• 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
• 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 Australopithecines
  – 4-3 mya
• Derived Australopithecines 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

DNA sequences apes and humans 98.2% similar

• The ape-human divide?
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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.

The ape-human divide?
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  – mya
changing environments

Open savanna grassland

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?
When are the fossils?

• Basal hominids 6-4 mya
• Primative 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

• 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

• Laetoli footprints 3.75 mya
  – unequivocal proof of bipedal locomotion
  – not fully modern, but close!
  – *Australopithecus afarensis*?
• Derived Australopithecines 3-1mya
  – “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?