

EARLY HOMININS: THE AUSTRALOPITHECINES



EARLIEST HOMININ (DEBATED)

Sahelanthropus tchadensis

- discovered in 2002 in Chad
- possibly dates to 7 - 6 Mya
- shook up the paleontological community because of age and location
- habitat: wooded grasslands & forests



SAHELANTHROPUS TCHADENSIS

ANATOMICAL FEATURES

- Ape-like features: 320 – 370 cc brain size
- Transitional features: Teeth differ from apes
- Hominin features:
 - Foramen magnum positioned under skull
 - Relatively flat face with massive brow ridges

EARLY HOMININS

Orrorin tugenensis

- 12 fossil specimens recovered from Kenya
- Securely dated to 6 Mya
- Habitat was likely a mix of woodland & savanna



ORRORIN TUGENENSIS ANATOMICAL FEATURES

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Ape-like features

- Climbing adaptations
- Tooth morphology

Hominin features

- Thick enamel
- Morphology of femur
- Cortical bone distribution

EARLIEST CONFIRMED HOMININ

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Ardipithecus ramidus

- Dates to ~4.4 Mya
- First specimen found in East Africa (Ethiopia)
- 40% of one individual recovered
- To date, remains (mostly teeth) from 50+ individuals have been recovered



EARLIEST CONFIRMED HOMININ

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ARA-VP-6/500 (AKA “Ardi”)

- Most famous *Ar. ramidus* specimen
- Discovered in 2009
- Nearly complete skeleton
- Female
- Weighed 51 kg (~ 112 lbs)
- 1.2 m tall (3.9 ft.)

Science
2 October 2009



AAAS

ARDIPITHECUS RAMIDUS

ANATOMICAL EVIDENCE FOR BIPEDALISM

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- Foramen magnum anterior
- Humerus not weight-bearing
- Wrist and finger joints are highly flexible
- Flared upper pelvis for stability when walking
- Big toe functions like a thumb for grasping but is more rigid (mixed arboreal)
- Lower pelvis more apelike to accommodate large hind limb muscles for climbing (arboreal)

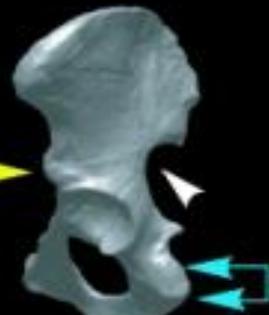
ARDIPITHECUS RAMIDUS

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Pelvic Comparison



Homo sapiens ♀



Au. afarensis



Ar. ramidus



P. troglodytes

Modern humans
biped

Lucy
biped

Ardi
biped

Chimp
quadruped

AR. RAMIDUS – KEY ANATOMICAL FEATURES

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Ape-like features

- cranial capacity: 300 – 350 cc
- size of teeth
- U-shaped dental arcade
- thin enamel

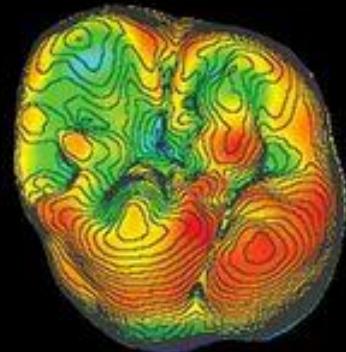
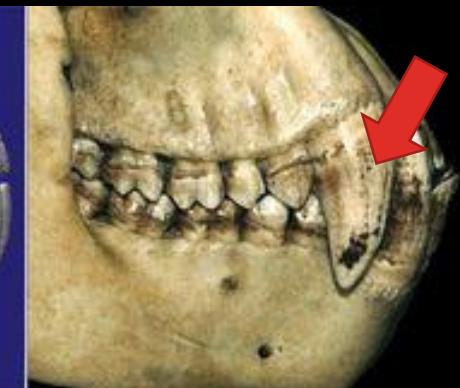
Hominin features

- incisors smaller
- canine size is smaller
- canines not sharpened by premolar

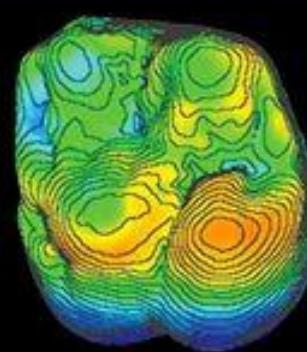
ARDIPITHECUS RAMIDUS

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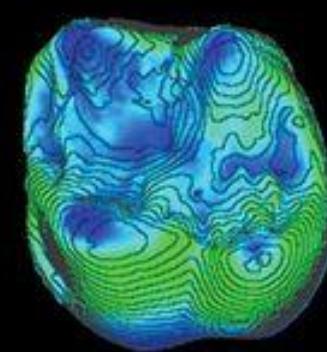
Dental Comparison



Modern humans
small canines,
thick enamel



Ardi
small canines,
thin enamel



Chimp
large canines,
thin enamel

ARDIPITHECUS RAMIDUS

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Lived in a wooded environment

- preserved fossil wood & seeds
- arboreal monkey fossils are common
- savanna megafauna fossils rare

Other hominin(?) fossils from same site

- date back to 5.8 Mya
- not certain whether hominins or not

AUSTRALOPITHECINES

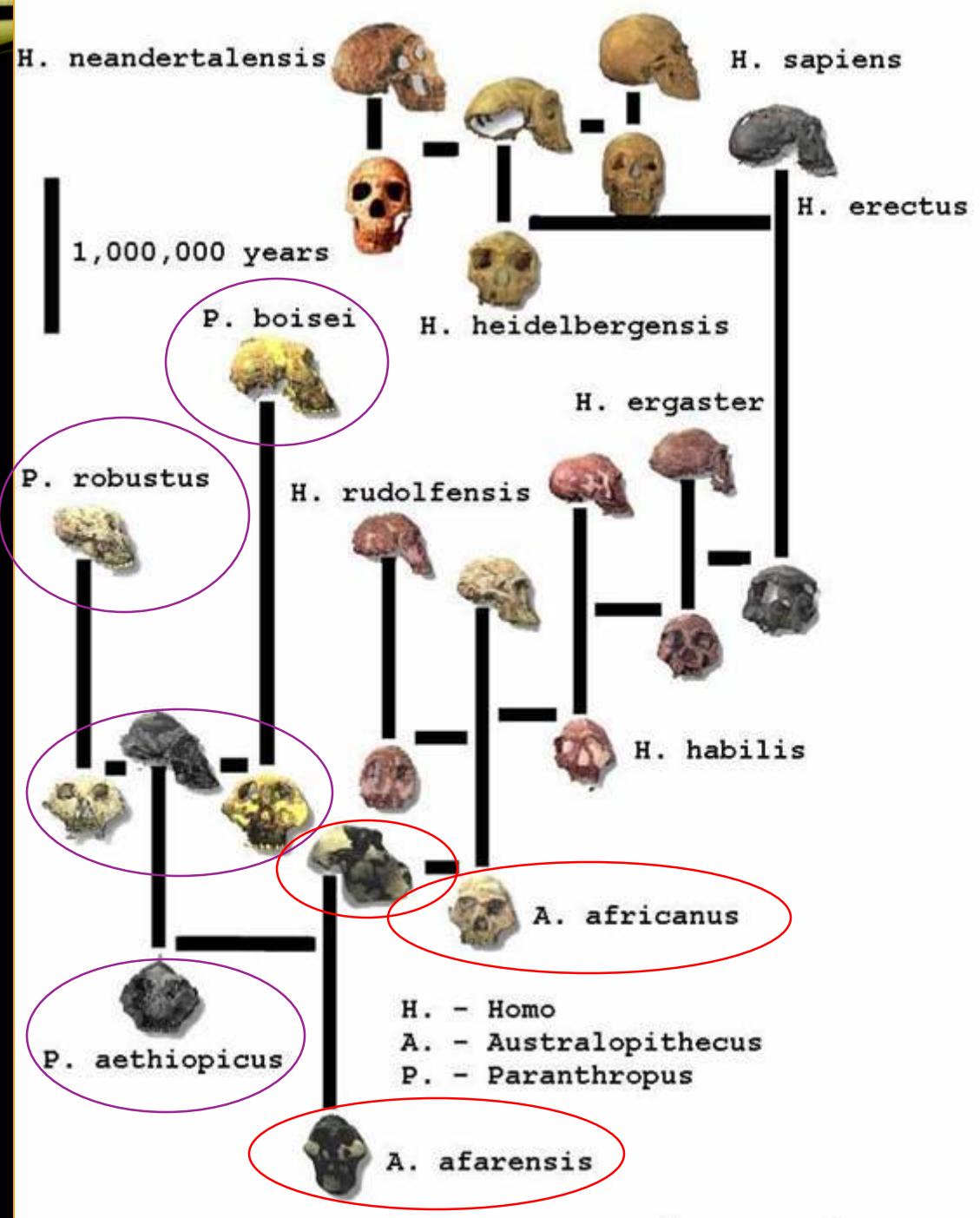
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- Genus-level designation (*Australopithecus*)
- *Australopithecus* means “southern ape”
- Date from 4.2 – 2.0 Mya
- Small bipeds with teeth, skull, and jaws adapted to a generalized diet

Hominin Family Tree

Australopithecus
(formerly known as
gracile australopiths)

Paranthropus
(formerly known as
robust australopiths)



AUSTRALOPITHECINES

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- Largely bipedal
- 400 - 600cc brain size (ape-like)
- Small front teeth and large premolars/molars with thick enamel
- Highly sexually dimorphic

AUSTRALOPITHECINES

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Lifestyle

- Teeth adapted for fruit and “hard objects”
- Primarily lived in woodland habitats
- Some evidence of bones & horns used as digging tools

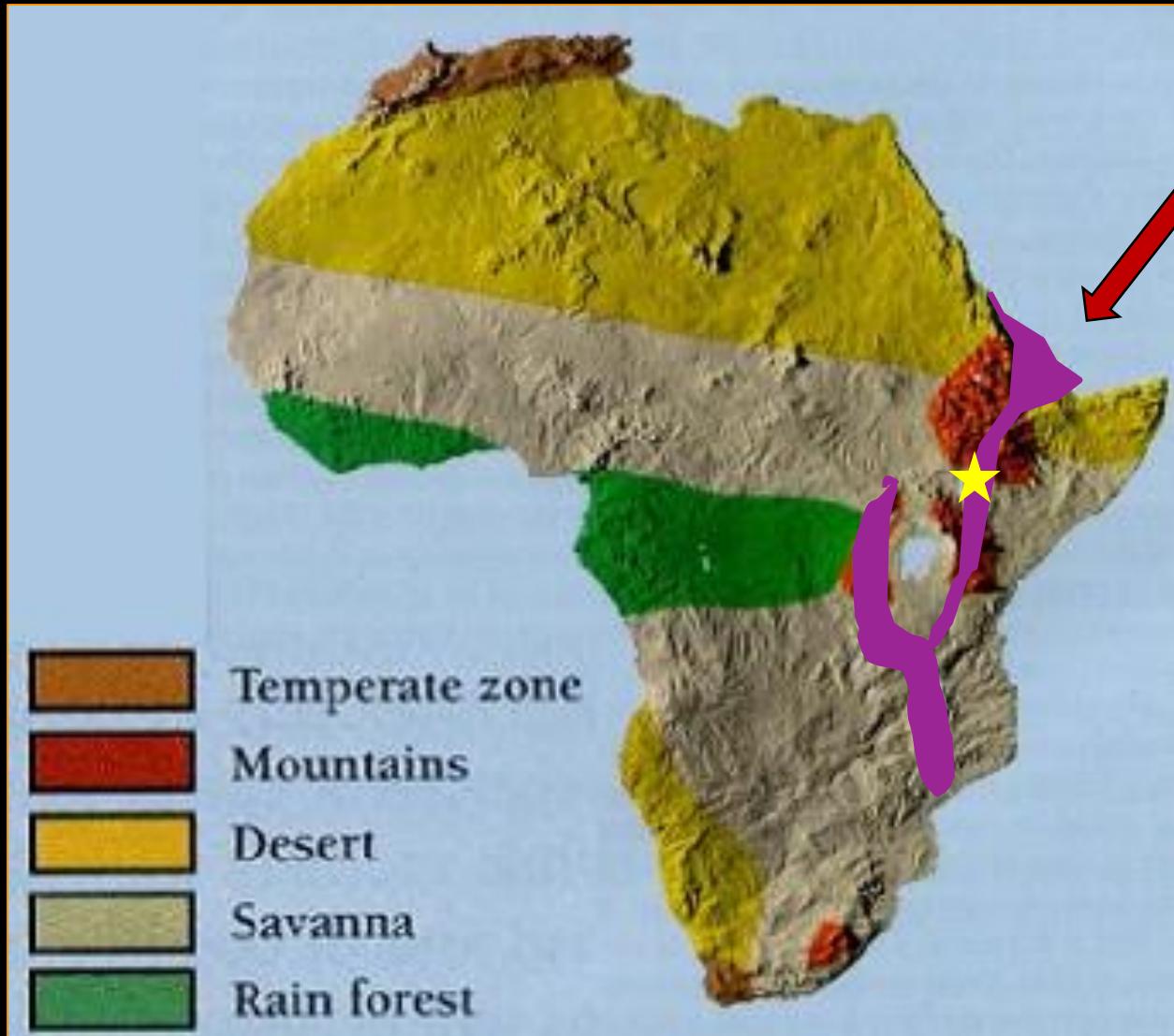


AUSTRALOPITHECINES

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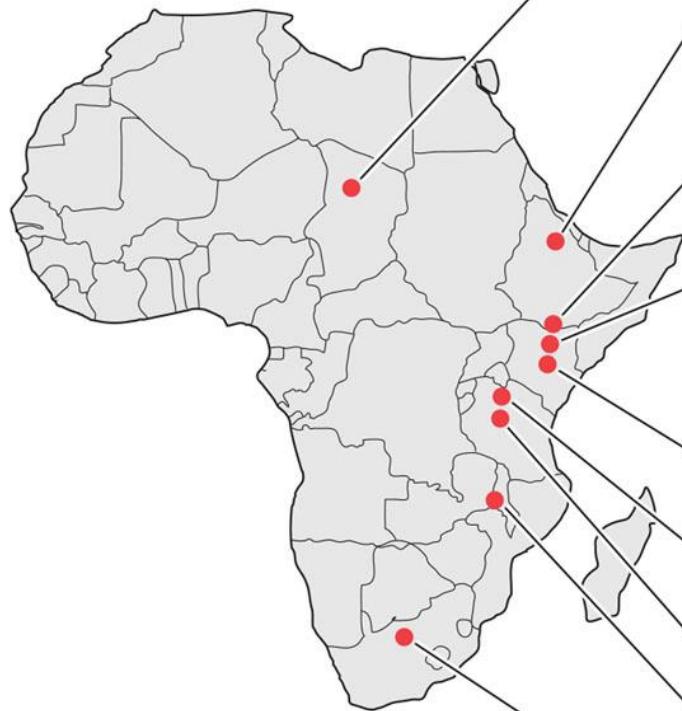
- Gracile compared to *Paranthropus* genus
- Facial & masticatory structure is gracile
- Found in both East Africa & South Africa
- Includes several species:
 - *Au. anamensis*
 - *Au. afarensis*
 - *Au. deyiremeda*
 - *Au. garhi*
 - *Au. africanus*
 - *Au. sediba*

MODERN MAP OF AFRICA



Great Rift Valley in
East Africa
(location of several
important fossil
finds)

★ = Lake Turkana



Koro Toro	<i>S. tchadensis</i> <i>Au. afarensis</i>
Hadar, Konso, Middle Awash	<i>P. boisei</i> <i>H. habilis</i> <i>Au. afarensis</i> , <i>Au. deyiremeda</i> , <i>Au. garhi</i> <i>Ar. kadabba</i> , <i>Ar. ramidus</i>
Omo	<i>Au. afarensis</i> <i>P. aethiopicus</i> , <i>P. boisei</i> <i>H. erectus</i>
Lake Turkana	<i>Au. anamensis</i> <i>P. aethiopicus</i> , <i>P. boisei</i> <i>K. platyops</i> <i>H. habilis</i> , <i>H. rudolfensis</i> , <i>H. erectus</i>
Tugen Hills	<i>O. tugenensis</i>
Olduvai	<i>P. boisei</i> <i>H. habilis</i> , <i>H. erectus</i>
Laetoli	<i>Au. afarensis</i>
Uraha	<i>H. rudolfensis</i>
South Africa	<i>Au. africanus</i> , <i>Au. sediba</i> <i>P. robustus</i> <i>H. habilis</i> , <i>H. erectus</i>

AUSTRALOPITHECINES

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Australopithecus anamensis

- Earliest known Australopithecine
- 4.2 – 3.9 Mya
- Discovered in East Africa (Kenya), near Lake Turkana
- Riverine woodland or bushland habitat

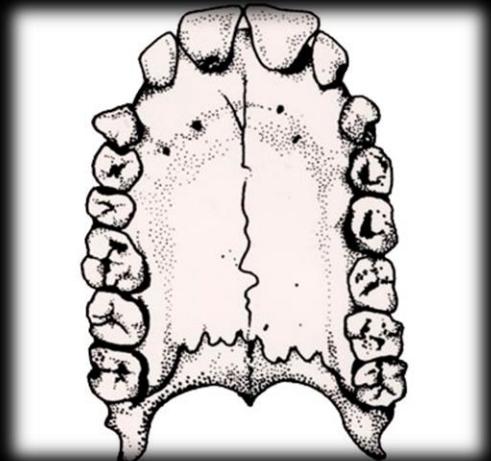


AUSTRALOPITHECUS ANAMENSI

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Anatomical Features:

- Parallel tooth row & U-shaped dental arcade
- Large posterior teeth
- Considerable canine size dimorphism



AUSTRALOPITHECUS ANAMENSIS

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Anatomical Features (cont.):

- Weight = 50 – 55 Kg
- Tibia, knee, and ankle joints suggest *Au. Anamensis* was a habitual bipedal



AUSTRALOPITHECINES

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Australopithecus afarensis

- 3.6 – 3.0 Mya
- Widespread in East Africa
- Habitat ranged from woodland to dry savanna
- Famous specimens: “Lucy,” the “Dikika child,” and (most likely) the Laetoli footprints

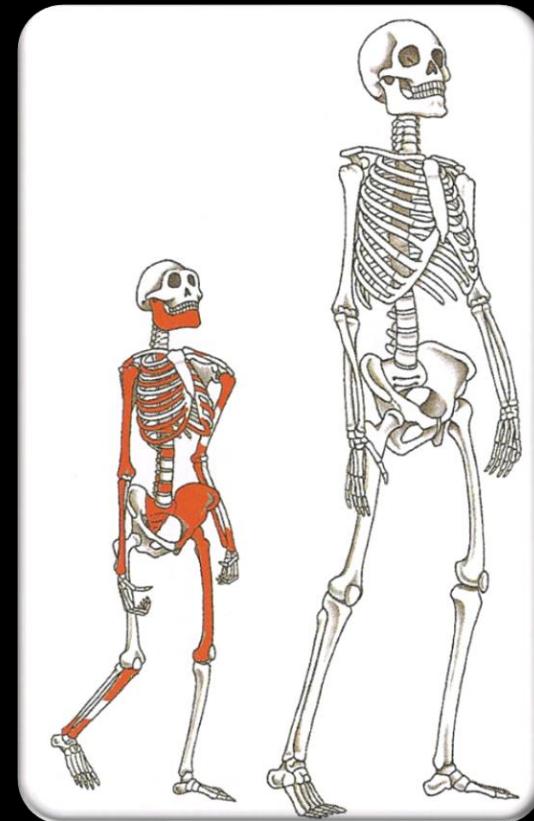


AUSTRALOPITHECUS AFARENSIS

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Ape-Like Features:

- Chimp brain size (450 cc)
- 3 feet tall
- Gorilla-like size dimorphism
- Projecting muzzle
- Curved fingers and toes
- Hyoid bone shape more ape-like



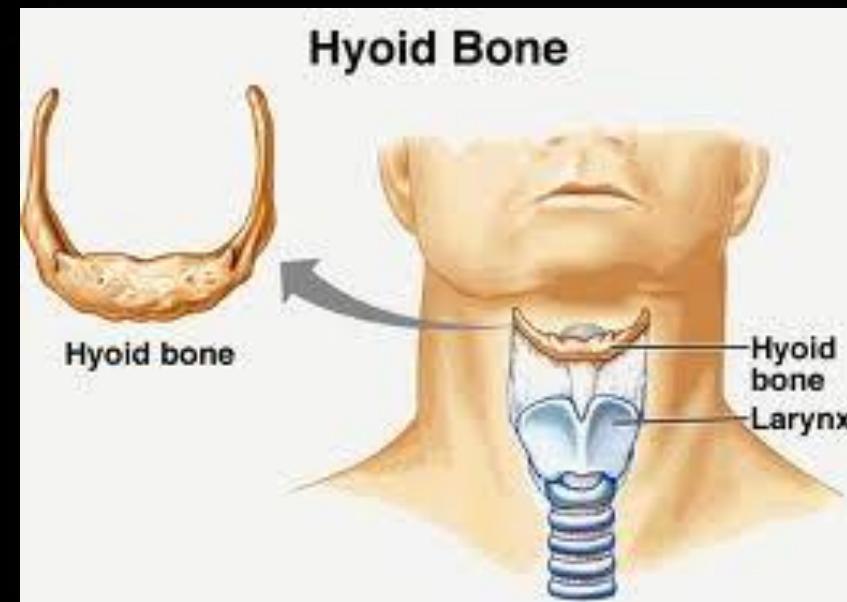
Au. afarensis Homo sapien

AUSTRALOPITHECUS AFARENSIS

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Hyoid

- Horseshoe-shaped bone in the neck
- Aids in tongue movement and swallowing
- Forms part of the human voice box
- Analysis of morphology can tell us about the vocal capabilities



AUSTRALOPITHECUS AFARENSIS

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Intermediate Features:

- 1) Slightly horseshoe-shaped jaw



Comparison of Chimp (left), *A. afarensis* (middle), and human (right)

AUSTRALOPITHECUS AFARENSIS

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Intermediate Features:

- 2) Moderate canine size dimorphism
- 3) Iliac blade more antero-posterior
- 4) Intermembral Index: 90



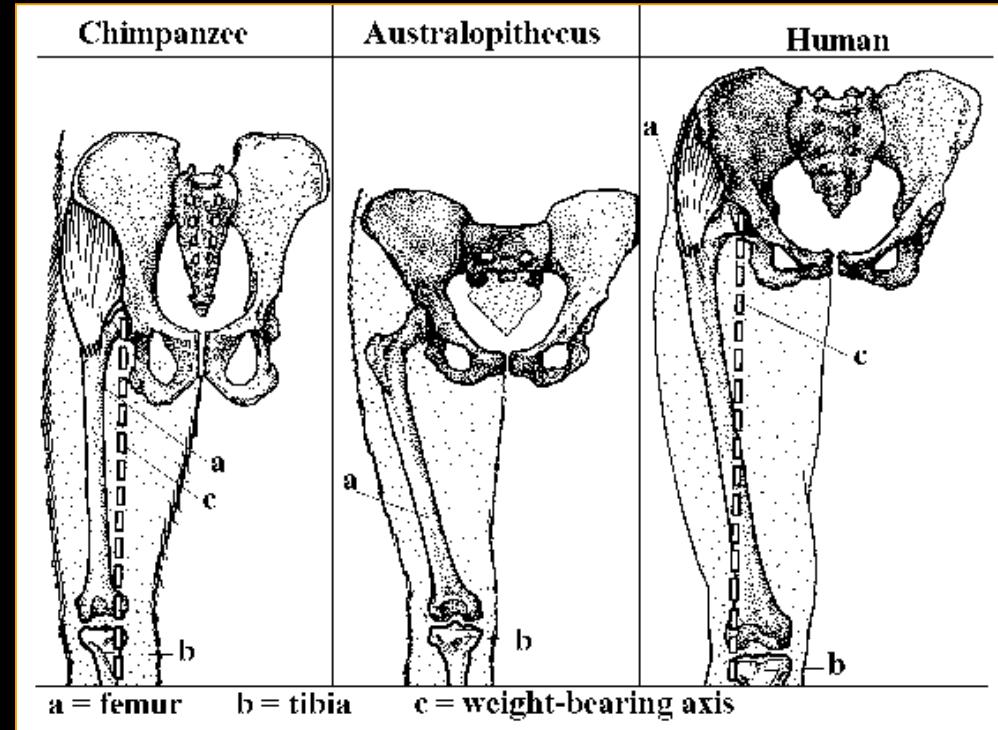
AUSTRALOPITHECUS AFARENSIS

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Human-Like Features:

1) Major bipedalism characteristics

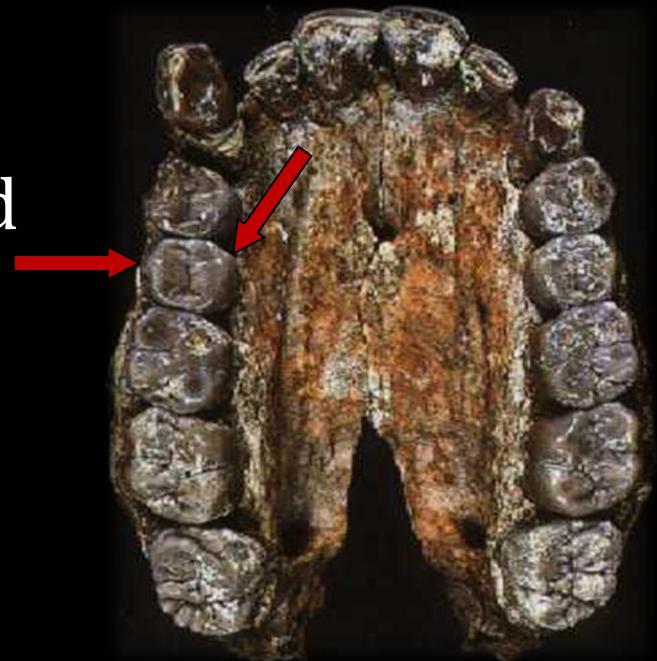
- short & wide pelvis
- long femoral neck
- femur slants inward



Human-Like Features:

2) Two-cusped premolars

- 1st time seen in the fossil record
- Present in all hominins that came afterward



AUSTRALOPITHECUS AFARENSIS

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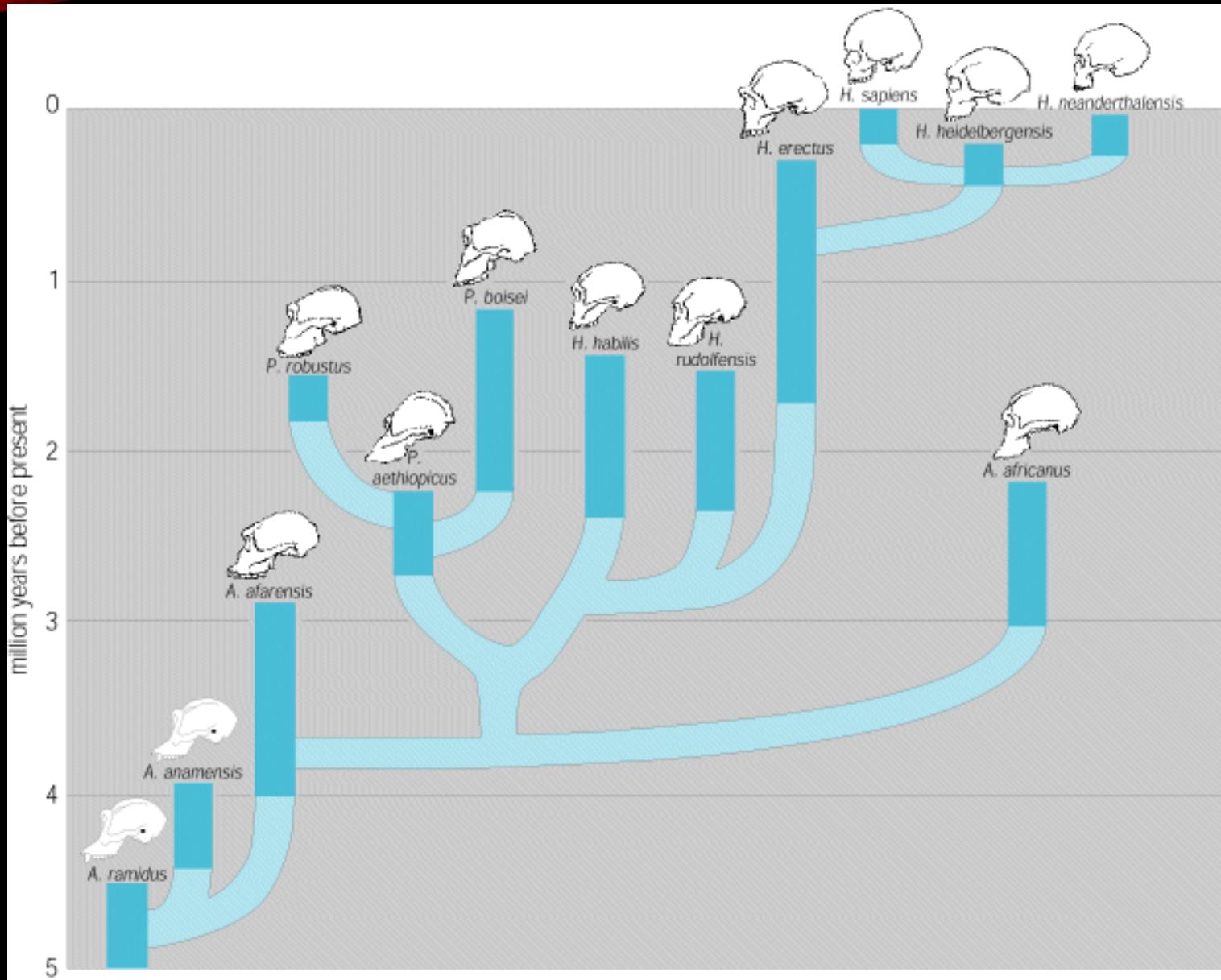
Other Evidence of Bipedalism:

- East Africa (Tanzania)
- 3.5 Mya
- We can learn about gait, foot size, and shape



POSSIBLE FAMILY TREE

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AUSTRALOPITHECINES

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Australopithecus africanus

- Taung Child
- 3.0 – 2.2 Mya
- South Africa only
- More skulls found than any other species

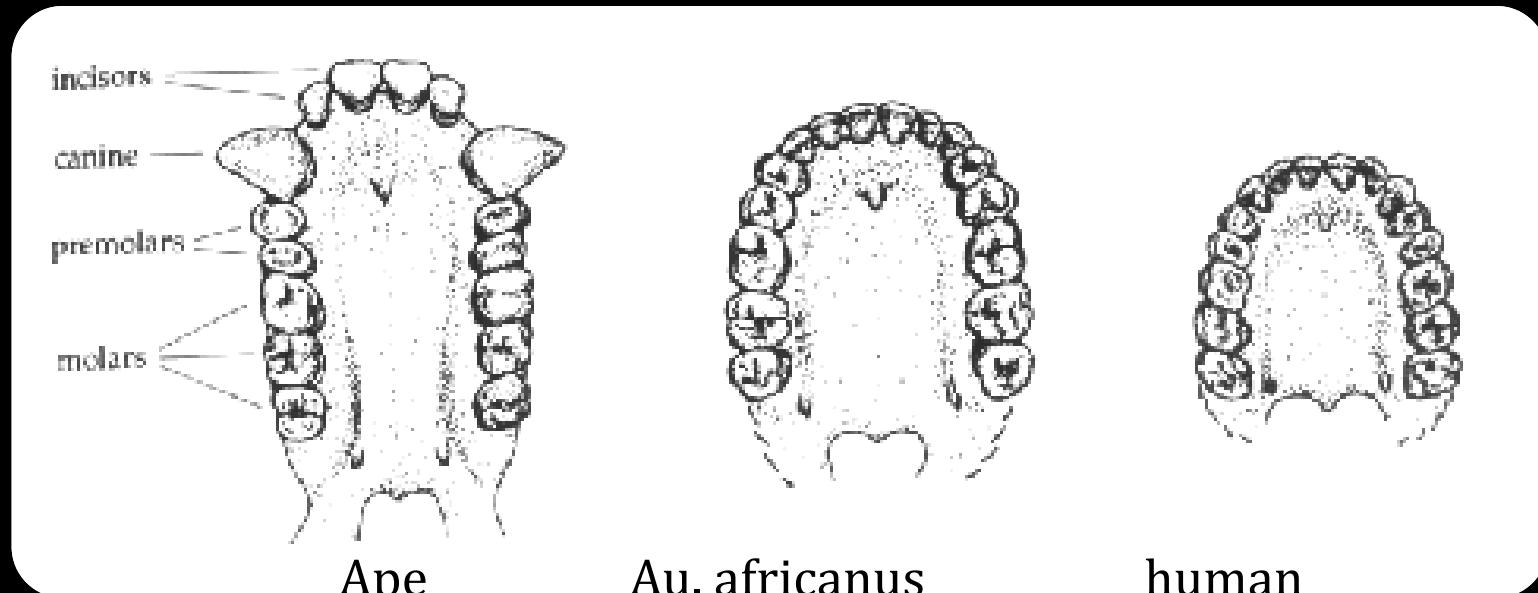


AUSTRALOPITHECUS AFRICANUS

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Anatomical Features

- 1) More horseshoe-shaped Jaw



AUSTRALOPITHECUS AFRICANUS³⁴

Anatomical Features (cont'd)

- 2) slightly higher forehead (trending human)
- 3) brain slightly larger (460 cc on average)
- 4) projecting muzzle (ape-like)
- 5) similar bipedalism to *Au. Afarensis*
- 6) Heavy facial buttressing



AUSTRALOPITHECUS AFRICANUS

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Lifestyle

- Woodland savanna (*like Au. afarensis*)
- Diet Studies (microwear & isotope)
- Tool Use (microwear)

AUSTRALOPITHECINES

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Australopithecus garhi

- 2.5 Mya
- East Africa (Ethiopia)
- Skull appears similar to *Au. afarensis*, though the fossil lacks specific diagnostic features
- Some of the fossils had a sagittal crest



AUSTRALOPITHECUS GARHI

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Features

Mostly like *afarensis* except:

- 1) Larger posterior teeth
- 2) Larger anterior teeth
- 3) More variation in size and robusticity



AUSTRALOPITHECUS GARHI

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Lifestyle

- Lived on grassy plain surrounding a lake
- Found in same layer with bashed open antelope bones

AUSTRALOPITHECINES

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Australopithecus sediba

- Discovered in 2008 near Johannesburg, South Africa
- 2.0 – 1.8 Mya
- smaller teeth, less prominent zygomatics than *Au. africanus* and *Au. Garhi*
- Juvenile's brain size ~420 cc

