“The human family tree: meet your ancestors”

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George Mason University
Osher Lifelong Learning Institute
Course: The History of Life, Part 2
Milestones in the Evolution of Humans

6 million years ago

4 million years ago

2.6 million years ago

1.8 million years ago

800,000 years ago

32,000 years ago

90,000 years ago

10,000 years ago

200,000 years ago
The last common ancestor of humans and living apes lived between 8 and 6 million years ago. We do not yet have its remains.

The last common ancestor of monkeys and apes lived about 25 million years ago.
Today

1
Million years ago

2
Million years ago

3
Million years ago

4
Million years ago

5
Million years ago

6
Million years ago

Past

Ardipithecus group

The earliest humans are our closest link to other primates. They evolved in Africa and took the first steps towards walking upright.

Ardipithecus ramidus

Sahelanthropus tchadensis

Ardipithecus kadabba

Orrorin tugenensis
**Sahelanthropus tchadensis**

Name Means: Sahel ape-man from Chad  
Nickname: “Toumai”

When Found: 2001  
Who Found: M. Brunet

Lived When: sometime between 7-6 Ma  
Lived Where: Chad, western Africa

How Big? ~ chimpanzee (but no body fossils!)  
Fossil Record: 1 skull, some jaw & tooth fragments  
Basic Morphology: apelike: small brain, sloping face, very prominent brow ridges, and elongated skull; humanlike: small canine teeth, a short middle part of the face, and a **spinal cord opening beneath the skull** instead of towards the back
**Orrorin tugenensis**

**Name Means:** original man in the Tugen region  
**Nickname:** “Millenium Man”

**When Found:** 2001  
**Who Found:** B. Senut & M. Pickford

**Lived When:** sometime between 6.2-5.8 Ma  
**Lived Where:** Tugen Hills, central Kenya

**How Big?** ~ chimpanzee  
**Fossil Record:** 13 fossils, 5+ individuals  
**Basic Morphology:** apelike long, curved finger bones and canine and premolar teeth, but  
**femur shows bipedal walking**

**Known For:** Contender for earliest human

**Burning Questions:**  
• Is it our direct ancestor?  
• How often did it walk bipedally?  
• How does it relate to *Sahelanthropus*?
Ardipithecus kadabba

Name Means: *Ardi* = "ground/floor"; *pithicus* is from the Greek word for "ape"; *kadabba* is from the Afar for “basal family ancestor”

Nickname: none

When Found: 1997 (2004 named to a separate species)
Who Found: Y. Haile-Selassie

Lived When: sometime between 5.8-5.2 Ma
Lived Where: Middle Awash Valley, Ethiopia

How Big? ~ chimpanzee

Fossil Record: 11 fossils, 5+ individuals; a few sets of teeth, some foot bones, partial arm bones, and a collarbone (clavicle)

Basic Morphology: one bone from the large toe is broad and robust, suggesting its use in bipedal push-off (5.2 Ma)

Known For: Contender for earliest human

Burning Questions:
• Was *Ar. kadabba* routinely bipedal? What was its gait like?
• Did bipedalism independently develop in the *Ardipithecus* lineage? Or is *Ar. kadabba* somehow related to *Orrorin* and/or *Sahelanthropus*?
• How is the *Ardipithecus* lineage related the *Australopithecus* lineage?
Ardipithecus ramidus

Name Means: *ramid* = “root“
Nickname: “Ardi”

Who Found: T. White & team

Lived When: about 4.4 Ma
Lived Where: Middle Awash Valley and Gona, Ethiopia

How Big? (female) 3 ft 11 inches, 110 lbs
Fossil Record: >100 fossils; partial female skeleton “Ardi”

Basic Morphology: divergent large toe combined with a rigid foot; (crushed) pelvis shows adaptations that combine tree-climbing and bipedal activity (short & broad)

Known For: oldest partial skeleton; little male-female size difference (canine teeth); lived in a wooded environment

Burning Questions:
• Is it really an early human?
• What does the low level of sexual dimorphism mean?
• Is this species descended from *Ar. kadabba*? How is it related to us?
Species in this group of early humans walked upright on a regular basis, but they still climbed trees, too.
**Australopithecus anamensis**

**Name Means:** Latin *australis* = "southern"; Turkana *anam* = "lake"

**Nickname:** none

**When Found:** 1965/1994

**Who Found:** B. Patterson/M. Leakey

**Lived When:** about 4.2-3.9 Ma

**Lived Where:** Lake Turkana, Kenya (Allia Bay, Kanapoi) & Middle Awash Valley, Ethiopia

**How Big?** ~ chimpanzee; strong sexual dimorphism

**Fossil Record:** ~100 fossils; ~20 individuals

**Basic Morphology:** human-like: expanded upper tibia *(shin bone)* and orientation of the ankle joint; ape-like: long forearms and wrist features

**Known For:** human-like knee

**Burning Questions:**
- Is *Au. anamensis* a separate species from *Au. afarensis*, or part of a single lineage?
- Is *Au. anamensis* a direct descendant of *Ar. ramidus*?
**Australopithecus afarensis**

**Name Means:** Southern ape of the Afar

**Nickname:** "Lucy"

**When Found:** 1930s/1974

**Who Found:** Don Johanson's team

**Lived When:** about 3.85 – 2.95 Ma

**Lived Where:** Ethiopia, Kenya, Tanzania

**How Big?** ~ chimpanzee; strong sexual dimorphism

**Fossil Record:** >300 individuals, including many juveniles!

**Basic Morphology:** mosaic - ape-like: face proportions (a flat nose), strong jaws, small braincase, and long, strong arms with curved fingers; more human-like small canine teeth, pelvis, leg bones.

**Known For:** One of the longest-lived, best-known early human species; "Lucy" AL 288-1; "First Family" (Hadar); Laetoli footprints; Dikika child

**Burning Questions:**
- Is a fossil found in Chad at 3.5 Ma part of this species?
- What did their bipedal locomotion look like?
- How did they persist through environmental fluctuations?
- How do properties of *A. afarensis* teeth relate to their diet?
**Australopithecus africanus**

**Name Means:** southern ape-man of Africa  
**Nickname:** none

**When Found:** 1924  
**Who Found:** R. Dart

**Lived When:** about 3.3-2.1 Ma  
**Lived Where:** South Africa (Taung, Sterkfontein, Makapansgat, Gladysvale)

**How Big?** (avg) males: avg 4 ft 6 in, 90lbs; females: 3 ft 9 in, 66 lbs  
**Fossil Record:** hundreds of fossils: skulls, partial skeletons

**Basic Morphology:** mosaic - ape-like: shoulder and hands, relatively long arms and a strongly sloping face that juts out from underneath the braincase with a pronounced jaw; human-like larger brain, smaller teeth, pelvis, femur (upper leg), and foot bones

**Known For:** 1st early human fossil found in Africa; 1st modern back curvature; osteodontokeratic culture

**Burning Questions:**  
• Where did this species come from?  
• Is it one of our ancestors? Or an ancestor of *Paranthropus*?  
• What will “Little Foot” tell us about this species?
**Australopithecus garhi**

**Name Means**: southern ape-man of Africa  
**Nickname**: none

**When Found**: 1990  
**Who Found**: T. White, B. Asfaw & team

**Lived When**: about 2.5 Ma  
**Lived Where**: Middle Awash, Ethiopia (Bouri)

**How Big? ~other Australopithecus**  
**Fossil Record**: 1 skull + 4 other skull fragments, possibly a nearby partial skeleton

**Basic Morphology**: skull has a **mix** of *Homo*-like cranial features, an *Australopithecus*-like brain size, and large *Paranthropus*-sized teeth; partial skeleton has a longer femur (compared to other *Australopithecus* specimens, like ‘Lucy’) with long, powerful arms

**Known For**: ????

**Burning Questions**:  
• Will scientists find more individuals of this species?  
• Do the large molars of this species align it with *Paranthropus*? Or is it a late *Australopithecus*?  
• Did it make the nearby stone tools and cutmarked animal bones?
**Australopithecus sediba**

**Name Means:** *sediba* = “natural spring/well” (SeSotho)

**Nickname:** none

**When Found:** 2008

**Who Found:** L. Berger (Matthew)

**Lived When:** between 1.95 and 1.78 Ma

**Lived Where:** South Africa (Malapa)

**How Big?** 4 ft 3 in tall; low sexual dimorphism

**Fossil Record:** MH1 (13-14 year old male), MH2 (adult female)

**Basic Morphology:** human-like: pelvis, femur and humerus strength, small premolars and molars, face, lower chest; ape-like: long arms, small brain size, upper chest

**Known For:** contender for ancestor of *Homo*

**remarkable completeness; unique form of bipedalism**

**Burning Questions:**
- What is the time and geographic range this species?
- Is this species descended from *Au. africanus*?
- Is this species as closely related to *Homo* as some think?
Paranthropus group

Large teeth and powerful jaws enabled this group of early humans to feed on a variety of foods.

Paranthropus robustus

Paranthropus aethiopicus

Paranthropus boisei
**Paranthropus aethiopicus**

**Name Means:** “Para” = beside (Greek); “anthropus” = man; “aethiopicus” = from southern Africa

**Nickname:** “The Black Skull”

**When Found:** 1967 / 1985

**Who Found:** French team (Omo 18) / Alan Walker & Richard Leakey (KNM-WT 17000)

**Lived When:** about 2.7 – 2.3 Ma

**Lived Where:** eastern Africa (northern Kenya, southern Ethiopia)

**How Big?** Unknown; may be large

**Fossil Record:** one fairly complete skull, a few other bits

**Basic Morphology:** strongly protruding face, huge teeth, powerful jaw, and a well-developed **sagittal crest** on top of skull

**Known For:** big sagittal crest, teeth, and jaws

**Burning Questions:**

• What kind of environments did it prefer to live in?

• Is it actually more closely related to *Au. afarensis*, or the other “robust” australopithecines like *P. boisei*, which may be its direct descendant?

• How big were this species (body size)?

• Did it exhibit body size sexual dimorphism, like most other australopithecines?
**Paranthropus boisei**

Name Means: *Zinj* for the medieval East African region of Zanj; *boisei* for Charles Boise, the team’s funder

Nickname: “Zinjanthropus”, “Nutcracker Man”

**When Found:** 1955 / 1959
**Who Found:** Mary Leakey

**Lived When:** about 2.3 – 1.2 Ma
**Lived Where:** eastern Africa (Ethiopia, Kenya, Tanzania, Malawi)

**How Big?** (avg) males: 5 ft 4 in, 108 lbs; females: 4 ft 1 in, 75 lbs

**Fossil Record:** some nearly complete skulls, some postcrania

**Basic Morphology:** big sagittal crest; **huge cheek teeth** with very thick enamel; flaring cheekbones

**Known For:** big teeth, sagittal crests, strong chewing muscles, co-existed with *H. habilis*, *H. erectus* and *H. rudolfensis* in east Africa

**Burning Questions:**
- What did *P. boisei* eat? (tooth morphology and microwear conflict)
- Did *P. boisei* use stone tools? (found in stratigraphic layers w/ lithics)
- What was the advantage of the big jaws and teeth of *P. boisei*?
- Did their highly specialized diet lead to their extinction?
Paranthropus robustus

**Name Means:** robustus = robust
**Nickname:** none

**When Found:** 1938
**Who Found:** Robert Broom

**Lived When:** about 1.8 – 1.2 Ma
**Lived Where:** southern Africa (South Africa) - Swartkrans, Kromdraai, Drimolen, Gondolin, Coopers

**How Big?** (avg) males: 3 ft 9 in, 119 lbs; females: 3 ft 3 in, 88 lbs
**Fossil Record:** >130 individuals just at Swartkrans

**Basic Morphology:** **big teeth with thick enamel**, flaring cheekbones, sagittal crest

**Known For:** Using bone tools to dig in termite mounds

**Burning Questions:**
- Which species did *P. robustus* evolve from? Was it *P. aethiopicus*, or were there regionally distinct robust australopithecine lineages - meaning it evolved from *Au. africanus*?
- Bone tools presumably used by *P. robustus* to dig into termite mounds have been found at several South African sites. Was this behavior something shared by all populations, or was it regional?
*Homo* group

Like modern humans, other species in this group had large brains and used tools. Members of this group were the first to expand beyond Africa.
**Homo habilis**

**Name Means**: handy man  
**Nickname**: none  

**When Found**: 1960  
**Who Found**: Louis & Mary Leakey  

**Lived When**: about 2.4-1.4 Ma  
**Lived Where**: eastern and southern Africa  

**How Big**: 3 ft 4 in – 4 ft 5 in; 70 lbs  
**Fossil Record**: many fairly complete skulls, partial skeleton, others  

**Basic Morphology**: slightly **larger braincase and smaller face and teeth** than *Australopithecus*; modern arch of the foot; some ape-like features (long arms and a moderately prognathic face)  

**Known For**: oldest toolmaker & meat-eater; put East Africa on the human evolution map  

**Burning Questions**:  
• How does this species fit into our evolutionary tree?  
• Are *H. habilis* and *H. rudolfensis* a single species?  
• Was *H. habilis* really the only/earliest and meat-eater?  
• Was there a connection between the origin of *Homo* and climate change?
**Homo rudolfensis**

**Name Means:** (named after specimen found in Lake Rudolf, Kenya)

**Nickname:** none

**When Found:** 1972 (named in 1986)

**Who Found:** Richard Leakey

**Lived When:** about 1.9-1.8 Ma

**Lived Where:** eastern Africa (northern Kenya, possibly northern Tanzania and Malawi)

**How Big?** Unknown (no body fossils)

**Fossil Record:** only one really good skull; also 2 jaws w/teeth and a face

**Basic Morphology:** larger braincase, longer face, and larger premolar and molar teeth than *Homo habilis*

**Known For:** one of earliest *Homo* species

**Burning Questions:**

- Was *Homo rudolfensis* part of our direct evolutionary lineage?
- Are *Homo rudolfensis* and *Homo habilis* indeed different species? Or was one ancestral to the other?
- Are *Homo rudolfensis* fossils more like australopithecines than other *Homo* fossils, as some scientists have suggested?
- How big was *Homo rudolfensis*? Was this species sexually dimorphic?
**Homo erectus**

Name Means: upright walking man
Nickname: “Turkana Boy”, ‘Peking Man”, “Java Man”

When Found: 1891
Who Found: E. Dubois “Pithecanthropus erectus” (Trinil 2)

Lived When: about 1.89 Ma – 70,000 Ya
Lived Where: Northern, Eastern, and Southern Africa; Western Asia (Dmanisi, Republic of Georgia); East Asia (China and Indonesia)

How Big? 4 ft 9 in – 6 ft 1 in; 88-150 lbs
Fossil Record: many fairly complete skulls, partial skeletons

Basic Morphology: **human-like body size and shape** with longer legs and shorter arms

Known For: longest lived species on our family tree; first out of Africa; modern body size and shape; Acheulean handaxes; increased meat-eating; first evidence of caring for old, weak individuals

Burning Questions:
• Does this species encompass African fossils often called Homo ergaster?
• How well did they master the control of fire? How widespread was it?
• Did they grow up in a more human-like pattern and rate, or more ape-like one? Was it the first species to experience an adolescent growth spurt?
**Homo heidelbergensis**

**Name Means:** (named after the University of Heidelberg, Germany)
**Nickname:** none

**When Found:** 1908
**Who Found:** workman Daniel Hartmann -> Professor Otto Schoetensack

**Lived When:** about 700,000 – 200,000 Ya
**Lived Where:** Europe; Africa (eastern and southern); possibly Asia (China)

**How Big?** (avg) males: 5 ft 9 in, 136 lbs; females: 5 ft 2 in, 112 lbs
**Fossil Record:** many fairly complete skulls, partial skeletons

**Basic Morphology:** **very large brow ridge + braincase**, flat face; short, wide bodies

**Known For:** Living in colder climates; first to control fire; first to build shelters; first to routinely hunt large animals with wooden (thrusting) spears; direct ancestor of modern humans & Neanderthals

**Burning Questions:**
- Is there more than one species represented among *H. heidelbergensis* fossils (*H. antecessor*, *H. cepranensis*, and *H. rhodesiensis*)?
- Did regional groups or populations of *H. heidelbergensis* exhibit any unique behaviors or anatomical adaptations?
- Did this species have cultural or behavioral adaptations to the cold?
“Denisovans”

**Name Means:** (named after the cave where it was discovered)  
**Nickname:** none

**When Found:** 2008  
**Who Found:** Russian archaeologists

**Lived When:** ~41,000 Ya (to 400,000 ya?)  
**Lived Where:** Siberia (to southeast Asia) - and Spain?

**How Big?** (avg) males: 5 ft 9 in, 136 lbs; females: 5 ft 2 in, 112 lbs  
**Fossil Record:** finger bone, 2 teeth, toe bone, (?)  

**Basic Morphology:** Neanderthal-like but more primitive

**Known For:** interbred with Neanderthals (17% of Denisovan DNA is Neanderthal) and modern humans (Melanesian s, some SE Asians, and Australian Aboriginals: 4-6%)

**Burning Questions:**  
• Denisovans shared a common ancestor with modern humans (804myr) and Neanderthals (640myr) 1Ma. Who was that ancestor?  
• DNA analysis indicates they were part of a separate out-of-Africa migration. When did this occur?  
• Did this species have “culture”? (A bracelet was found in the same layers as the hand and foot bones)
**Homo neanderthalensis**

**Name Means:** “tal” – a modern form of “thal” = valley
(Feldhofer Cave, Neander Valley, Germany)
**Nickname:** “Neanderthal Man”

**When Found:** 1829, 1848, named in 1864
**Who Found:** quarry workers -> local teacher Fuhlrott -> anatomist Schaaffhausen

**Lived When:** about 200,000 – 28,000 Ya
**Lived Where:** Europe; southwestern to central Asia

**How Big?** (avg) males: 5 ft 5 in, 143 lbs; females: 5 ft 1 in, 119 lbs
**Fossil Record:** many nearly complete skulls and skeletons
**Basic Morphology:** low forehead; brow ridges; large middle face; angled cheek bones; big nose; big brains; short, muscular bodies; DNA tells us some had red hair & fair skin

**Known For:** Our closest extinct cousins; made sophisticated tools (Mousterian); skilled large game hunters (including marine shellfish & mammals); made loose-fitting clothing; occasionally made symbolic/ornamental objects; burial (ritual?)

**Burning Questions:**
- Will the Neanderthal genome project identify what’s unique about them, and us?
- Why did they go extinct? Climate change? Competition with modern humans?
- What was the relative contribution of animal and plant sources to their diet?
- Were Neanderthals routinely symbolic, or did this just occur in specific populations?
**Homo floresiensis**

**Name Means:** (named after the island of Flores, where it was found)
**Nickname:** “Hobbit”

**When Found:** 2003
**Who Found:** Indonesian-Australian team

**Lived When:** about 95,000 – 17,000 Ya
**Lived Where:** Asia (Indonesia)

**How Big?** 3 ft, 6 in; 66 lbs
**Fossil Record:** LB 1 (nearly complete female skeleton), 12+ others
**Basic Morphology:** tiny brains, large teeth, no chins, receding foreheads, shrugged-forward shoulders, relatively large feet (due to short legs)

**Known For:** very small body and brain size, most recent species to go extinct, most recent species to be discovered*

**Burning Questions:**
- How did these early humans manage to get to the island of Flores?
- Which hominin species made the 1 million year old stone tools found on Flores? Was this species the ancestor of *H. floresiensis*?
- Did *H. floresiensis* have cultural expression (language, art)?
- Did *H. floresiensis* ever come into contact with *H. sapiens*?
- Was a volcanic eruption on Flores the reason this species went extinct?
**Homo sapiens**

**Name Means**: Latin: “wise man” or “knowing man”  
**Nickname**: “Cro-Magnon Man”

**When Found**: 1868 / no true type specimen  
**Who Found**: (workmen)

**Lived When**: about 200,000 Ya - present  
**Lived Where**: evolved in Africa, now worldwide

**How Big?** varies across time and space  
**Fossil Record**: excellent!  
**Basic Morphology**: lighter skeletons than earlier humans; thin-walled, high-vaulted skull with flat and near vertical forehead; virtually no brow ridges; lightly built jaws with smaller teeth

**Known For**: Worldwide distribution with huge population size, very large brains, using tools to make other tools/technological advancements, agriculture and domestication, civilization/cities, low genetic diversity

**Unique Behaviors**:  
- fishing, bows and arrows  
- long-distance trade and social networks  
- varied diet  
- language, writing, art, music, personal adornment, rituals  
- abstract reasoning  
- self-awareness  
- long growth & development (only species to have grandparents), ...

[Image of Homo sapiens]
**Homo erectus**
(female)
Lived 1.89 million – 70,000 years ago
Africa; Asia; possibly Europe

**Homo neanderthalensis**
(male)
Lived 200,000 – 28,000 years ago
Europe and Asia

**Homo heidelbergensis**
(male)
Lived 700,000 – 200,000 years ago
Europe, Asia, Africa

**Paranthropus boisei**
(male)
Lived 2.3-1.3 million years ago
Eastern Africa

**Australopithecus africanus**
(female)
Lived 3.3 -2.1 million years ago
Southern Africa

**Homo floresiensis**
(female)
Lived 95,000 -17,000 years ago
Southeast Asia; nicknamed ‘Hobbit’

**Australopithecus afarensis**
(male)
Lived 3.85 – 2.95 million years ago
Eastern Africa

**Sahelanthropus tchadensis**
Lived 7-6 million years ago
Africa

**Australopithecus afarensis**
(female)
Lived 3.3 -2.1 million years ago
Southern Africa