The ape-human divide?

- DNA sequences apes and humans 98.2% similar

- the ape-human divide?
- Miocene 23.5 - 5.2 ma
  - early 23.5 –7 ma
  - late 7 – 5.2 ma
- Pliocene 5.2 - 1.6 ma
- Pleistocene 1.6-0.01 ma
- early Miocene
  - arboreal habitats
  - apes = arboreal adaptations
- late Miocene
  - grassland savannas
  - terrestrial bipeds =
- Hominoidea Hominidae
- bipedal locomotion
  - benefits of bipedalism
  - skeletal features of bipedalism
- Basal hominids 6-4 mya
- Primitive Australo-pithecines
  - 4-3 mya
- Derived Australo-pithecines
  - 3-1 mya
  - Derived =
  - Early Homo 2.5 – 1.6 mya

What does it take to be defined as human?

Confirmed in recent publicly sponsored experiments
humans and apes share a recent, common origin
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  - mya

early to middle Miocene 23.5 –8 mya
tropical arboreal habitats

Miocene Apes 23.5 – 8 mya – Arboreal Adaptations

- Quadrupedal locomotion
- Head in front of spinal column
- Flat pelvis
- Prehensile hands & feet
- equal limb proportions

*Proconsul sp.*

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changing environments

late Miocene and Pliocene 8 – 1.6 mya
expanding savanna habitats

Pleistocene 1.6 – 0.01 mya
savanna habitats
consequences for apes?

most ape species extinct by end of Miocene

but not all Miocene apes extinct

bipedalism = habitual upright walking

Definitions

- superfamily Hominoidea = Apes and humans
  - hominoids = both the quadrupedal and bipedal apes

- family Hominidae = humans and human ancestors
  - hominids = any of the bipedal (upright walking) human ancestors

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  - mya
- benefits of bipedal locomotion
  - energy efficient – good for long distances
  - frees hands for carrying resources
  - frees hands for tool use
  - minimizes exposure to sun
  - visibility over tall grasses

- head balanced on spinal column
  - foramen magnum beneath skull
- reduction in muscle attachments at neck
  - nuchal crest smaller
- arms not used in locomotion
  - arms more “gracile” and shorter
- femur angled under body
  - keeps weight at central axis
- big toe not opposable
  - loss of prehensile feet

When did bipedalism arise?

Where are the fossils?

- Basal hominids 6-4 mya
- Primitive Australopithecines 4-3 mya
- Derived Australopithecines 3-1 mya
- Early Homo 2.5 – 1.6 mya

Species names follow binomial form & MUST be in **ITALICS** or **UNDERLINED**

Homo sapiens or Homo sapiens
- Basal hominids 6-4 mya

- *Sahelanthropus; Orrorin; Australopithecus anamensis*

- *Ardipithecus ramidus* 6-4.4 mya
  - ardi = ground; pithecus = ape
  - ramidus = root
  - small ape-like cranium
  - “gracile” limbs
  - “bowl-shaped” pelvis
  - basal foramen magnum

- Primitive Australopithecines 4-3 mya
  - primitive = older, ancestral

- *Australopithecus afarensis* 3.9 – 2.8 mya
  - fully bipedal
  - small brain size 400-500 ml
  - “Lucy” 3.18 mya
    - 40% complete skeleton
    - pelvis and lower limb bones suggest fully bipedal
    - long arms and curved fingers suggest arboreal ability

- Laetoli footprints 3.75 mya
  - unequivocal proof of bipedal locomotion
  - not fully modern, but close!
  - *Australopithecus afarensis?*

- Derived Australopithecines 3-1 mya
  - Derived = specialized
  - “gracile” = lightly built
  - *A. africanus* 3.5 – 2.3 mya
  - southern Africa ONLY
  - fully bipedal
  - lightly built for moving long distances
  - small brain size 400-500 ml
- Derived Australopithecines 3-1 mya
  - "robust" = heavily built
    - *A. robustus* 1.8 – 1.0 mya
      - southern Africa ONLY
    - *A. boisei* 2.2 – 1.3 mya
    - *A. aethiopicus* 2.7 – 2.3 mya
    - fully bipedal
    - small brain 400-500 ml
    - massive jaws, teeth!
    - adaptation for chewing hard plant fibers and seeds

- Early *Homo*
  - *Homo habilis* 1.9 – 1.6 mya
  - same Genus as us!
  - same time as Derived Australopithecines
  - Specialized anatomy
    - larger brain 600-700 ml
    - taller, vaulted cranium
    - smaller molars and narrower premolars

**Take-home messages**
- Bipedalism the key to survival on savanna
- Bipedalism preceded the development of large brains, use of stone tools, language and other "human" traits
- Once bipedalism "solved" by evolution, explosion of diversity

**Take-home question**
- What impact did bipedalism and life in an open savanna have on early hominid behavior?