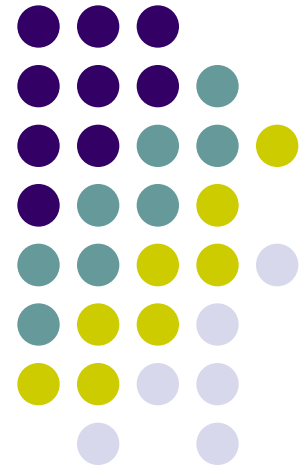
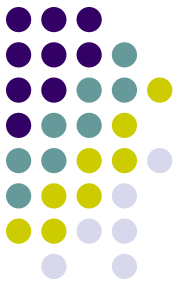


Hominid Origins



Definition of Hominid



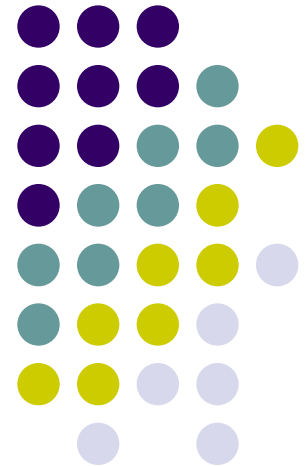
Large brain size



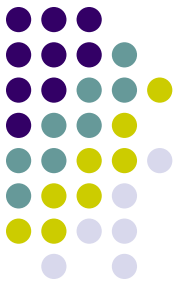
Australopithecus
afarensis

Becoming Human

Learning Center,
Calculating Cousins



Definition of Hominid

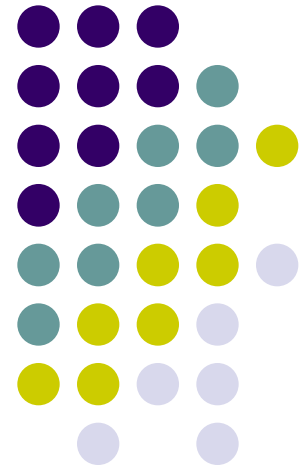


Tool making behavior

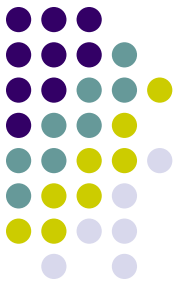


Becoming Human

Culture, No. 3 – Making Tools



Definition of Hominid



Bipedal locomotion

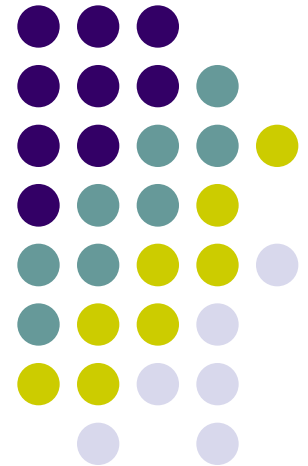


All the major structural changes required for bipedalism are seen in early hominids from East and South Africa.

Laetoli footprint

Walking Tall

Bipedalism



Patterns of Evolution

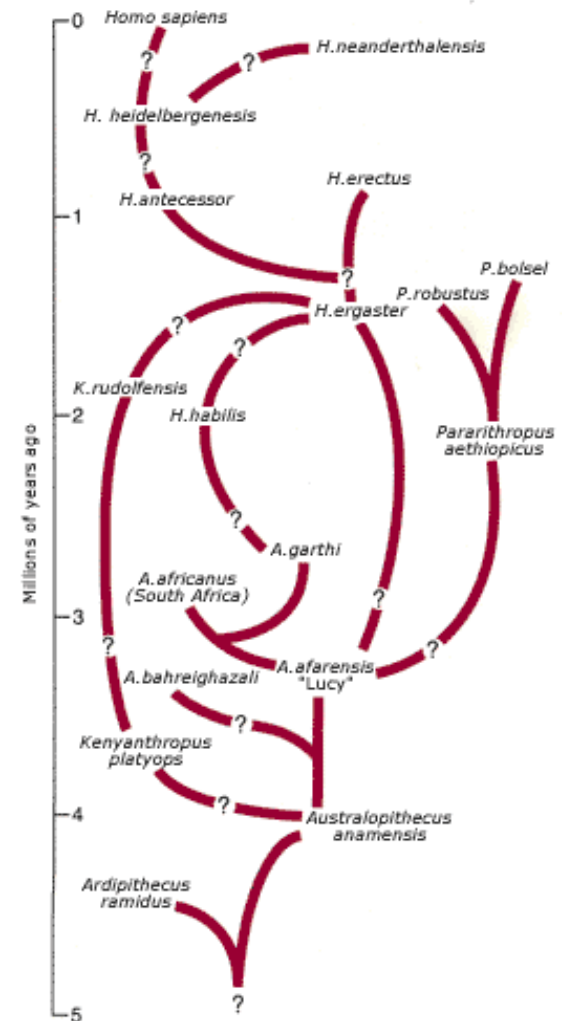


Mosaic evolution

- Evolutionary pattern in which physiological and behavioral systems evolve at different rates.

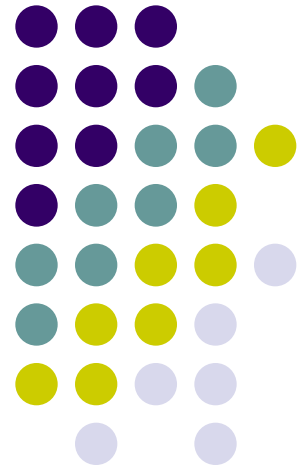
Biocultural evolution

- Biology makes culture possible and developing culture further influences biological evolution.



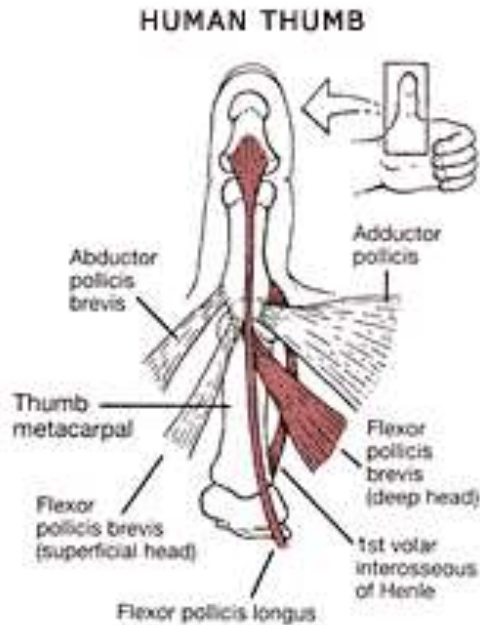
Evolving Ideas

How do we
know evolution
happens?

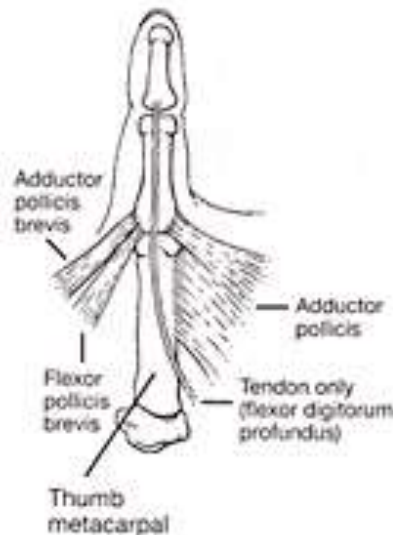




Paleoanthropology



CHIMPANZEE THUMB



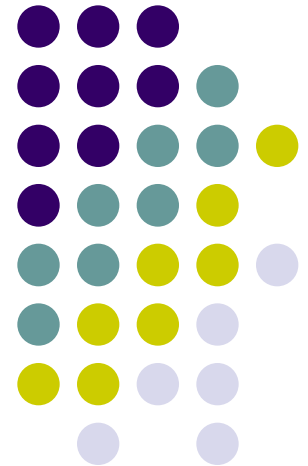
Paleoanthropologists reconstruct the anatomy, behavior, and ecology of our ancestors:

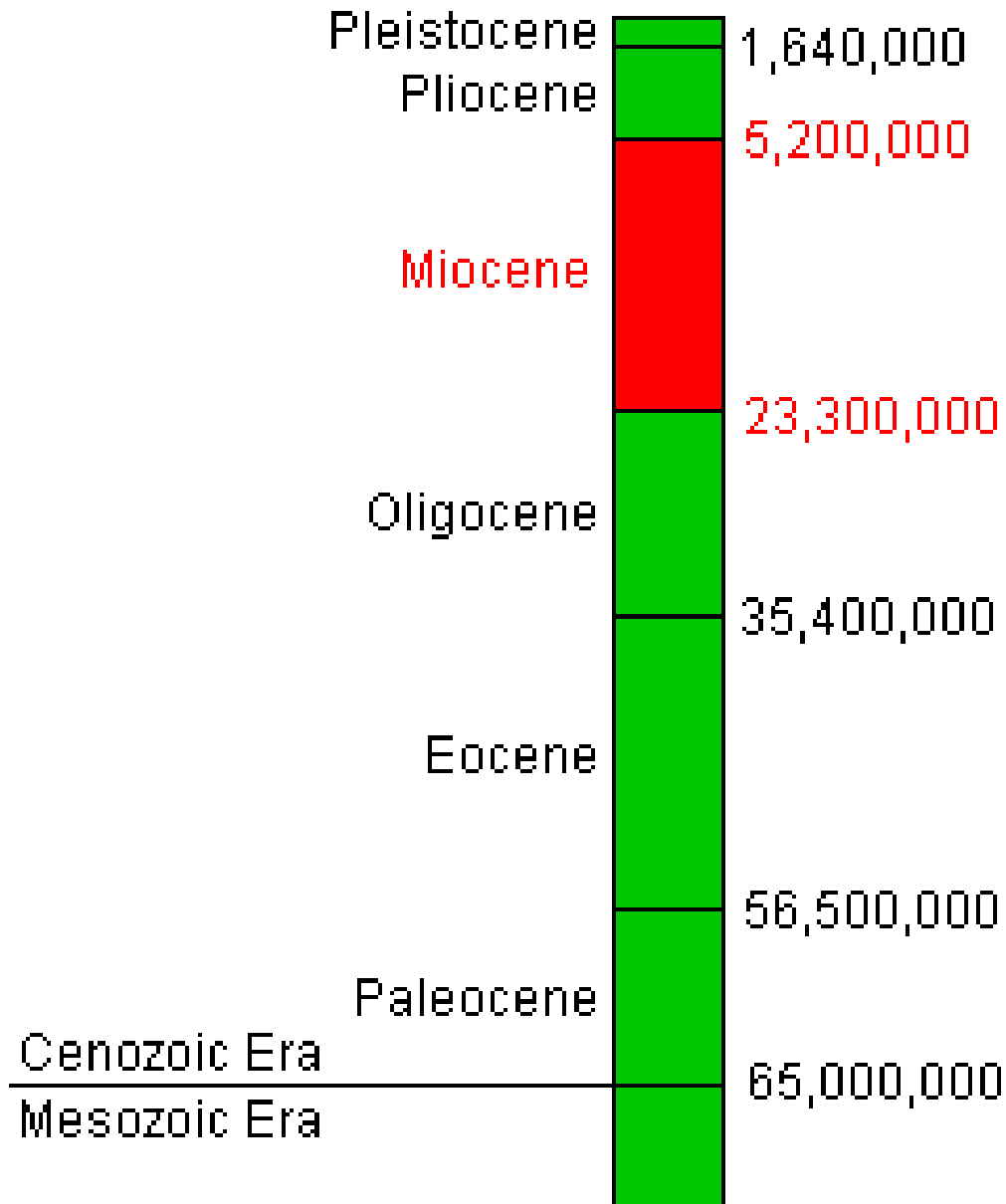
- Geologists work with anthropologists to locate potential early hominid sites.
- Archeologists excavate the site and search for hominid traces.

Becoming Human

Prologue

*Australopithecus
africanus*





Hominids appear
in the fossil
record following
the long
development of
primate adaptive
radiation.



Dating Methods



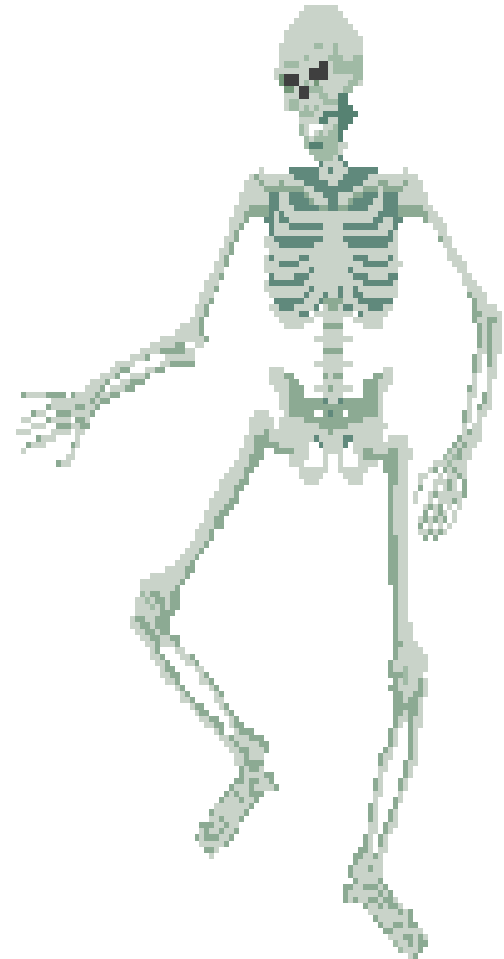
Paleoanthropologists use two types of dating methods to tell us the age of sites and fossils:

- Relative dating determines only whether an object is older or younger than other objects.
- Chronometric (absolute) dating provides an estimate of age in years based on radioactive decay.

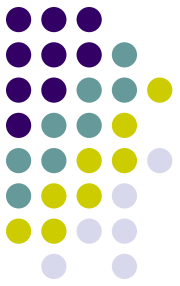
Relative Dating Techniques



- Stratigraphy - based on the law of superposition, that a lower stratum (layer) is older than a higher stratum.
- Fluorine analysis applies to buried bones and groundwater seepage - bones incorporate fluorine during fossilization.



Relative Dating Techniques

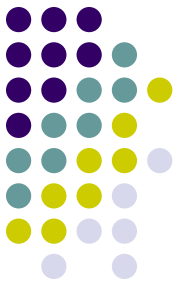


- Biostratigraphy - related to changes in the dentition of animals.



- Paleomagnetism - based on the shifting of the geomagnetic pole.

Chronometric Dating Techniques

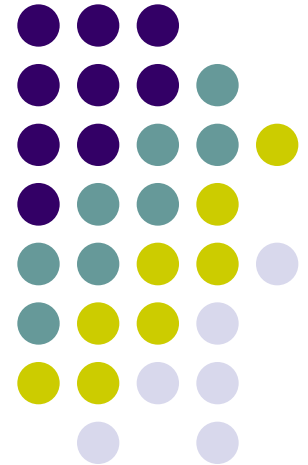


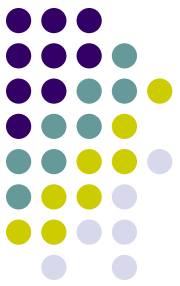
- The age of an object can be determined by measuring the rate of disintegration:
 - Potassium/argon (K/Ar) dating involves the decay of potassium into argon gas. K/Ar has a half-life of 1.25 billion years.
 - Carbon-14 is a radiometric method commonly used by archeologists. Carbon 14 has a half-life of 5730 years.

Becoming Human

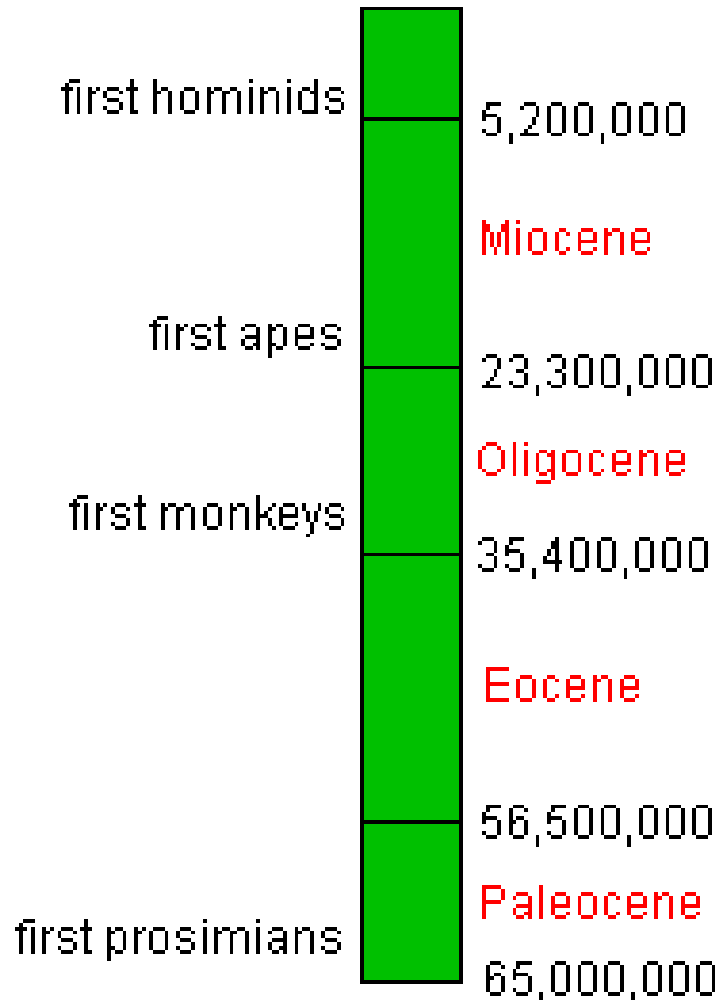
Evidence

*Paranthropus
boisei*





Primate Speciation

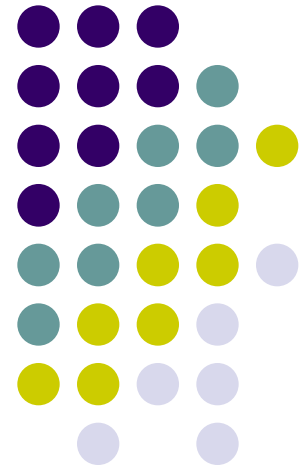


- The first evidence of primate speciation occurs 65mya.
- The first evidence for the appearance of early hominids is much more recent.

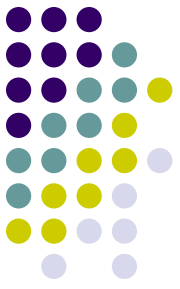
Becoming Human

Anatomy

Paranthropus
Boisei



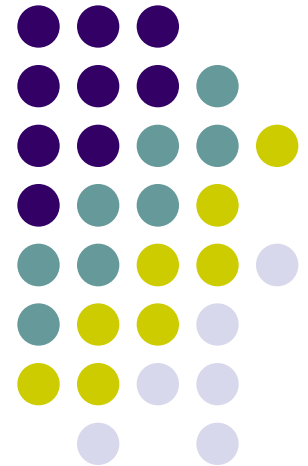
The Primate Descendancy



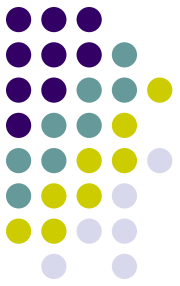
- Primates appear in the fossil record after the beginning of the Cenozoic Era.
- Prosimians thrive during the Paleocene & Eocene.
- Monkeys become dominant by the Oligocene.
- Apes evolve by the Miocene.
- In the late Miocene, the hominid evolutionary line finally becomes distinct – and includes our direct ancestors.

Did Humans Evolve?

PBS
Evolution



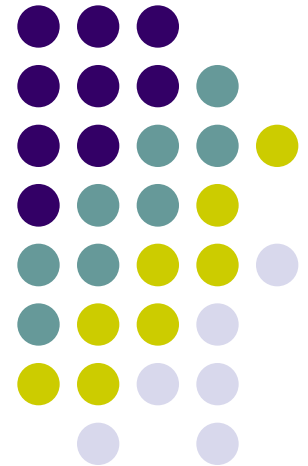
The East African Rift Valley



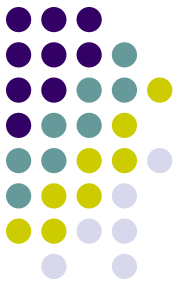
- Known for mountain building, faulting and volcanic activity over the last several million years.
- Early sediments were thrown to the surface where they were located by paleoanthropologists.
- Volcanic sediments make it possible to chronometrically date the sites.

Becoming a Fossil

“Lucy”



Earliest Traces of East African Hominids

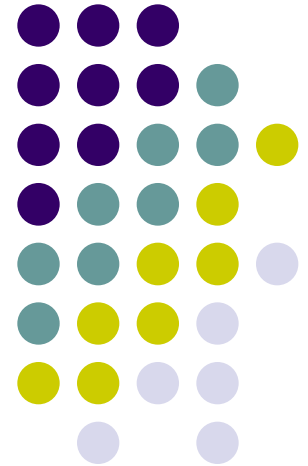


- The oldest specimen that is believed to be a hominid comes from Lothagam, northern Kenya.
- Several other fragmented specimens have been found around the same area of east Africa

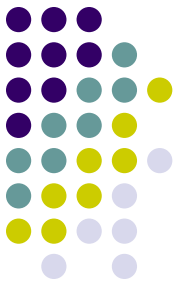


Origins of Humankind

*Paranthropus
boisei*



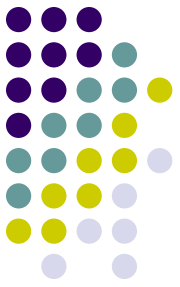
Aramis



- Dated at 4.4 million years old, this is the oldest collection of hominids discovered.
- The remains provide anatomical evidence of bipedalism, the criterion for hominid status.
- The excavators suggested that the Aramis hominids be assigned to a new genus and species, *Ardipithecus ramidus*.



Australopithecines



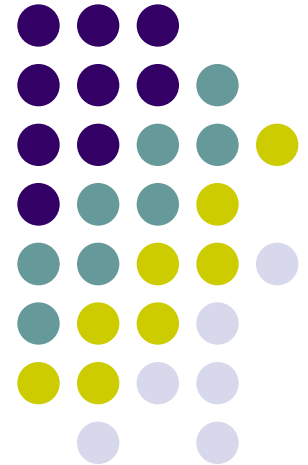


Laetoli



- Dated between 3.5-3.7 mya.
- Fossilized hominid footprints found in an ancient volcanic bed.
- The individuals were bipedal, but maybe not in the same way as modern humans.

Laetoli Footprints

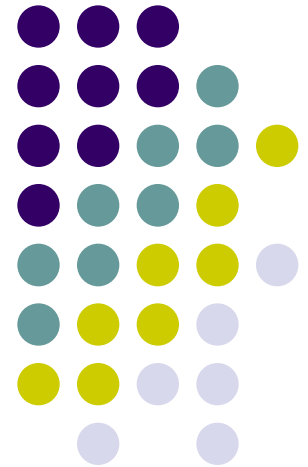


Hadar (Afar Triangle)

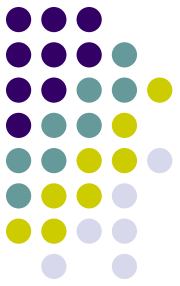


- Dating suggests a range from 3.9-2.3 mya
- Recovered:
 - "Lucy" an *Australopithecus afarensis* female, was recovered here.
 - Group of bones representing 13 individuals, including 4 infants, suggest a social unit died at the same time.
 - Stone tools that may be 2.5 million years old, making them the oldest cultural evidence.

Finding Lucy

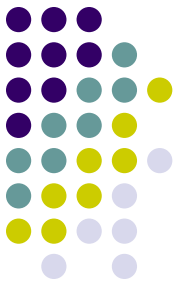


Bouri (Middle Awash)



- Several fossils were discovered dating to 2.5 mya
- These fossils are quite different from other Plio-Pleistocene hominids:
 - Projecting face
 - Very large back teeth
 - Long hind limbs
- Animal bones found with these fossils show clear signs of butchering.

Koobi Fora (East Lake Turkana)

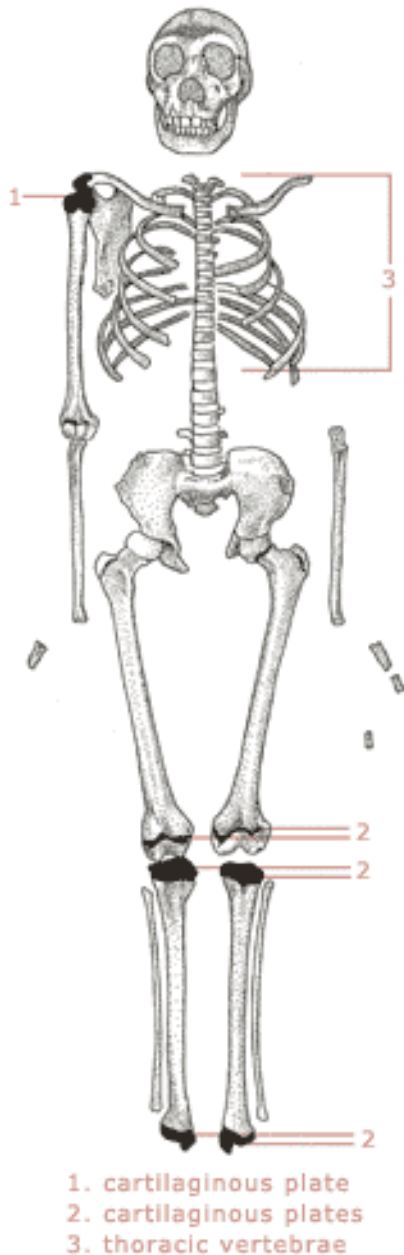


- This site yielded the richest assemblage of Plio-Pleistocene hominids from the African continent.
- Most of the hominids date to 1.8 mya, others date back to 3.3 mya.
- The 150 hominid specimens recovered at Koobi Fora in Kenya represent at least 100 individuals.





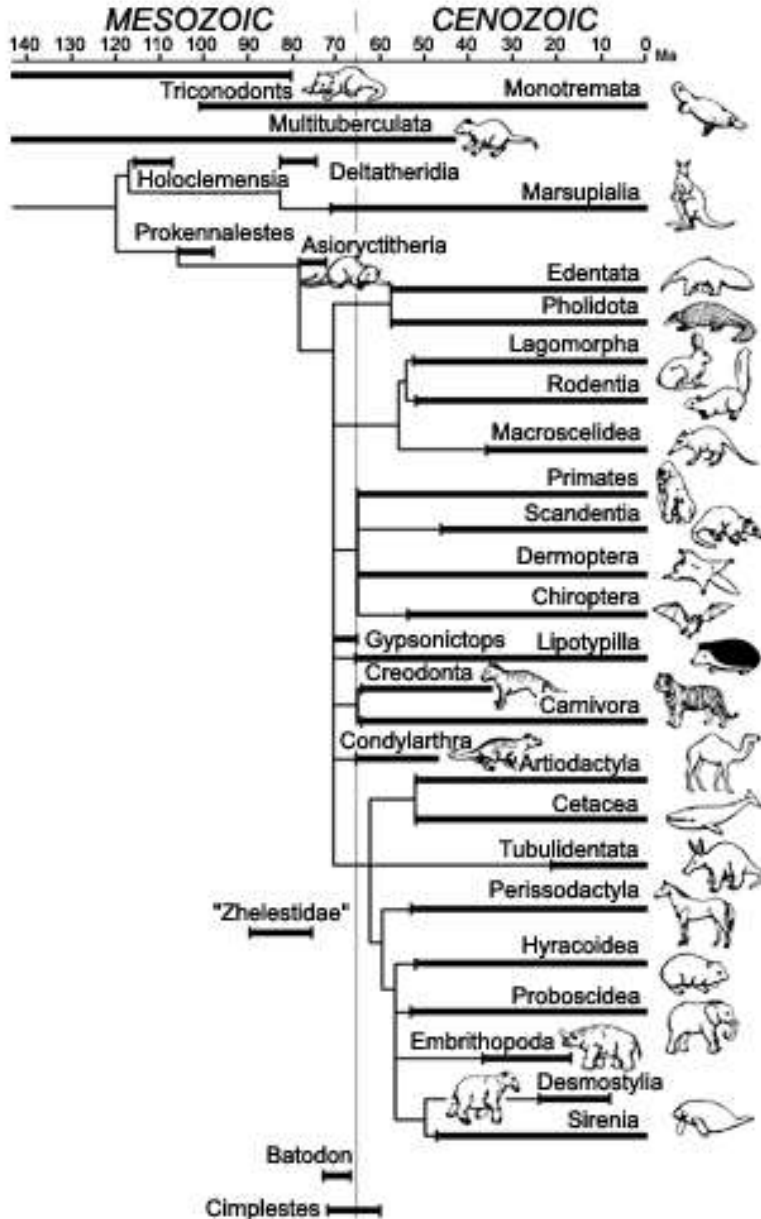
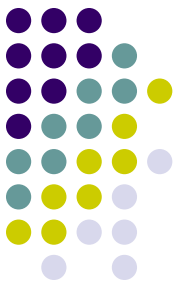
West Turkana



Two important discoveries:

- The nearly complete 1.6 mya *Homo erectus* adolescent.
- The black skull, a well-preserved 2.4 million year old skull which caused a major re-evaluation of Plio-Pleistocene evolution.

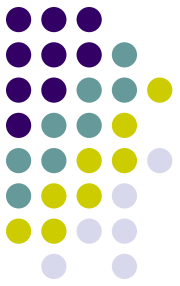




Olduvai Gorge

- Louis and Mary Leakey conducted continuous excavations from the 1930's to early 1980.
- Paleontological evidence includes more than 150 species of extinct animals which can provide clues to the ecological conditions of early hominid habitats.

Central Africa

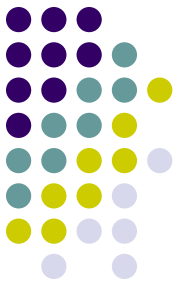


- A hominid mandible was discovered in Chad dating from 3.5 to 3.0 mya.
- Preliminary analysis suggests that this fossil's closest affinity is to *Australopithecus afarensis*.
- The fossil was found more than 1,500 miles west of the previously established range of early hominids.

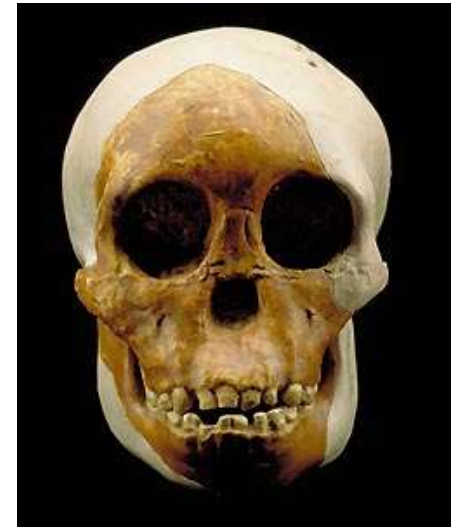
Australopithecus afarensis



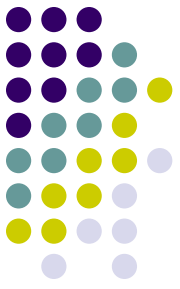
South African Sites



- The first australopithecine was discovered at a quarry at Tuang.
- As the number of discoveries accumulated, it became clear that the australopithecines were not simply aberrant apes.
- The acceptance of the australopithecines as hominids required revision of human evolutionary theory.



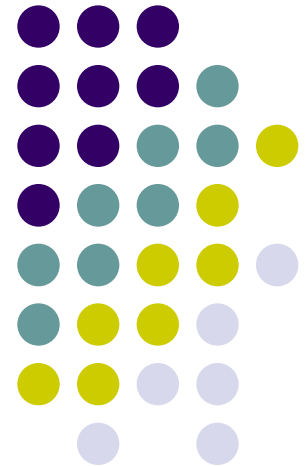
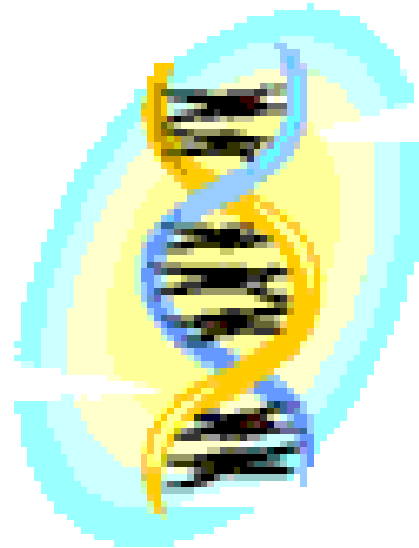
Groups of Plio-Pleistocene Hominids



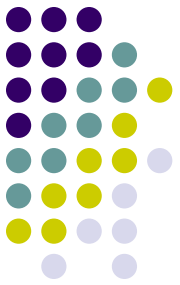
- Specimens represent 200 individuals from South Africa and more than 300 from East Africa.
- Divided into four broad groupings:
 - Set I Basal Hominids.
 - Set II Early Primitive Australopithecus.
 - Set III Later, more derived Australopithecus.
 - Set IV Early homo.

Becoming Human

Lineages,
No. 3 - The Human
Family Tree

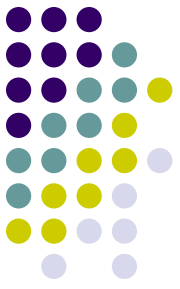


Estimated Body Weights and Stature in Plio-Pleistocene Hominids



	Body Weight		Stature	
	Male	Female	Male	Female
<i>A. afarensis</i>	99 lb	64 lb	59 in.	41 in.
<i>A. africanus</i>	90 lb	65 lb	54 in.	45 in.
South African “robust”	88 lb	70 lb	52 in.	43 in.
East African “robust”	108 lb	75 lb	54 in.	49 in.
<i>H. habilis</i>	114 lb	70 lb	62 in.	49 in.

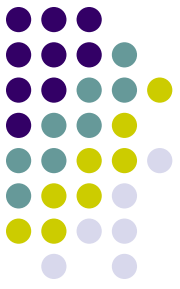
Set I. Basal Hominid (4.4 mya)



- The earliest and most primitive remains are those from Aramis.
- They have been classified as *Ardipithecus ramidus*, a different genus from all other Plio-Pleistocene forms.

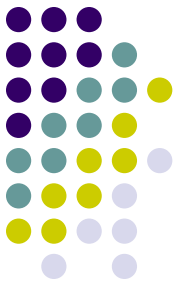


Early Primitive *Australopithecus* (4.2-3.0 mya)



- The hominids from Laetoli and Hadar are assigned to *Australopithecus afarensis*.
- *A. afarensis* is so primitive in the majority of dental and cranial features that if it were not for evidence of bipedalism, this primate would not be classified as a hominid.





Later, More Derived *Australopithecus* (2.5-1.0 mya)

- **Robust Australopithecines**

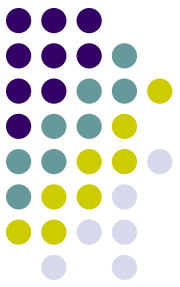
- Larger body size
- Small cranial capacities
- Very large, broad faces
- Massive back teeth and lower jaws

- **Gracile Australopithecines**

- Different face dentition



Set IV.
Early *Homo*
(2.4-1.8 mya)

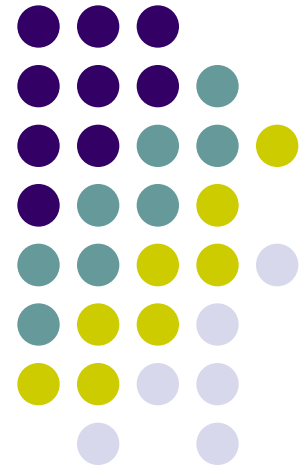


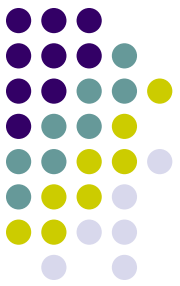
- The earliest appearance of our genus, *Homo* may be as ancient as the robust *Australopithecines*.
- Leakey named these specimens *Homo habilis* ("handy man").
- *H. habilis* differs from *Australopithecus* in cranial cavity and dental proportions.



Becoming Human

Lineages





What we know...

