

# Bio 1M: Hominins — Chapter 56

## 1 Emergence — S 56.1

- **Hominins** refer to people and our upright ancestors
- Characterized by:
  - Walking upright
  - Specific changes in chewing design: teeth, jaws and skull

**Taxonomy** — <https://en.wikipedia.org/wiki/Hominini>

- Homonoidea, Hominidae, Homininae, Hominini, Hominina, Homo
- Why so much detailed splitting?
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## Putting together the puzzle

- What did our common ancestor with chimpanzees look like?
- Which fossils are related to which other fossils?
- The key is which features are reliable indicators of relatedness?
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## Competition and replacement — Fig 56.2

- *H. erectus* replaced everything that came before it
- *H. sapiens* replaced everything that came before *it*

## Modern humans

- Characterized by small face and teeth
- Less robust skeletal structure
- Evolved in Africa around 200 **kya** (thousand years ago)
- Took over most of the world in the last 50,000 years

## Why are we here?

- Modern humans arose around 200 kya, but took over the world around 50 kya
- What happened?
  - Cultural change?
  - Evolutionary change?
    - \* Sudden or gradual?
  - Why don't we see evidence?
    - \*

## Evaluating evidence

- There are a lot of theories and a great deal of expertise
- But expertise can also lead to over-confidence
- As with other examples, we try to make and test theories
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## Apelike ancestors — See First Hominin subsection

- Were our ancestors more like us, or more like apes?
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## Observer bias

### Upright posture — S56.3 Bipedalism

- How did upright posture and upright walking evolve?
- It's not known, but there are many theories:
  - Adaptation to walking on the ground instead of swinging through trees
    - \*
  - Adaptation for keeping cool
  - Adaptation for harvesting food
  - Adaptation for carrying food

## Gradual evolution

- Hominins' evolution of upright posture was likely dependent on evolutionary history and circumstance
  - Built on previous adaptations
- Evolution of upright posture almost certainly led to further evolutionary change:
  - Carrying and storing things
  - Making and using tools

## Studying evolution

- Evidence from fossils
  - knees, hips, backs, skulls all provide evidence about posture — Fig 56.8
  - teeth and jaws provide evidence about diet
- Evidence from archaeology
  - hominin fossils may be found in particular places
  - associated with fossils from things that hominins used to eat
  - or with tools

## Back and forth evolution

- Very early hominins (6 mya) had facial and dental features that were similar to later hominins (2 mya)
  - Less similar to chimpanzees
  - But also less similar to *Australopiths* (3 mya)
- Is this surprising?
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## Hominin phylogenies

- Hominins had a large number of speciation and extinction events
  - Consistent with radiation and contraction
  - Likely provided more opportunities for adaptation in the long run
- The tree is not well understood, despite intensive study
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## 2 Sociality

### Complex foraging

- A key part of human evolution was shaped by **complex foraging** strategies of our ancestors – they relied on many types of food, including types of food that are difficult to get or process
- What adaptations likely favored this strategy?
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- What further adaptations might this strategy have favored?
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### Looping

- Lots of adaptations may be partly explained by adaptive loops
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### Complex foraging and co-operation

- Complex foraging may have promoted co-operation between females and males, since primate child care is not well suited to a hunting life style
- It may have promoted co-operation between people with different skills, since they might have access to food at different times
- It may have promoted co-operation among hunters, since hunting success is highly variable
- It may have promoted co-operation in teaching and learning

### Complex foraging and thinking

- Complex foraging favors large brains that can learn a lot
- It also favors a long learning period
  - Sensitivity vs. crystallization
- It also favors communication

## Complex foraging and gender roles

- How might complex foraging affect child care and sexual dimorphism?

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## Social behaviour

- As behaviour becomes more social, a wide variety of other adaptations may become available
  - Mostly related to thinking and communication
- Leading to more opportunities for looping:

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## How social were early hominins?

- What kind of clues might be available?

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## Sexual dimorphism

- The extent of sexual dimorphism tells us at least something about social structures
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- How do we know whose bones are male and female?
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- How do we know whose teeth are male and female?

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## Bimodality

- Bimodality means having two peaks in a distribution
  - For example, a modern human height distribution would have a peak for men, and a peak for women
- If traits are strongly dimorphic, we should be able to tell by sampling, even if we don't know which fossils come from males and which from females — <https://www.cdc.gov/nchs/nhis/index.htm>

## Teeth

- Chimpanzees and (especially) gorillas have extreme sexual dimorphism in tooth size
- We can tell our ancestors have less dimorphism than that *even if we can't tell the males from the females*

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## Rate of development

- Why do human children develop *so* slowly?
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- We are therefore very interested in how long it took our ancestors to mature
- Clues are available
  - Dental enamel — <https://embryo.asu.edu/pages/human-evolution-inferred-tooth-growth>
  - Molar development
- But it's a hard problem

## Summary

- People evolved by the same basic rules as other organisms
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- Followed a very different path
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- There is a lot we can learn about ourselves from biology
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- And also a lot that we can't learn
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