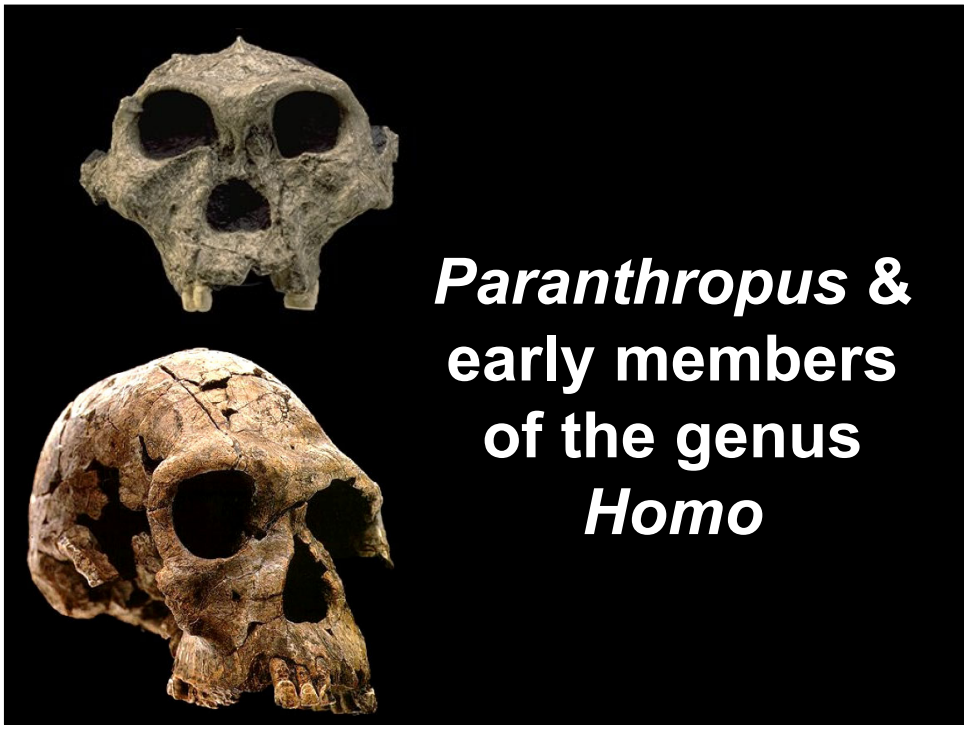


1

Paranthropus

("robust" australopiths)

P. boisei

(East Africa)

P. robustus

(South Africa)

P. aethiopicus

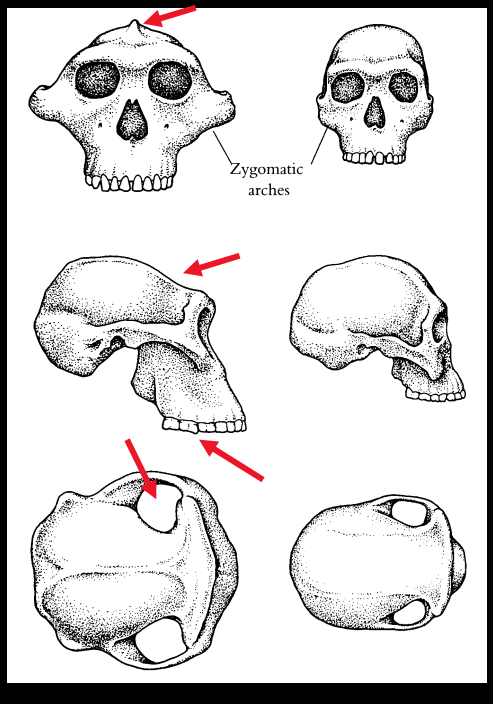
(East Africa)

2

"Robust" forms

P. aethiopicus
P. robustus
P. boisei

(some think these are also genus *Australopithecus*)



"Gracile" forms

Au. anamensis
Au. afarensis
Au. africanus
Au. sediba
Au. bahrelgazali
Au. garhi

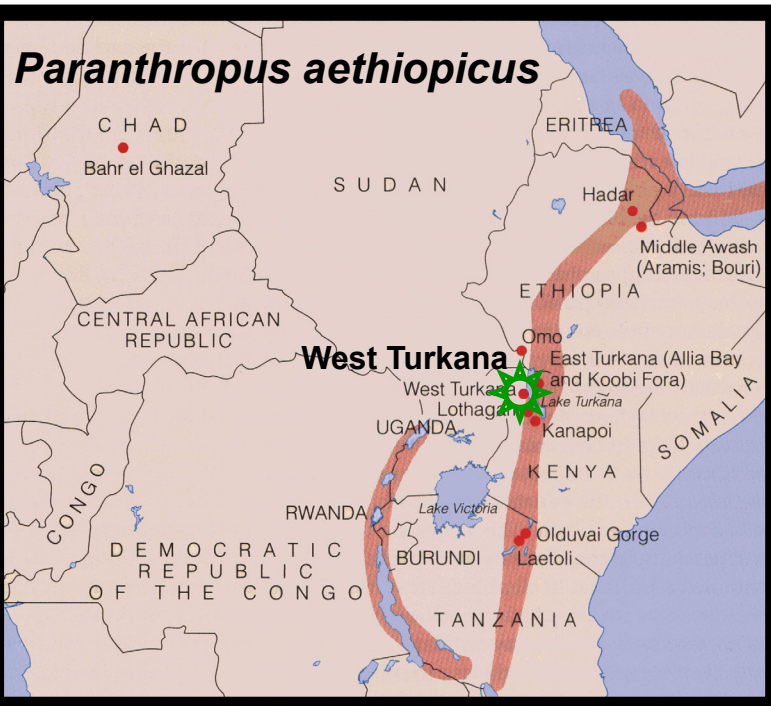
3

Paranthropus



- Found in East & South Africa
- Habitually bipedal
- Masticatory specializations: massive jaws, huge crushing & grinding cheek teeth, sagittal crests
- Though to be for processing high quantities of low-quality foods – seeds nuts etc.
- Dry, more open, seasonal environment

4



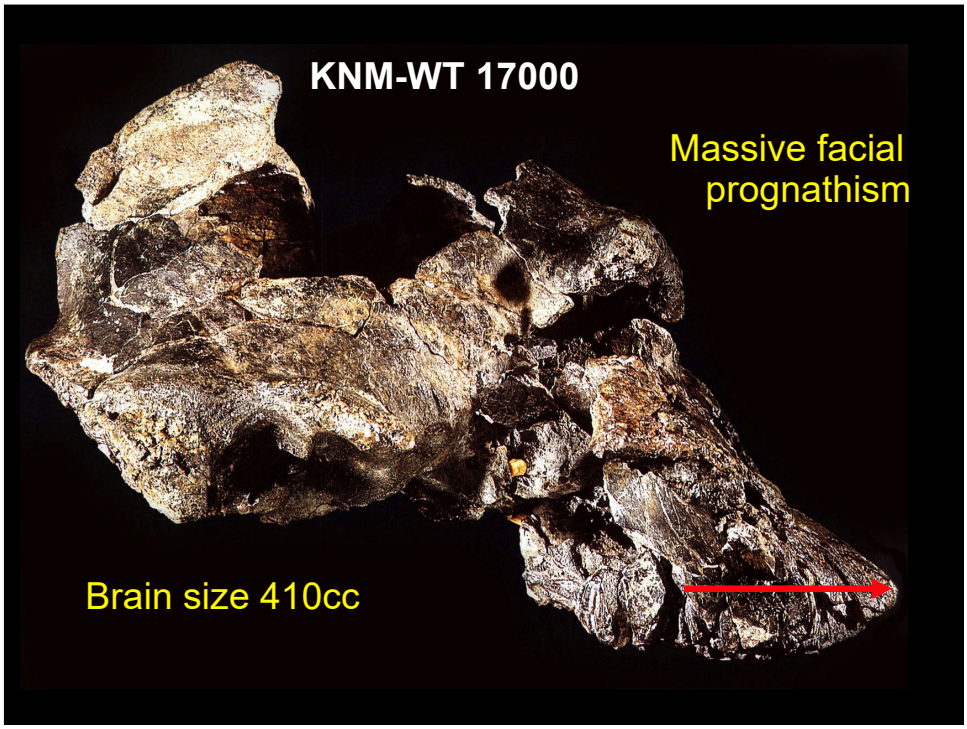
5

Paranthropus aethiopicus

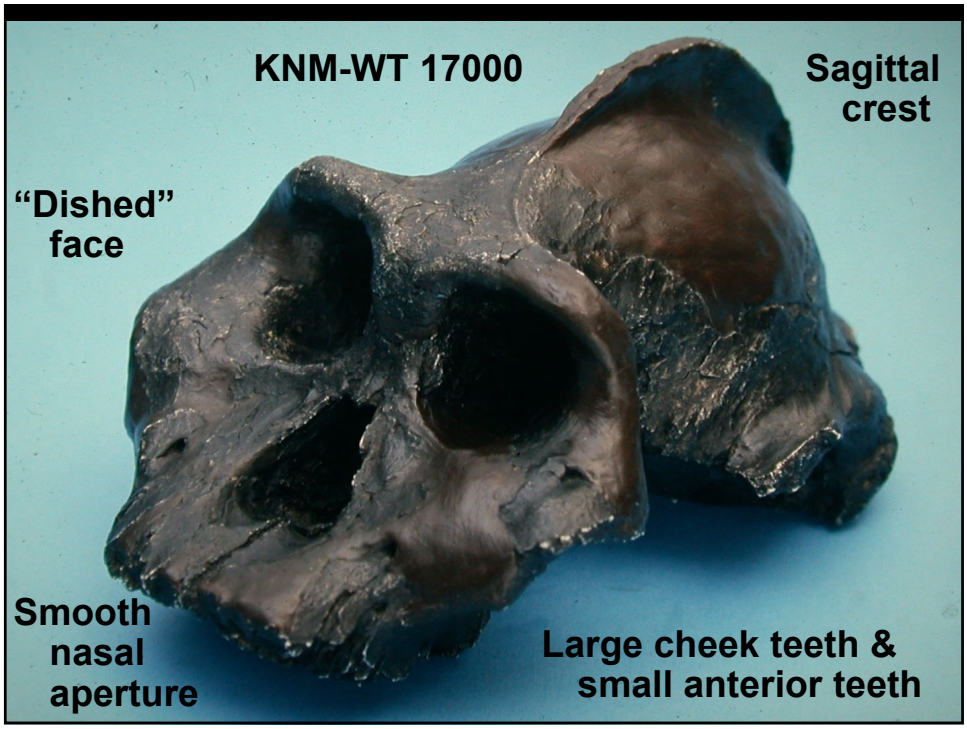
KNM-WT 17000, "The Black Skull"

- Found in 1985
- Dated to 2.7 - 2.5 mya (older than other *Paranthropus*)
- West Turkana, Kenya, and Ethiopia

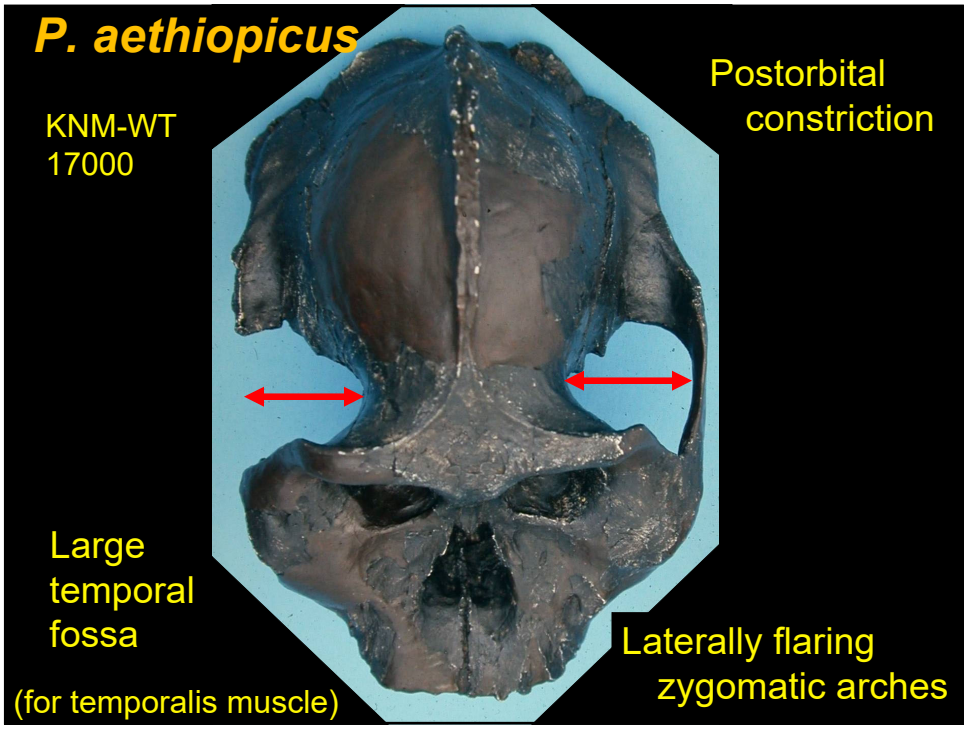
6


KNM-WT 17000
Massive facial prognathism
Brain size 410cc

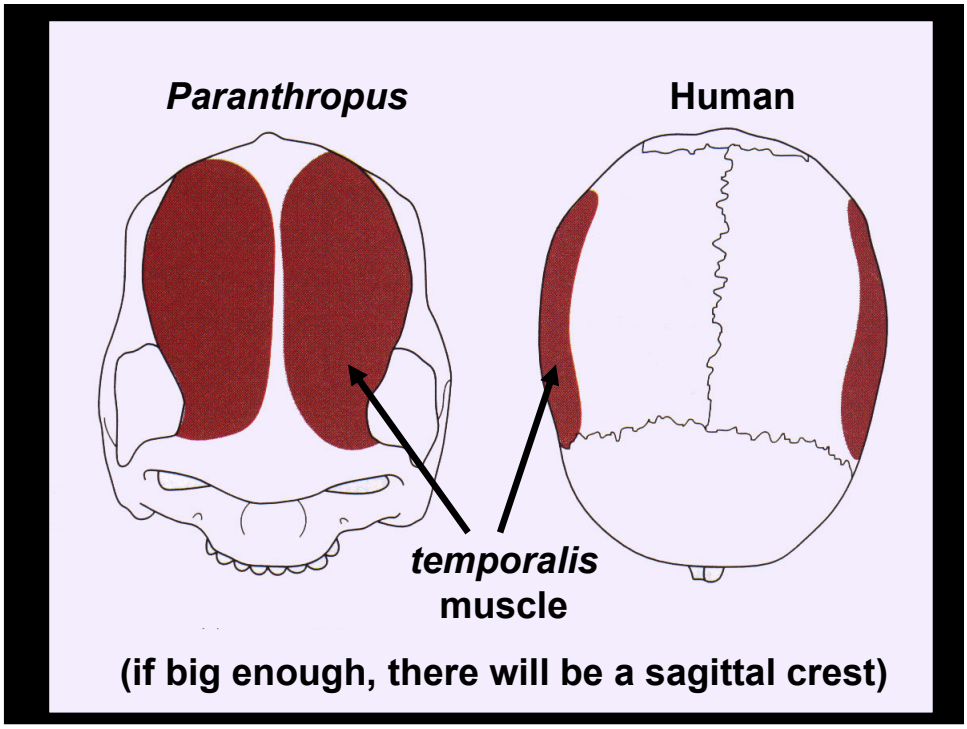
7


KNM-WT 17000
Sagittal crest
"Dished" face
Smooth nasal aperture
Large cheek teeth & small anterior teeth

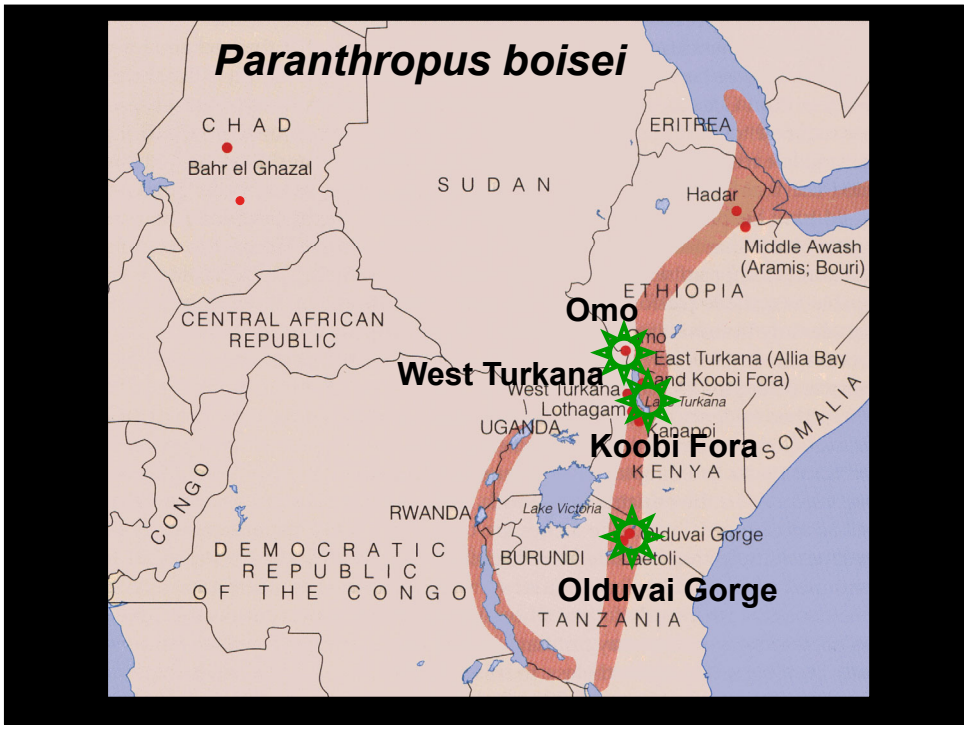
8


P. aethiopicus
KNM-WT 17000
Postorbital constriction
Large temporal fossa
(for temporalis muscle)
Laterally flaring zygomatic arches

9


Paranthropus
Human
temporalis muscle
(if big enough, there will be a sagittal crest)

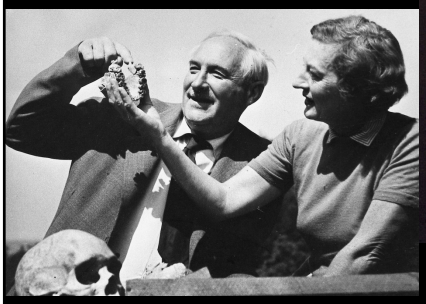
10



11

Paranthropus boisei

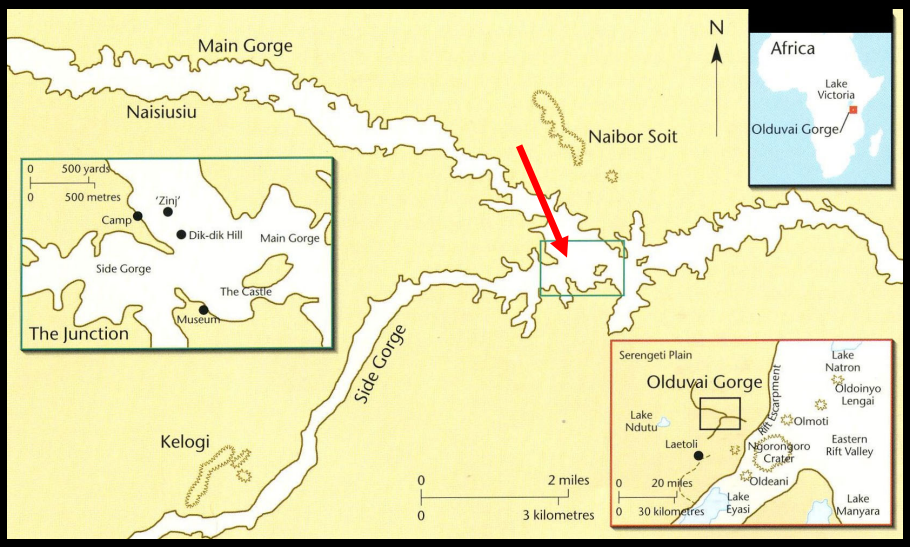
- 2.3-1.2 mya (contemporary with early *Homo*)
- "Zinj" OH 5 aka "Nutcracker Man"



Discovered by Mary Leakey

12

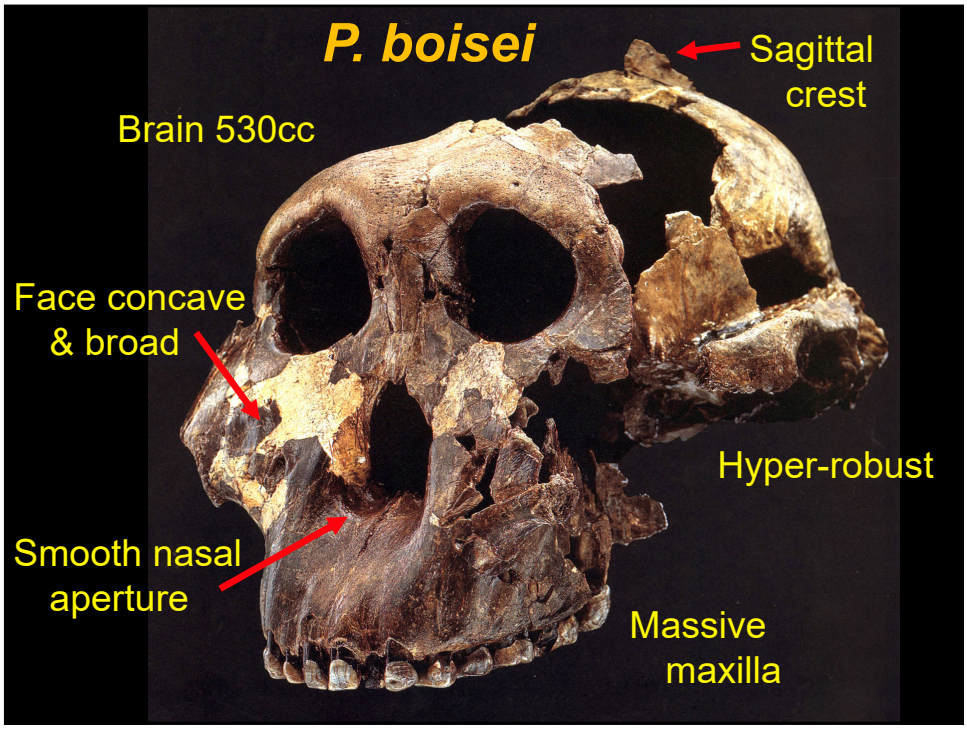
Olduvai Gorge, Tanzania



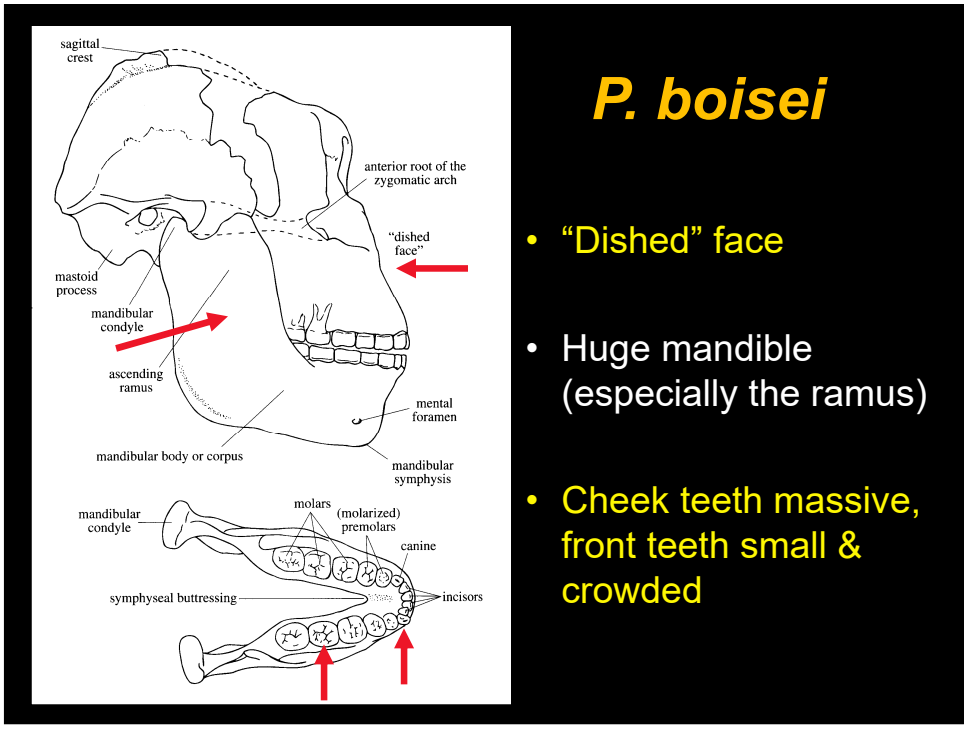
13

Zinjanthropus site, Olduvai Gorge, Tanzania

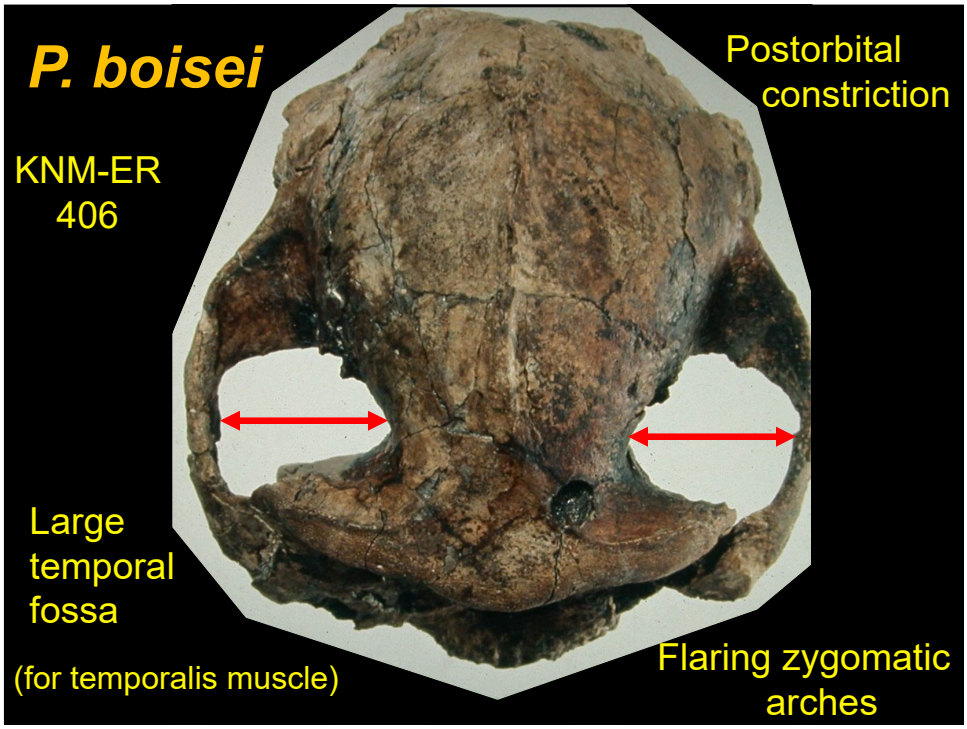
14


P. boisei
Sagittal crest
Brain 530cc
Face concave & broad
Hyper-robust
Smooth nasal aperture
Massive maxilla

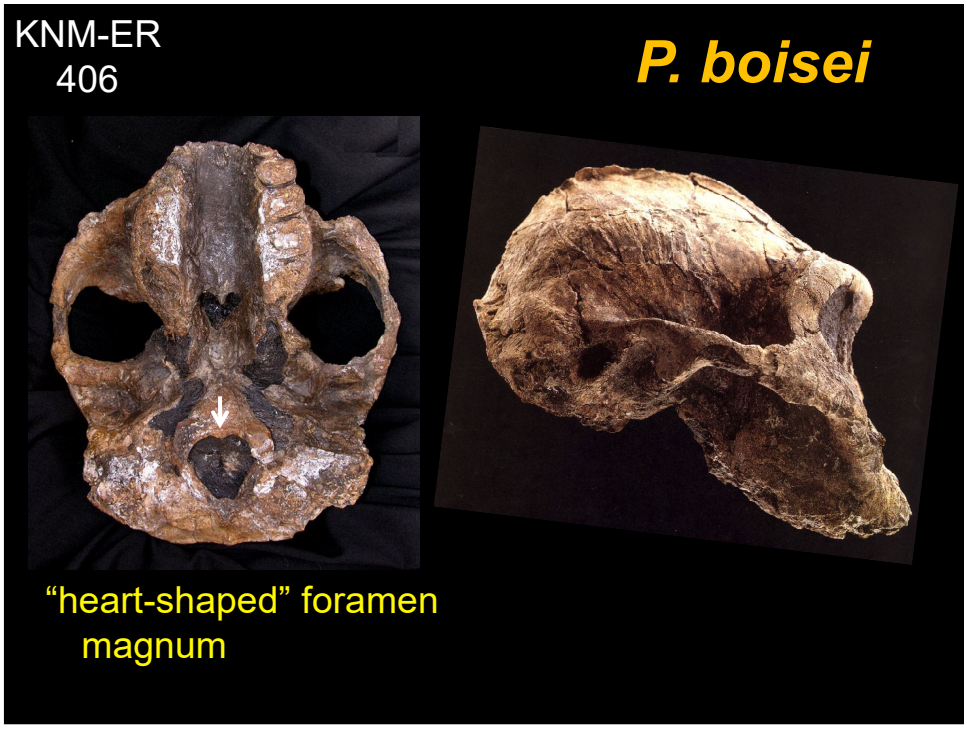
15


sagittal crest
anterior root of the zygomatic arch
"dished face"
mastoid process
mandibular condyle
ascending ramus
mental foramen
mandibular body or corpus
mandibular symphysis
molars
(molarized) premolars
canine
mandibular condyle
symphyseal buttressing
incisors
P. boisei
• "Dished" face
• Huge mandible (especially the ramus)
• Cheek teeth massive, front teeth small & crowded

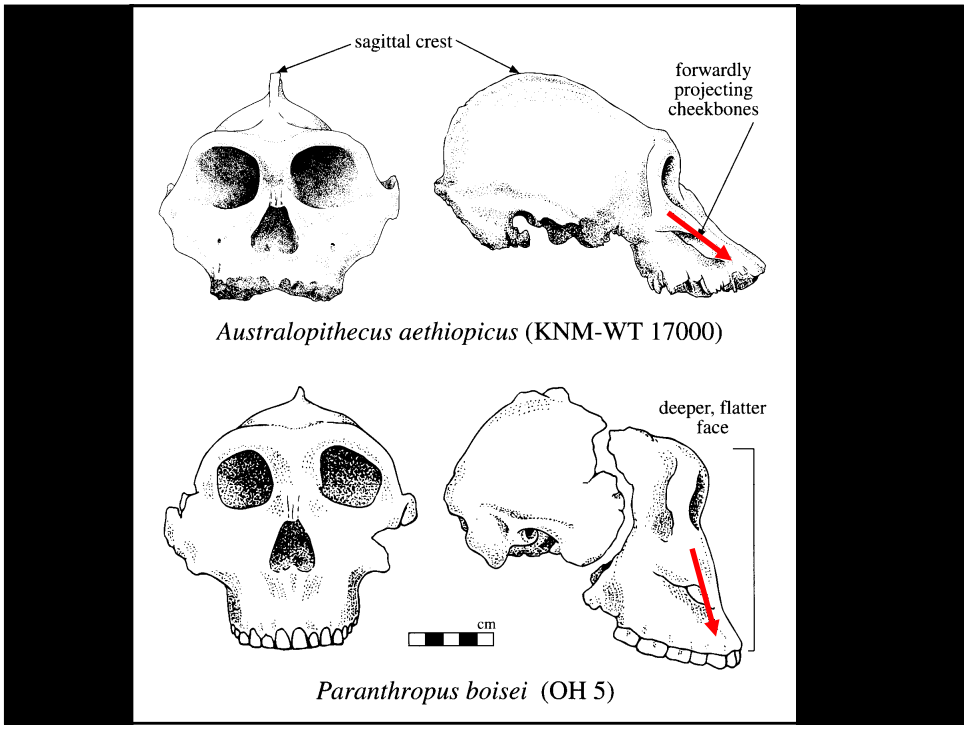
16


P. boisei
KNM-ER 406
Postorbital constriction
Large temporal fossa
(for temporalis muscle)
Flaring zygomatic arches

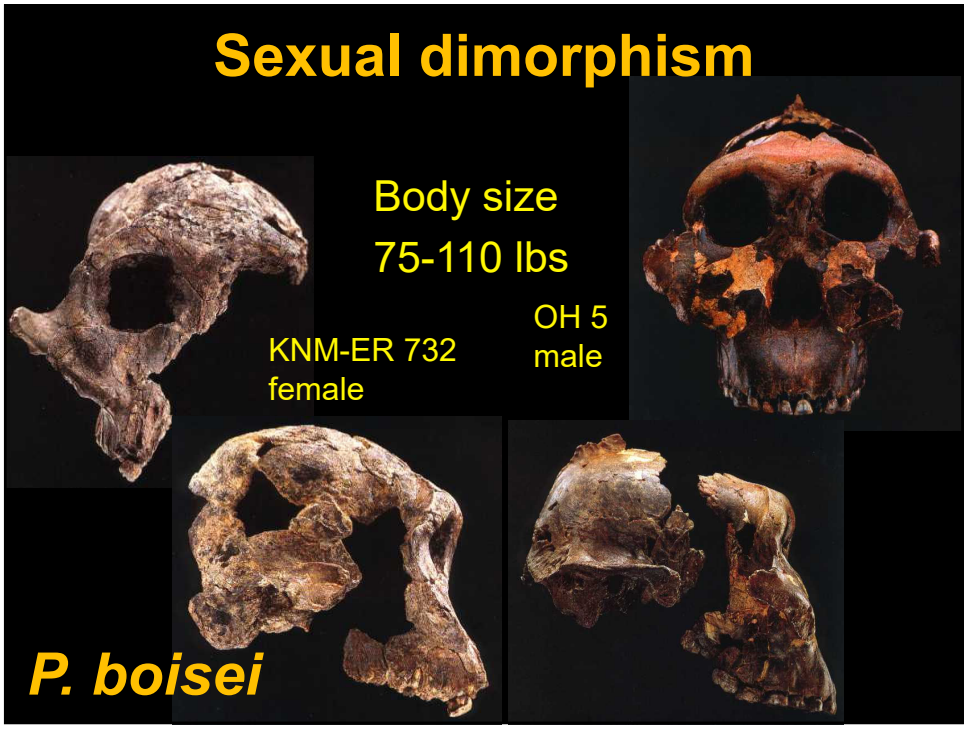
17


KNM-ER 406
P. boisei
"heart-shaped" foramen magnum

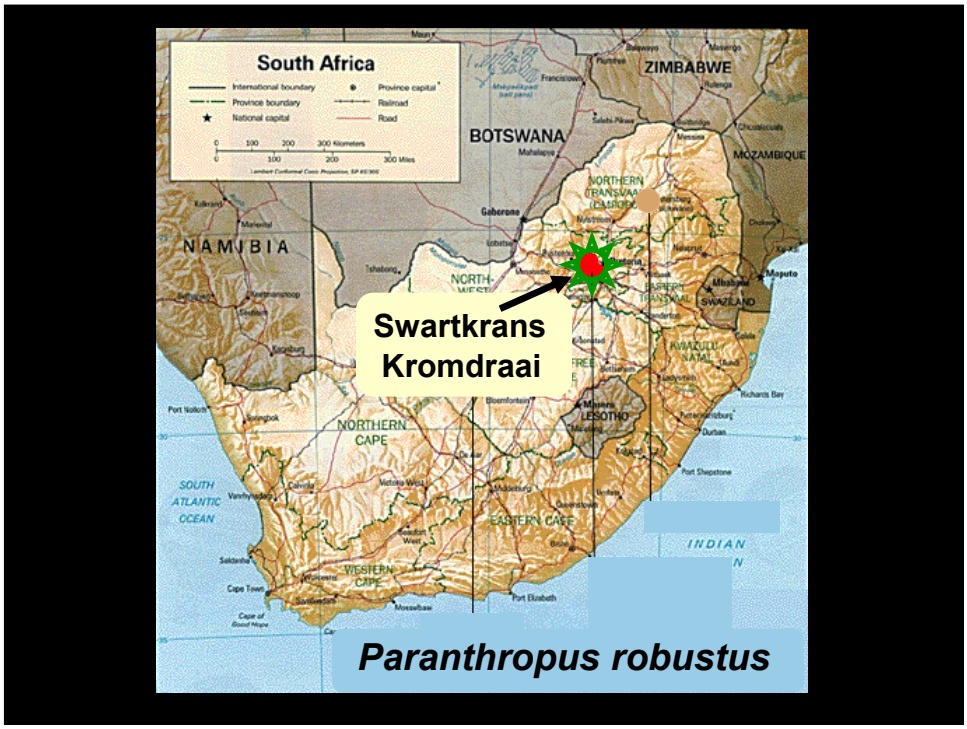
18


sagittal crest
forwardly projecting cheekbones
Australopithecus aethiopicus (KNM-WT 17000)
deeper, flatter face
cm
Paranthropus boisei (OH 5)

19


Sexual dimorphism
Body size
75-110 lbs
KNM-ER 732
female
OH 5
male
P. boisei

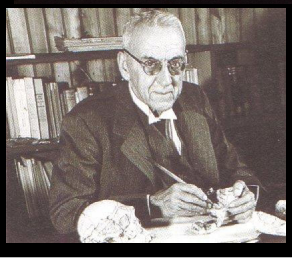
20



21

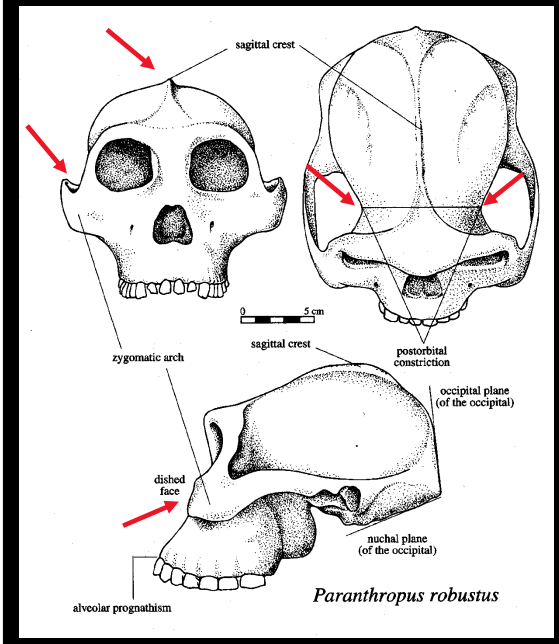
Paranthropus robustus (2–1.5 mya)

- Limited material from Kromdraai, more from Swartkrans
- Heavily built face & jaws
- Massive cheek teeth, but not as large as *P. boisei*
- Small anterior teeth
- Body size 70-90 lbs



Robert Broom:
called it *Australopithecus*

22



Brain 500-550 cc

SK 46

P. robustus

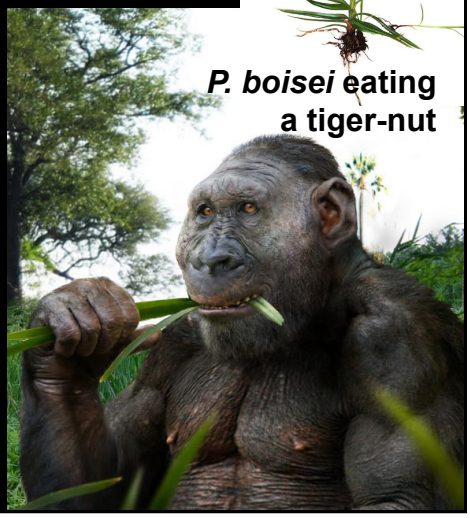
(2-1.5 mya)

South Africa

23

Paranthropus diet

- Interpreted as based on hard, brittle foods: nuts, seeds, tubers, sedges, etc.
- Stable isotope and microwear analyses indicate plant-based diet similar to other hominins
- Brittle foods were "fallback" foods - low-quality, require a lot of chewing
- *P. robustus* may have consumed honey (caries)



***P. boisei* eating a tiger-nut**

24

Paranthropus: Homology or analogy?

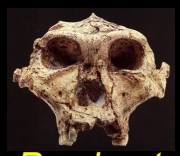
P. boisei
(East Africa)

P. robustus
(South Africa)

25

Option 1: Homology

P. boisei
East Africa



P. robustus
South Africa

P. aethiopicus
East Africa

If this phylogeny is true, then the later species (*P. boisei* & *P. robustus*) are robust because they share a common robust ancestor (*P. aethiopicus*). This makes them a monophyletic group (aka a clade), and justifies giving them their own genus (*Paranthropus*)

26

Option 2: Analogy

Au. boisei

East Africa

Au. robustus

South Africa

Au. aethiopicus

East Africa

Au. africanus

South Africa

If this phylogeny is true, then robust features evolved TWICE, once in East Africa (*P. aethiopicus, P. boisei*) and once in South Africa (*P. robustus*). This might occur if there were similar environments to adapt to. This would make *Paranthropus* polyphyletic (not a clade), which is why some put all these species in the genus *Australopithecus.*

27

Let's talk about phylogeny

H. habilis

?

?

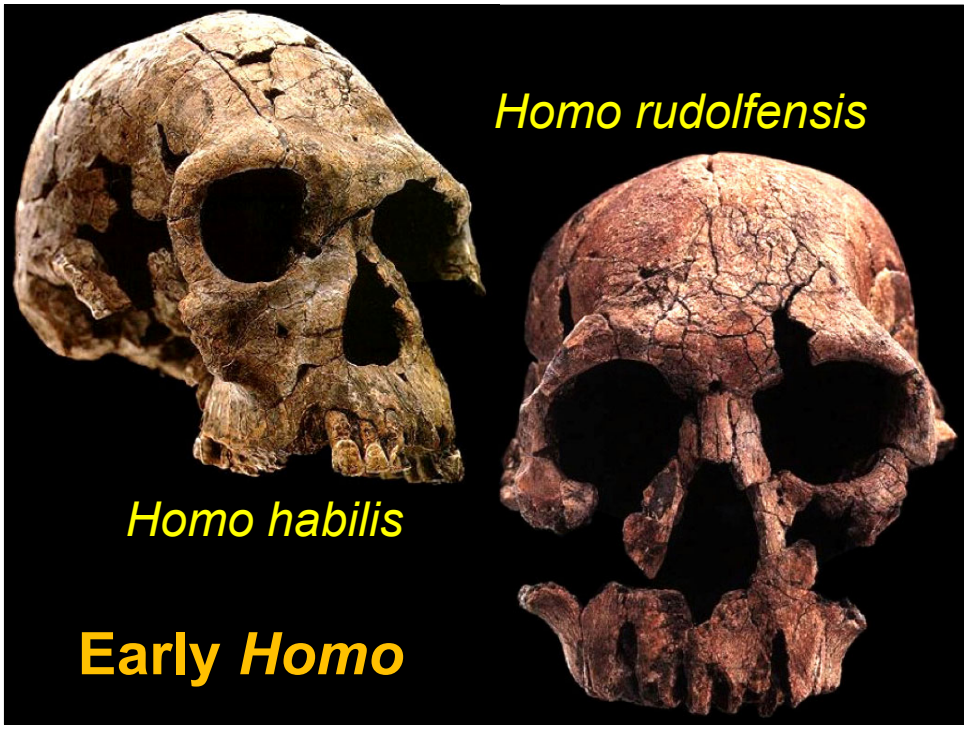
Paranthropus

Au. sediba

Au. africanus

Not all hominins are ancestors of later ones!

28



29

Post-Taung 1925

- For a long time knowledge of *Australopithecus* better than earliest *Homo*
- Only *Homo* known older than 500 Ka - *Homo erectus*
- Mid 1960s: OH 7 - first *Homo habilis*

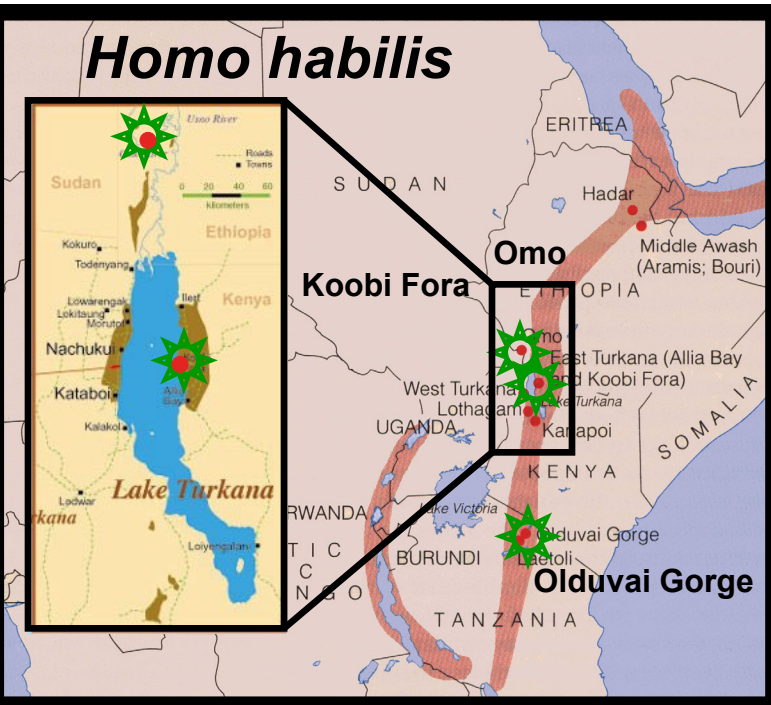
30

Earliest *Homo*

- Very few *Homo* fossils between 3 and 2.5 mya
  - isolated left and right P3-M2 crowns of a single individual from Koobi Fora, 3-2.7 mya
  - Mandible from Ledi-Geraru, Afar, Ethiopia at 2.8-2.75 Ma

Seyoum *et al.* 2015

31



32

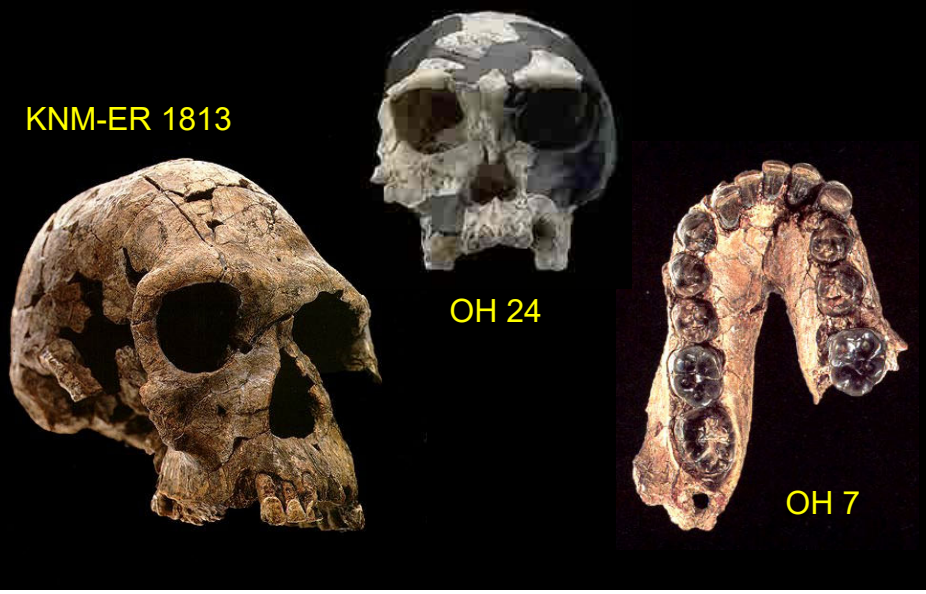
33

Homo habilis

- Found in 1964 at Olduvai Gorge, Tanzania
- 2.4–1.8 mya
- Also known from:
  - Koobi Fora, Kenya
  - Omo, Ethiopia
  - Sterkfontein, South Africa

34

Homo habilis



35

Sexual dimorphism in *Homo habilis*


OH 24 – 'Twiggy'


KNM-ER 1805

- Some small & lightly built (= females 25 kg or 55 lbs?)
- Others larger & stronger (= males 40 kg or 88 lbs?)
- Thought to represent sexual dimorphism (but could be species differences)

36

Homo habilis brain

- Brain size 500-650cc, 40% bigger than *Australopithecus*
- But overlap in lower range (e.g., KNM-ER 1813 = 510 cc)

37

Homo habilis vs *Au. africanus*

More globular lightly built braincase

Weaker muscle markings

More projecting supraorbital torus

40% larger brain size - 500-650cc

Face = less prognathic & smaller

Less powerful chewing muscles

No facial pillars

KNM-ER 1813

38

Homo habilis teeth

OH 7 - type specimen

- Anterior teeth (I & C) small in females & moderately large in males
- More gracile jaws & smaller teeth than *Australopithecus*
- More parabolic dental arcade (OH 7 is crushed)

39

Homo habilis postcrania

- Forelimbs long, robust & strongly muscled, curved fingers
- Hindlimbs short & relatively lightly built
- Primitive for age & cranial morphology
- Problematic reconstruction!

40

Homo habilis arm & hand

- Hand more human-like than in *Australopithecus*
- BUT ape-like wrist, long curved fingers & powerful muscles
- Thumb joint human like (broad & shallow) - more adapted to precision grip (used to make stone tools)

41

Homo habilis foot

OH 8

- Arches not as well developed as in modern humans
- Fully adducted big toe
- Missing metatarsal heads, pits on talus – crocodile tooth marks

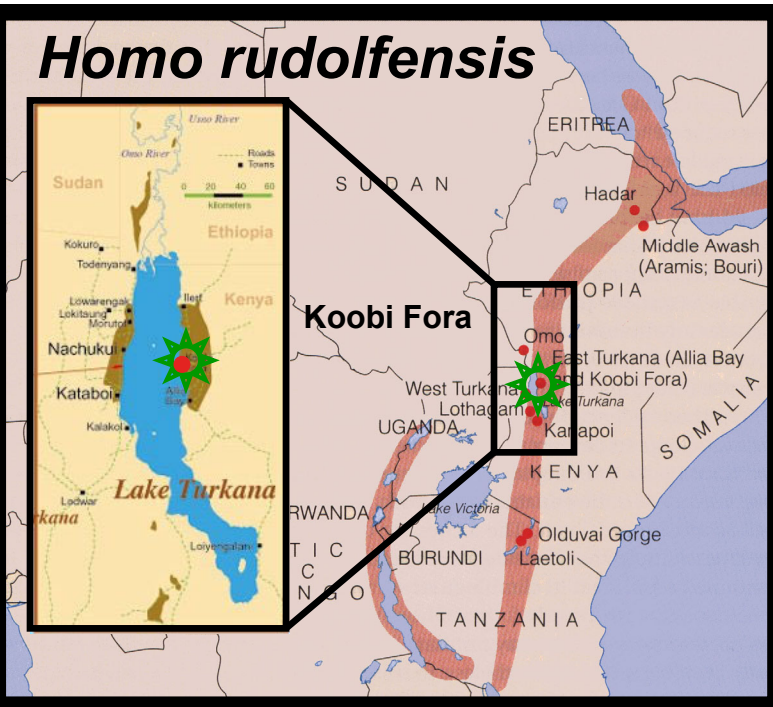
42

Homo habilis conclusion

- Small brain (500-650 cc)
- Face & dentition more similar to later *Homo*
- Retains arboreal adaptations
- Made stone tools

43

Homo rudolfensis



44

Homo rudolfensis

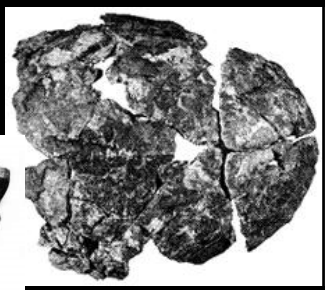
- Koobi Fora, Kenya
- 3 specimens from:
  - Malawi
  - Omo, Ethiopia
  - Chemeron, Kenya
- 2.4 – 1.8 mya

KNM-ER 1470

45

Not many specimens

KNM-ER 1590



KNM-ER 1470

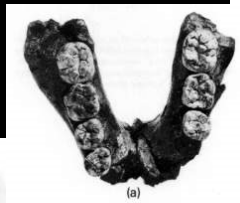


PLATE 22. KNM-ER 1801, occlusal.

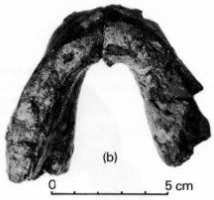


PLATE 23. KNM-ER 1802 (a) occlusal, (b) inferior.

KNM-ER 1801

KNM-ER 1802

46

H. rudolfensis vs *H. habilis*

Bigger brained
750-800 cc

Higher forehead

No supraorbital torus

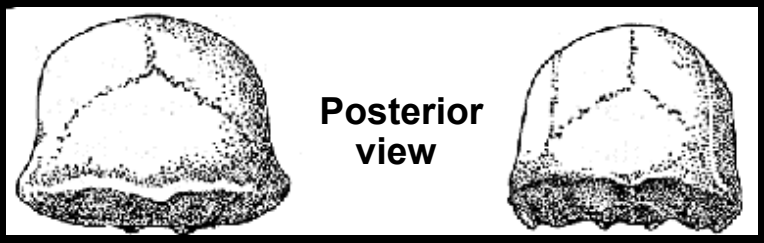
Cheek bones wide & set forward of nasal aperture

Face = broader, deeper & less prognathic

KNM-ER 1470

47

H. rudolfensis vs *H. habilis*



- *H. rudolfensis* bell-shaped:
  higher frontal bone & broader at base
- *H. habilis* spherical

48

PLATE 23. KNM-ER 1802 (a) occlusal, (b) inferior.

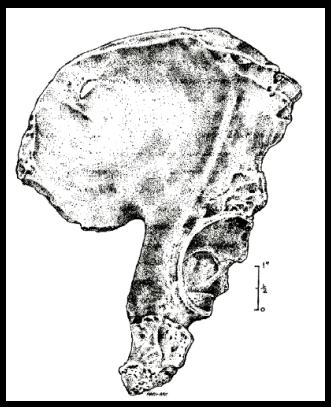
Mandible

- Strong
- Thick corpus
- V-shaped tooth row
- Large posterior teeth:
  - complex crowns
  - multiple roots

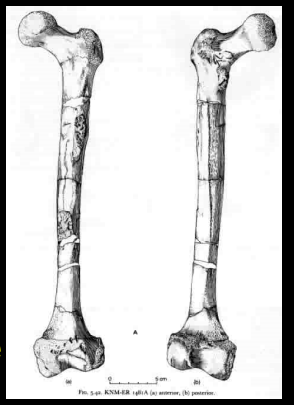
KNM-ER 1802

49

Homo rudolfensis postcrania (?)



- 1.9 mya
- No postcranial remains associated with crania
- Indistinguishable from *H. erectus*



KNM-ER 3228

KNM-ER 1481

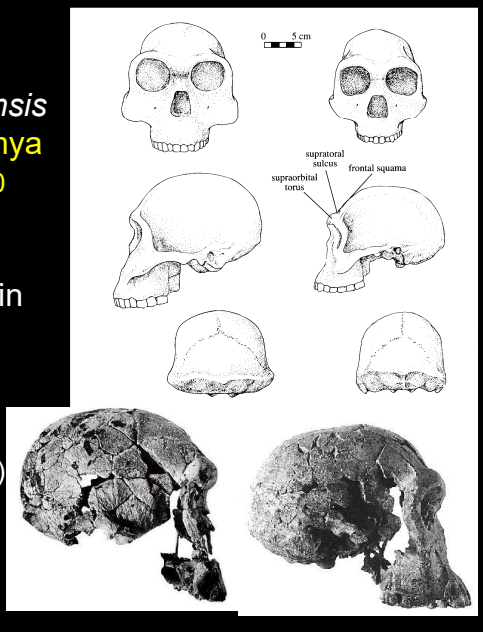
50

One species or two?

H. rudolfensis
2.4 - 1.8 mya
ER 1470

Larger brain

Less prognathic
(problematic reconstruction)



H. habilis
2.4 - 1.8 mya
ER-1813
OH-7
OH-62

Smaller brain

More human-like in cranial proportions

Smaller face & teeth

51

Both *H. habilis* & *H. rudolfensis* vs *Australopithecus*

- Relatively smaller teeth
- Less prognathic face
- More parabolic dental arcade
- Larger brain (500-750cc)

52

Differences between early *Homo* species

- Compared to *H. habilis, H. rudolfensis* has:
  - a larger brain (over 700cc)
  - Higher, more vertical frontal bone (forehead)
  - relatively long face subnasally, but less prognathic (?)
  - more robust jaws & larger posterior teeth (australopith-like)
  - postcranially more human-like (IF not *H. erectus*)

53

2 - 1.5 mya

- Unparalleled diversity in hominin evolution
- genus *Paranthropus*
- *Australopithecus sediba*
- *Homo habilis*
- *Homo rudolfensis*
- *Homo erectus / ergaster*

} Contemporaneous

- Morphological & adaptive diversity

54