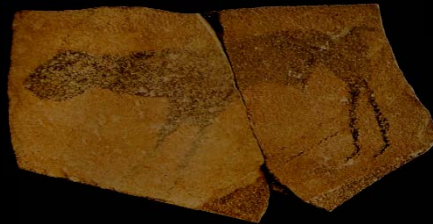


Human Evolution and the origins of symbolic thought, culture, and spirituality

Washington Theological Union
November 10, 2012



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Human Origins Program

National Museum of Natural History, Smithsonian Institution

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-

Why we must have CONVERSATIONS.



People do not always process our thoughts
as we expect or hope.

Flow of the talk:

1. An overview of human evolution, including core messages
2. **Profound environmental change**
3. Archeological evidence relevant to the emergence of human thought, adaptability, our symbolic universe
4. **Extinction in human prehistory**
5. Greatest challenges and opportunities for conversation and mutual understanding

Smithsonian's Human Origins Collections



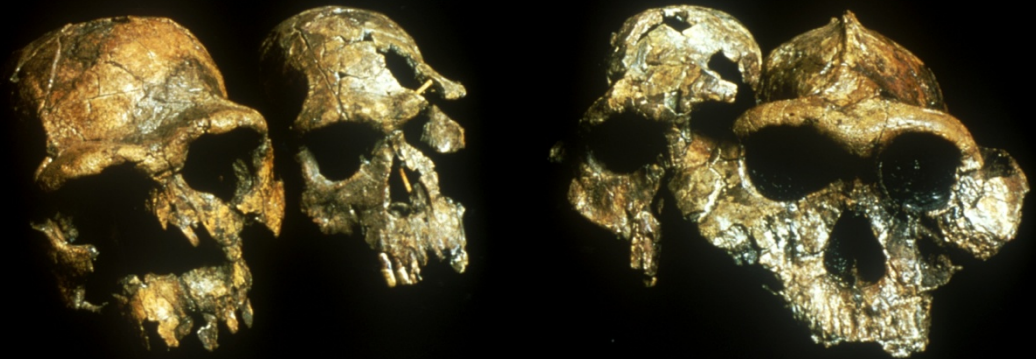
Sahelanthropus, 6-7 million years old



Homo floresiensis,
95,000 – 17,000 yrs old

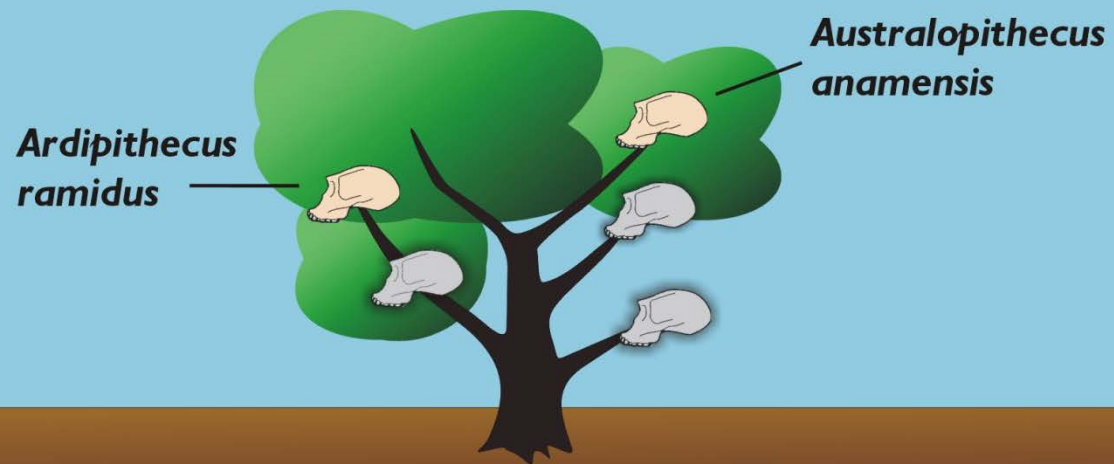


'Ardi' skeleton, 4.4 million years old

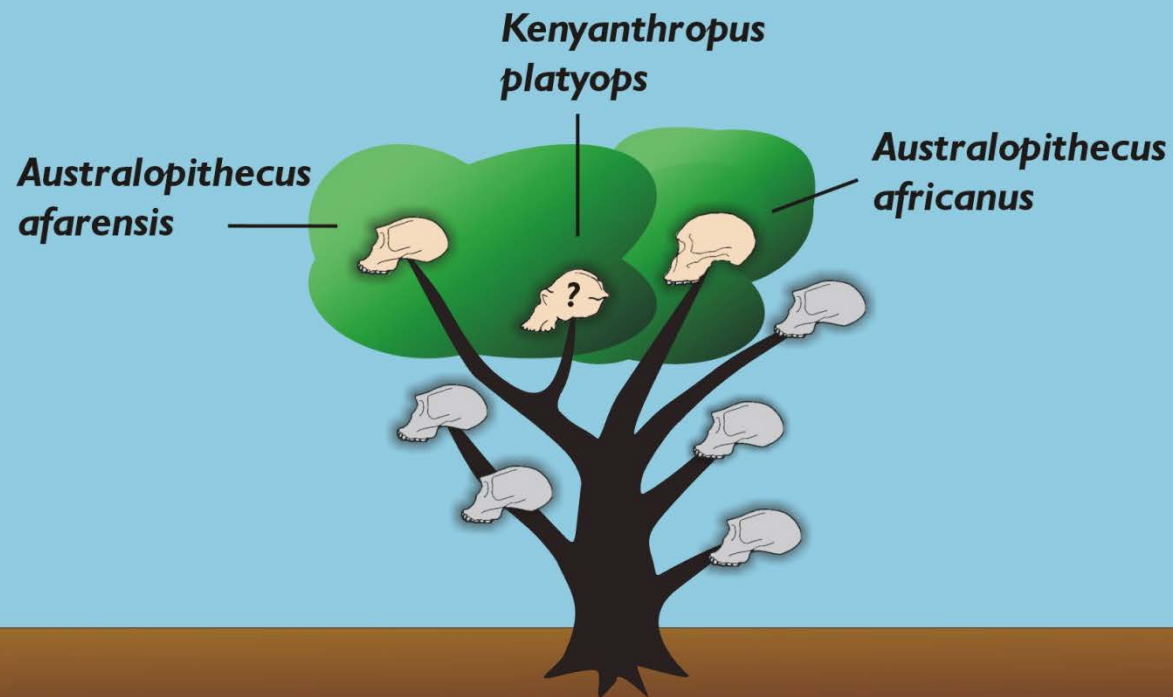




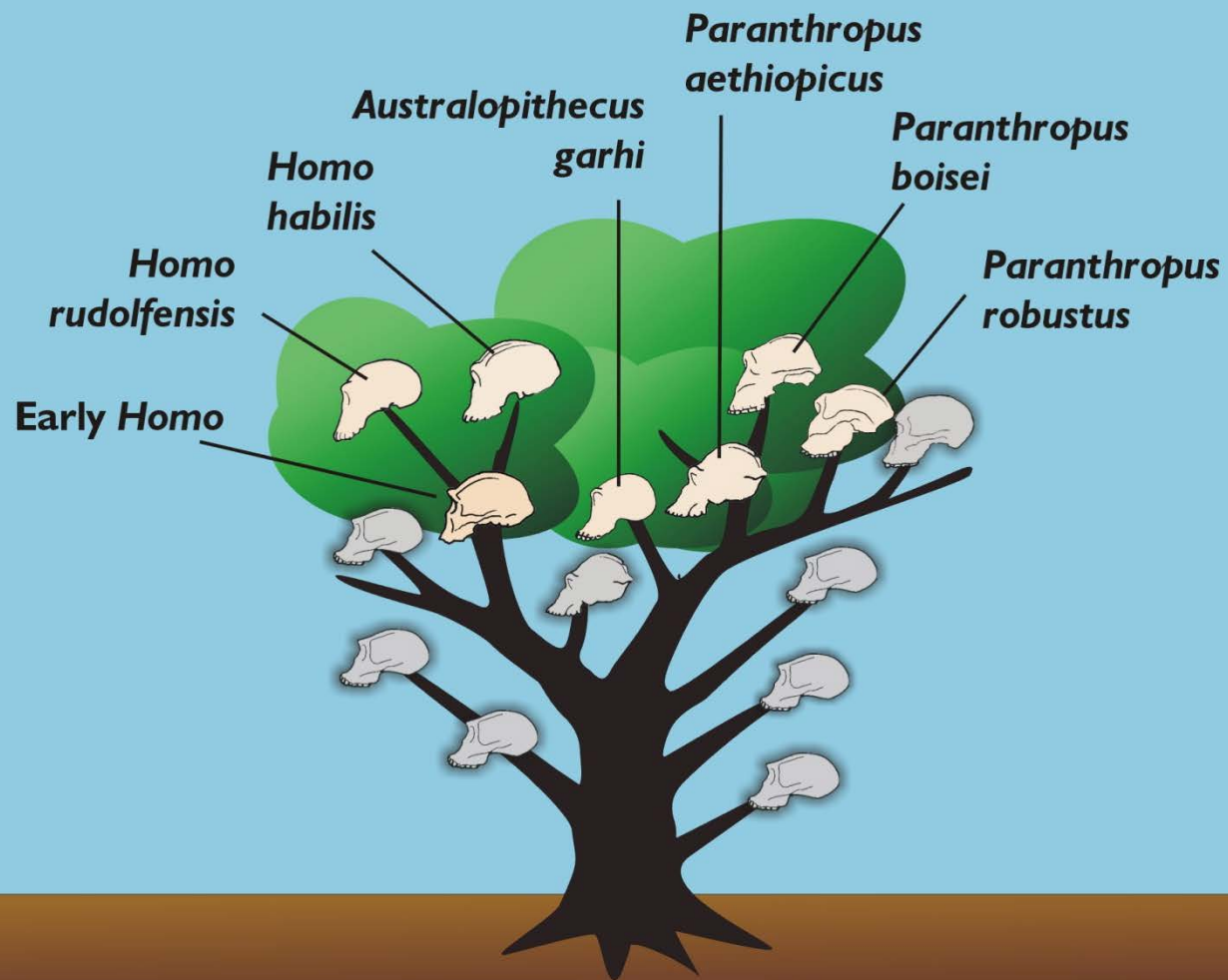
5 to 6 million years ago



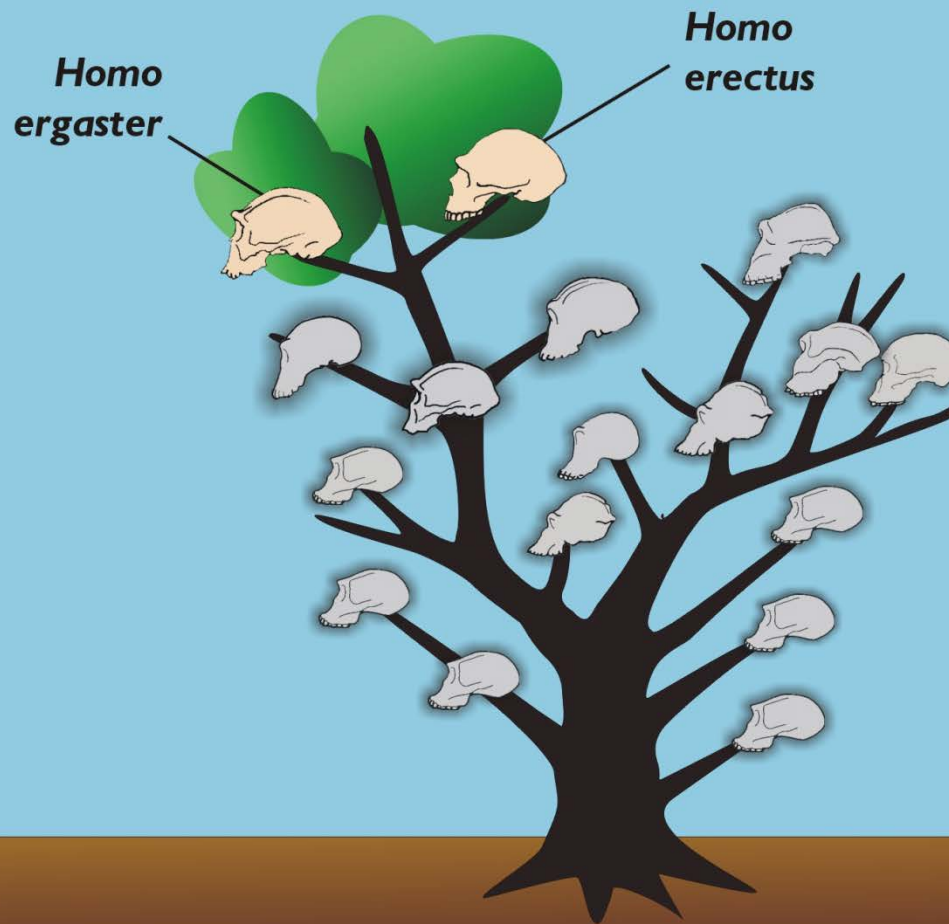
4 to 5 million years ago



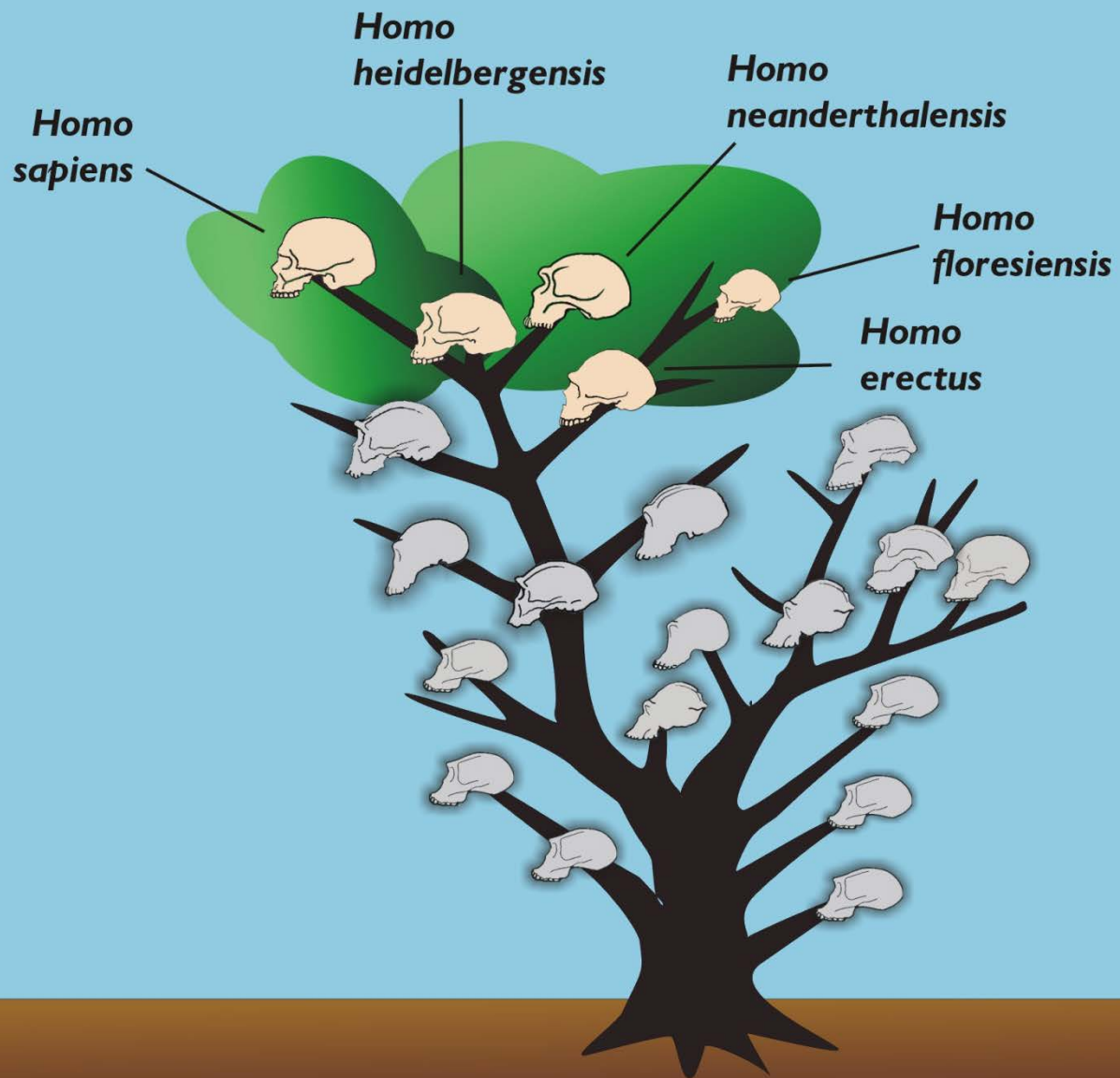
3 to 4 million years ago



2 to 3 million years ago



1 to 2 million years ago



1 million years ago to present

Evidence of the accumulation of human qualities



Smithsonian's Hall of Human Origins

Theme: What Does It Mean To Be Human?



Walking up the Evolution of Hominids...



changes in the body, brain, social life, and language



One Species Living Worldwide



HOT Topics: HumanOrigins.si.edu

Smithsonian
National Museum of Natural History

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What does it mean to be human?

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Was the Pit of Bones a 350,000 years old grave for *Homo heidelbergensis*?

March 6, 2010
Giant Early-Human-Eating Horned Croc Fossils Found in Tanzania
Newly discovered fossil crocodile may have been largest predator humans ever encountered

February 6, 2010
Running Barefoot Blunts Foot's Force
Going shoeless tempers impact, but effect on injuries uncertain

Events

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The Scientist is In

March 21, 2010
Panel Discussion "Religious Perspectives on the Science of

What Does It Mean To Be Human?

Explore Other Answers >>

Share your answer (max 140 characters): *

Name * Location *

*These fields are required.

Other responses

Being human is a responsibility to show compassion to all your distant relatives, no matter what branch of the tree they sit on. – *Skeet Freeman*, Bowling Green, KY

To be human is to be both the epicentre of the universe and just one of billions of tiny ants scurrying around an obscure rock in space. – *Francis Crice*, London, UK

Humans perform altruistic acts without apparent benefit, and are less hairy than a typical mammal. – *Fred Whiteman*, Albuquerque, NM

HumanOrigins.si.edu

- Extensive content on the science of human origins
- Unique digital 3D access to fossil specimens
- Interactive exhibition floor plan, discussion area for educators
- Resources developed by the Broader Social Impacts Committee

Core concepts about human evolution

1. The origin of the distinctive features of our species did not occur all at once.
2. Abundant evidence for the accumulation of adaptations: related to how we walk, how our brains work, how we interact with our surroundings, how our social behavior became so elaborate...

TIME

EVOLUTIONARY CHANGE

100 ka to present

Increased cultural diversity & technological innovation



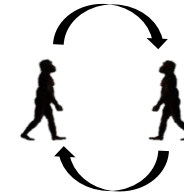
by 250 ka

Enhanced symbolic behavior



by 250 ka

Complex spatial mapping & resource exchange



by 800 - 400 ka

Controlling fire & building shelters



800 - 200 ka

Most rapid increase in relative brain size



by 1.7 Ma

Initial advances in stone technology

by 2.0 – 1.5 Ma

Pronounced elongation of the legs



by 2.0 Ma

Extensive carrying of stones & food



by 2.6 Ma

Simple stone flaking



by 4 – 3 Ma

Increased range of foods eaten



~6 – 2 Ma

Bipedal walking & tree climbing



ka = thousands
of years ago

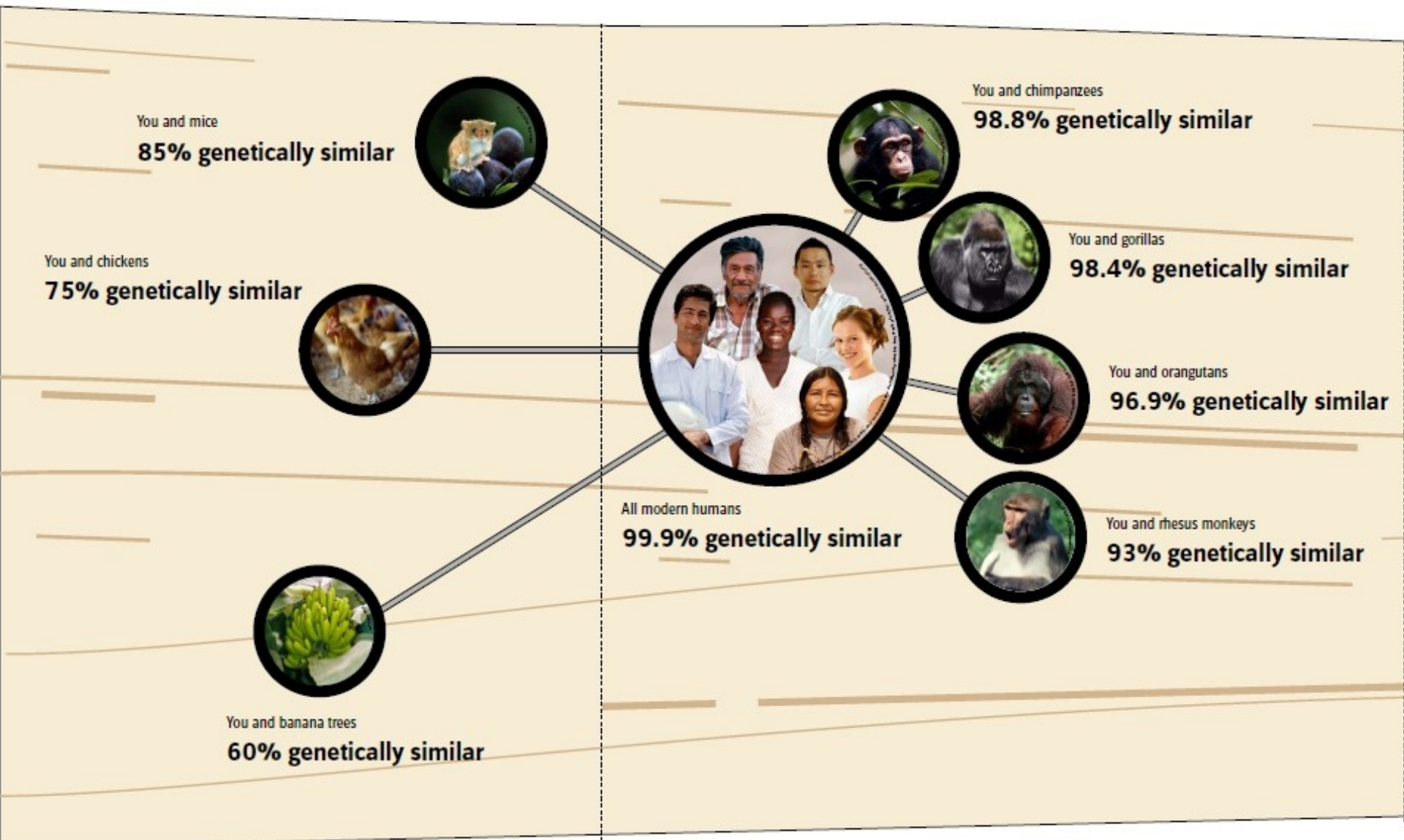
Ma = millions
of years ago

Core concepts about human evolution

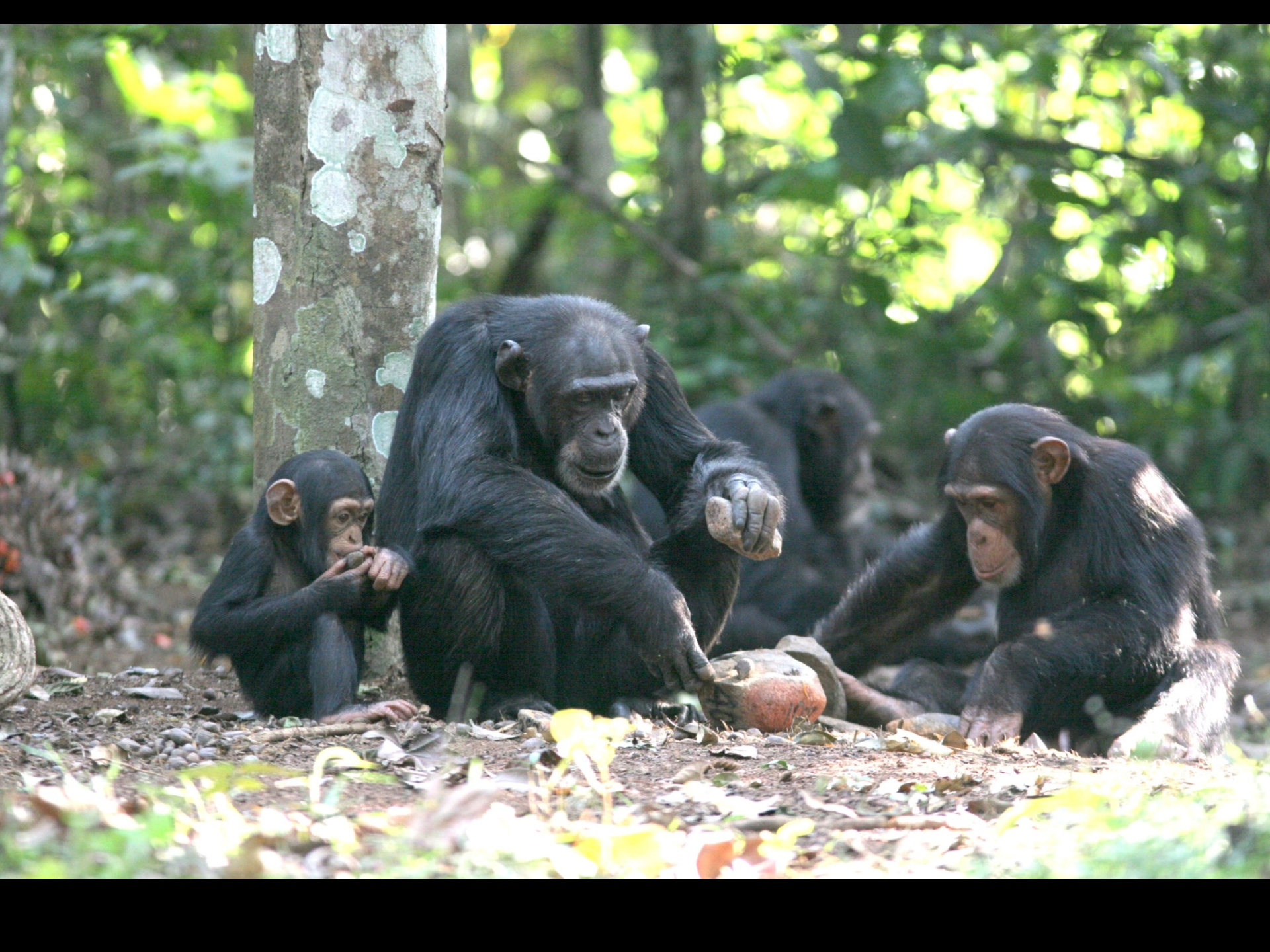
3. *Homo sapiens* is connected to all other living organisms on the planet. There is continuity in the evolved characteristics of humans with those of our primate relatives.
4. Our species is the only one left of a diverse evolutionary tree of earlier species.

Genetic similarity

Reflects genealogy (relationships) and can help trace the history of dispersal of human groups to different regions of the world.







Core concepts about human evolution

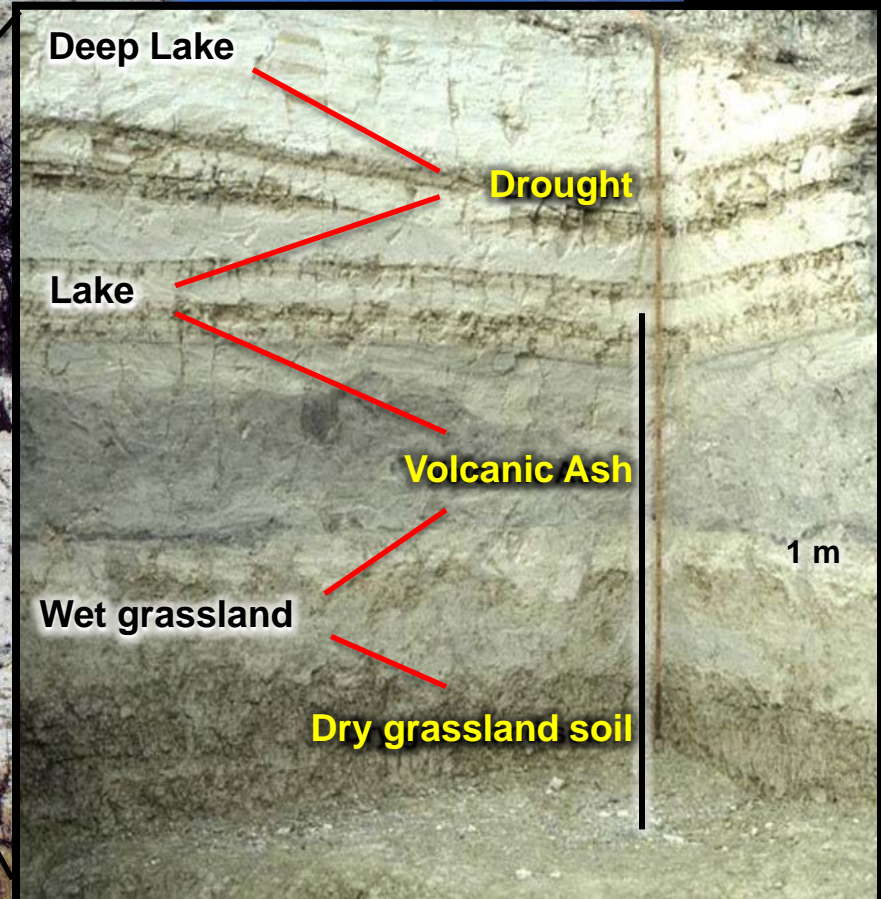
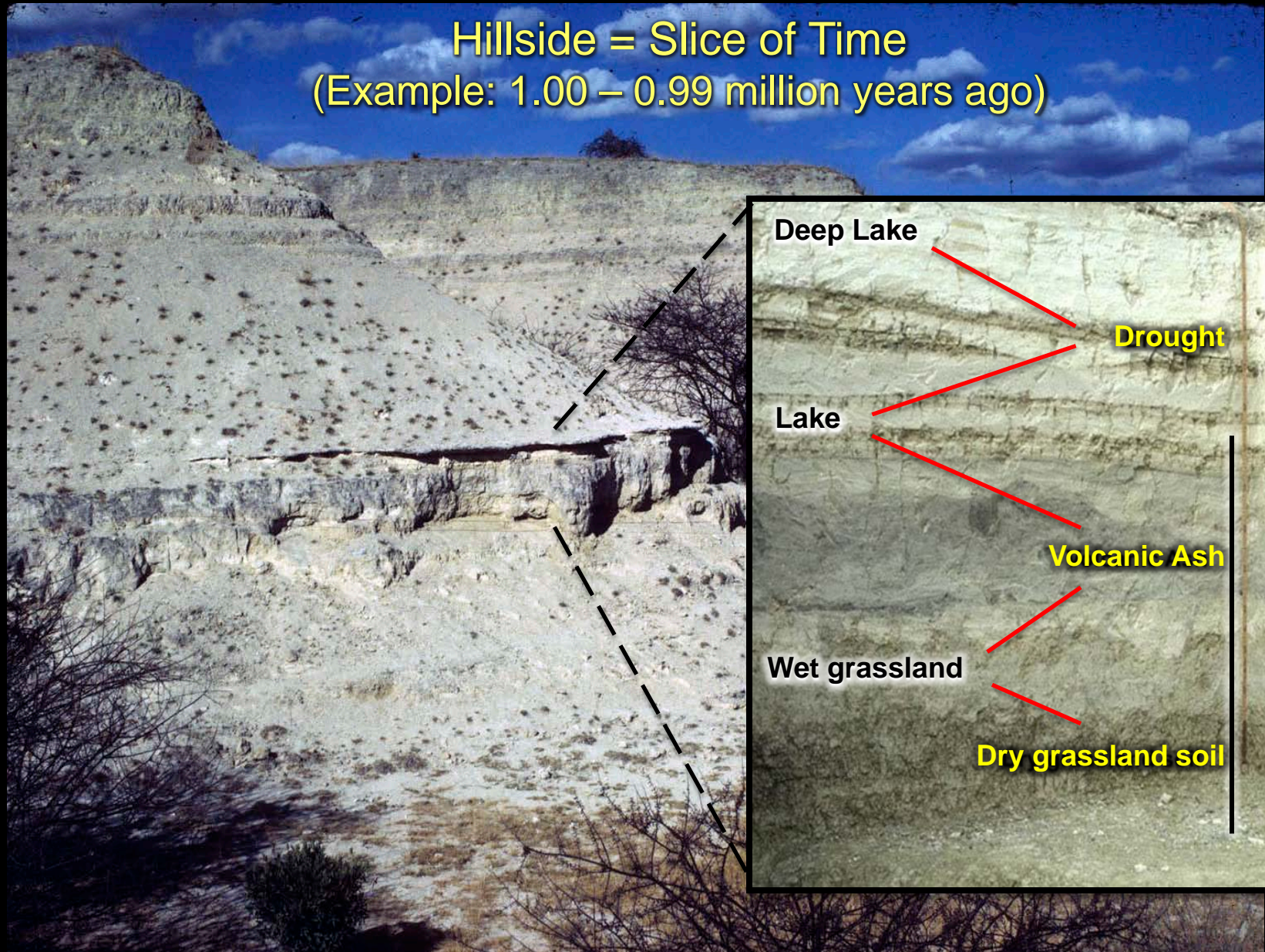
5. Human ancestors evolved in dramatically changing surroundings → survival challenges
6. The benefits of particular adaptations came at a cost (one of the hallmarks of evolution)



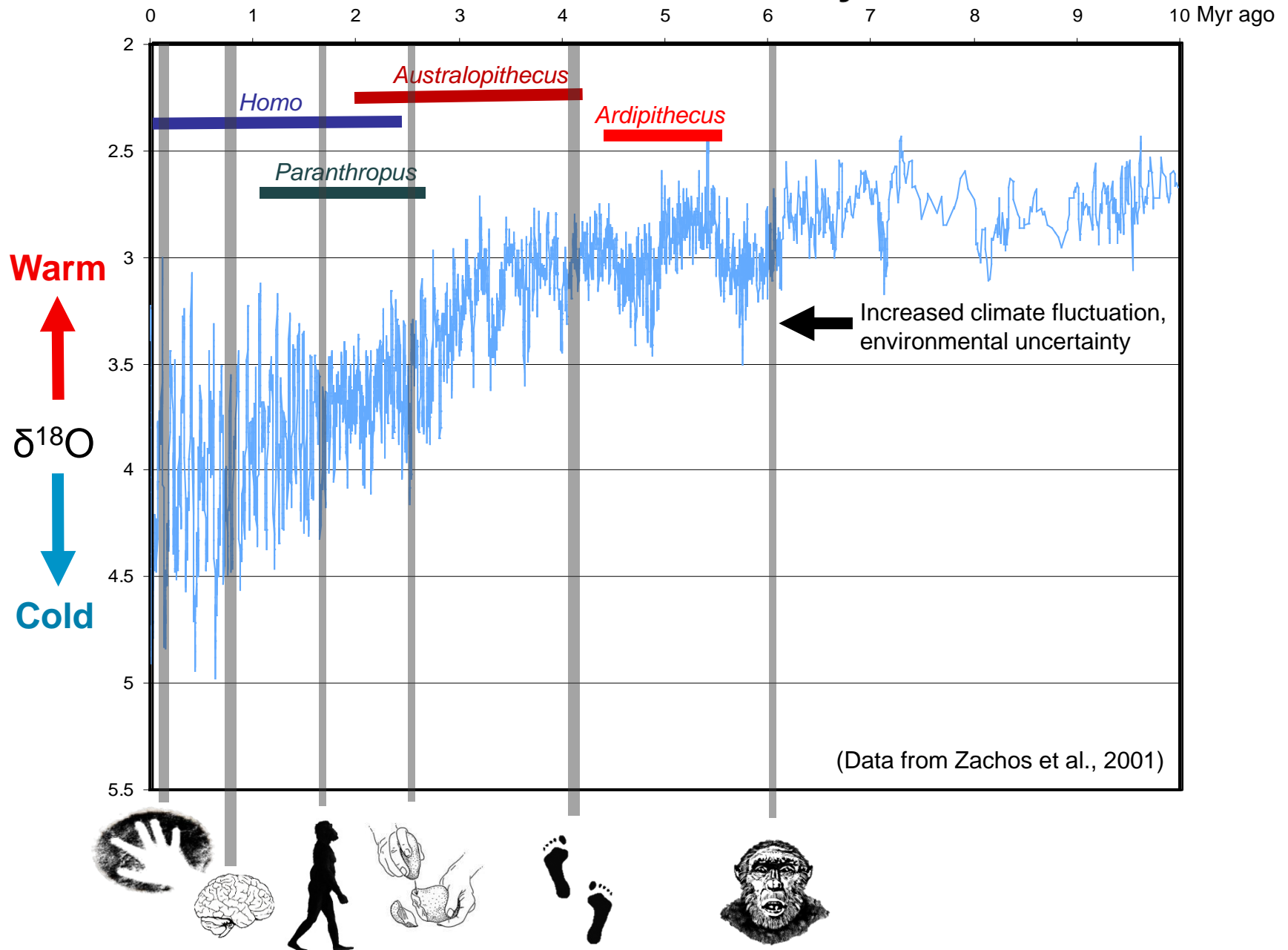
Olorgesailie: Rift Valley, southern Kenya

Hillside = Slice of Time

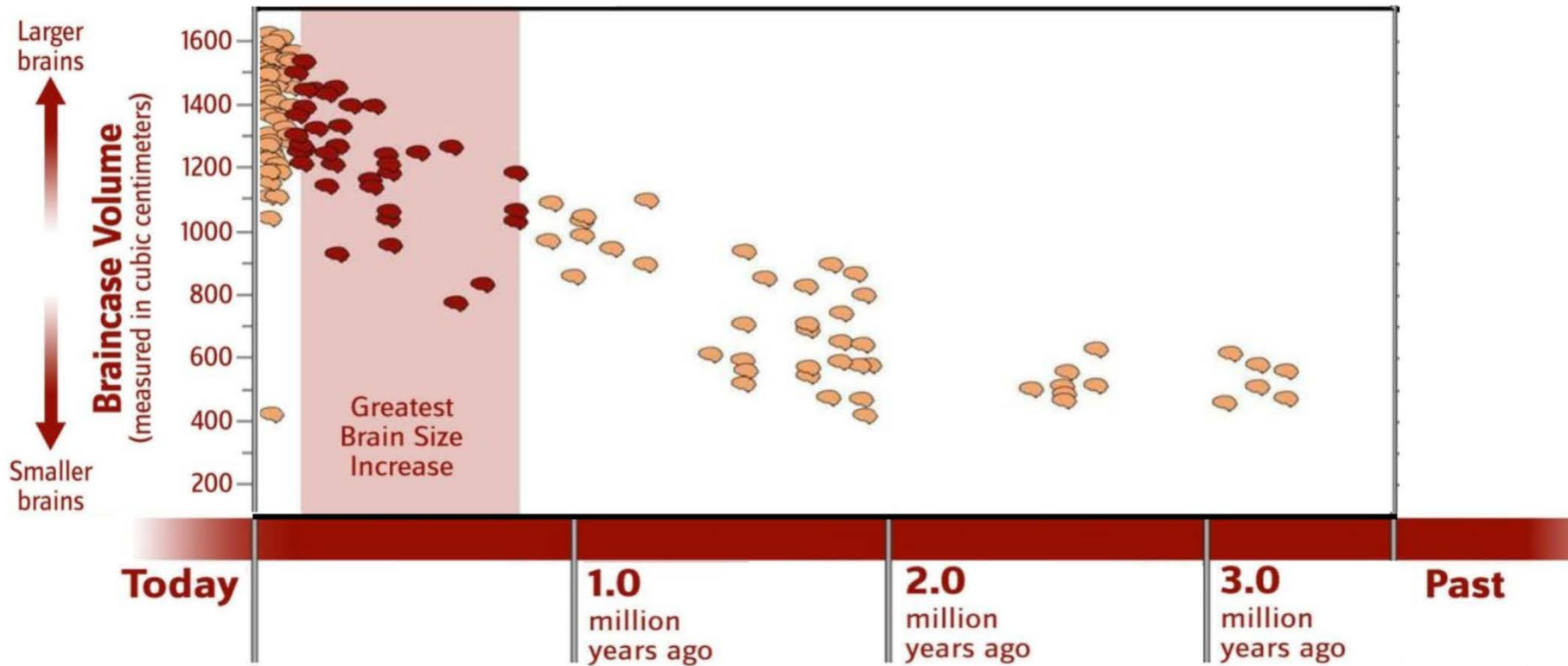
(Example: 1.00 – 0.99 million years ago)

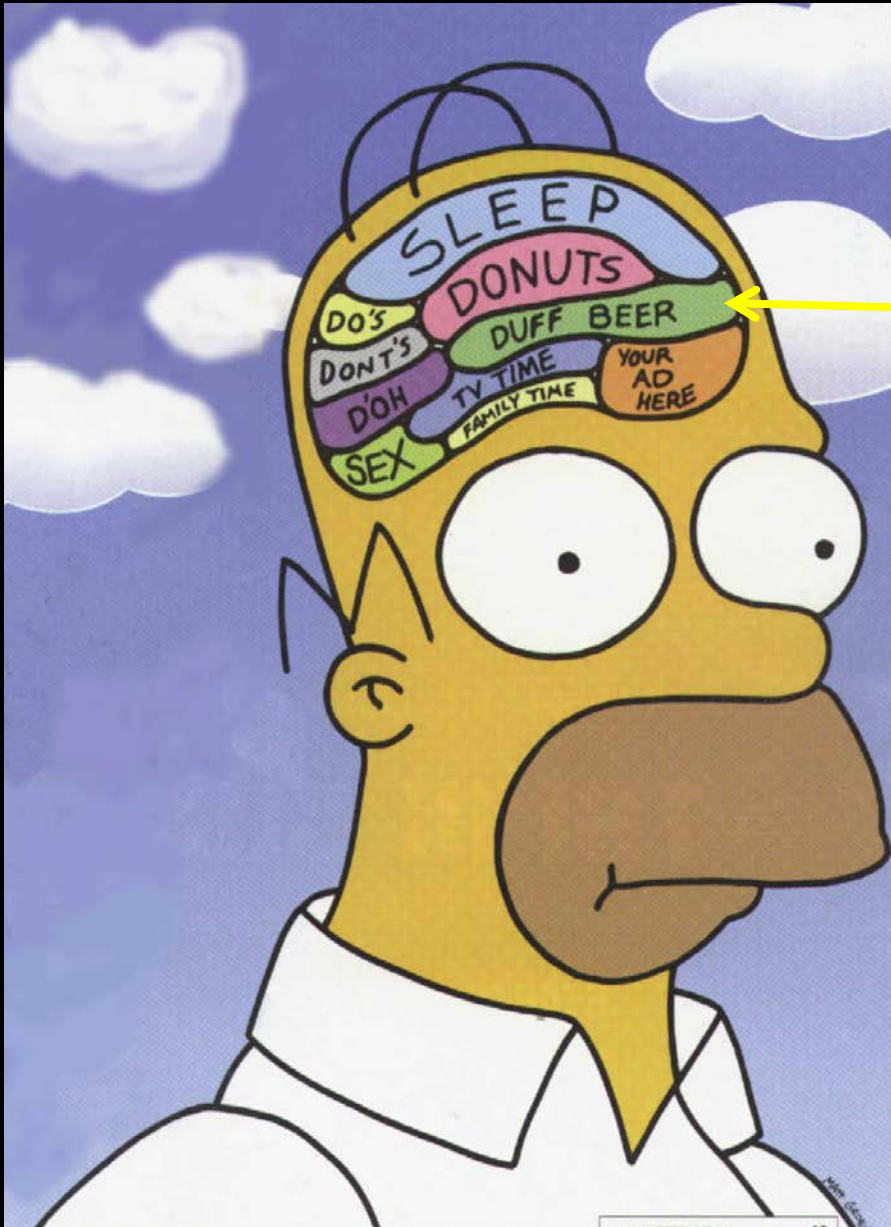


Oxygen isotope data for marine benthic foraminifera over the last 10 million years



Hominin cranial capacity: the past 3.5 million years

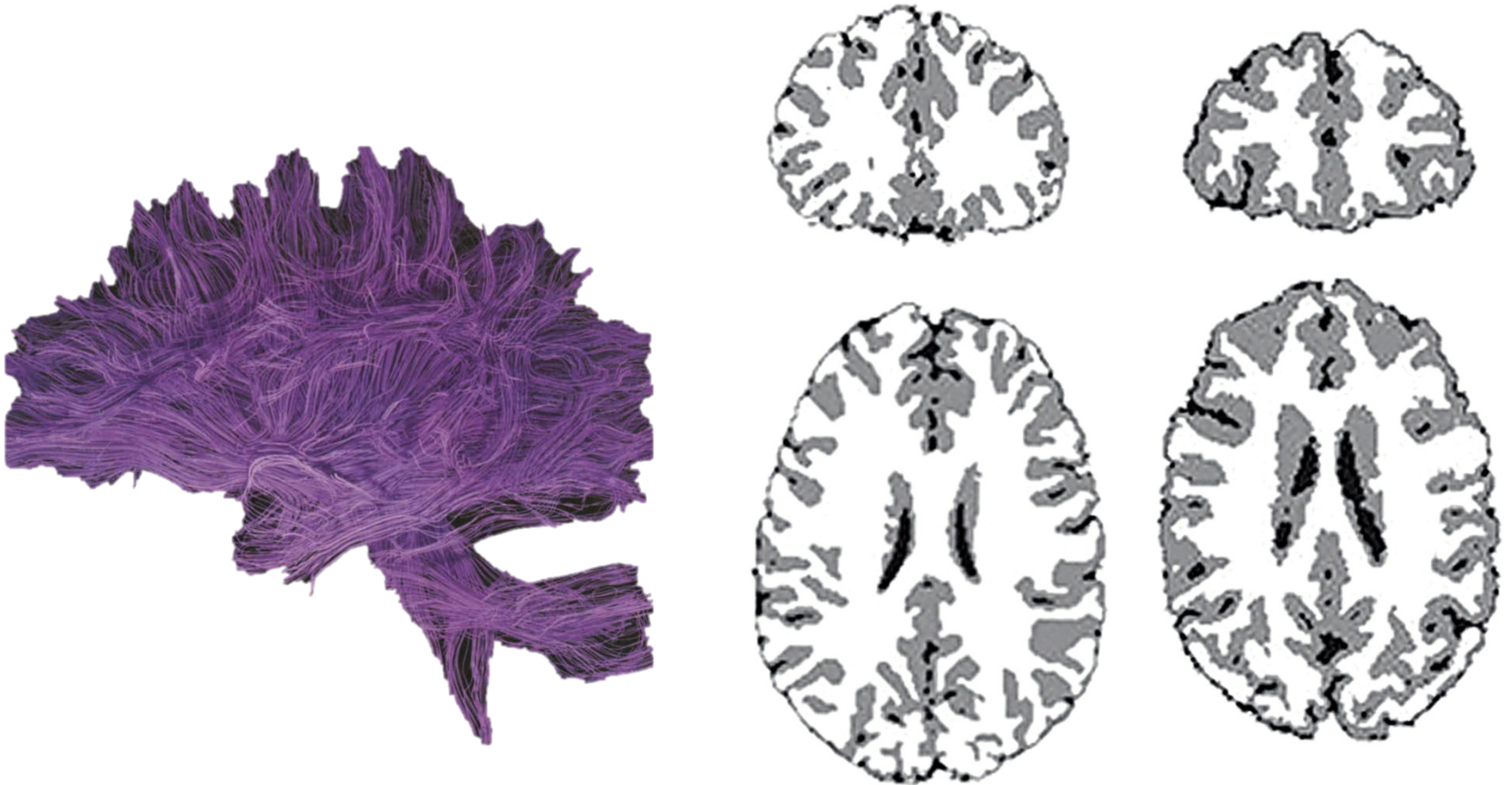




The human brain: 2% of body weight; 20-25% of our energy.

Our large, hungry brain favored:

- rich food sources
- delayed eating
- prolonged maturation
- cooperative care of young



Prefrontal white matter volume is disproportionately larger in humans than in other primates (Schoenemann et al. 2005, *Nature Neuroscience*)

Prefrontal cortex is highly interconnected with other cortical and subcortical regions

TIME

EVOLUTIONARY CHANGE

ADAPTIVE BENEFITS

100 ka to present

Increased cultural diversity & technological innovation

Expanded range of adaptive options

by 250 ka

Enhanced symbolic behavior

Greater capacity to imagine, plan, & communicate novel ideas

by 250 ka

Complex spatial mapping & resource exchange

Enlarged store of information about the ecological & social surroundings

by 800 - 400 ka

Controlling fire & building shelters

Food sharing at home bases: enhanced social memory & buffering of uncertainty

800 - 200 ka

Most rapid increase in relative brain size

Expanded memory & processing of data about the surroundings

by 1.7 Ma

Initial advances in stone technology

Increased ability to use & modify the environment

by 2.0 – 1.5 Ma

Pronounced elongation of the legs

Enhanced mobility & dispersal capability

by 2.0 Ma

Extensive carrying of stones & food

Improved ability to adjust to changes in food availability & spatial distribution

by 2.6 Ma

Simple stone flaking

Expanded ability to process new foods, like meat, marrow, & underground plants

by 4 – 3 Ma

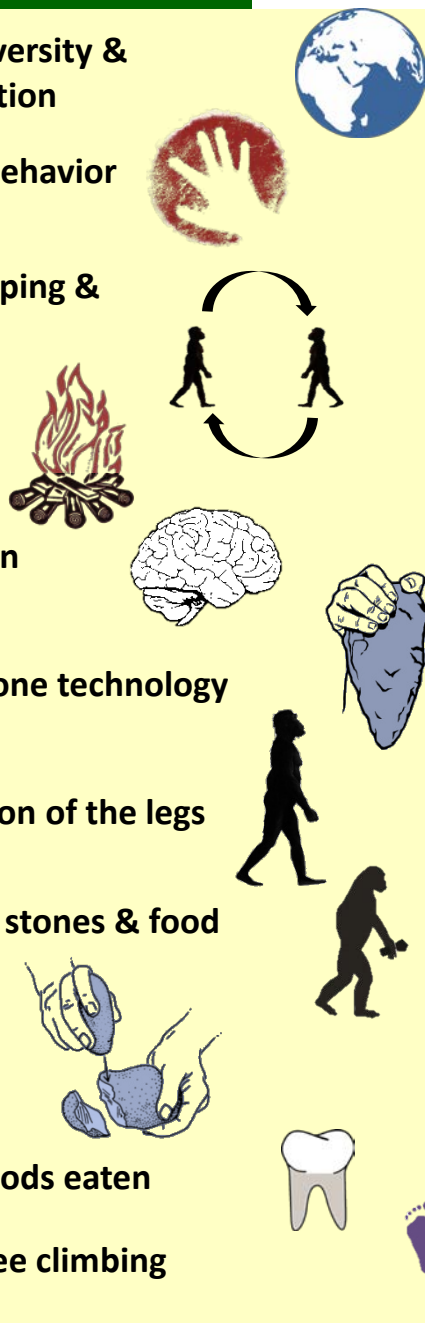
Increased range of foods eaten

Improved access to diverse foods

~6 – 2 Ma

Bipedal walking & tree climbing

Versatile movement in wooded & open environments



Core concepts about human evolution

7. Discoveries pertaining to human evolution uncover changes in some of the defining qualities of our species (*H. sapiens*)... yet public usage of the word 'human' is broader than what science and evolution deals with.





Kanjera South, western Kenya: ~2.0 million years old

- Carrying of animal & plant foods
- Carrying stone material >12 km
- Delayed eating of food





Prolonged Maturation



Our prolonged maturation (compared to other primates)

- Much of what is familiar about our lives stems from a prolonged life history: how we care for others, seek out partners, create social alliances, learn & build up cultural knowledge.
- Unique childhood and adolescence phases in living humans; grandparents, too!



Homo sapiens

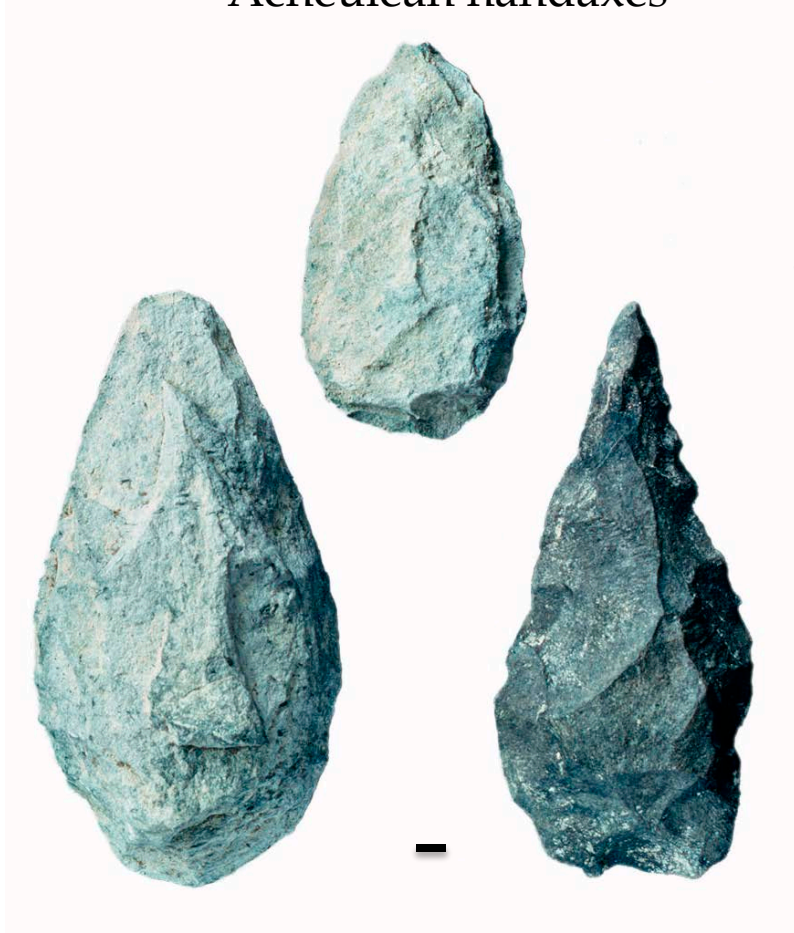


Early African *Homo erectus*
~1.53 million years old



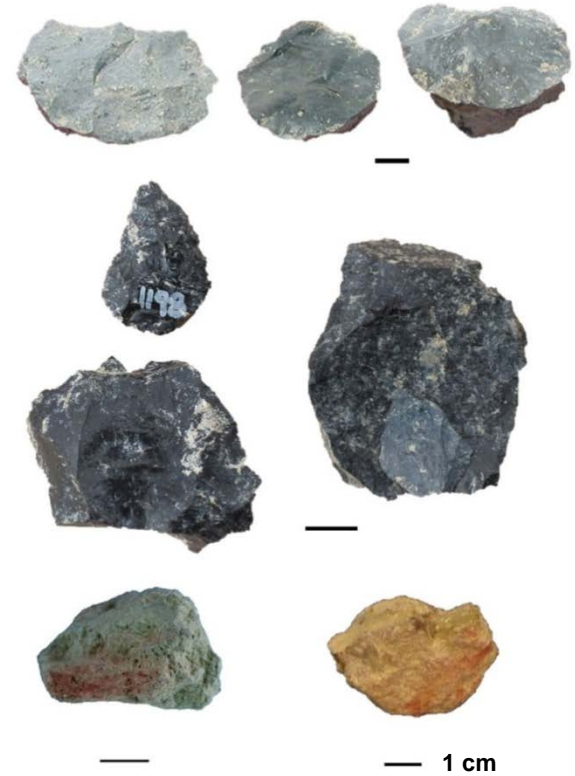
1.7 million - 500,000 years ago

Acheulean handaxes



By 316,000 years ago

Middle Stone Age innovations

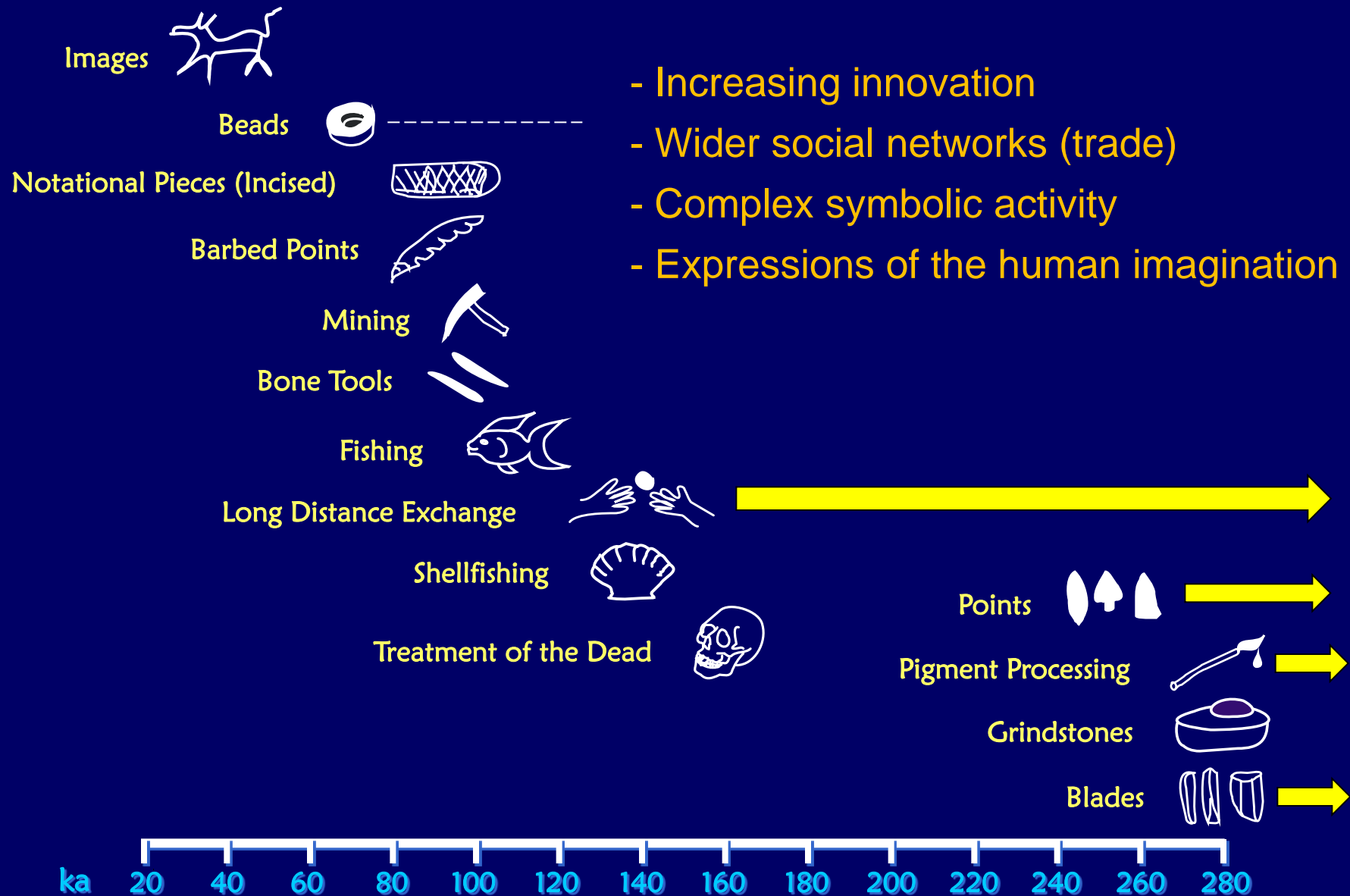


Oldest known pigments

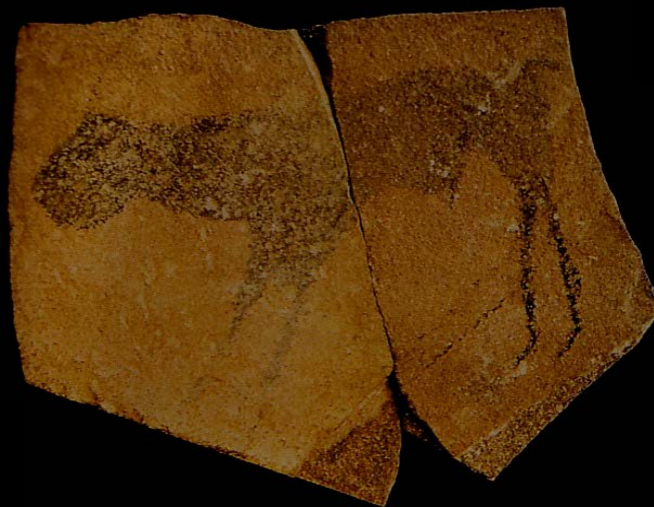
~ 316,000 to 250,000 years old



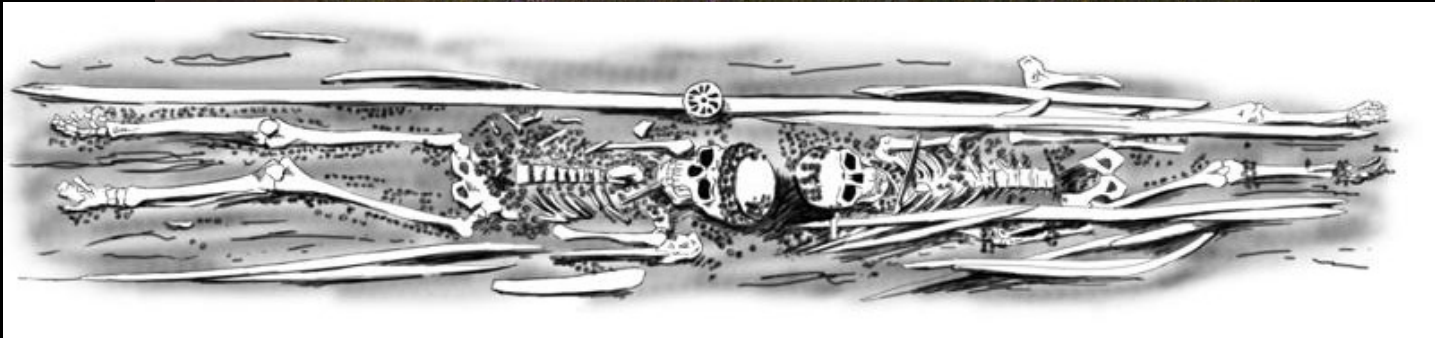
Behavioral Innovations of the Middle Stone Age in Africa



(From: McBrearty & Brooks, 2000)









The skeleton lies as it was, buried with wild flowers.

Homo erectus

(female)

Lived 1.89 million – 143,000 years ago
Africa; Asia; possibly Europe

Homo heidelbergensis

(male)

Lived 700,000 -200,000 years ago
Europe, Asia, Africa

Homo neanderthalensis

(male)

Lived 225,000 – 28,000 years ago
Europe and Asia



Paranthropus boisei

(male)

Lived 2.3-1.3 million years ago
Eastern Africa

Australopithecus africanus

(female)

Lived 3.3 -2.1 million years ago
Southern Africa

Homo floresiensis

(female)

Lived 95,000 -17,000 years ago
Southeast Asia; nicknamed 'Hobbit'

Australopithecus afarensis

(male)

Lived 3.85 – 2.95 million years ago
Eastern Africa

Concerns, apprehensions, obstacles

1. Existential concerns:

Humans are 'just a speck.'

Humans are 'just an accident.'

2. Concerns about values:

'Evolution erodes my core values.'

3. Biblical and doctrinal concerns

4. Representation of science, evolution

5. Surveys reinforce the science-religion divide.

Challenges Posed by Human Evolution

1. Extinction of species
2. Common ancestry
3. Natural selection
4. Survival and adaptability

Opportunities Presented by Human Evolution for the religion-science conversation

1. Extinction of species
2. Common ancestry
3. Natural selection
4. Survival and adaptability
5. A shared sense of awe