EARLY HOMININS

• What Makes Us Human?
• Chronology of Hominin Evolution
• Who Were the Earliest Hominins?
• The Varied Australopithecines
• The Australopithecines and Early Homo
• Oldowan Tools

1. WHAT MAKES US HUMAN?

• Determining if a fossil is a human ancestor:
  • Similarities in DNA
  • Bipedal locomotion, extended childhood dependency, big brains, use of tools and language
  • teeth
BIPEDALISM

- *Ardipithecus* (5.8–4.4 m.y.a.): earliest recognized hominin genus; shows capacity for upright bipedal locomotion
  - Reliance on bipedalism differentiates the early hominins from apes
    - Adapted to woodland habitat
    - More adaptive in subsequent savanna habitat
    - Ability to see over long grass, carry items back to a home base, and reduce body’s exposure to solar radiation

BRAINS, SKULLS, AND CHILDHOOD DEPENDENCY

- Brain size increased during hominin evolution, especially with genus *Homo*
  - Human children have long period of childhood dependency, during which brains and skulls grow dramatically
  - Natural selection struck balance between structural demands of upright posture and tendency toward increased brain size

TOOLS

- Hominin stone tool manufacture dated to 2.6 m.y.a.
  - Upright bipedalism permitted use of tools and weapons in open grassland habitat
  - Contemporary ape tool use
TEETH
• Big back teeth: an early hominin trait
  • Permitted thorough chewing of tough, fibrous vegetation
  • Churning, rotary motion associated with such chewing favored reduction of canines and bicuspids

CHRONOLOGY OF HOMININ EVOLUTION
• *Hominin* designates human line after its split from ancestral chimps

• *Hominid:* includes humans and the African apes and their immediate ancestors
• If we compare Earth’s history to a 24-hour day (one second = 50,000 years):
  • Earliest fossils were deposited at 5:45 a.m.
  • First vertebrates appeared at 9:02 p.m.
  • Earliest mammals showed up at 10:45 p.m.
  • Earliest primates came at 11:43 p.m.
  • Earliest hominins arrived at 11:57 p.m.
  • *Homo sapiens* arrived at 36 seconds before midnight (Wolpoff, 1999)

• The most important epochs for study of hominin evolution are the
  • Pliocene (5–2 m.y.a.)
  • Pleistocene (2 m.y.a.–10,000 B.P.)
  • Recent (10,000 B.P.–present)
  • *Australopithecus* main hominin genus until end of Pliocene
  • Some form of *Australopithecus* evolved into Homo by start of Pleistocene

WHO WERE THE EARLIEST HOMININS?
• Significant recent discoveries in Africa
  • Kenya
  • Tanzania
  • Ethiopia
  • South Africa
  • Chad
SAHELANTHROPUS TCHADENSIS
• 6- to 7-million-year-old skull
oldest possible human ancestor yet found
  • Also known as Toumai
  • Heavy brow ridges
  • Adult male with chimp-sized brain
  • Relatively flat, humanlike face
  • Moves scientists closer to time when humans and African apes diverged

ORRORIN TUGENENSIS
• 6-million-year-old fossils from at least five individuals suggest upright bipedalism and tree-climbing skills
  • Chimp-sized creature
  • Teeth more like a female chimpanzee
  • Lived after Toumai but before Ardipithecus kadabba
  • Hominin status of Ardipithecus more generally accepted

ARDIPITHECUS
• Dates to at least 4.4 m.y.a.
  • Subsequently, fossils from 5.8 m.y.a. found in Ethiopia (Ardipithecus kadabba)
  • Apelike in size, anatomy, and habitat
  • Because of its probably upright bipedalism, Ardipithecus kadabba has been recognized as the earliest hominin
  • Ardipithecus ramidus (4.4 m.y.a.) is earliest known hominin skeleton
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KENYANTHROPUS
- Maeve Leakey’s Kenyanthropus platyops complicates picture
  - At least two hominin lineages existed as far back as 3.5 m.y.a.
  - *Kenyanthropus* has flattened face and small molars

THE VARIED AUSTRALOPITHECINES
- *Australopithecus* had at least 7 species
  - *A. anamensis* (4.2–3.9 m.y.a.)
  - *A. afarensis* (3.8–3.0 m.y.a.)
  - *A. africanus* (3.0?–2.0? m.y.a.)
  - *A. garhi* (2.5 m.y.a.)
  - *A. robustus* (2.0?–1.0? m.y.a.)
  - *A. boisei* (2.6?–1.2 m.y.a.)
  - *A. sediba* (1.98–1.78 m.y.a.)
**Australopithecus anamensis**

- Fossils, reported first by Leakey and Walker, date to 4.2–3.9 m.y.a.
  - Molars have thick enamel
  - Large apelike canines
  - Weighed about 110 pounds (50 kg)
  - Bipedal
  - May be ancestral to *A. afarensis*

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**Australopithecus afarensis**

- lived 3.8–3.0 m.y.a.
- Indicates recent common ancestry with African apes
  - Larger and sharper canines projected beyond other teeth
  - Very small brain case
  - Upright striding bipedalism
  - Sexual dimorphism especially marked
  - Shows that as recently as 3 m.y.a., ancestors had mixture of apelike and hominin features

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Laetoli, Tanzania 3.5 MYA
Don Johanson

- 40% complete
- 3' 8"
- 3.2-3.8 MYA

*Australopithecus afarensis*

over 300 specimens found

“LUCY”

1974: Hadar, Ethiopia

- Mixture of ape-like and human-like teeth.
- Arms proportionately longer, legs shorter than humans.
- Looked apelike but walked bipedally.

Chimpanzee family
GRACILE AND ROBUST AUSTRALOPITHECINES

- Two groups of South African australopithecines (3–1 m.y.a.)
  - **Gracile** (*A. africanus*): smaller and lighter;
  - **Robust** (*A. robustus*): larger than gracile
- Both probably descend from *A. afarensis*
- Some contend that graciles and robusts separate species that overlapped; others believe graciles ancestral to robust
Hyper Robust East African Australopithecines

- large back teeth, large chewing muscles, small canines and incisors
- Sagittal crest
- "paranthropus"- Lumpers and splitters?
- Brain size increased slightly from A. afarensis (430 cm³) to A. africanus (490 cm³) to A. robustus (540 cm³)

The 1985 discovery of “black skull” (2.6 m.y.a.) apparently an early A. robustus

- Walker and Leakey view skull as an early hyperrobust A. boisei
- Shows that some anatomical features did not change much during more than 1 million years

THE AUSTRALOPITHECINES AND EARLY HOMO

- Homo ancestors reproductively isolated from later australopithecines by 2 m.y.a.
- Hunted and gathered, made sophisticated tools, and eventually displaced its sole surviving cousin species, A. boisei
- Johanson and White propose that A. afarensis split into two populations
- Eventually gave rise to Homo habilis
OLDOWAN TOOLS
• Oldest tools from Olduvai Gorge are about 1.8 m.y.a.
  • Stone tools consist of cores and flakes
    • Chopper: tool made by flaking the edge of such a core on one side
    • Most tools at Olduvai Gorge were made from basalt

A. GARHI AND EARLY STONE TOOLS
• 1999, Ethiopia, associated with stone tools, remains of butchered animals
  • Thigh bone elongated 1 million years before forearm shortened
  • Australopithecines were tool-makers with some capacity for culture