1*} Francesco d'Errico,^{2*} Chris Stringer,³ Sarah L. James,⁴ Jonathan A. Todd,³ Henk K. Mienis⁵

Pigments from the Middle Palaeolithic levels of Es-Skhul (Mount Carmel, Israel)

Francesco d'Errico^{a,b,*}, H el ene Salomon^{a,c}, Colette Vignaud^d, Chris Stringer^e



MEET THE BLING STONES

By CLODAGH HARTLEY

CAVEGIRLS were more like modern misses than thought — they were big fans of **BLING**.

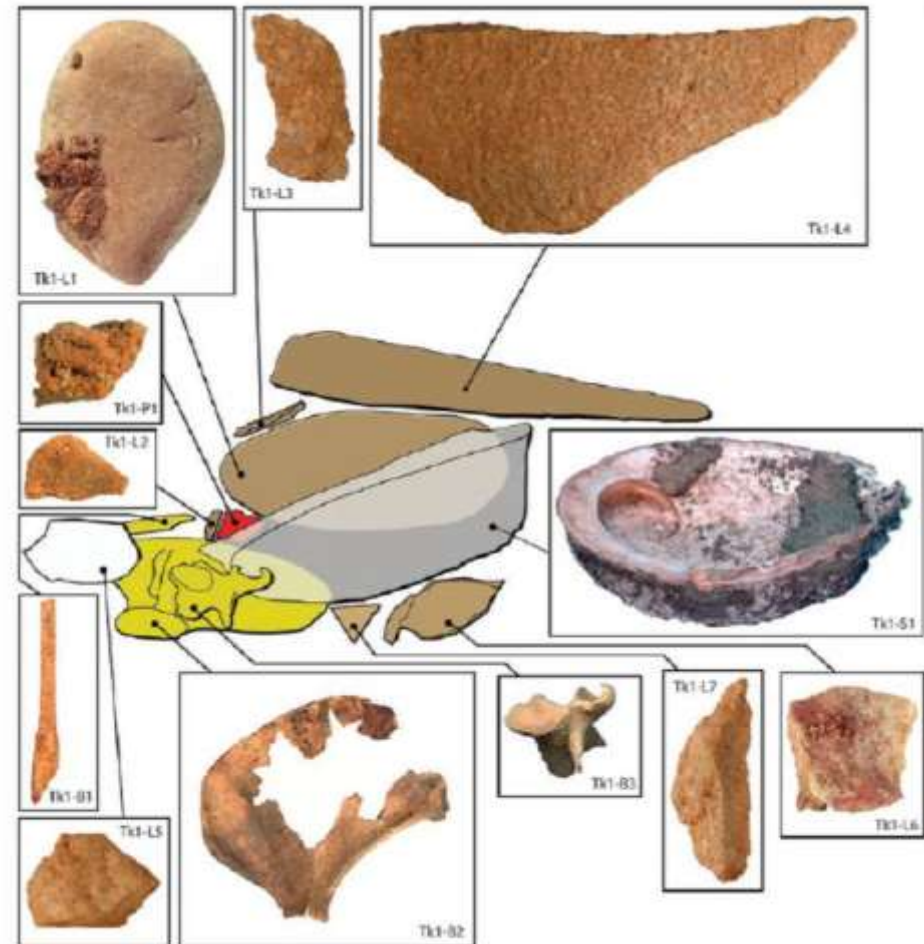
Early humans loved to act like chavs by decorating themselves with flash jewellery, scientists have discovered.

The only difference was that while today's girls like to go clubbing, in the Stone Age they were more likely to get clubbed over the head.



A 100,000-Year-Old Ochre-Processing Workshop at Blombos Cave, South Africa

Christopher S. Henshilwood,^{1,2*} Francesco d'Errico,^{3,1} Karen L. van Niekerk,¹ Yvan Coquinot,⁴ Zenobia Jacobs,⁵ Stein-Erik Lauritzen,⁶ Michel Menu,⁴ Renata García-Moreno³



Artifacts making up Tk1 and their relative spatial locations. [Image: C. Henshilwood and F. d'Errico]

Ochre-processing toolkits in situ showing Tk1 (A) and Tk2 (B). [Images

Shell jewellery + red pigments ~70-120 ka

Middle Paleolithic Shell Beads in Israel and Algeria

Marian Vanhaeren,^{1*} Francesco d'Errico,^{2*} Chris Stringer,³ Sarah L. James,⁴ Jonathan A. Todd,³ Henk K. Mienis⁵

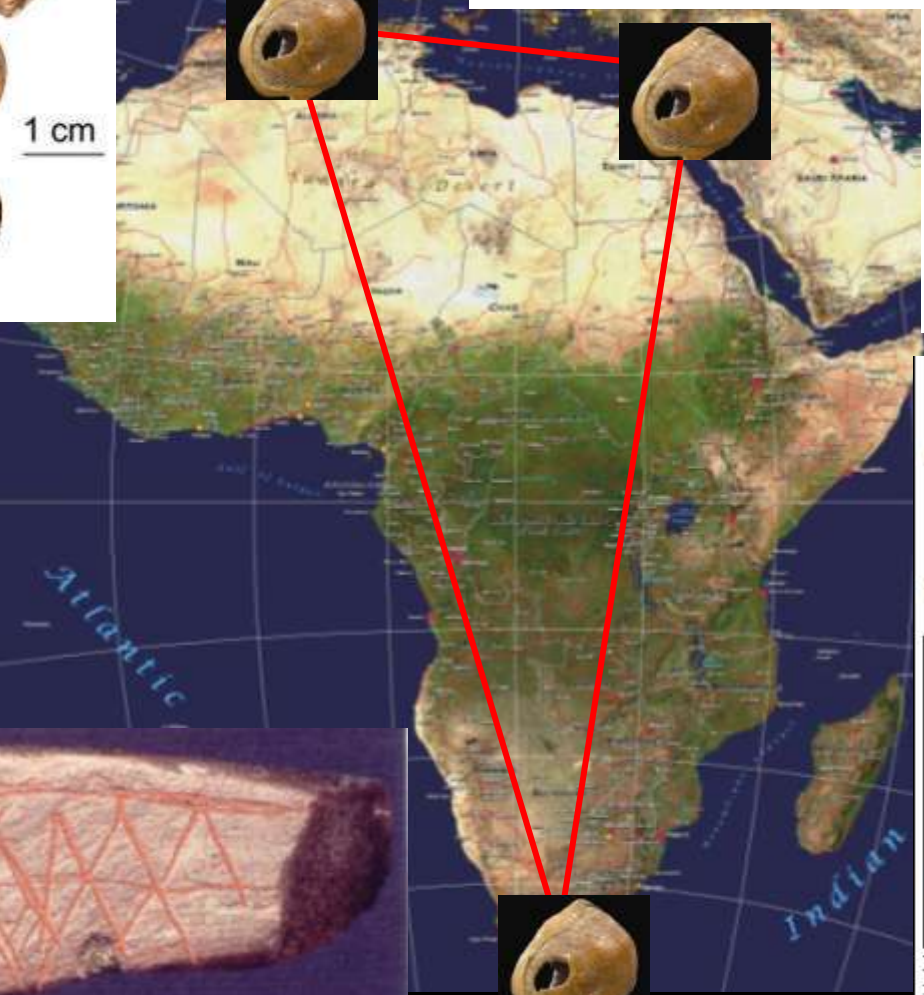
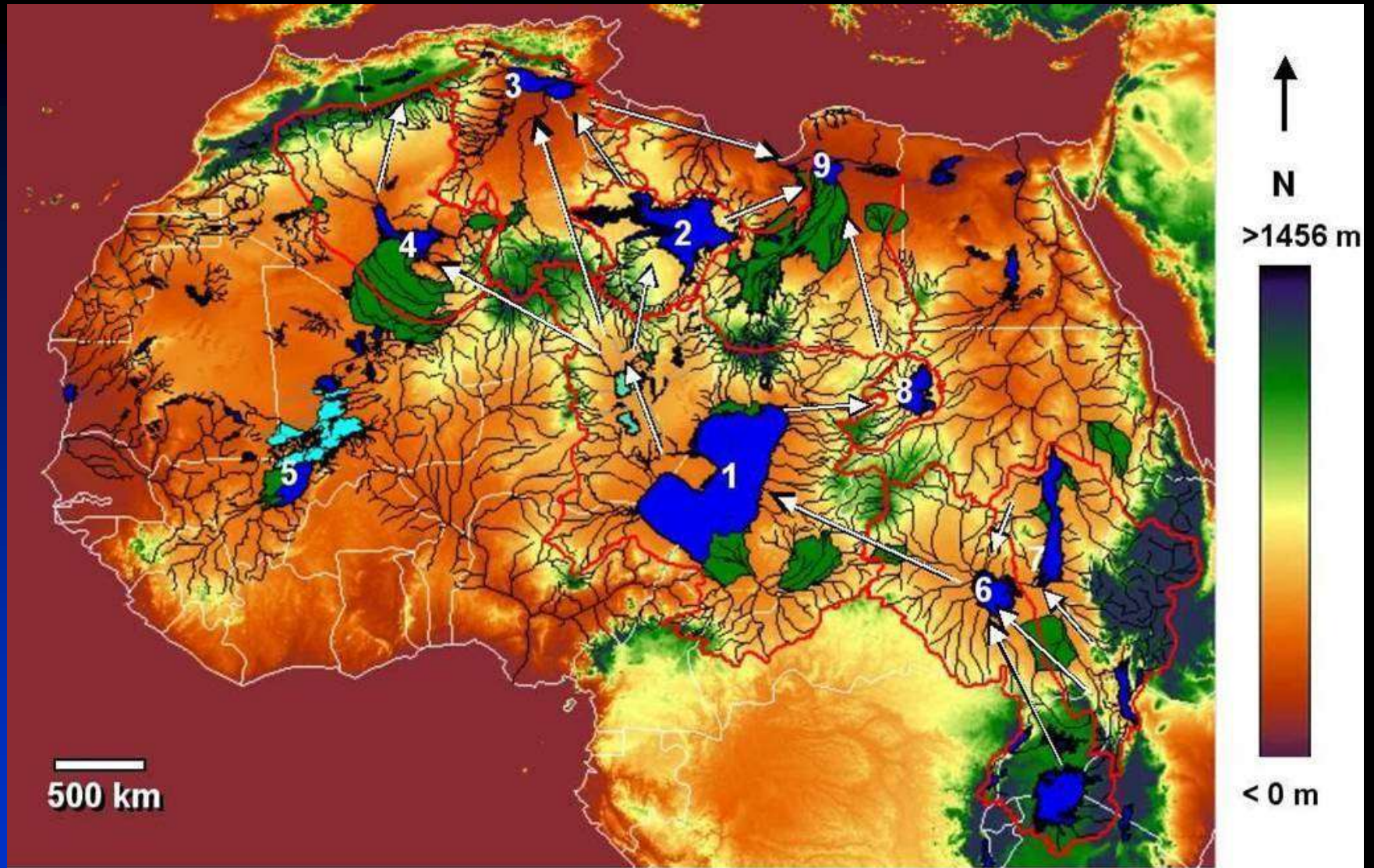


Fig. 1. Perforated *Nassarius kraussianus* beads from the Middle Stone Age of Blombos Cave. Scale bars = 5 mm.

The Sahara Megalakes Project (Nick Drake et al.)

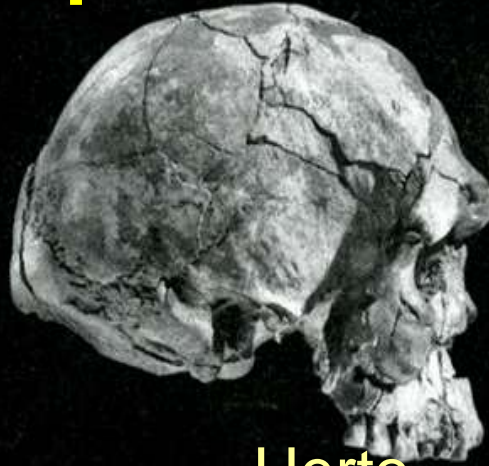


The evolution of modern humans: simple or complex?



Nature

Broken Hill



Herto



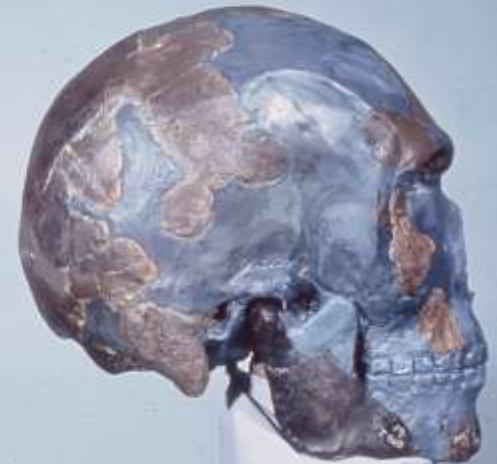
Qafzeh



Herto



Omo Kibish 2

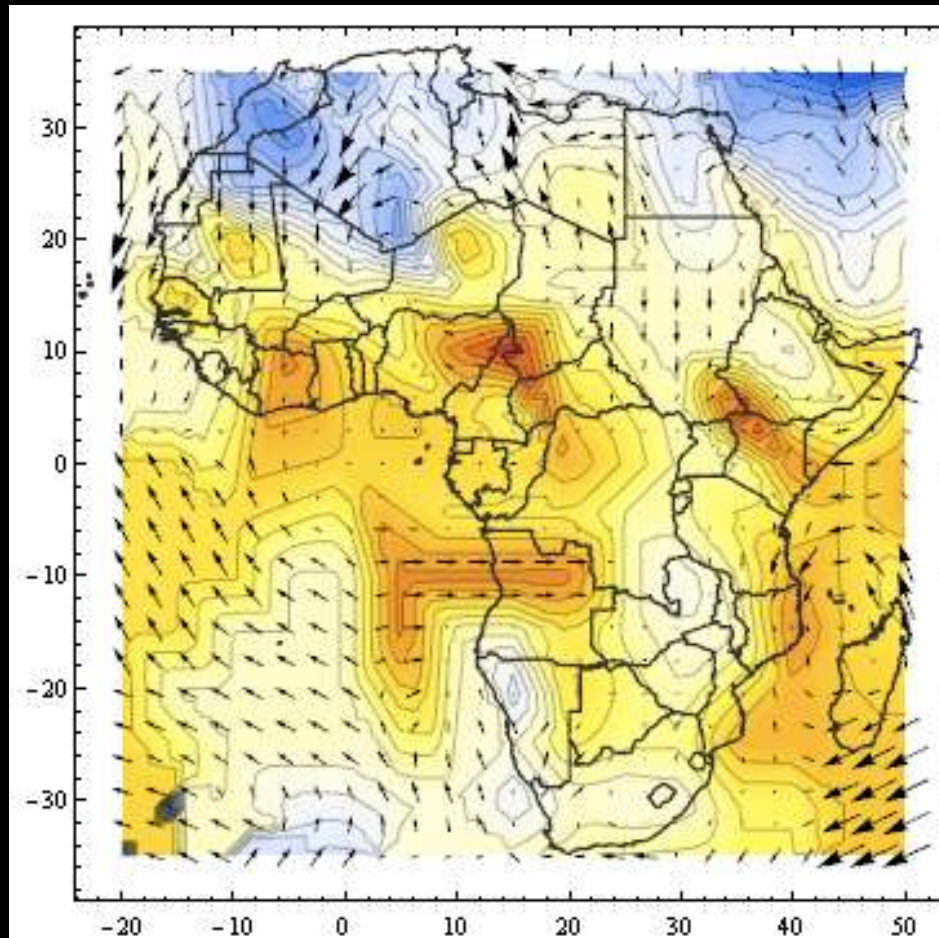


1

The complexity of African climates

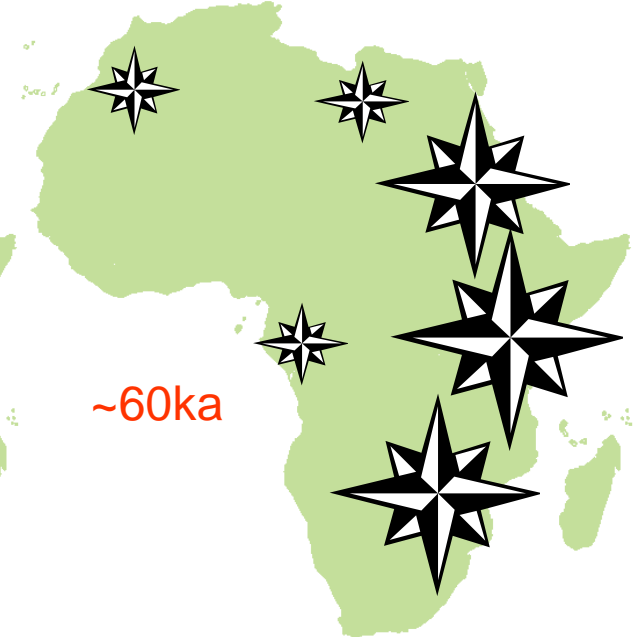
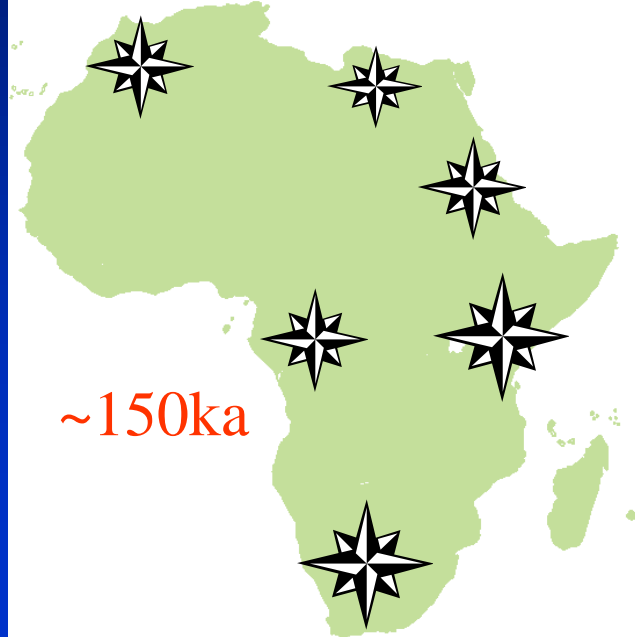
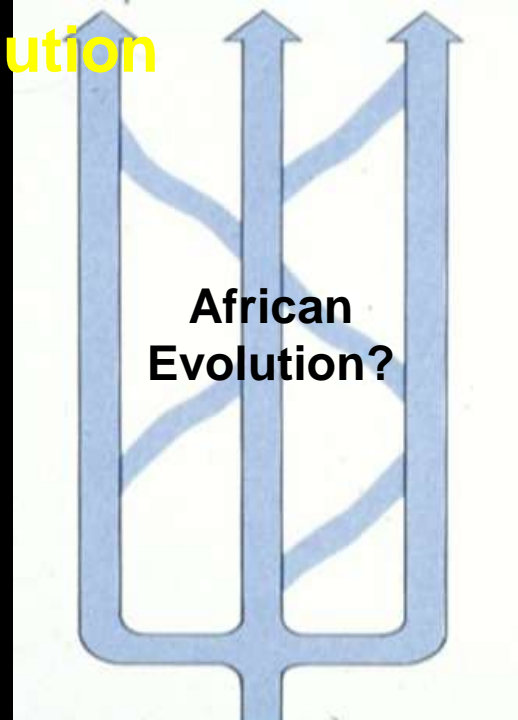


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Wolfram

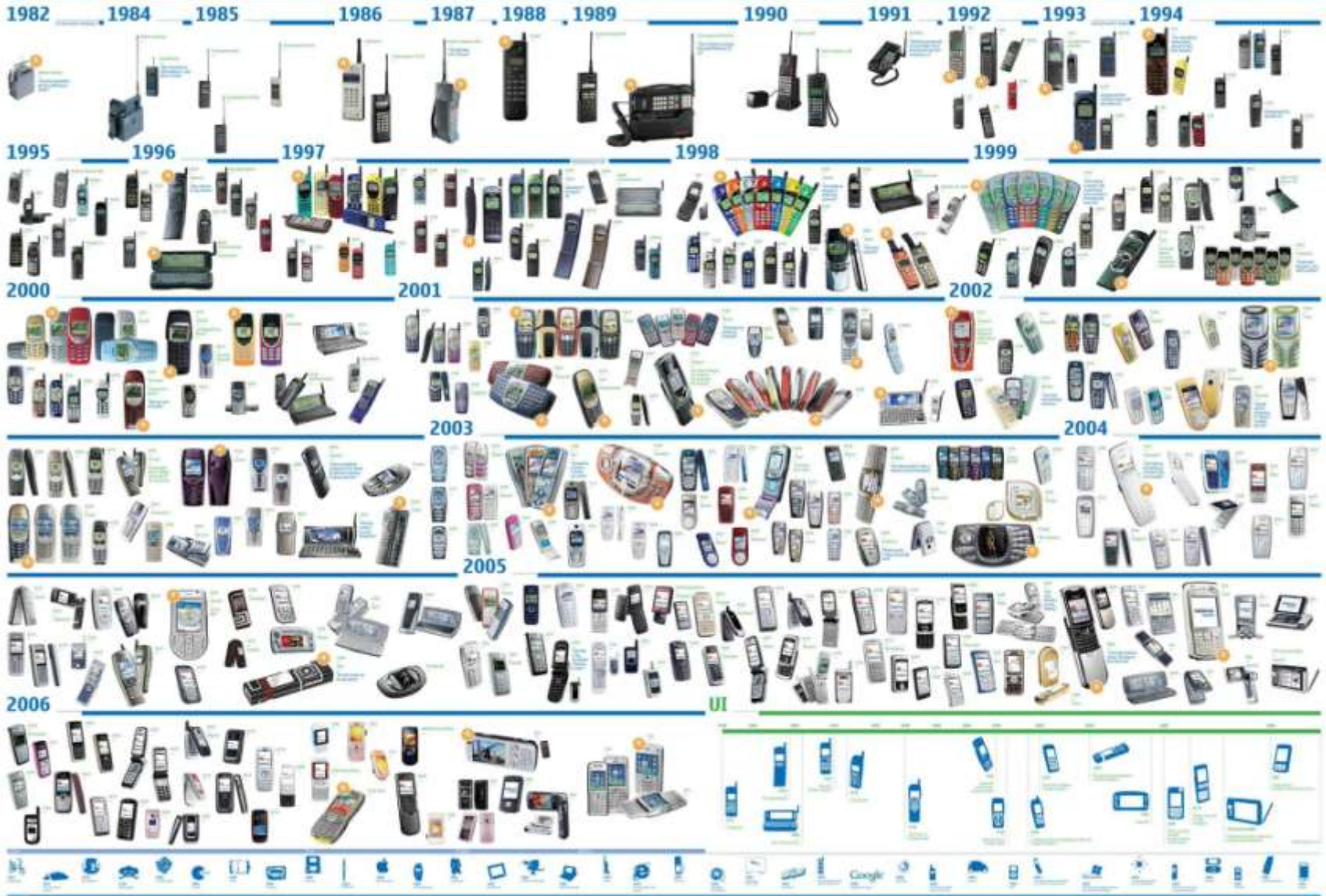
Climate change and African Human Evolution



Today innovations spread and take hold.....

NOKIA
Connecting People

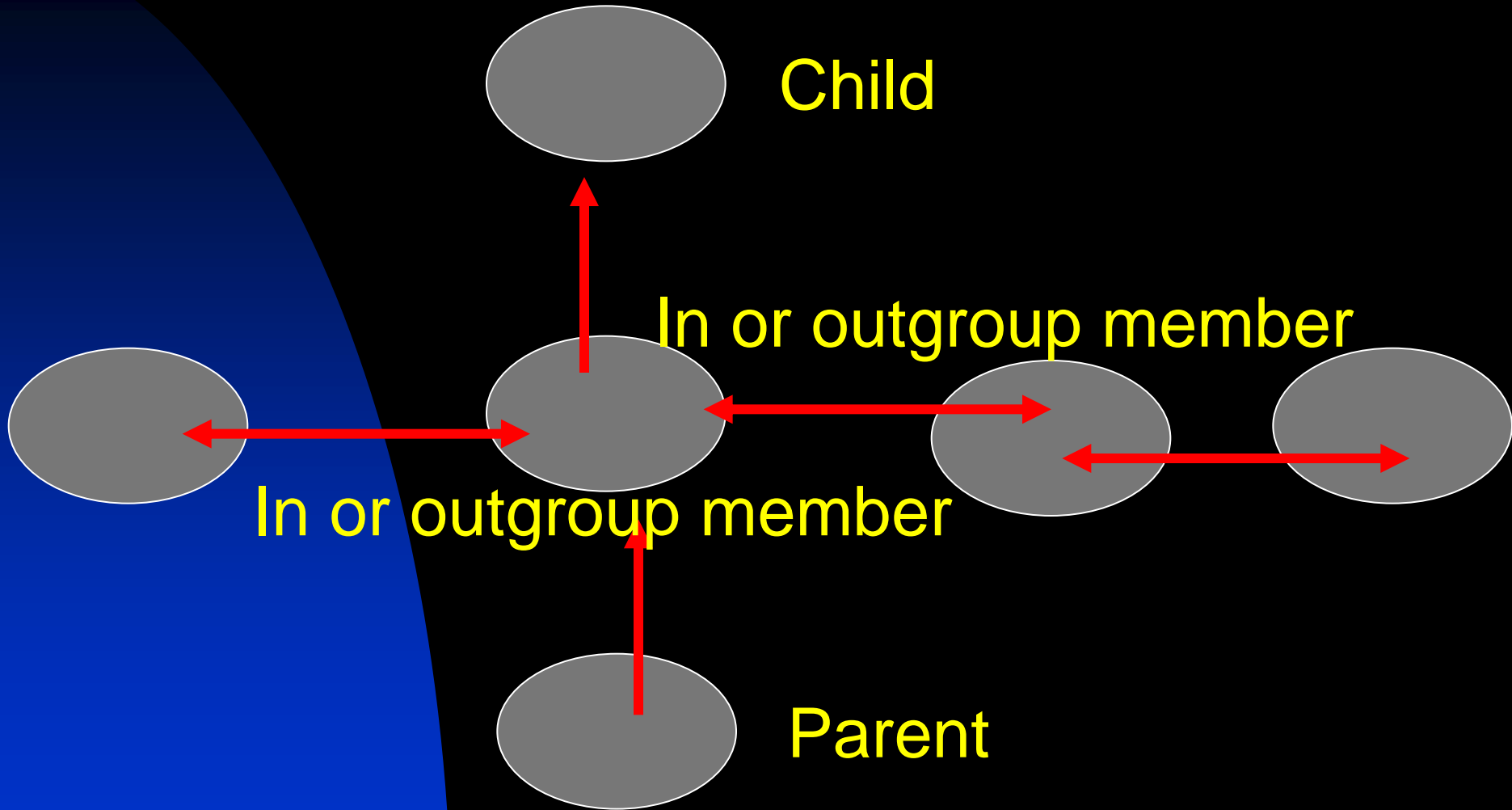
Know our past. Create the future...



Human behavioural evolution: gains + losses

In the past, small populations would have been prone to extinction, or forced into relatively rapid movement or adaptation to survive, and this could have led to the regular loss of innovations that might have been useful in the longer term. Thus repeated 'bottlenecking' did not just remove genetic diversity, but also discoveries and inventions associated with the human populations concerned..

Transmission in archaic humans?



vis-à-vis: Explorations in Anthropology, Vol. 10: 102–125.
Style, Symboling, and Interaction
in
Middle Stone Age Societies
JAYNE WILKINS

Modern humans grow more slowly, live longer, and network more widely...

Current Anthropology
Volume 41, Number 4, 2000
The “Venus” Figurines:
Textiles, Basketry, Gender,
and
Status in the Upper
Paleolithic
by O. Soffer, J. M. Adovasio
& D. C. Hyland

Dental evidence for ontogenetic differences between modern humans and Neanderthals

Tanya M. Smith^{a,b,1}, Paul Tafforeau^{c,1}, Donald J. Reid^d, Joane Pouech^{b,c}, Vincent Lazzari^{b,c,e}, John P. Zermeno^a, Debbie Guatelli-Steinberg^f, Anthony J. Olejniczak^b, Almut Hoffman^g, Jakov Radović^h, Masrou Makaremiⁱ, Michel Toussaint^j, Chris Stringer^k, and Jean-Jacques Hublin^b

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Edited* by Richard G. Klein, Stanford University, Stanford, CA, and approved Oct

Humans have an unusual life history, with an early weaning age, long childhood, late first reproduction, short interbirth intervals, and long lifespan. In contrast, great apes wean later, reproduce

Older age becomes common late in human evolution

Rachel Caspari^{*†} and Sang-Hee Lee[‡]

^{*}Department of Anthropology, University of Michigan, Ann Arbor, MI 48109-1092; and [†]Department of Anthropology, University of California, Riverside, CA 92521-0418

[‡]Communicated by Ward H. Goodenough, University of Pennsylvania, Philadelphia, PA, May 27, 2004 (received for review October 28, 2003)

Increased longevity, expressed as number of individuals surviving to older adulthood, represents one of the ways the human life history pattern differs from other primates. We believe it is a critical demographic factor in the development of human culture. Here, we examine when changes in longevity occurred by assessing the ratio of older to younger adults in four hominid dental samples from successive time periods, and by determining the significance of differences in these ratios. Younger and older adult status is assessed by wear seriation of each sample. Whereas there is significant increased longevity between all groups, indicating a trend of increased adult survivorship over the course of human evolution, there is a dramatic increase in longevity in the modern humans of the Early Upper Paleolithic. We believe that this great increase contributed to population expansions and cultural innovations associated with modernity.

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By longevity span attainable adults who lived individuals lived selection favored longevity. To involved with study to adult younger adult. Although this living population insight into the evolution of age structure in the human fossil record.



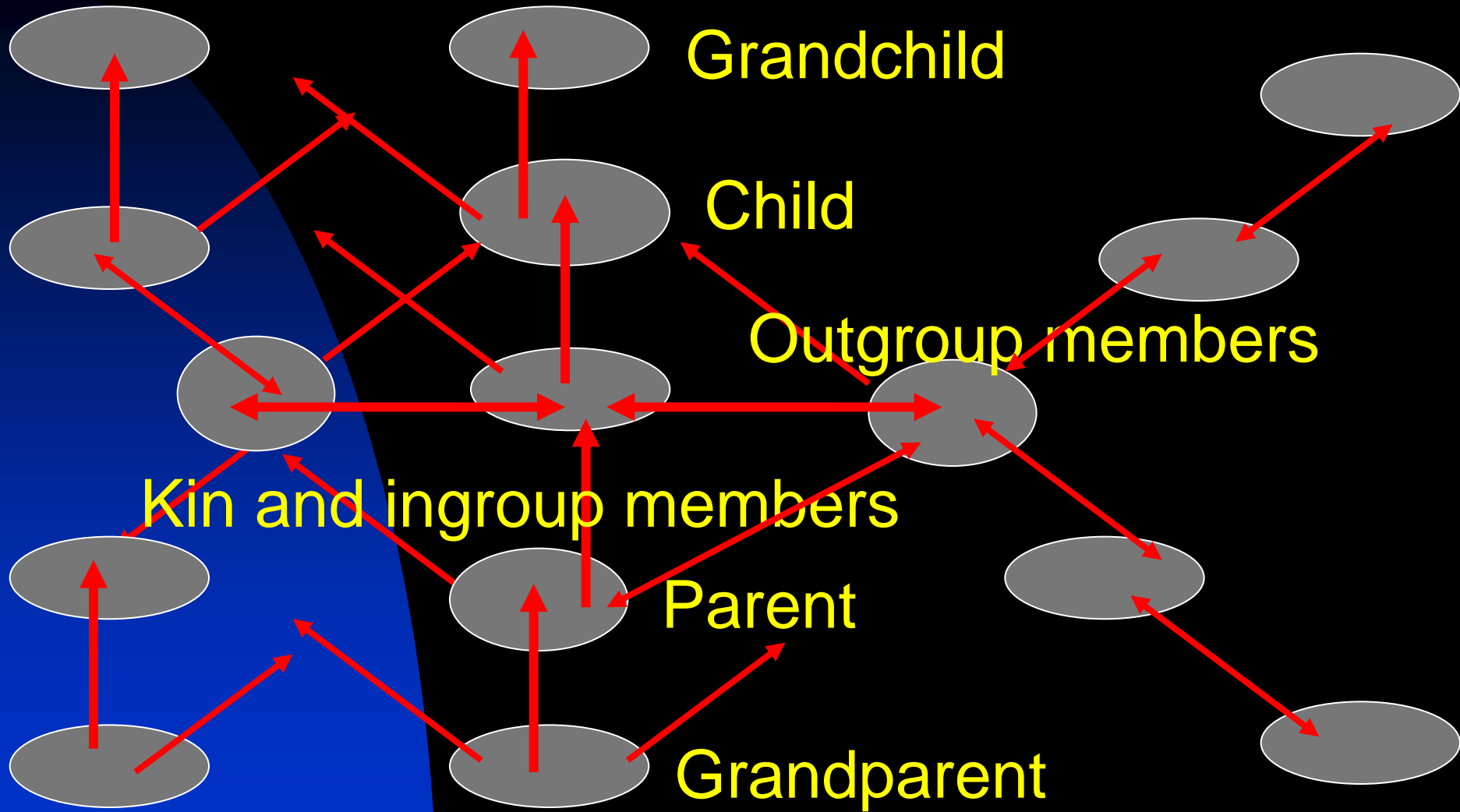
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Science 11 September 2009:
Vol. 325 no. 5946 p. 1359
DOI:
10.1126/science.1175404

**30,000-Year-Old Wild Flax
Fibers**

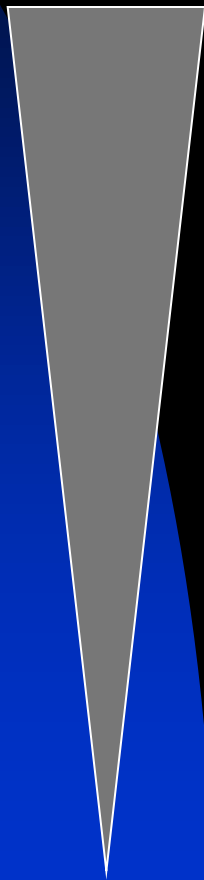
Transmission in modern humans?



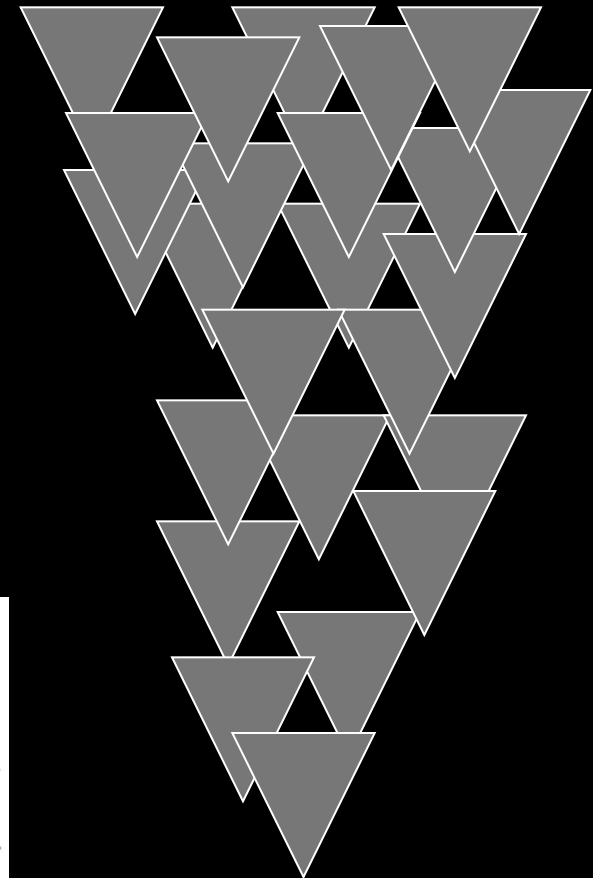
Patterns of Physical and Behavioural Evolution?

Gradual

0
50
100
200



“Piecemeal”
coalescence



SCIENCE 2009. 324: 298 - 1301
Late Pleistocene Demography and the
Appearance of Modern Human
Behavior. Adam Powell, Stephen
SHENNAN, Mark G. THOMAS

Ages for the Middle Stone Age of Southern Africa: Implications for Human Behavior and Dispersal

Zenobia Jacobs,^{2*} Richard G. Roberts,³ Rex F. Galbraith,² Hilary J. Deacon,³ Rainer Grün,⁴
Alex Mackay,⁵ Peter Mitchell,⁶ Ralf Vogelsang,⁷ Lyn Wadley⁸

The expansion of modern human populations in Africa 80,000 to 60,000 years ago and their initial exodus out of Africa have been tentatively linked to two phases of technological and behavioral innovation within the Middle Stone Age of southern Africa—the Still Bay and Howieson's Poort industries—that are associated with early evidence for symbols and personal ornaments. Establishing the correct sequence of events, however, has been hampered by inadequate chronologies. We report ages for nine sites from varied climatic and ecological zones across southern Africa that show that both industries were short-lived (5000 years or less), separated by about 7000 years, and coeval with genetic estimates of population expansion and exit times. Comparison with climatic records shows that these bursts of innovative behavior cannot be explained by environmental factors alone.

~60,000 yrs: Modern Humans start to leave Africa...

Ancient history in the DNA

By comparing mutations in the DNA of people who live in different parts of the world, geneticists are developing new theories about how humans populated Earth. The evidence points to a common African origin about 150,000 years ago. Much of the work has been based on maternal lines.

Venus of Lespugue
Found: Lespugue, France
Dated: 26,000 years ago



Horse pendant
Found: Sungir, Russia
Dated: 25,000 years ago



Roots in Central Asia

All Asians derived from two common roots, with some lineages more frequent in southern Asia (Vietnamese, Malays, New Guineans) and others more prevalent in the north (Tibetans, Koreans, Siberians).

The first Europeans

Migrants arrived from the Near East as early as 50,000 years ago. The population shrank drastically during the last ice Age 20,000 years ago, then rebounded. About 9,000 years ago, migrants from the Middle East moved north along with the spread of agriculture.

The Australian enigma

Modern humans traveled to Australia by boat 40,000 to 60,000 years ago. One theory suggests that they followed the southern Asian coast, mastering boat building along the way.

Many paths through the Middle East

Humans journeyed from Africa into the Middle East about 75,000 years ago. Over thousands of years, in multiple migrations, they spread east into Asia and northwest into Europe.

Africa, the ancestral home

The DNA of present-day Africans is more diverse than that of people on other continents, indicating that humans have lived there longest. Traces of ancient African genes can be found in everyone living today.

Early Homo sapiens skull

Found: Omo River, Ethiopia
Dated: 125,000 years ago



Red ochre burial

Found: Mungo National Park, Australia
Dated: about 60,000 years ago



Stone tools

Found: Cactus Hill, Virginia
Dated: 15,000 to 18,000 years ago



Land bridge between continents

A bridge to the New World

The first inhabitants of the New World migrated from central Siberia 20,000 to 30,000 years ago along the Bering land bridge. They may have been joined by a second migration 15,000 years ago that skirted the coast. Na-Dene people, who include the Athabascans, Apaches, and Navajos, are genetically distinct from the first American Indians, and came from northern Siberia about 9,000 years ago. Eskimos and Aleuts arrived 4,000 to 6,000 years later.

Along the Andes to Tierra del Fuego

The earliest migration swept from Siberia to Tierra del Fuego, traveling along the Andes. Another route curved farther east, to present-day Brazil.

The X factor

A small group of Indians near the Great Lakes has a lineage (haplogroup "X") unlike those of other American Indians, but related to a European strain. Some archaeologists think that the colonists came from Iberia about 15,000 years ago, crossing the North Atlantic ice pack to Greenland. Others believe the X factor is the remnant of a vanished Asian lineage.

For most of the past 65,000 years, sea levels have been lower than today. During the last ice Age 20,000 years ago, sea levels were about 400 feet lower.



Throwing stone

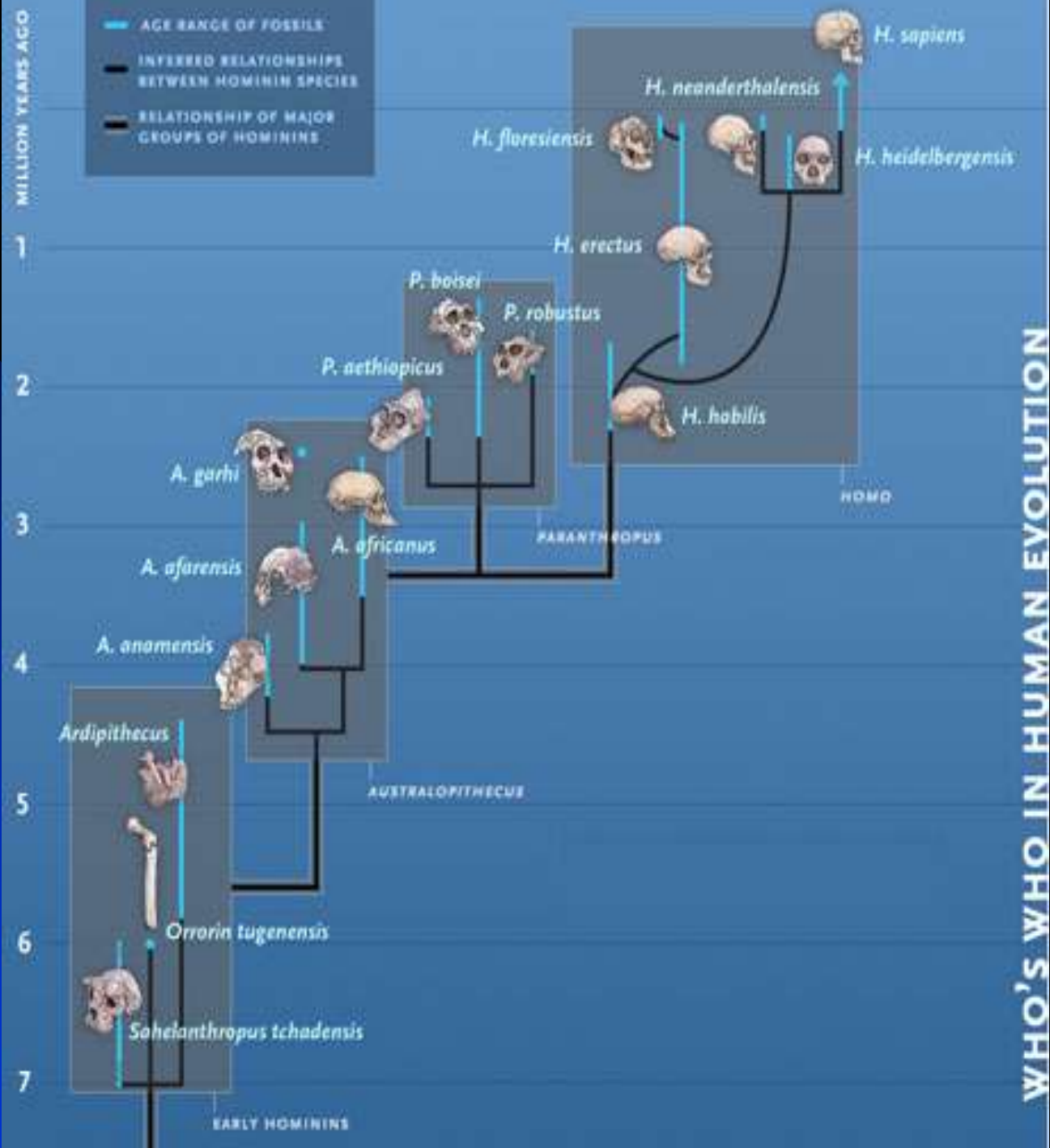
Found: Monte Verde, Chile
Dated: 14,800 years ago

Key
Dotted arrows show hypothetical routes.
Colored arrows represent separate genetic lineages.

Scale: Major migrations in thousands of years before present.

Ancient coastlines

Source: Douglas Wallace, Michael Hammer, and Mark Stoneking, Emory University; Christy Turner, Florida State; NOAA; University of South Carolina; Smithsonian Institution; University of Pennsylvania; The Human Genome Project.



WHO'S WHO IN HUMAN EVOLUTION

Our future is partly up to us....

