

Chapter 2

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Human Evolution

Chapter Questions

- Darwin and Natural Selection
- Humans and our Nearest Relatives
- The Evolution of Humans
- *Homo Sapiens* Culture
- Human variation

Evolution

- The change in the properties of populations of organisms that occur over time.

Natural Selection

- The mechanism of evolutionary change.
- Changes in traits of living organisms that occur over time as a result of differences in reproductive success among individuals.

Theory of Natural Selection

- Theory formulated by Charles Darwin.
- Changes in living organisms occur over time as a result of reproduction.
- The most convincing scientific explanation of the variety and history of life on earth.

Theory of Natural Selection

- No two living things, even those of the same species, are alike.
- Sources of variation:
 - Mutation
 - Sexual reproduction
 - Genetic drift

Theory of Natural Selection

- Most creatures did not survive long enough to have offspring.
- Creatures who won the struggle for survival passed traits that led to their success to their offspring.

Question

- Darwin's emphasis upon the struggle for food and the notion of competition that allows the more "fit" individuals to leave more offspring, is the aspect of his contribution to evolutionary theory we know as
 - a) natural selection.
 - b) genetic mutation.
 - c) diffusion.
 - d) maladaptation.
 - e) social betterment.

Answer: a

- Darwin's emphasis upon the struggle for food and the notion of competition that allows the more "fit" individuals to leave more offspring, is the aspect of his contribution to evolutionary theory we know as **natural selection**.

Evolution, Politics and Religion

- Most debate about evolution is religious rather than scientific.
- Evolution challenges religious creation stories.
- In 1950, the Catholic Church declared evolution compatible with Christianity.

Common Ancestors

- Humans, gorillas and chimpanzees evolved from common ancestors.
- All animals are equally evolved in different ways and under different circumstances.
- Human ancestors diverged from those of chimpanzees and gorillas 5 to 8 m.y.a.

Primates

Characteristics:

- Share a tree-dwelling (arboreal) ancestry.
- Grasping hands and feet for climbing.
- Hands and feet with fully opposable thumbs.
- Acute eyesight.

Primate Social Behavior

- Core of society is the bond between mothers and their offspring.
- Play becomes central to the interaction of older primates with their age-mates.
- Primates have displays of aggression and means of reconciliation.

Primate Tool Use

- Females first develop tool-using skills and become more adept than males.
- Tool use is learned behavior and passed along by the social group.
- Some groups of chimpanzees do some activities and others do not.

Examples of Primate Tool Use

- Use sticks to threaten others or defend themselves.
- Use water to separate grains of wheat from sand.
- Termite fishing - Use twigs or blades of grass to fish termites from their mounds.

Question

- Which of the following has **not** been reported as instances of tool-uses by non-human primates?
 - a) termite fishing
 - b) spears for killing game
 - c) use of sticks in threat displays
 - d) use of water for rinsing grains of wheat
 - e) leaf sponges

Answer: b

- **Spears for killing game** has **not** been reported as instances of tool-uses by non-human primates.

Early Human Ancestors

- Few in number and geographically confined to Africa.
- Did not depend heavily on tools, and left few material remains.
- Spread from African origins to inhabit most of the globe.

Terms

- **Genus**

In biological classification, a group of similar species.

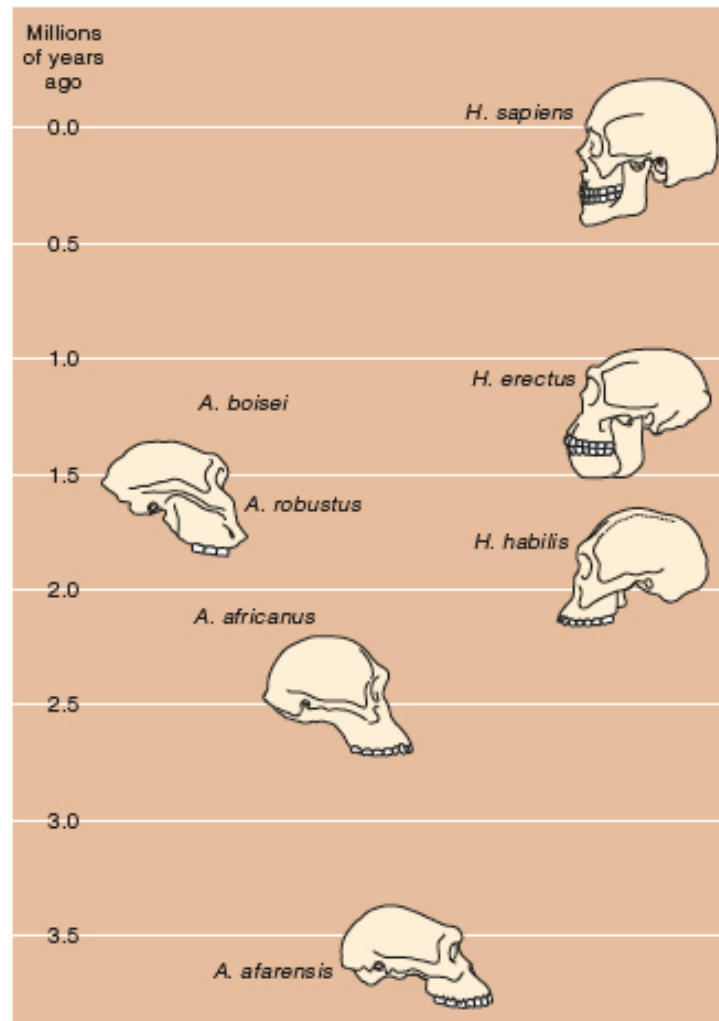
- **Species**

A group of organisms whose members are similar to one another and are able to reproduce with one another but not with members of other species.

Evolution of Humans

- Humans have adapted to many different climates and ecosystems.
- All humans are members of the biological family *Hominidae*.
- Humans fall into two genera: *Australopithecus* and *Homo*.

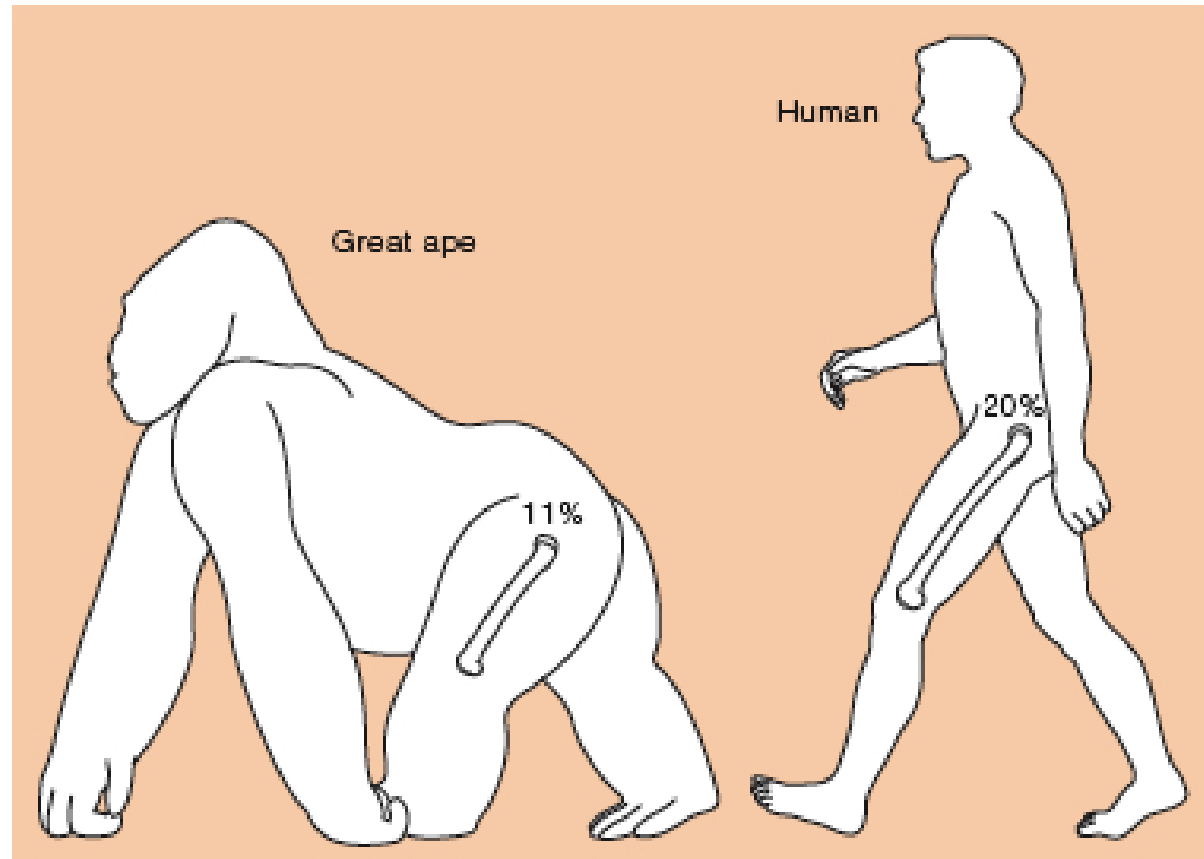
A Plausible View of Early Human Evolution



Australopithecines

- Members of an early hominid genus found in Africa and characterized by bipedal locomotion and small brain size.
- Bipedalism - Walking on two feet, a distinctive characteristic of humans and our ancestors.

Bipedalism



Omnivore

- An animal that eats both plant and animal foods.

Homo Habilis

- A species of early human found in Africa.
- Homo habilis were present between 2.5 and 1.8 million years ago.
- **Oldowan tools** - Sophisticated stone tools made by *Homo habilis*.
- Stone rings indicate that *habilis* probably built shelters for protection

Question

- Which of the following characteristics of *Homo habilis* distinguishes this group most clearly from the australopithecines?
 - a) presence of stone tools
 - b) evidence for the hunting of large game
 - c) ability to walk on two legs
 - d) care of their young
 - e) a "robust" skull with large teeth and jaws

Answer: a

- The **presence of stone tools** distinguishes *Homo habilis* most clearly from the australopithecines.

Homo erectus

- Found in Africa, Asia, and Europe between 1.8 million and about 200,000 years ago.
- Became increasingly dependent on culture to survive in the Ice Age.
- Capable of controlling and using fire.
- Lived by hunting, scavenging, and gathering.

Homo sapiens

- A species of human found throughout the world.
- The earliest *Homo sapiens* appeared about 500,000 years ago.

Neandertals

- Members of a population of archaic *Homo sapiens*.
- Lived between 130,000 and 35,000 years ago.
- Pollen found in graves show bodies were buried with flowers, suggesting rituals and belief in the afterlife.

Multiregional Model

- A theory that argues that different populations of Homo sapiens are descendant from different populations of Homo erectus.

Replacement Model

- The theory that modern people evolved in Africa then spread out to inhabit all the world, out competing or destroying other human populations in the process.

Hybridization Model

- A theory that proposes that modern and archaic forms interbred.

Homo Sapiens Culture

- **Atlatl** - A spear thrower; a device used to increase and extend the power of the human arm when throwing a spear.
- **“Venus” figurines** - Small stylized statues of females made in a variety of materials by early modern humans.

Human Variation

- Human traits change in frequency geographically.
- Blood type and skin color vary geographically.
- Melanin is a pigment found in the skin, hair, and eyes of human beings, and other species, and responsible for variations in color.
- The sickle cell gene is common in areas that have a high incidence of malaria.

Clinial Distribution

- The frequency of change of a particular trait as you move geographically from one point to another.

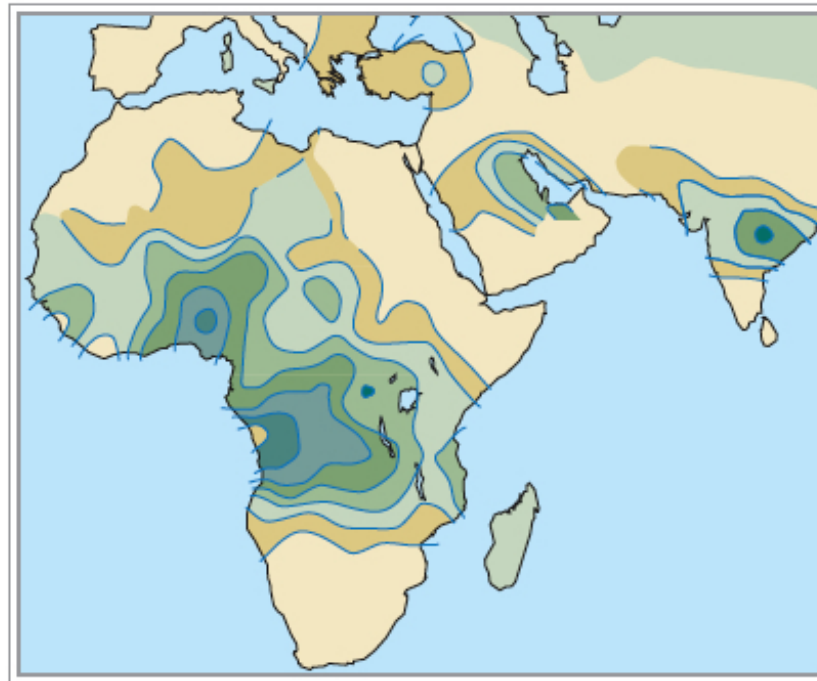
Question

- Anthropologists draw upon all **except** which one of the following types of biological evidence to understand the past relationship between ourselves and other living primate groups?
 - a) DNA
 - b) skin color
 - c) immunology
 - d) blood protein
 - e) blood-clotting agents

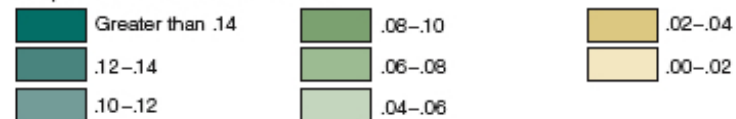
Answer: b

- Anthropologists draw upon all except **skin color** to understand the past relationship between ourselves and other living primate groups.

Map of the Sickle Cell Trait Showing a Clinal Distribution



Frequencies of the sickle-cell allele:



Rickets

- A childhood disease characterized by the softening and bending of leg and pelvis bones.
- Related to insufficient vitamin D and/or Calcium.

Quick Quiz

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1. In looking at the geographical variation in the frequency of a trait, such as blood type, one is looking at a(n) _____ distribution.

- a) racial
- b) clinal
- c) selective
- d) immunological
- e) epidemiological

Answer: b

- In looking at the geographical variation in the frequency of a trait, such as blood type, one is looking at a(n) **clinal** distribution.

2. Darwin's emphasis upon the struggle for food and the notion of competition that allows the more "fit" individuals to leave more offspring, is the aspect of his contribution to evolutionary theory we know as
 - a) natural selection.
 - b) genetic mutation.
 - c) diffusion.
 - d) maladaptation.
 - e) social betterment.

Answer: a

- Darwin's emphasis upon the struggle for food and the notion of competition that allows the more "fit" individuals to leave more offspring, is the aspect of his contribution to evolutionary theory we know as **natural selection**.

3. The evolutionary relationship between human and other non-human primates is best expressed by which of the following statements?
- a) Humans evolved from monkeys during the past 20 million years.
 - b) Humans, chimpanzees, gorillas and other great apes evolved from a common ancestor.
 - c) Among the apes, humans appear to be most closely related to the orangutan.
 - d) Chimpanzees appear to be the common ancestor for the 'apes' as well as human beings.
 - e) Humans evolved directly from their closest relative, the chimpanzees.

Answer: b

- The evolutionary relationship between human and other non-human primates is best expressed by which the following statement:
 - Humans, chimpanzees, gorillas and other great apes evolved from a common ancestor.

4. The progression of ancestral forms leading to modern-day humans, the earliest being first, is which of the following sequences?
- a) Australopithecines – Homo erectus – Homo habilis – Homo sapiens
 - b) Homo erectus – Australopithecines – Homo habilis – Homo sapiens
 - c) Australopithecines – Homo habilis – Homo erectus – Homo sapiens
 - d) Australopithecines – Homo sapiens – Homo habilis – Homo erectus
 - e) Homo habilis – Homo erectus – Australopithecines – Homo sapiens

Answer: c

- The progression of ancestral forms leading to modern-day humans, the earliest being first, is the following sequence:
 - **Australopithecines – Homo habilis – Homo erectus – Homo sapiens**