Last time

- What are the major theories regarding the last million years of human evolution and the origins of modern humans?
- What are the data that each use to support the theory?
- What are the relative impacts of gene flow and local selective forces in each theory?
- In each theory, how are archaic humans, Neandertals, *Homo erectus*, and Flores regarded?

New news

- http://www.nytimes.com/2011/05/10/science/10neanderthal.html?ref=science

- What can we make of their conclusion?

Overview...

- The pattern of human evolution
- When did the major defining aspects of humans arise and in which populations?
  - bipedalism?
  - big brains?
  - modern anatomy?
  - modern behavior?

Becoming human...

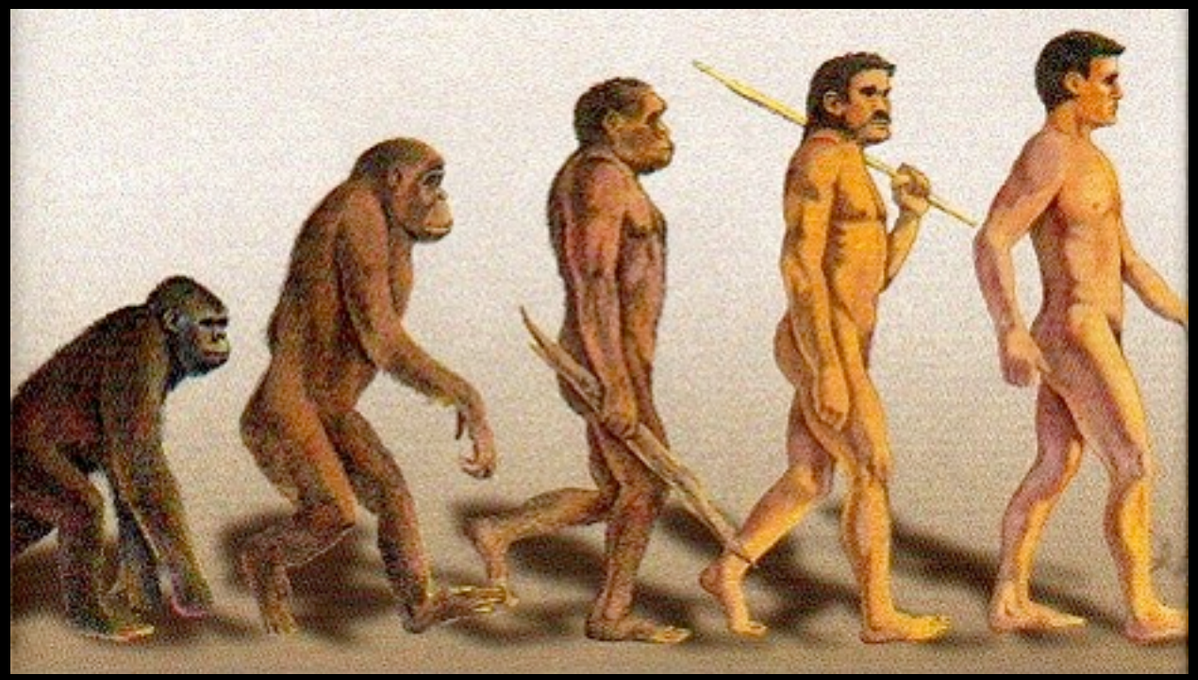
- The Australopithecine adaptive radiation
- Early *Homo*
- *Homo erectus*
- Emergence of modern humans

Evolutionary trends in the human line

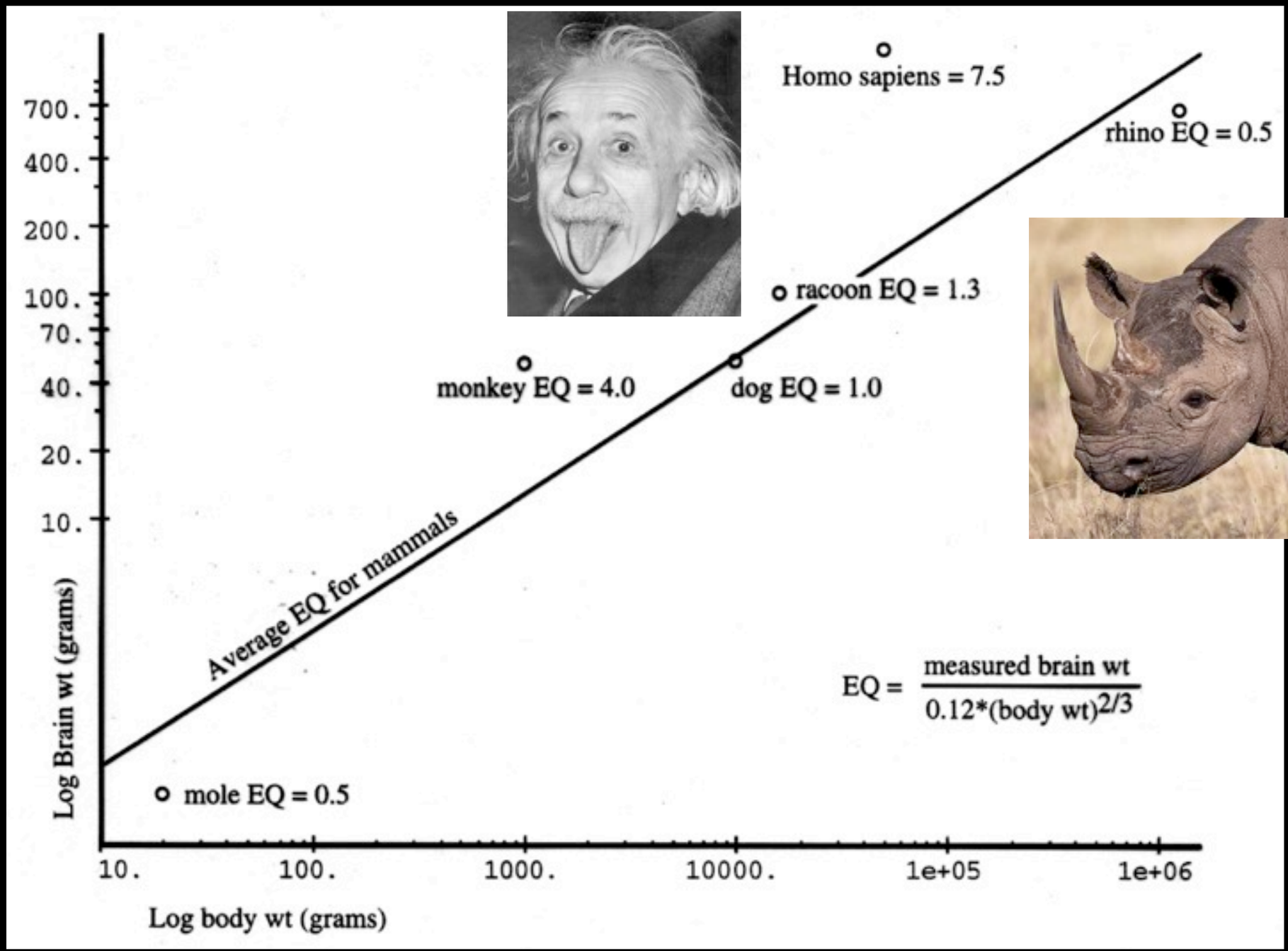
- Bipedalism came first...
- Then.....
  - Big brains
  - Culture
  - Language

Bipedalism

- When did our lineage become bipedal?
- What is the adaptive advantage of being bipedal?



Encephalization quotient (EQ)



Big brains

- When did our lineage begin to increase brain size?
- What is the adaptive advantage of big brains?

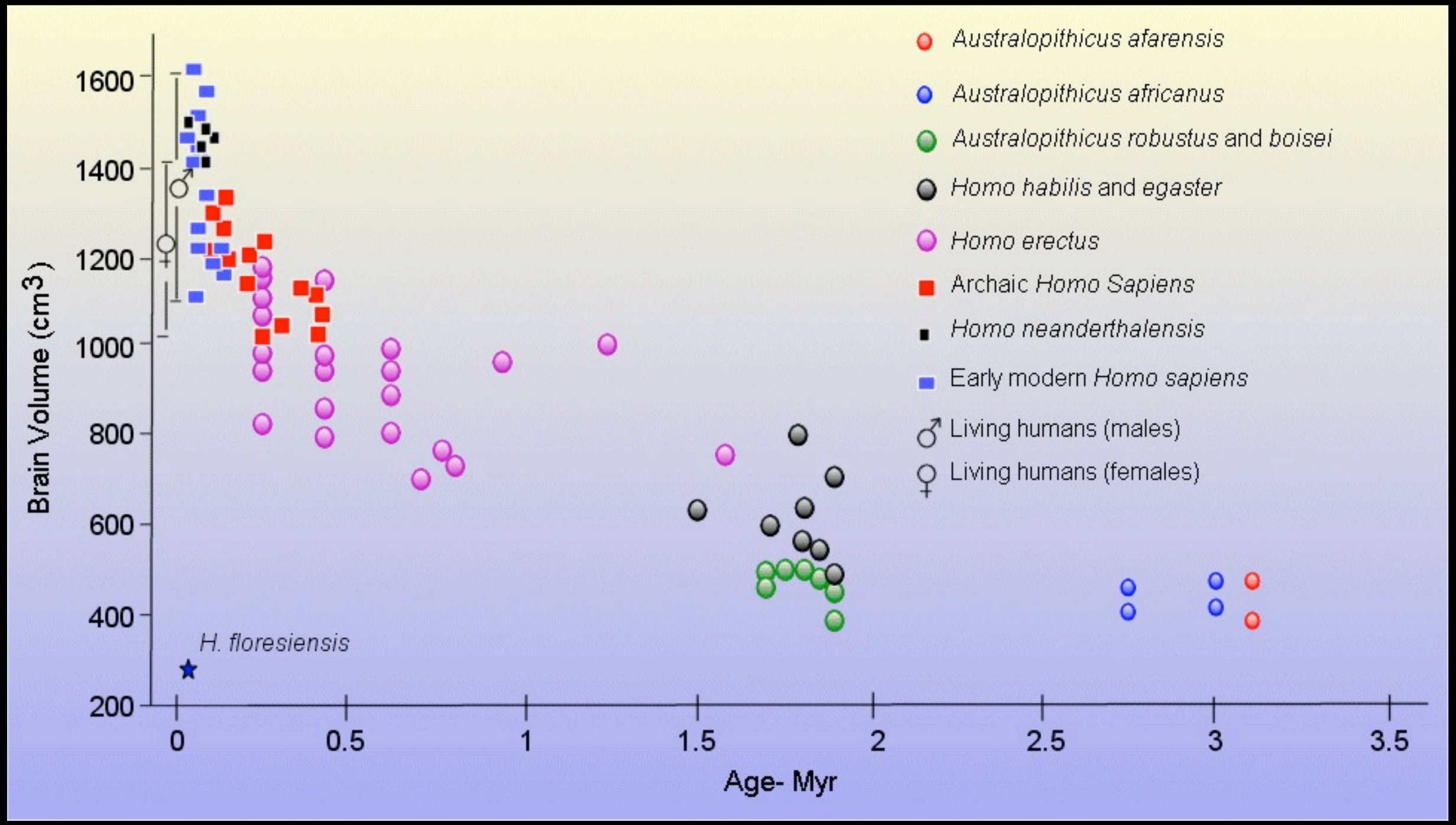

Brain Volume (cm3)
1600
1400
1200
1000
800
600
400
200
0
0.5
1
1.5
2
2.5
3
3.5
Age- Myr
H. floresiensis
Australopithicus afarensis
Australopithicus africanus
Australopithicus robustus and boisei
Homo habilis and egaster
Homo erectus
Archaic Homo Sapiens
Homo neanderthalensis
Early modern Homo sapiens
♂ Living humans (males)
♀ Living humans (females)

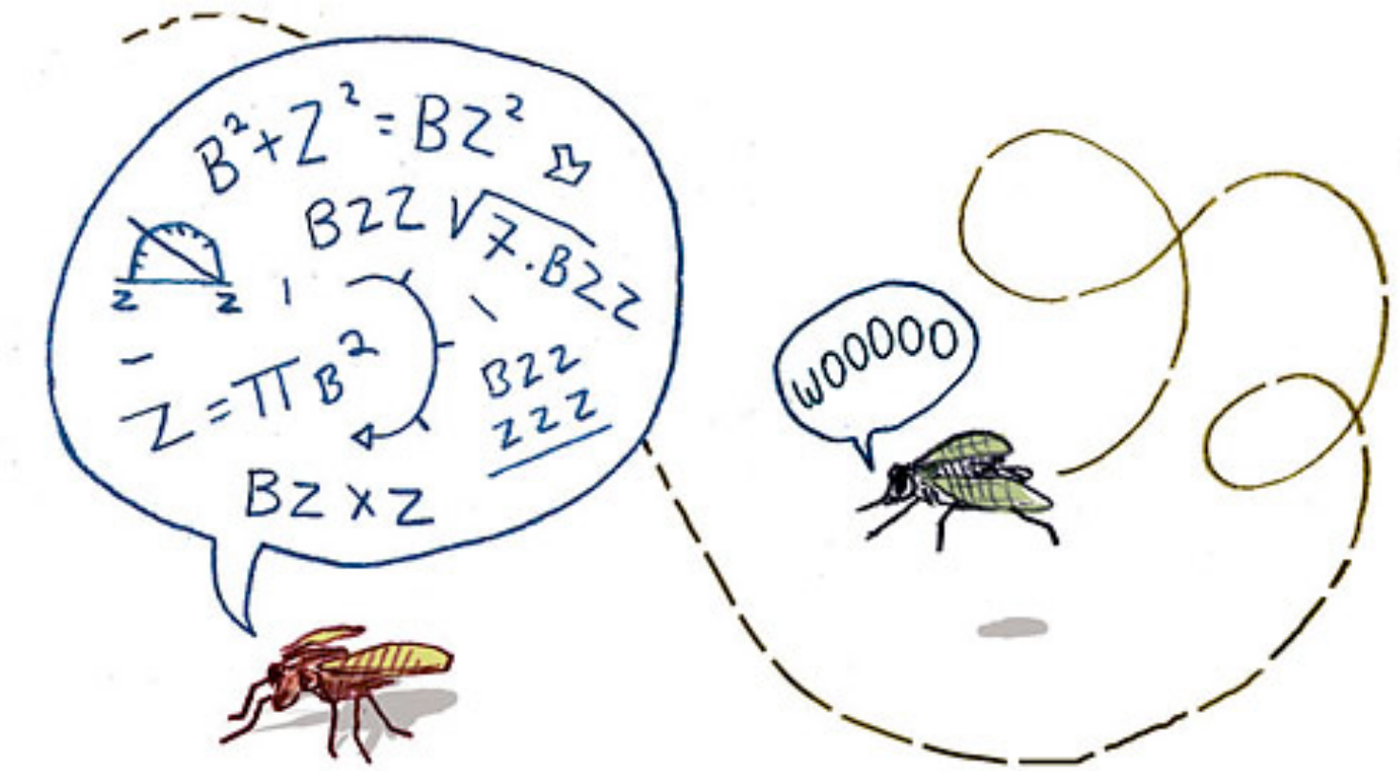
TABLE 16.2 Average Cranial Capacities for Fossil Hominids (adult specimens only)

TAXON	NUMBER OF SPECIMENS	AVERAGE CRANIAL CAPACITY (CC)	RANGE (CC)	ESTIMATED EQ
A. afarensis	2	450	400–500	1.87
A. africanus	7	445	405–500	2.16
A. robustus and *A. boisei*	7	507	475–530	2.50
H. habilis	7	631	509–775	2.73–3.38
H. erectus	22	1,003	650–1,251	3.27
Archaic *H. sapiens*	18	1,330	1,100–1,586	3.52
H. neanderthalensis	19	1,445	1,200–1,750	4.04
Modern *H. sapiens* (older than 8,000 years)	11	1,490	1,290–1,600	5.27

Sources: Aiello and Dean (1990), Kappelman (1996), and Holloway (1999).

Note: Estimated EQs are not derived using all the specimens included in the second column.

Lots of Animals Learn, but Smarter Isn't Better



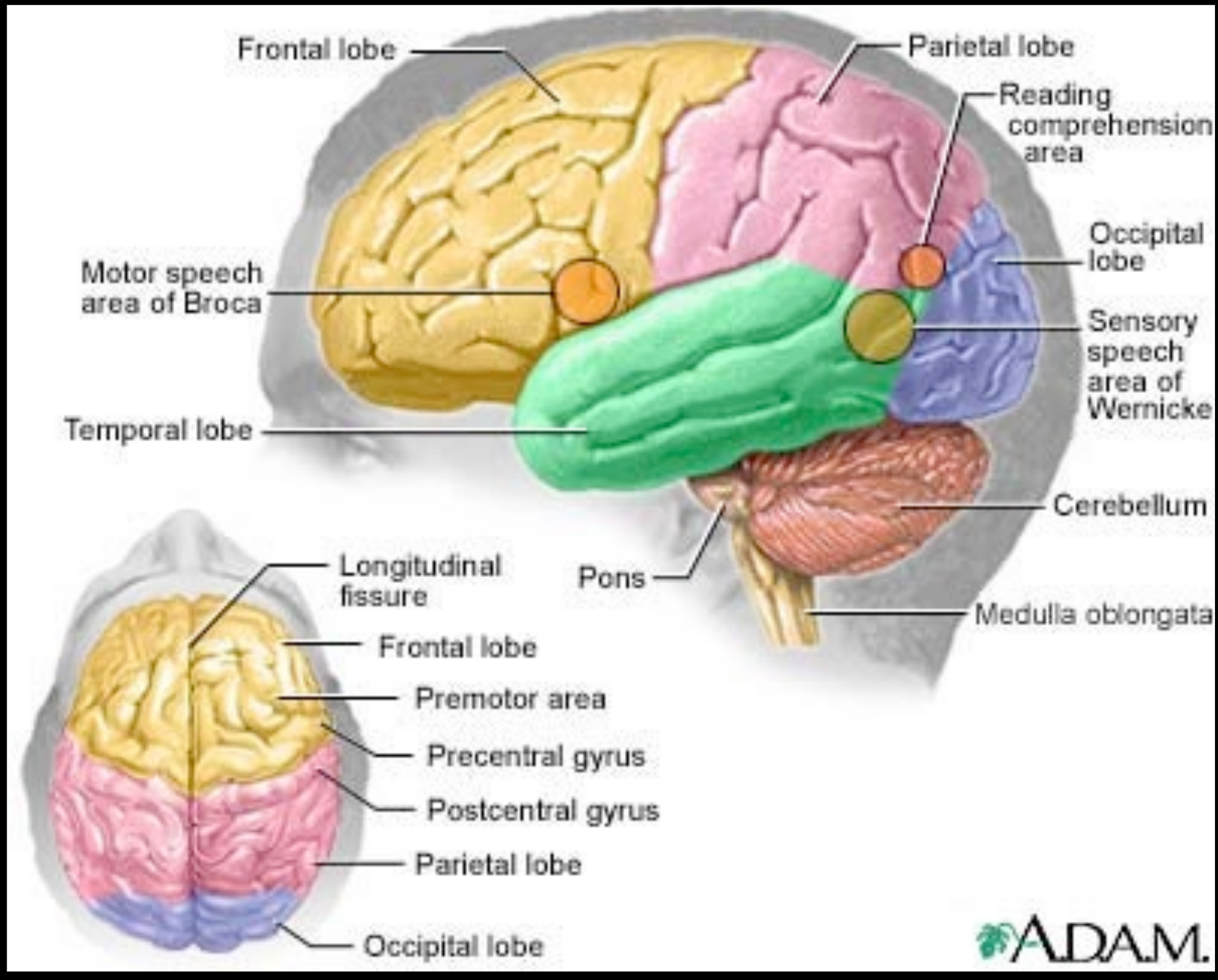
Leif Parsons

By CARL ZIMMER
Published: May 6, 2008

E-MAIL

Homo sapiens

Pan troglodytes


Frontal lobe
Parietal lobe
Reading comprehension area
Occipital lobe
Motor speech area of Broca
Sensory speech area of Wernicke
Temporal lobe
Cerebellum
Pons
Medulla oblongata
Longitudinal fissure
Frontal lobe
Premotor area
Precentral gyrus
Postcentral gyrus
Parietal lobe
Occipital lobe
A.D.A.M.

Language

- When did our lineage begin to have language?
- What is the adaptive advantage of language?

What is Language?

- Language is spoken
- Language is semantic
- Language is phonemic
- Language is grammatical

Language is spoken

- debatable
    - deaf babies babble with their hands
- BUT we are anatomically specialized to both produce language and produce language-oriented sounds

Language is semantic

- words have meanings linked to objects and ideas
- at an order of magnitude larger than any other animal
- these are learned through traditional transmission

Language is phonemic

- words are assembled from smaller sound units called phonemes
- no biological limit to the combination of phonemes into words
- association of words and objects or actions is arbitrary

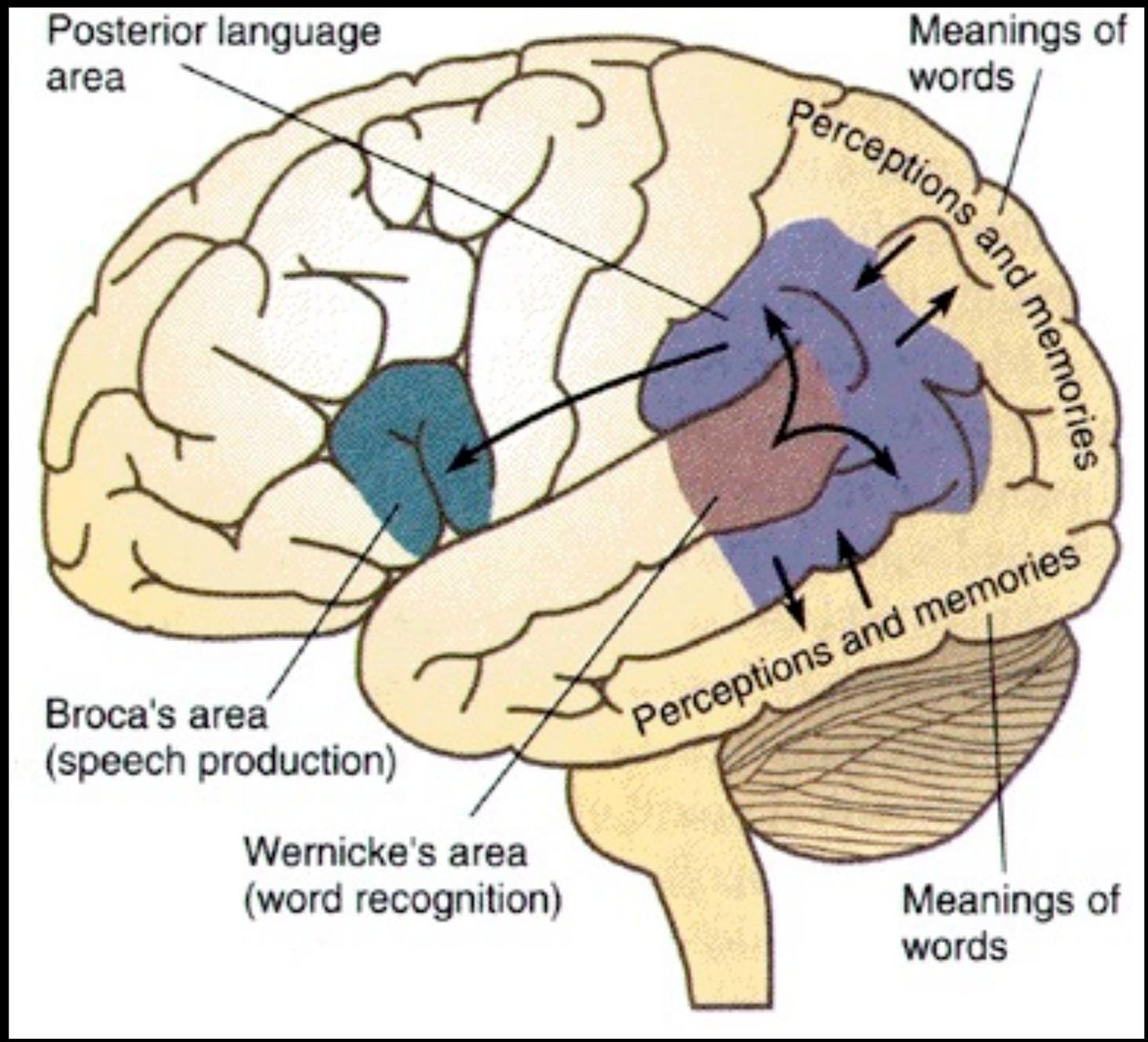
Language is grammatical

- a grammar is a system governing how word classes are defined and used and the rules of word order
- grammar is learned subconsciously

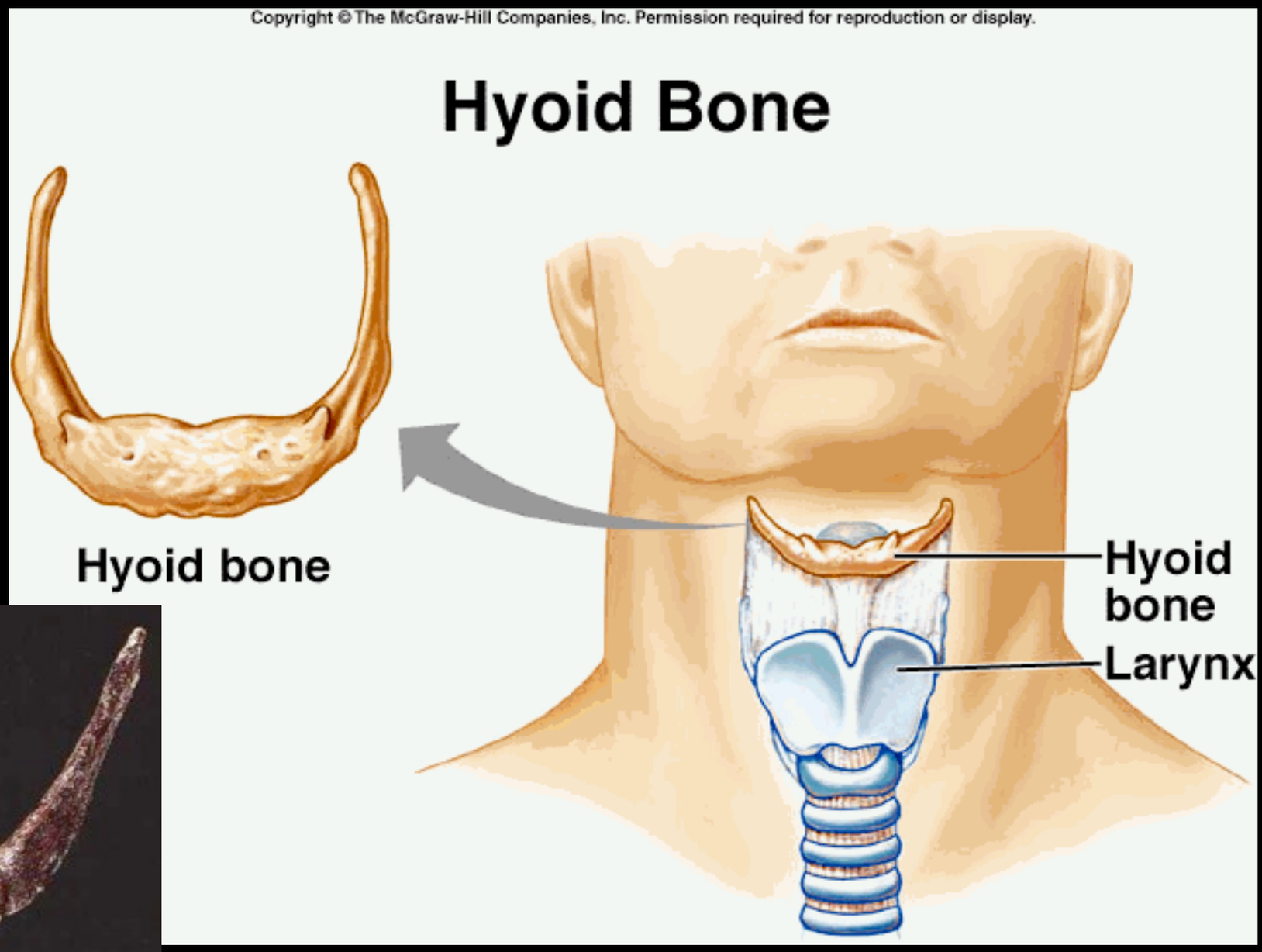
Evolution of language

- Look at Brain?
- Cranial anatomy
- Hyoid bone
- Genetics - FOXP2

Language in the brain



Hyoid bone



Adaptive advantage to language?

Language

- What is culture?
- When did our lineage begin to have culture?
- What is the adaptive advantage of culture?

Culture?

- from wikipedia:
- generally refers to patterns of human activity and the symbolic structures that give such activities significance and importance. Cultures can be "understood as systems of symbols and meanings that even their creators contest, that lack fixed boundaries, that are constantly in flux, and that interact and compete with one another"[2] Different definitions of "culture" reflect different theoretical bases for understanding, or criteria for evaluating, human activity
- ways of life
  - arts beliefs and institutions

Middle Stone Age	Upper Paleolithic	26	Ceramic firing technology
		30	Grindstones—plant processing
		32	Cave art
		35	Mobiliary art
	Middle Paleolithic	40	Grave goods Cremation
		50	Definite structures
		60	Sea travel Chert mining Deliberate burial Hafting
		65	Microlith technology
		70	Symbolism—incised ochre Bone technology Fishing technology
		120	Pigment grinding
Early Stone Age Lower Paleolithic	Acheulian	200	Use of ochre Blade technology
		400	Possible structures
		500	Fire
		Millions of years ago	
		1.6	Hand-axe technology
	Oldowan	1.8?	Hominids in the Old World
		2.6	First stone artifacts

DEVELOPMENT OF CULTURAL ACTIVITY IN THE PALEOLITHIC