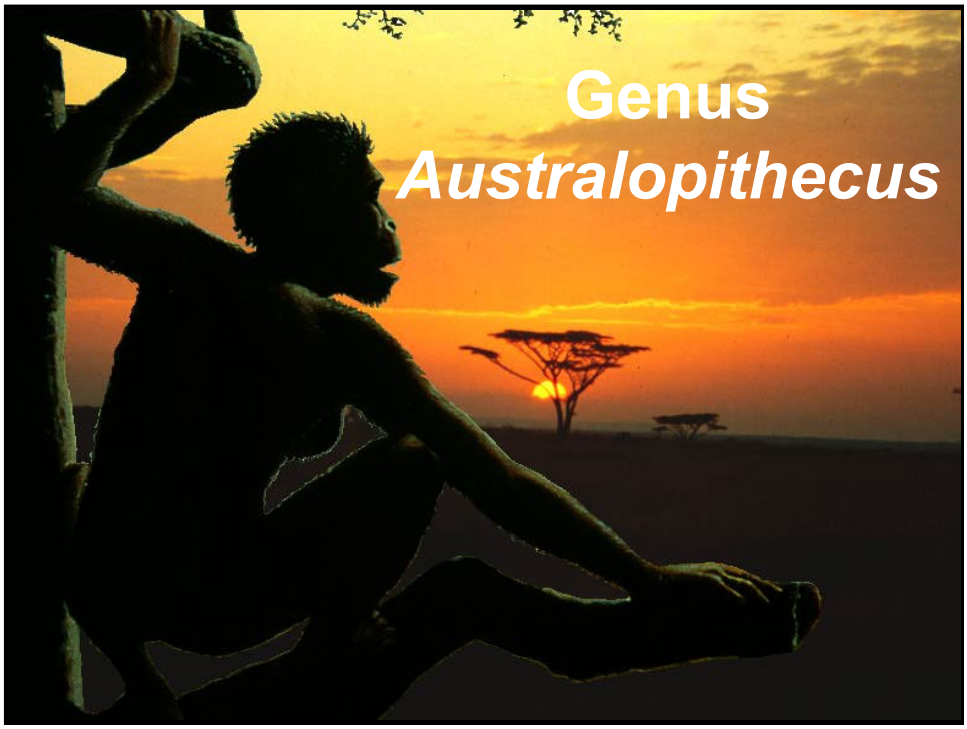
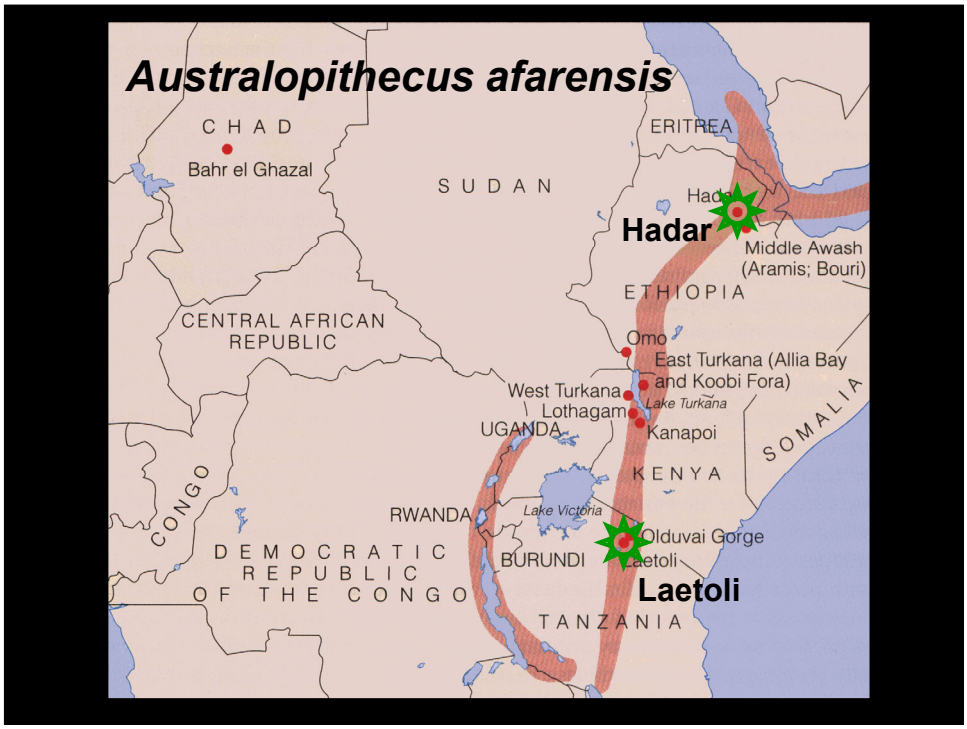


1

Australopith genera

- *Australopithecus* (4.2-2.0 mya)
- *Kenyanthropus* (3.5 mya)
- *Paranthropus* (2.5-1.2 mya)

2



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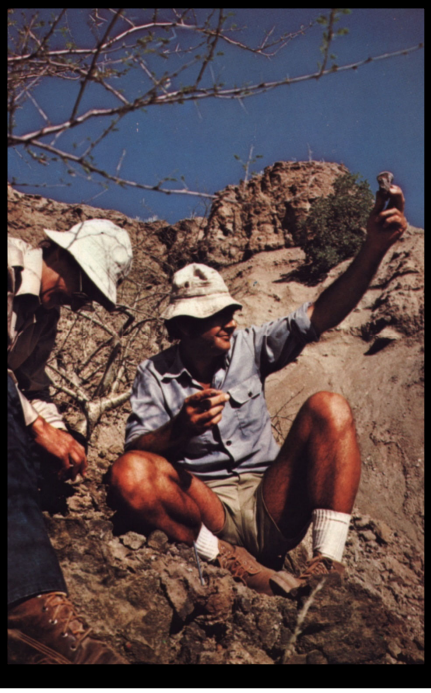


Australopithecus afarensis

- Discovered in 1973
- Knee joint found

4

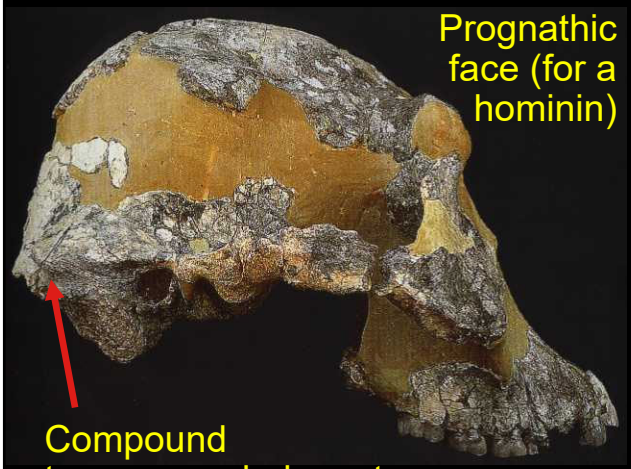
Australopithecus afarensis

- 3.9 –2.9 mya
- Primarily sites along Awash River, Hadar, Ethiopia
- Laetoli,Tanzania
- Represented by MANY individuals, different ages, sexes, & most skeletal regions

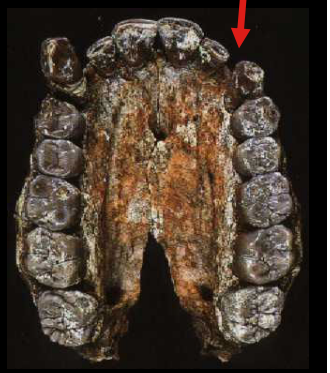
5

Au. afarensis

Brain 415 cc

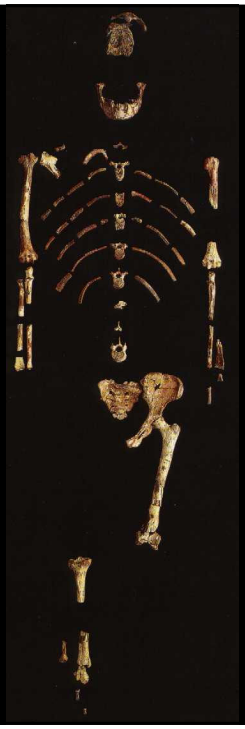


Some had a small diastema



A.L. 444

6



AL 288-1 "Lucy"

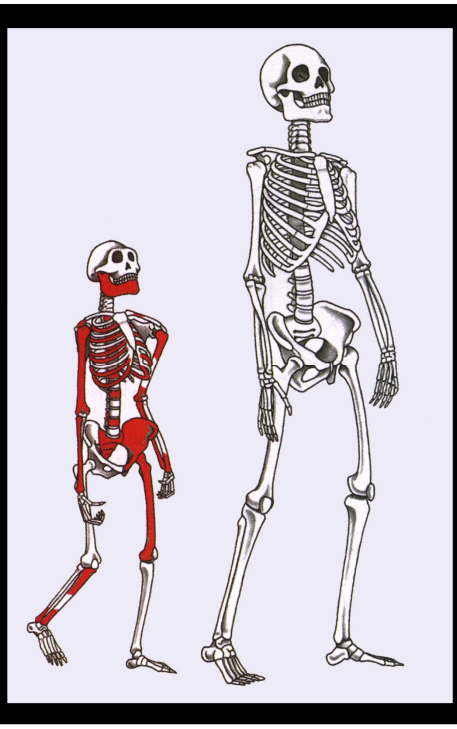
- 1974 Hadar, Ethiopia (3.2 mya)
- 40% complete skeleton
- Important because associated cranial & postcranial remains
- Definitely bipedal

7

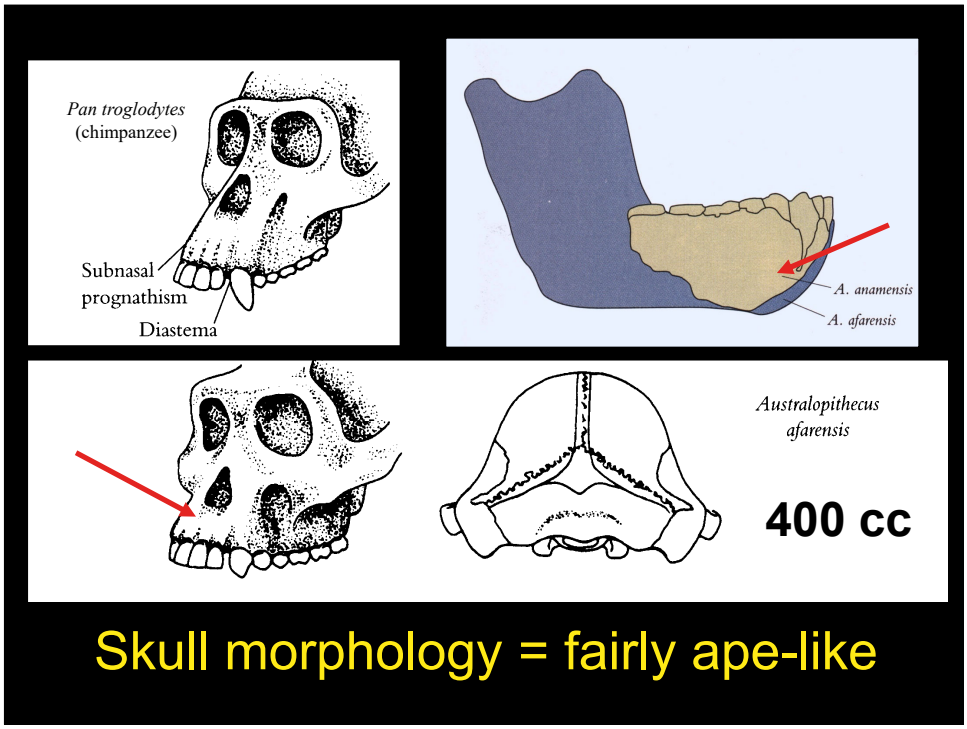
Fully adult individual

Roughly 3.5 feet tall

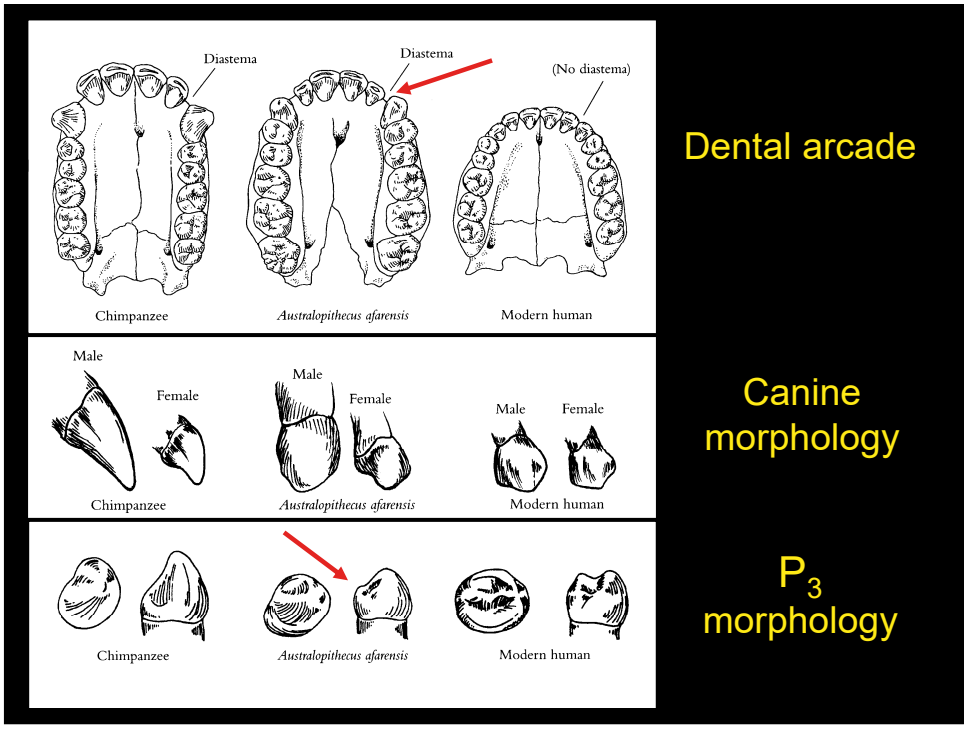
Weighed around 60 lbs



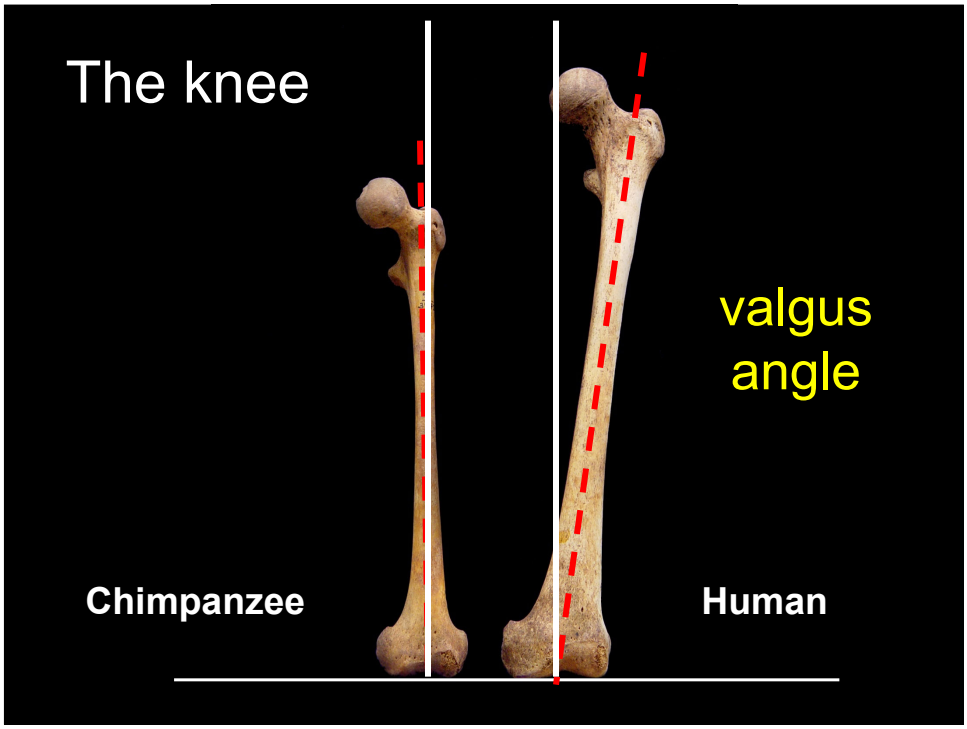
8


Pan troglodytes
(chimpanzee)
Subnasal
prognathism
Diastema
A. anamensis
A. afarensis
Australopithecus
afarensis
400 cc
Skull morphology = fairly ape-like

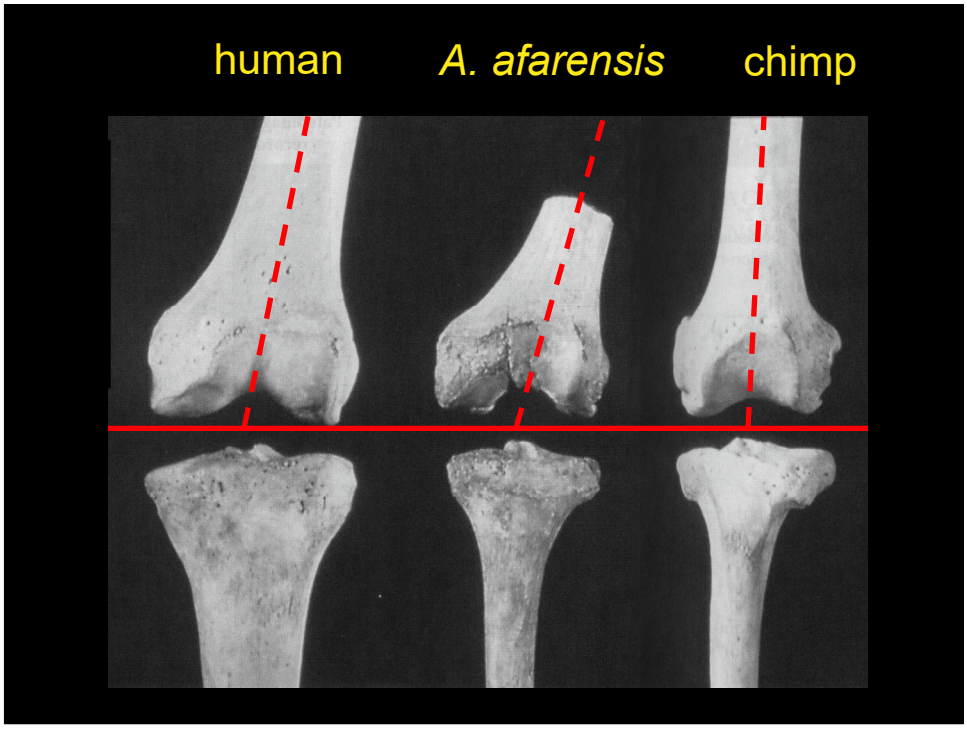
9


Diastema
Diastema
(No diastema)
Chimpanzee
Australopithecus afarensis
Modern human
Dental arcade
Male
Female
Male
Female
Male
Female
Chimpanzee
Australopithecus afarensis
Modern human
Canine
morphology
Chimpanzee
Australopithecus afarensis
Modern human
P3
morphology

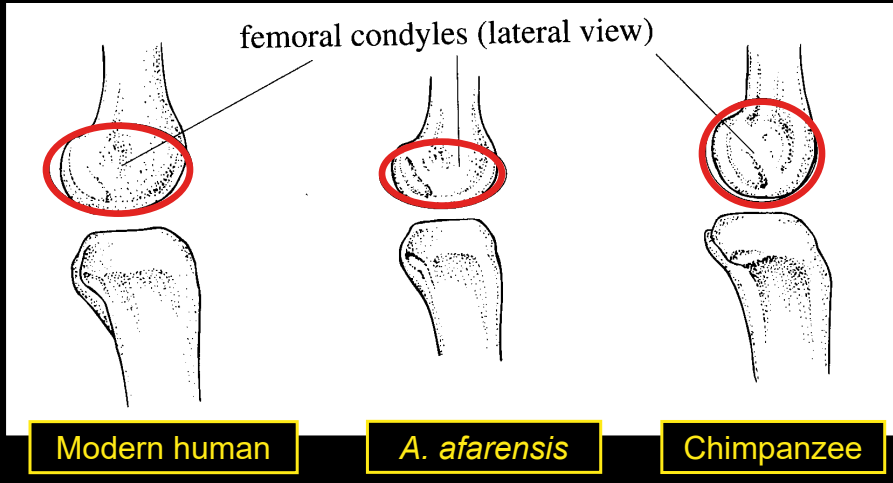
10


The knee
valgus
angle
Chimpanzee
Human

11

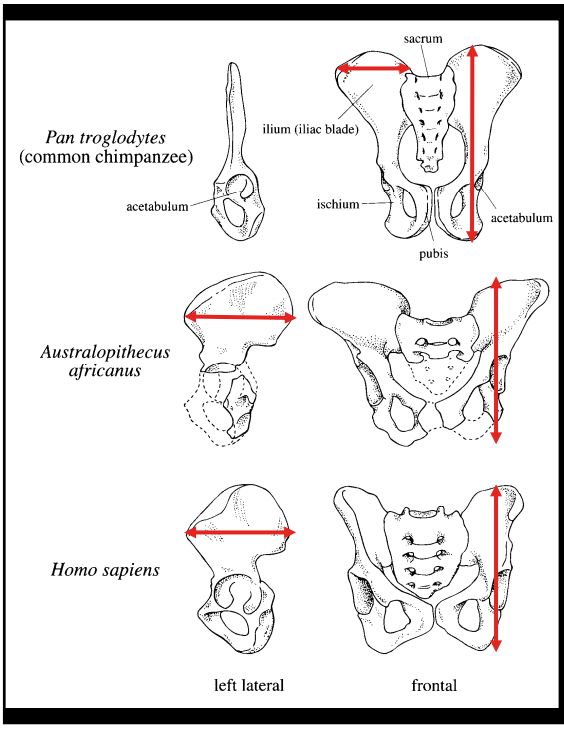

human
A. afarensis
chimp

12



Femoral condyles = more oval shaped

13

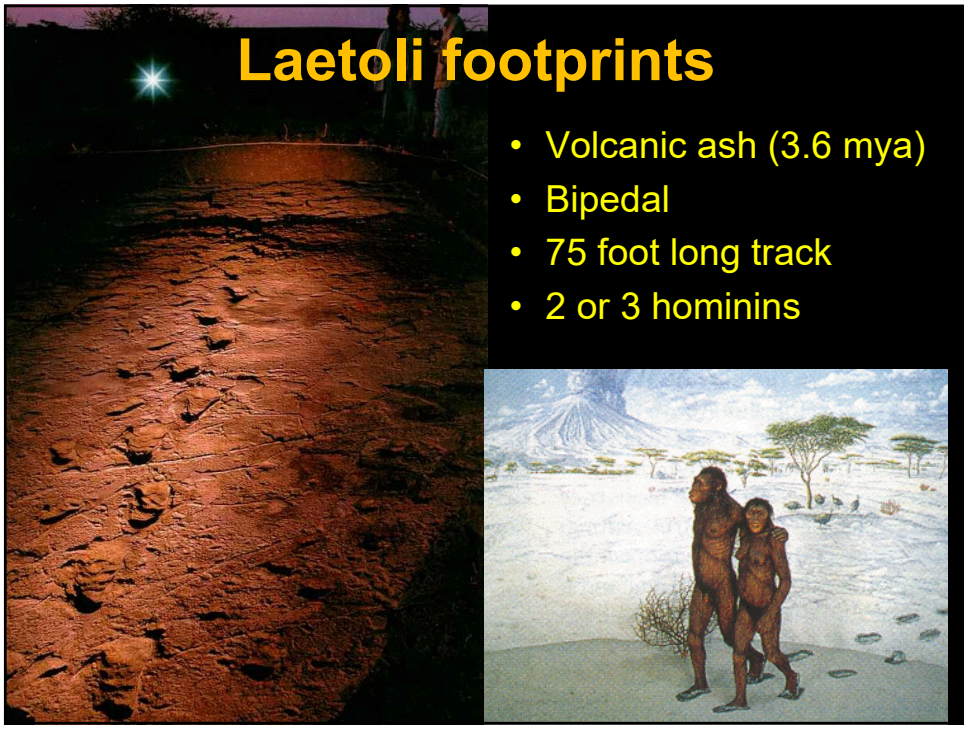


Pelvic morphology

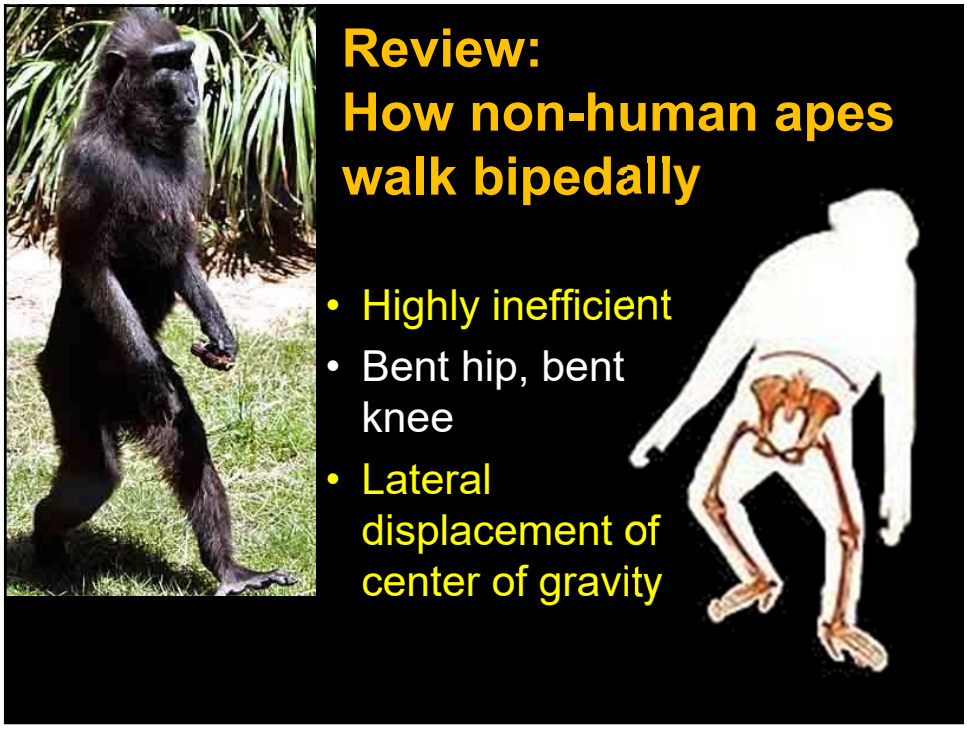
Chimpanzee = narrow & long with thin iliac blades in coronal plane

Humans & *Au. afarensis* = broad & short, with flared & robust iliac blades in a more sagittal plane

14

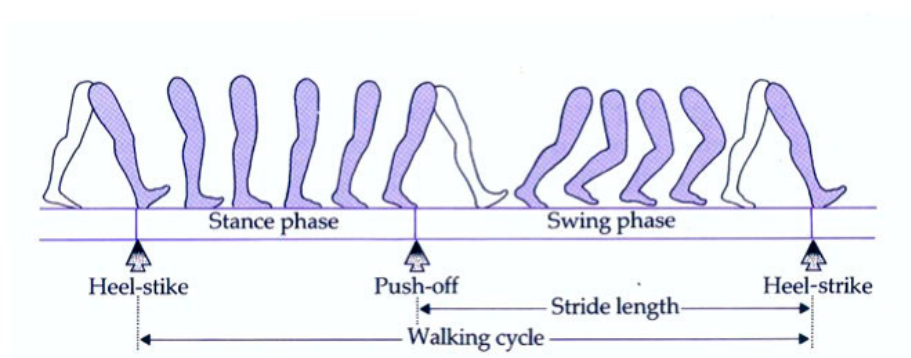

Laetoli footprints
• Volcanic ash (3.6 mya)
• Bipedal
• 75 foot long track
• 2 or 3 hominins

15

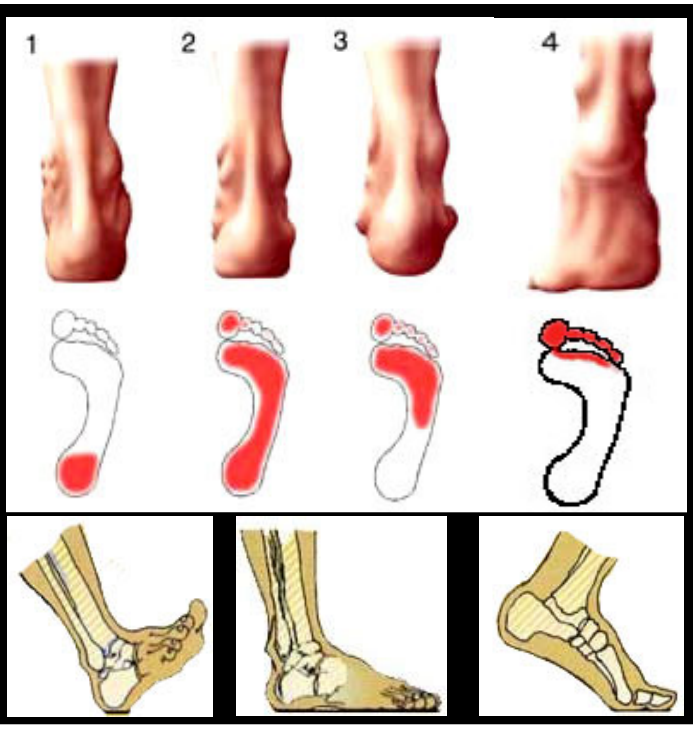

Review:
How non-human apes walk bipedally
• Highly inefficient
• Bent hip, bent knee
• Lateral displacement of center of gravity

16

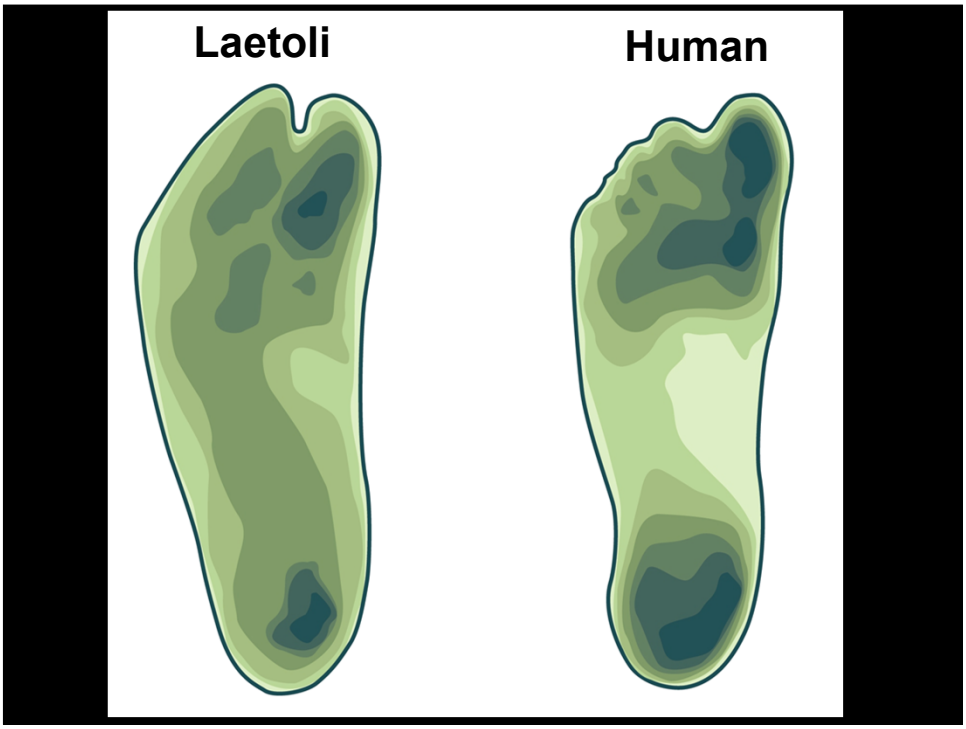
Review:
How human walk bipedally



17



18

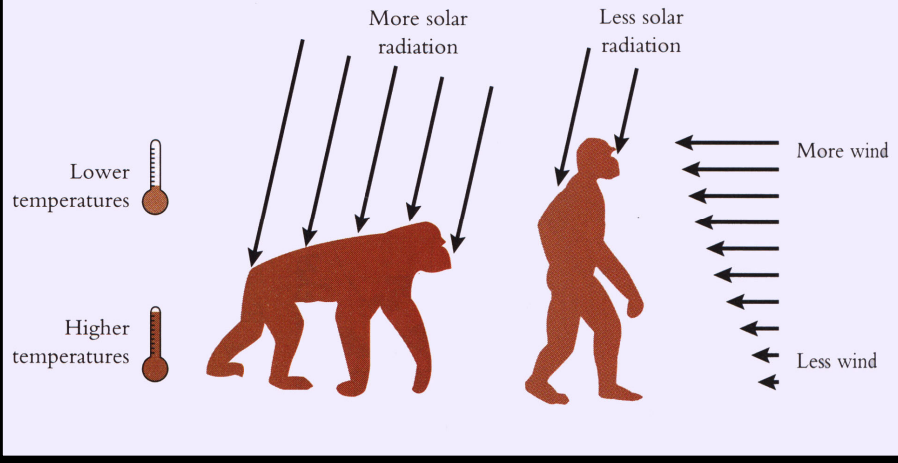


19

WHY BIPEDALISM?

More than 10 hypotheses, including:

20



21

How bipedal was Lucy?

Hominin-like traits:

- Erect posture (S-curve spine, short pelvis)
- Efficient walking bipedally (has an anterior inferior iliac spine & an adducted [in-line] big toe)

Chimp-like traits (all focus on upper body):

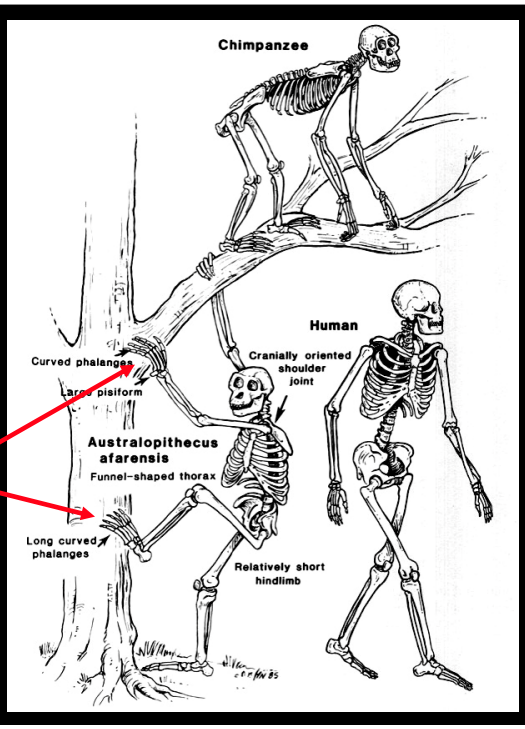
- Torso shape (cone-shaped, affects muscles of abs & back)
- Strong shoulders (broad, robust)
- Long arms (IMI = 88, higher than humans)
- Long, curved phalanges (grasping branches)

22

A. afarensis was likely still spending time in the trees (arboreal adaptations)

Long forelimbs

Long, curved phalanges and strong finger flexors



23

DIK-1/1, aka Selam

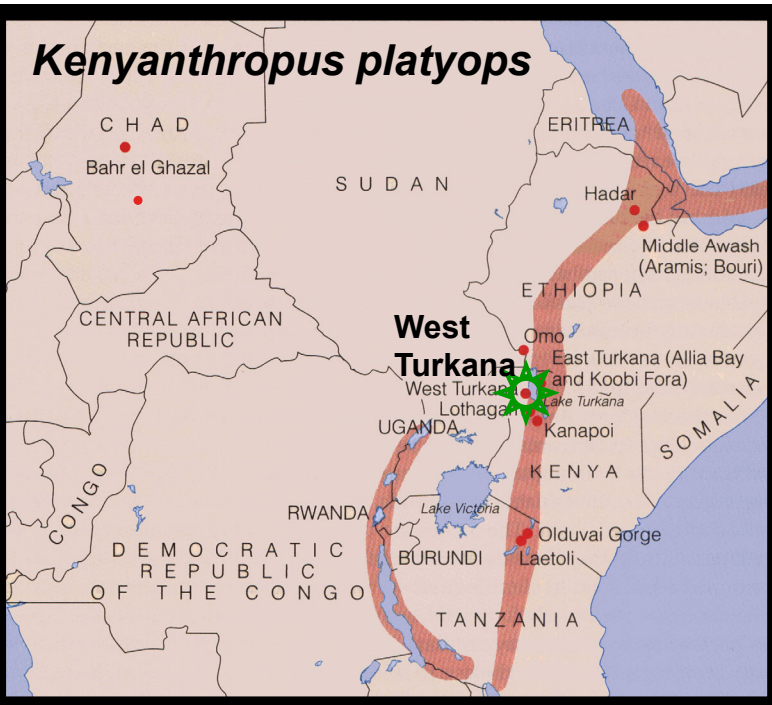
- Dikika, Ethiopia, 3.3 mya (pub. 2006)
- ~ 3 yr old *Au. afarensis*
- Partial skeleton, including complete skull, torso, and lower limb fragments
  - Climbing adaptations in arms and shoulder

24

Au. afarensis

- Sexually dimorphic in body size (108 vs 70 lbs)
- Bipedal, but still spent time in the trees
- No conclusive evidence of stone tool making or use, or of hunting
- May be ancestral to *Homo* (?)

25



26

Kenyanthropus platyops

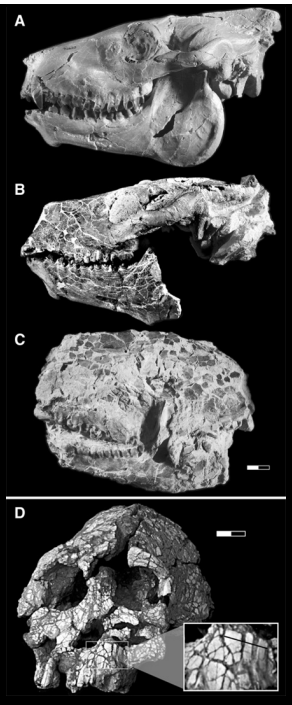
- 3.5 mya
- Found in West Turkana, Kenya, 1999
- One specimen KNM-WT 40000
- Broad flat face & small teeth
- Small brain

KNM-WT 40000

27

EMD
Expanding Matrix Distortion

CRAP
Cement Replacement of Anatomical Parts



28

Stone tool use

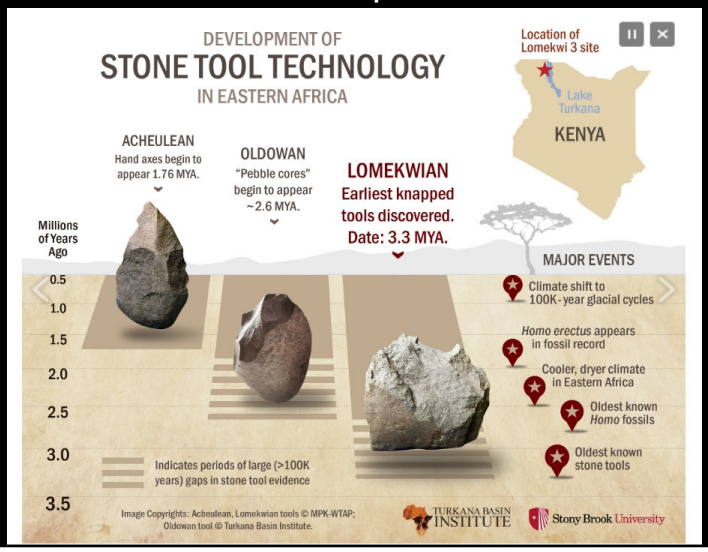
- Possible evidence of cut marks at Dikika, Ethiopia, at 3.4 mya (controversial – animal trampling?)
- Oldest known tools: Lomekwi 3, Kenya, at 3.3 mya
  - >100 pieces, including flakes, cores, and anvils
  - Deliberately knapped, some very large
  - Made by an australopith, but which one (*Au. afarensis* or *K. platyops*)?

Harmand and Lewis examine stone tool findings at the excavation site in Kenya. Item 2 of 5

29

Lomekwian tools

- Unlike later Oldowan – unique cultural tradition



30

Darwin's predictions for the first hominin:

- Bipedal
- Uses tools
- Reduced tooth size
- Has large brain

31

Piltdown Man

(A Cautionary Tale!)

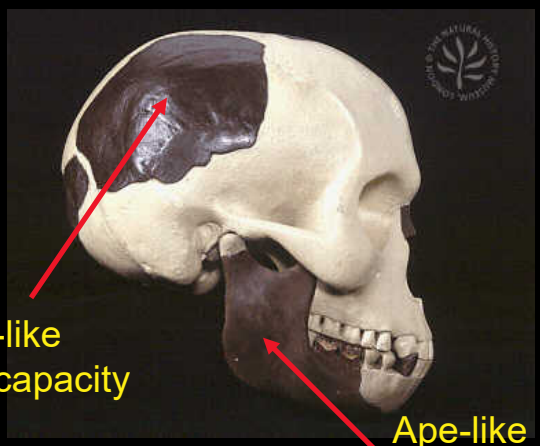
Between 1908 & 1913 fossil skull fragments were found in a gravel pit at Piltdown Common in southern England.

Given to amateur geologist - Charles Dawson. Dawson took them to Arthur Smith Woodward (BMNH)

32

"Eoanthropus dawsoni"

(Dawson's Dawn Man)



33

Piltdown forgery

- 1950 - Fluorine analysis (Kenneth Oakley). Level of flourine in cranium did not match mandible = not from same strata
- Modern human cranial fragments (2-3 people) chemically stained to look more ancient.
- Juvenile orangutan mandible with canines filed down

34

Martin Hinton & Charles Dawson

Hinton (left) and Dawson (right) at the site.

- 1980s – Hinton's trunk found at BMNH, contained bones stained with same combination of chemicals as Piltdown
- Now we think that Dawson was the only conspirator since he had a history of "finding" fraudulent historical artifacts
- DNA analyses of materials "found" at two different sites two years apart show they came from the same orangutan

35

Why did so many believe in Piltdown?

- Fit expectations of Darwin:
  - Large-brained early ancestor of humans
- Found in England
  - English scientists liked the idea of England being where our lineage first evolved!
- Not everyone believed it was real
  - Scottish, French, German, and Croatian anatomists wrote much earlier that this was clearly an ape and a human, but English scientists ignored them

36

East Africa = Volcanic

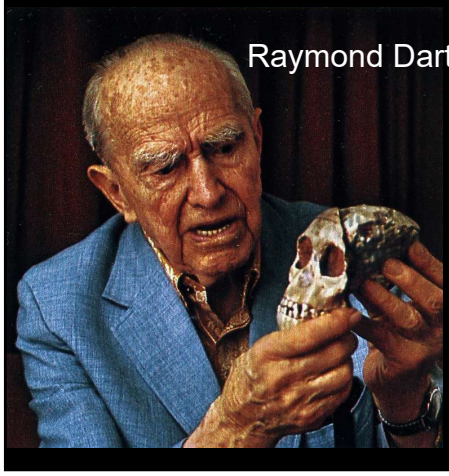
Can be radiometrically dated

South Africa = NOT Volcanic

Only relative dating methods can be used

37

First discovery of *Australopithecus*



Raymond Dart

Taung child

- Anatomy professor University of Witwatersrand
- 2 months of cleaning!!
- Nature, February 7th 1925
- *Australopithecus africanus* *"The southern ape from Africa"*

38

Taung child

- 2.3 mya
- ~4 years old at death
- Baby chimp or baby hominin?
- Foramen magnum is anterior
- No supraorbital torus
- High forehead
- Non-projecting canine
- No diastema
- MET WITH GREAT SKEPTICISM!
- Jaw of human & brain of ape
- Could Africa be homeland of hominins?

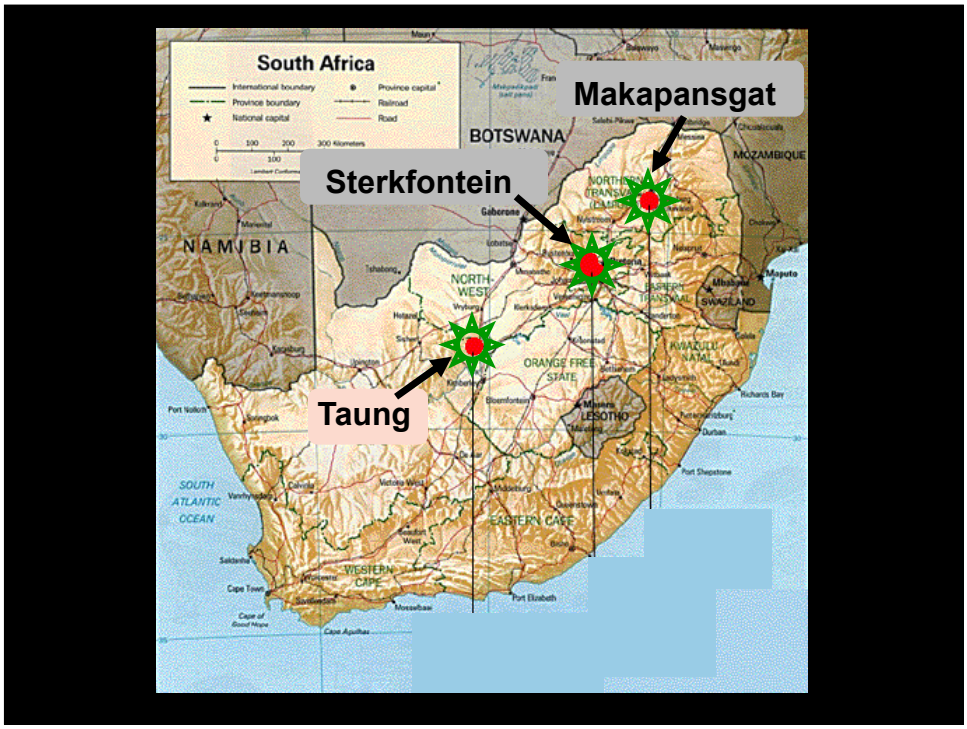
39

Australopithecus africanus

Taung child

- 3-2 Ma
- Sterkfontein, Taung and Makapansgat in South Africa
- Earliest hominin outside East Africa
- Clumps of woodland in open environment
- Postcrania similar to *A. afarensis*

40

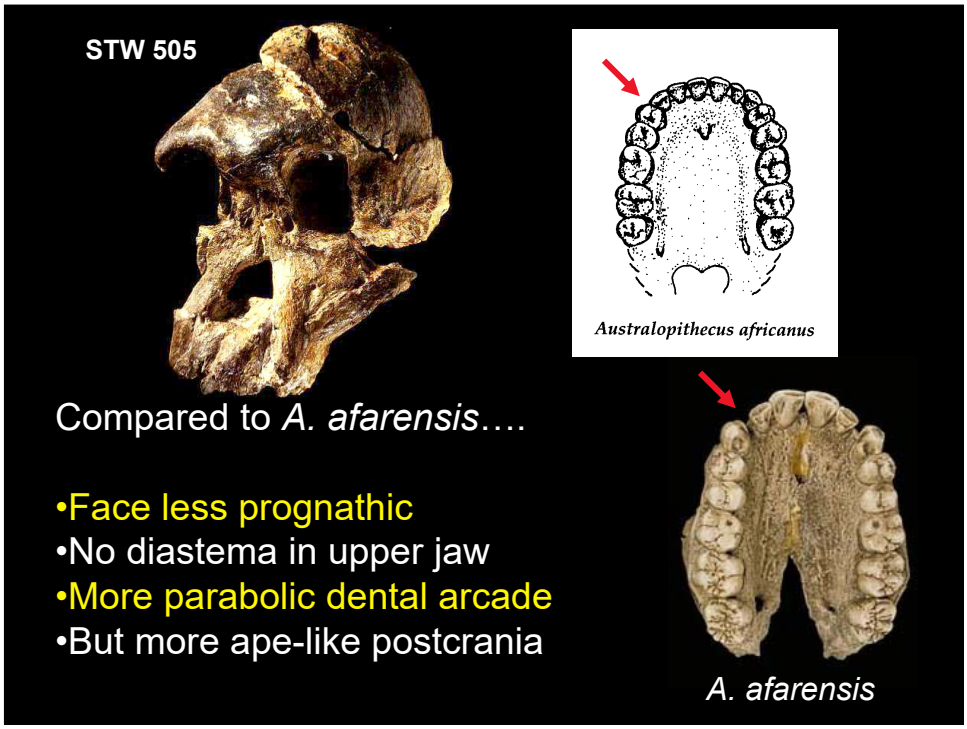


41

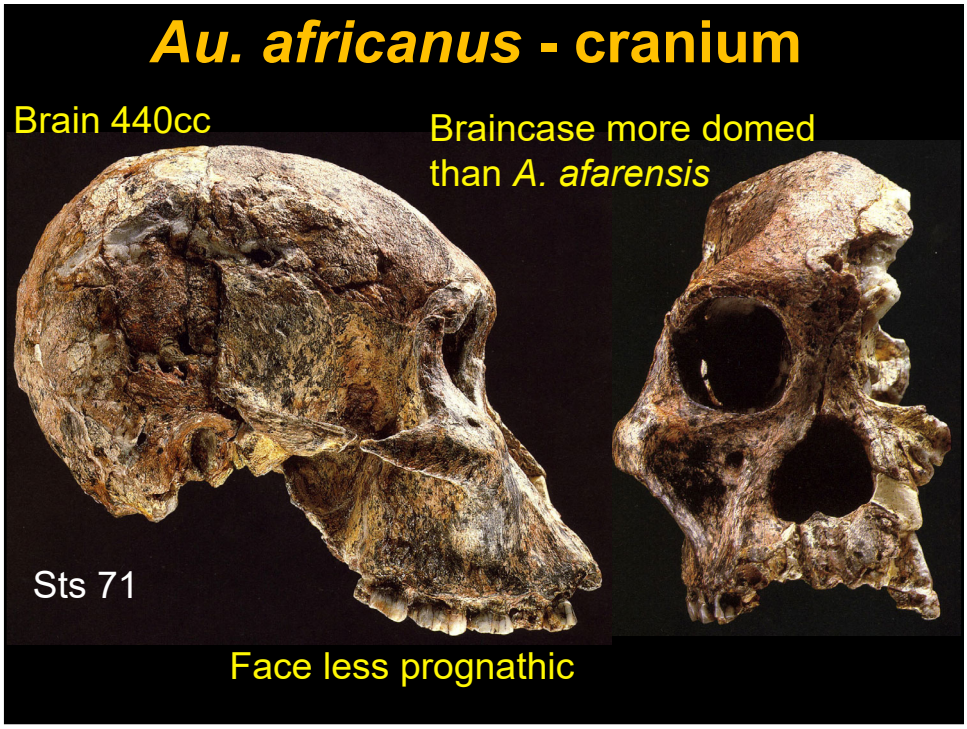
Sts 5 "Mrs Ples"

- Found 1947 by Robert Broom
- Sterkfontein, S. Africa
- 2.5 mya
- Demonstrated Taung child was not an ape

42


STW 505
Australopithecus africanus
Compared to A. afarensis….
•Face less prognathic
•No diastema in upper jaw
•More parabolic dental arcade
•But more ape-like postcrania
A. afarensis

43


Au. africanus - cranium
Brain 440cc
Braincase more domed than A. afarensis
Sts 71
Face less prognathic

44

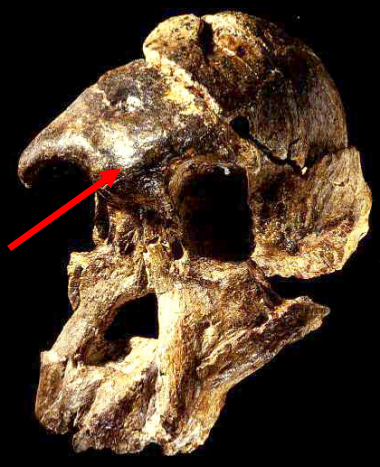
Au. africanus - dentition

- Incisors & canines smaller than *Au. afarensis*
- Molars larger – postcanine megadontia
- Reflecting shift away from slicing (e.g., fruit) towards crushing & grinding

45

Sexual dimorphism at Sterkfontein

Sts 5: smaller (female?)



Stw 505: larger w/ brow ridge (male?)

46

A. africanus postcrania

- 2.5 mya
- Found 1947 by Robert Broom
- Habitual biped
- Outward flare of iliac blades
- 6 lumbar vertebrae

47

48

Australopithecus sediba

- First described in 2009
- Malapa, near Sterkfontein
- 1.98 Ma (paleomag, U-Pb)
- Holotype: juvenile MH1
- Paratypes: MH2 (adult), two infant skeletons

Composite *Au. sediba* skeleton
Berger, 2013

49

Australopithecus sediba

- ~ 420 cc (95% of adult value)
- small postcanine teeth (*H. erectus*-like)
- Nasal pillars absent
- Widely spaced temporal lines, vertical parietals
- Brain reorganization?

50

Au. sediba

- Postcrania generally similar to other australopiths:
  - long upper limb
  - cranially oriented shoulder
  - Funnel-shaped thorax
  - Wrist, hand and some aspects of the foot still adapted for grasping/climbing
- Some features *Homo*-like
  - Less flaring iliac blades
  - Manipulative ability in the hand

Gibbons, 2009

51

Phylogeny

Not all hominins are ancestors of later ones!

52