Human Evolution

I. Phylogeny of Hominoids

II. Hominid Transitions
Phylogenetics of Primates

- Darwin (1871) proposed the following:
  1) *Homo sapiens* is sister species of the chimpanzee.
  2) Hominids evolved in Africa.

- Cladistic analysis of morphological and molecular data places gorillas, chimps, and humans in a monophyletic group.

- Darwin was probably correct on both counts.
A Simplified Phylogeny of Primates
Bonobo Chimpanzee
(Pigmy Chimpanzee)
Hominid Transitions

- Larger brain
- Bipedal locomotion
- Flatter face & smaller canines
Bonobo
(400 ml)

Human
(1450 ml)
Bipedal Locomotion

Chimp

Human

Chimp

Human
Bipedal Locomotion

Chimp  Human  Chimp  Human
Facial & Dental Structure

Human

Chimp
Did hominids come head first or foot first?

- Traditionally, scientists embraced the view that an increase in brain size preceded other hominid innovations.
- Alternatively, bipedal locomotion might have evolved prior to large brains.
The Piltdown Fraud

- In 1912, a skull was found in a gravel field at Piltdown in Sussex, England.
- The jaw was ape-like and the cranium was human-like.
- In the 1950’s the specimen was shown to be a fake; someone combined an orangutan jaw with a human cranium.
‘Lucy’
(Australopithecus afarensis)

- In 1974, Don Johanson found a skeleton in Ethiopia that resolved the controversy over which came first (big brains or bipedality).

- To date, fragments of 300 individuals have been found.

- *A. afarensis* lived from 4 to 3 mya, and may be a direct ancestor to *Homo sapiens*.

Johanson’s Lucy
A Comparison of Hominid Hips

Chimpanzee  Australopithecus africanus  Homo sapiens
Lucy was fully bipedal.
In 1978, Mary Leakey discovered footprints in Tanzania that were 3.6 mya.

The prints are presumably those of *A. afarensis*, and indicate a gait similar to our own.

Very likely, hominids walked the walk well before they talked the talk.
A Parting of Ways between Hominids

- About 2.3 mya the hominid lineage split into two major divisions; one lineage became more robust whereas the other became more gracile.

- Six species are known from these two lineages (all found only in Africa):

<table>
<thead>
<tr>
<th>Paranthropus</th>
<th>Australopithecus</th>
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<tbody>
<tr>
<td><em>P. robustus</em></td>
<td><em>A. anamensis</em></td>
</tr>
<tr>
<td><em>P. boisei</em></td>
<td><em>A. afarensis</em></td>
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<tr>
<td><em>P. aethiopicus</em></td>
<td><em>A. africanus</em></td>
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A Comparison of Hominid Skulls

“Paranthropus tried to chew his way out of trouble, and Homo thought his way out of trouble.”

Elisabeth Vrba, Yale University

Paranthropus boisei  Homo sapiens  A. africanus
Are we retarded apes?

- The human skull is remarkably similar in form to the skull of a juvenile chimpanzee.
- One hypothesis is that our cranial features evolved by a shift in the timing of development, causing humans to retain juvenile features.
Evolution of Brain Size

- Survival
- Mating success
- Social dynamics

A Bonobo chimp yields a weapon.
Why did *Homo sapiens* persist?

- *H. sapiens* outsmarted its competitor
  - building better tools and weapons
  - managing resources
- *H. sapiens* hybridized with its competitor

*Homo neanderthaliensis*