Summary

Dating Techniques
- Relative
- Absolute
- Taphonomy
- Paleoanthropology
- Plate Tectonics
- Etc.

Primate Evolution
- 65 mya (North America/Europe/N. Africa)
- Grasping extremities
- Arboreal
- Vision (color, depth)
- Insect eating/ omnivorous diet
Adaptive Radiations

Miocene Radiations
*Dryopithecus, Sivapithecus*

Comparison of a Sivapithecus cranium (center) with modern chimpanzee (left) and orangutan (right). The Sivapithecus fossil is specimen GSP 15000 from the Potwar Plateau, Pakistan, c. 8 m.y.a. (a) Lateral view.
Bipedalism

Bonobos: *Pan paniscus*

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### Early Hominids and Their Immediate Ancestors

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>TIME RANGE (millions of years ago)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sahelanthropus tchadensis</td>
<td>7 - 6</td>
</tr>
<tr>
<td>Orrorin tugenensis</td>
<td>6.0</td>
</tr>
<tr>
<td>Ardipithecus ramidus</td>
<td>5.8 - 4.4</td>
</tr>
<tr>
<td>Australopithecus anamensis</td>
<td>4.2 - 3.9</td>
</tr>
<tr>
<td>Australopithecus afarensis</td>
<td>4.0 - 2.9</td>
</tr>
<tr>
<td>Kenyanthropus platyops</td>
<td>3.5 - 3.2</td>
</tr>
<tr>
<td>Australopithecus bahrelghazalia</td>
<td>3.4 - 3.0</td>
</tr>
<tr>
<td>Australopithecus africanus</td>
<td>3.3 - 2.3</td>
</tr>
<tr>
<td>Australopithecus garhi</td>
<td>2.5</td>
</tr>
<tr>
<td>Australopithecus aethiopicus</td>
<td>2.5</td>
</tr>
<tr>
<td>Australopithecus robustus</td>
<td>2.0 ? - 1.5</td>
</tr>
<tr>
<td>Australopithecus boisei</td>
<td>2.0 - 1.2</td>
</tr>
</tbody>
</table>

The species listed above in red are controversial because of relatively limited discoveries and differing interpretations. Some researchers refer to the robust australopithecines as *paranthropoids* (genus *Paranthropus*).

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### Ardipithecus ramidus

Aramis, Ethiopia

4.4 mya
**Australopithecus anamensis**

Kanapoi & Allia Bay, Kenya ca 4 mya

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**Australopithecus afarensis**

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**Australopithecus africanus**
Australopithecus/Paranthropus boisei/robustus/aethiopicus

A. africanus vs. robustus/boisei

Bipedalism & Climate Change
**Homo habilis**

*Homo rudolfensis* (e.g., ER 1470)
2.4 - 1.9 mya
*Homo habilis* (1.9-1.6 mya)

**Earliest Tools 2.5 mya**

Ethiopia & Kenya

**Homo ergaster/Homo erectus**

- *Homo ergaster*
  - 1.8-1.5 mya (East Africa)
- *Homo erectus*
  - 1.2-0.2 mya
    (Africa, Asia & Europe)
Human Culture

Acheulean Tradition

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Early Archaic *Homo sapiens*

transitional *Homo erectus*

*Homo heidelbergensis/Homo antecessor*

archaic *Homo sapiens*

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Levallois Technique
Neandertals
150,000 - 28,000 (Europe, w. Asia, n. Africa)
*Homo sapiens neanderthalensis*/*Homo neanderthalensis*

Neanderthals: Cro-Magnon

Modern *Homo sapiens*
Upper Paleolithic

Two Extreme Models
a) Multiregional Continuity
b) Replacement

Other Models
Hominid Tree