Chapter 4 Outline – Human Evolution

I. INTRODUCTION

II. MAMMALIAN PRIMATE EVOLUTION
- A. Continental drift over the past 200 million years has both changed the position of the continents, as well as, affected mammalian evolution
- B. Around 65 million years ago dinosaurs went extinct, the climate changed, and mammals diversified into a host of available environmental niches
- C. By 60 million years ago, primates inhabited North America and Eurasia (Europe and Asia). The earliest primates were small nocturnal insect eaters adapted to life in the trees.
- D. About 40 million years ago Old World and New World species separated
- E. During the Miocene the Eurasian and African landmasses connected
- F. The Miocene is called the "golden age of the hominoids" by some primatologists because of the abundance and variation of fossil apes found from the caves of China, to the forests of France, to eastern Africa.

III. HUMAN EVOLUTION
- A. The African Apes (chimpanzees, bonobos, and gorillas) are the closest living relatives in the animal kingdom to humans.
  - a. Bipedalism played a pivotal role in setting humans apart from the apes and occurred before brain expansion.
- B. Several recent discoveries have begun to fill in the fossil record and have been suggested as possible original human ancestors.
  - a. *Orrorin*—meaning "original man"— Dates to 6 million years ago and was found in Kenya in 2001
  - b. *Toumai*, a 6-7 million-year-old skull—meaning "hope for life"--was discovered in Chad, Central Africa, in 2002
  - c. *Ardipithecus*—nicknamed Ardi—announced in 2009, dates to 4.4 million years ago and is remarkably complete. The *Ardipithecus* remains:
    - i. Show that some of the earliest bipeds inhabited a forest environment
    - ii. Have created debates about where she stands on the human line
    - iii. Shows that forest creatures moved about in a combination of ways including using the palms of their hands and feet facing outward to move across branches, walked between trees in an upward position
    - iv. Resembles Miocene apes more than living African apes
    - v. Calls into question what the human and ape common ancestor actually looked like
- C. The emergence of bipedalism required certain skeletal changes:
  - a. Movement of the *foramen magnum*
  - b. Convex and concave curves in the spinal column
  - c. A wider and foreshortened pelvis
  - d. "Kneeing-in"
  - e. Stable arched feet, shorter toes, loss of opposable big toe

D. Bipedal locomotion can be observed in fossilized footprints because of the character stride in humans and their ancestors where the body weight shifts from one foot to the other
   a. The Laetoli Footprints are an example left in Tanzania by 3 individuals who walked across newly fallen volcanic ash 3.6 million years ago

E. There are numerous benefits of bipedalism
   a. Steady paces over extensive distances
   b. The freedom to carry food and infants
   c. The ability to carry objects for protection
   d. Erect posture is better suited for endurance running
   e. Reduce the overall area of the body exposed to direct sunlight
   f. See food and predators in a savannah landscape

F. Australopithecines
   a. Australopithecines flourished in Africa between 1.1 and 4.3 million years ago
   b. They are found up and down the length of eastern Africa from Ethiopia to South Africa and westward into Chad
   c. There are two main classes of Australopithecines:
      i. Robust australopithecines
      ii. Gracile australopithecines

G. *Homo habilis*
   a. Fossils appeared around 2.5 million years ago
   b. They are associated with the Oldowan Tool Tradition which begins the Lower Paleolithic, of Old Stone Age
   c. They show characteristic human evolutionary trends of major brain size increase and tooth-size reduction

H. The fossil record provides many clues to early human behavior
   a. In the 1960s and 1970s paleoanthropologists focused on “man the hunter” as the image of early humans, stressing the role of men and underreporting the significance of women
   b. Since that time, there is more recognition of the importance of “woman the gatherer” in human evolution
   c. New evidence suggests that early humans depended more on scavenging than on hunting
   d. Many scientists argue that there is a feedback loop connecting tools, food, and brain expansion
   e. Paleoanthropologists debate whether evolution of the genus *Homo* from australopithecine ancestors was a gradual process or a sudden development.

I. Around 2 million years ago *Homo erectus* emerged
   a. While *H. habilis* remained confined to Africa, *H. erectus* was located in Africa as well as expanding into China, Indonesia, and Europe
   b. Development of *H. erectus* coincided with the beginning of the Pleistocene Epoch, spanning from 12,000 to 1.8 million years ago
      i. Climatic and geographic changes required adaptation
      ii. This led to a great deal of physical variation among *H. erectus*
   c. *H. erectus* physical variation has lead some paleoanthropologists to split *H. erectus* into several different species

d. Cultural abilities also proved increasingly complex and increasingly important, especially when considering the wide geographic area that *H. erectus* inhabited
    i. The Oldowan tools were replaced by sophisticated hand axes
    ii. They also developed flake tools
e. Fire use may have arisen by about 1 million years ago, enabling *H. erectus* to survive colder climates, detoxify poisonous plants, and cook food
f. Organized hunting may have been used in order to procure meat
g. Language development may have been correlated with the elaboration of culture and tools

H. *Homo sapiens* emerged roughly between 200,000 and 400,000 years ago
a. Some researchers argue that earlier finds might represent "early *H. sapiens*," "late *H. erectus*," or *H. antecessor*
b. "Lumpers" tend to tolerate large amounts of physical variation, while "splitters" routinely separate fossils into separate species

I. A debated aspect of our ancestry is how we classify Neandertals and whether they were a subspecies of *H. sapiens*
a. Neandertals were located in Europe from approximately between 30,000 and 125,000 years ago
b. Neandertals exhibited distinctly different physical characteristics than modern *H. sapiens* including:
    i. Sloping forehead
    ii. Prominent bony brow ridge over eyes
    iii. Receding chin
    iv. Bony mass on the back of the skull that allowed for attachment of powerful neck muscles
c. Neandertal physical characteristics are not in line with modern ideals of beauty but remain to a certain degree in humans today
d. They created different tool kits known as the Mousterian Tradition and were associated with the Middle Paleolithic, or Middle Stone Age

J. Archaic *H. sapiens* emerged by about 200,000 years ago
a. They have modern-sized brains, but share anatomical features as well with the *H. erectus*
b. *H. florensiensis* was discovered in 2004 and shows effects of geographic isolation on archaic *H. sapiens*

K. Anatomically modern *H. sapiens* appeared around 40,000 years ago, in a time known as the Upper Paleolithic transition
a. The Upper Paleolithic transition was characterized by an explosion of highly elaborate cultural expression, including:
    i. Specific regional cultural traditions
    ii. The creation of blade tools
    iii. Pressure-flaking for tool production
    iv. Artistic expression such as cave paintings, sculptures, or engravings
b. The elaboration of culture enabled a wider geographic expansion previously unseen in the human evolutionary record

IV. THE MODERN HUMAN ORIGINS DEBATE

A. There are two main hypotheses that attempt to explain modern *H. sapiens*' emergence: The Multiregional hypothesis and the Recent African Origins hypothesis

B. The Multiregional hypothesis:
   a. Argues that the fossil evidence suggests a simultaneous local transition for *H. erectus* to modern *H. sapiens* throughout all the parts of the world inhabited by the early members of the genus *Homo*

C. The Recent African Origins hypothesis (also referred to as the "Out of Africa" hypothesis or "Eve" hypothesis):
   a. Argues that all anatomically modern humans living today descend directly from a more recent single population of archaic *H. sapiens* in Africa.
   b. Asserts that improved cultural capabilities allowed members of this group to replace other archaic human forms as they began to spread out of Africa 100,000 years ago completely replacing other members of the genus Homo as they spread throughout the world.

A. How modern humans first arose is still a matter of great debate
   a. The Recent out of Africa Origins hypothesis was considered mainstream because of mitochondrial DNA analyisis and the fossil find of *H. sapiens idaltu*
   b. In 2010, researchers published a study comparing the Neandertal genome to that of five living human populations and found that a significant proportion of Neandertal genes persist among contemporary non-African populations, indicating mating between the Neandertals and the anatomically modern humans who first appeared in Africa some 200,000 years ago

B. There are many critiques of both the Multiregional hypothesis and the Recent Out of Africa hypothesis that are based on DNA studies and more recent fossil finds. The modern human origins debate raises important questions about the complex relationship between biological and cultural human variation