

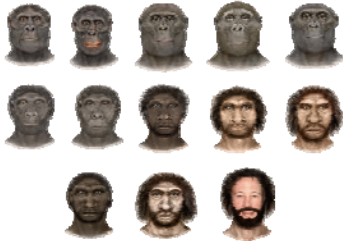


EARLY HOMININS

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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



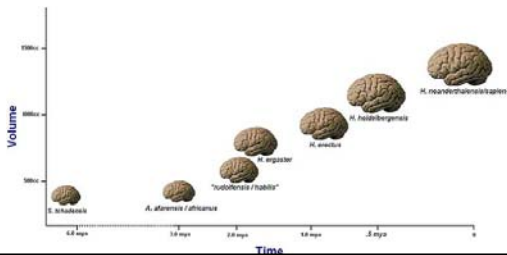
BIPEDALISM

- **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



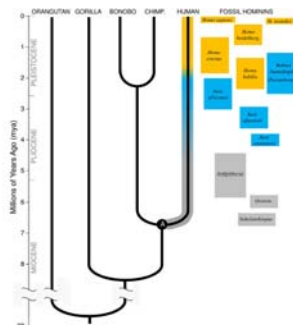
TEETH

- 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 bicuspsids



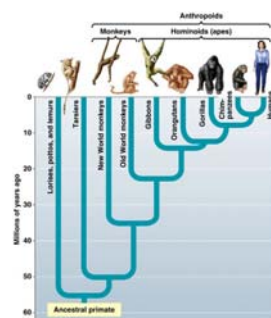
CHRONOLOGY OF HOMININ EVOLUTION

- *Hominin* designates human line after its split from ancestral chimps
- *Hominid*: includes humans and the African apes and their immediate ancestors



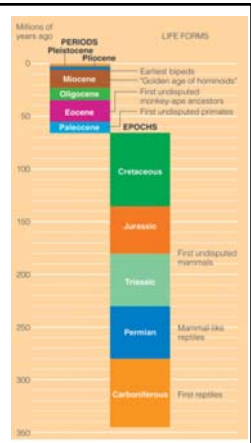
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- If we compare Earth's history to a 24-hour day (one second = 50,000 years):
 - Earliest fossils were deposited at 5:45 a.m.
 - First vertebrates appeared at 9:02 p.m.
 - Earliest mammals showed up at 10:45 p.m.
 - Earliest primates came at 11:43 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

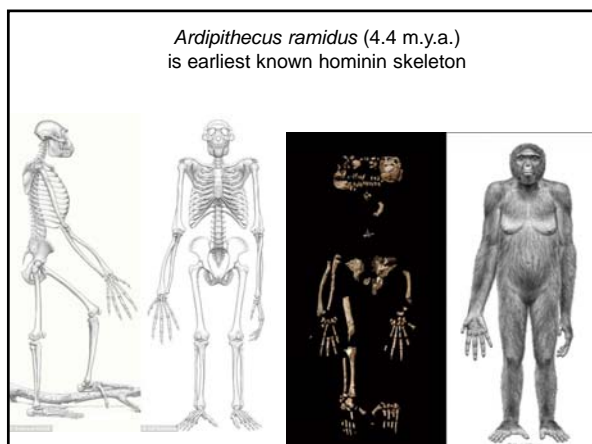
- 6-million-year-old fossils from at least five individuals suggest upright bipedalism and tree-climbing skills
 - Chimp-sized creature
 - Teeth more like a female chimpanzee
 - Lived after Toumai but before *Ardipithecus kadabba*
 - Hominin status of *Ardipithecus* more generally accepted



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





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*



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




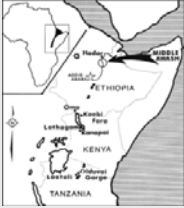
Laetoli, Tanzania 3.5 MYA



1974: Hadar, Ethiopia



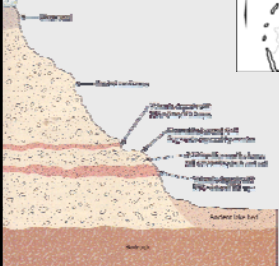
Don Johanson

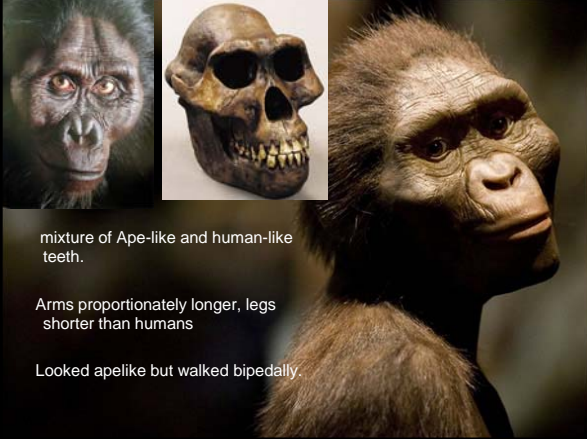


- 40% complete
- 3' 8"
- 3.2-3.8 MYA

Australopithecus afarensis
over 300 specimens found

"LUCY"



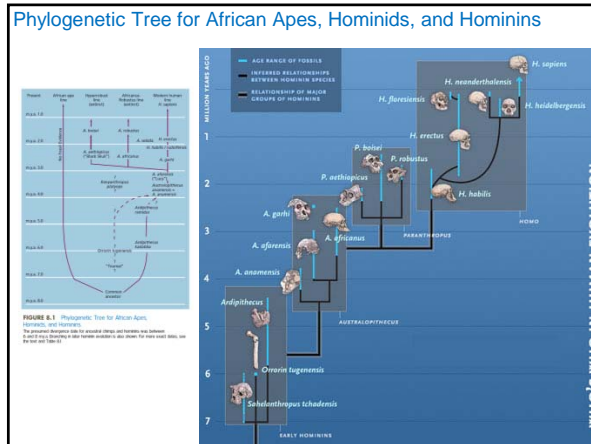


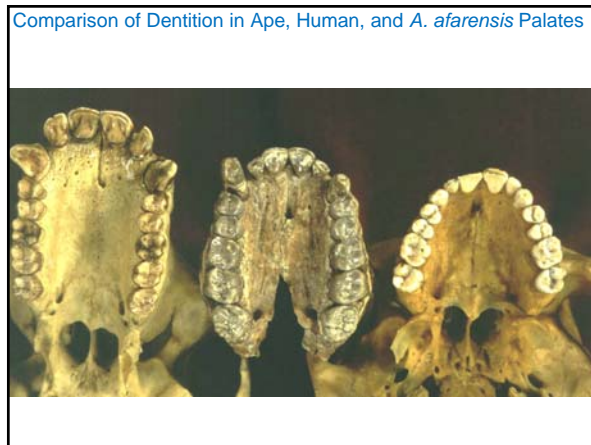
mixture of Ape-like and human-like teeth.

Arms proportionately longer, legs shorter than humans

Looked apelike but walked bipedally.







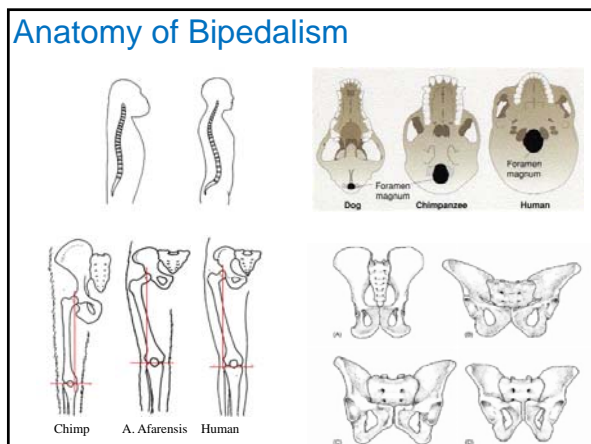


Figure 8.4: A Comparison of Human and Chimpanzee Pelvises

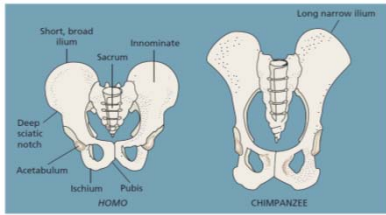


FIGURE 8.4 A Comparison of Human and Chimpanzee Pelvises. The human pelvis has been modified to meet the demands of upright bipedalism. The blades (ili; singular, ilium) of the human pelvis are shorter and broader than those of the ape. The sacrum, which anchors the side bones, is wider. The australopithecine pelvis is far more similar to that of Homo than to that of the chimpanzee, as we would expect in an upright biped.

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Figure 8.5: A Comparison of the Skull and Dentition (Upper Jaw) of *Homo* and the Chimpanzee

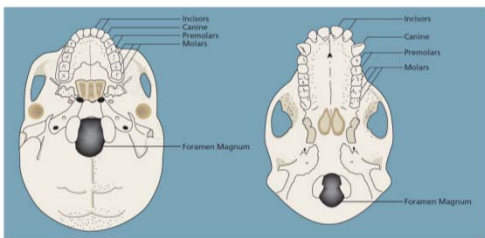


FIGURE 8.5 A Comparison of the Skull and Dentition (Upper Jaw) of *Homo* and the Chimpanzee. The foramen magnum, through which the spinal cord joins the brain, is located farther forward in *Homo* than in the ape. This permits the head to balance atop the spine with upright bipedalism. The molars and premolars of the ape form parallel rows. Human teeth, by contrast, are arranged in rounded, parabolic form. What differences do you note between human and ape canines? Canine reduction has been an important trend in hominin evolution.

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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