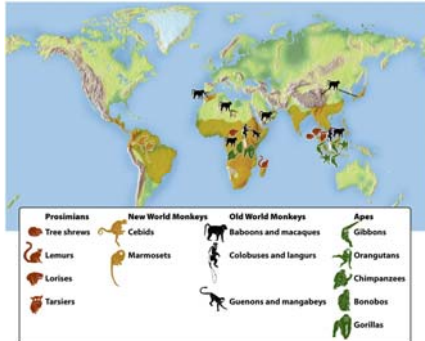
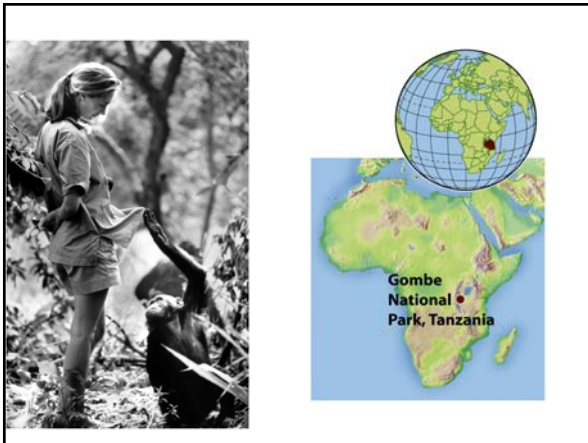


Chapter 6: Biology in the Present: The Other Living Primates





What Is a Primate?

Linnaeus first described the order *Primates* for classification purposes.

- i. As identified by Le Gros Clark, primates have the following traits:
 - 1) Primates are adapted to life in the trees (arboreal adaptation).
 - 2) Primates eat a variety of foods (dietary plasticity).
 - 3) Primates invest a lot in a few offspring (parental investment).

Arboreal Adaptation: Primates Live in Trees and Are Good at It

- i. Primates Have a Unique Combination of Specific Arboreal Adaptations.
- ii. Primates Have a Versatile Skeletal Structure
 - 1) Clavicle acts as a strut to keep upper limbs to sides of body.
 - 2) Ulna and radius rotate forearm.

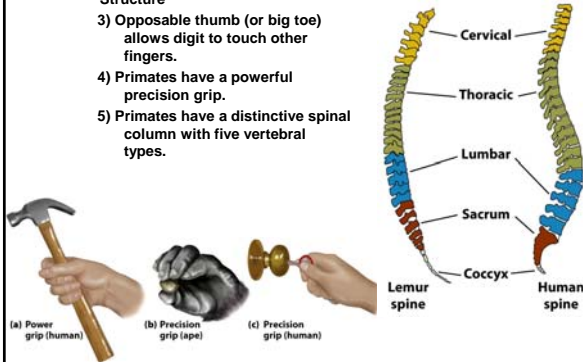
Generalized Skeletal Structure

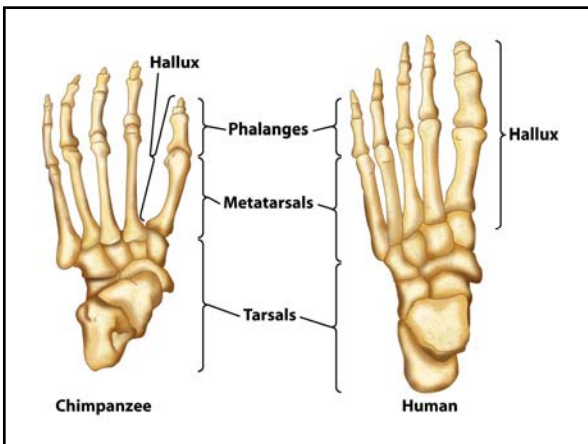


Arboreal Adaptation: Primates Live in Trees and Are Good at It

ii Primates Have a Versatile Skeletal Structure

- 3) Opposable thumb (or big toe) allows digit to touch other fingers.
- 4) Primates have a powerful precision grip.
- 5) Primates have a distinctive spinal column with five vertebral types.







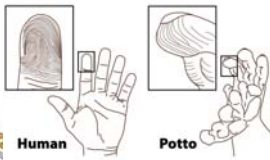
Primates Have an Enhanced Sense of Touch

- 1) The ends of fingers and toes are sensitive and allow for maximum information from environment.

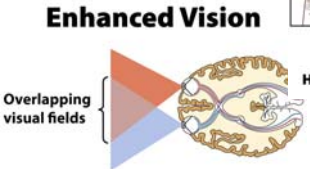
iii. **Primates Have an Enhanced Sense of Vision**

- 1) Eyes are rotated to the front of the head with overlapping fields of vision.
- 2) Most primates see in color.

Enhanced Touch



Enhanced Vision



Overlapping visual fields

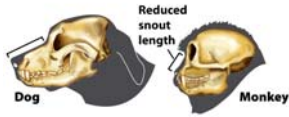
Human Potto



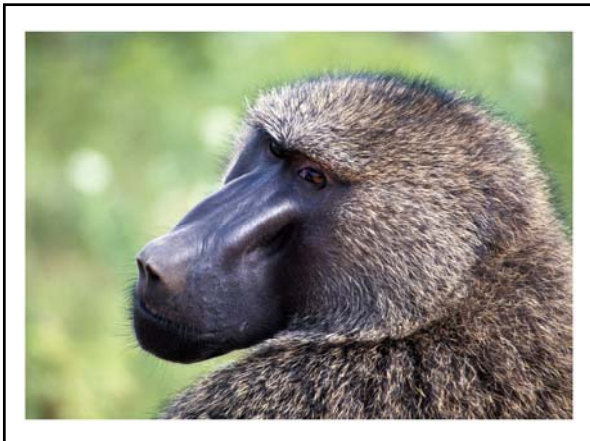
What Is a Primate?

- v. Primates Have a Reduced Reliance on Senses of Smell and Hearing
 - 1) Most higher primates have lost the naked rhinarium (wet nose).
 - 2) Some prosimians retain the rhinarium.
 - 3) Smell is a secondary sense in most primates.

Reduced Smell









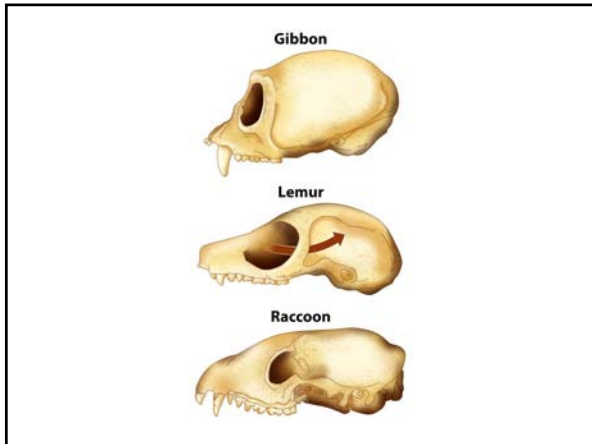


c. Dietary Plasticity—Primates Eat a Highly Varied Diet, and Their Teeth Reflect This Adaptive Versatility

- i. Primates Have Retained Primitive Characteristics in Their Teeth
 - 1) Dental traits in four functionally distinct tooth types
- ii. Primates Have a Reduced Number of Teeth
 - 1) Dental formula records number of teeth in one jaw quadrant.
 - 2) $2/1/2/3$ is the formula for Old World monkeys and apes.
 - 3) $2/1/3/3$ is the formula for New World monkeys.

Dietary Versatility

The image shows two diagrams of primate dental arches. The left diagram is a maxilla with teeth labeled I, C, P, M, I, C, P, M, I, C, P, M. The right diagram is a mandible with teeth labeled I, C, P, M, I, C, P, M, I, C, P, M. To the right is a grid of 12 small images of different primate teeth, showing various shapes and sizes.



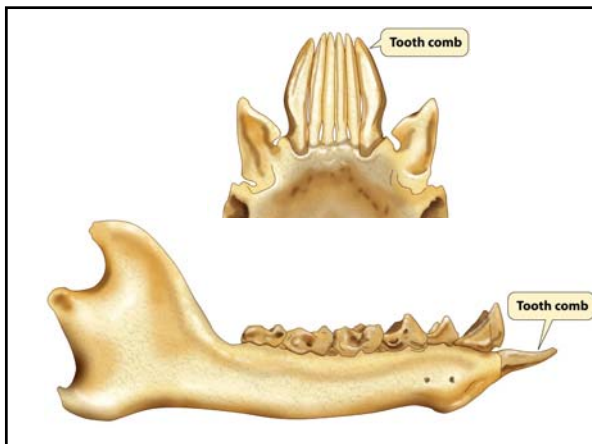
c. Dietary Plasticity—Primates Eat a Highly Varied Diet, and Their Teeth Reflect This Adaptive Versatility (cont'd)

iii. Primates Have Evolved Different Dental Specializations and Functional Emphases

- 1) Premolars and molars used for grinding.
- 2) Molars have different numbers of cusps.
 - a) Bilophodont (two lobes).
 - b) Y-5 (cusps in the shape of a "Y").
- 3) Canine-premolar honing complex slices food.
- 4) Enamel thickness varies across order.

(a) (b) (c) (d)

This block contains text and four panels of teeth. Panels (a) and (b) show bilophodont molars with two distinct cusps. Panels (c) and (d) show Y-5 molars with five cusps arranged in a Y-shape. Labels 'Bilophodont' and 'Y-5' are placed above the respective panels.



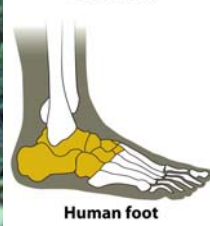
Ad Hominin? Genetic vs. Anatomical Classification

- i. DNA analysis demonstrates humans, gorillas, chimpanzees and bonobos are more closely related than each is to orangutans.
- ii. Chimpanzees and humans are more closely related than either is to gorillas.
- iii. DNA analyses (genetic classification) provide evolutionary relationships, anatomical classification provides insight into adaptations.

c. Prosimians: The Lesser Primates

- i. Among oldest living primates
- ii. Developed sense of smell
- iii. Combination of nails and claws with less dexterity than other primates
- iv. Geographic range: Madagascar and Southeast Asia
- v. Tarsiers share some traits with prosimians and anthropoids

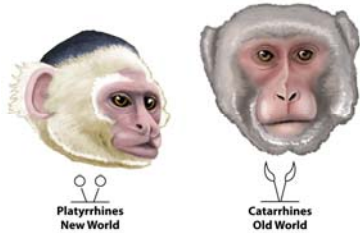




d. Anthropoids: The Higher Primates

i. Old World monkeys (catarrhines)

- 1) Nostrils separated by a septum that points downward
- 2) Most diverse and most successful nonhuman primates
- 3) Tough sitting pads on the rear (ischial callosities)
- 4) Inhabit terrestrial and arboreal habitats in Africa and Asia
- 5) Two subfamilies: cercopithecoids and colobines
- 6) Baboons, macaques, mandrills, colobus



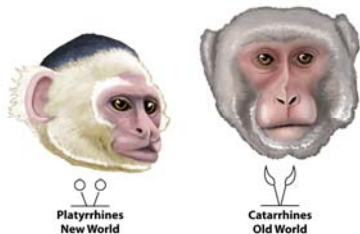
Platyrrhines
New World

Catarrhines
Old World

d. Anthropoids: The Higher Primates

ii. New World monkeys (platyrrhines)

- 1) Rounded nostrils separated by a septum
- 2) Prehensile tail
- 3) Inhabit arboreal habitats in Latin America
- 4) One subfamily: ceboids
- 5) Spider, squirrel, howler monkeys



Platyrrhines
New World

Catarrhines
Old World











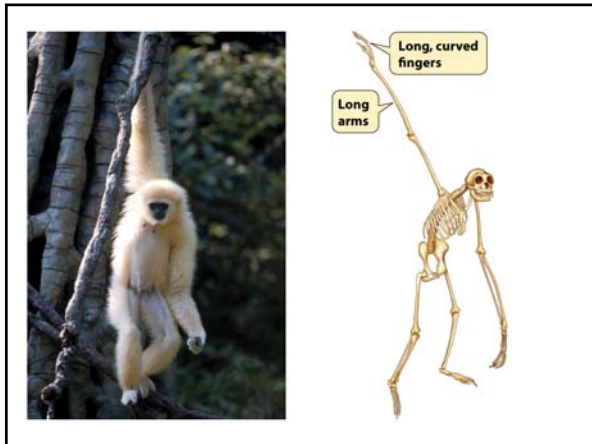


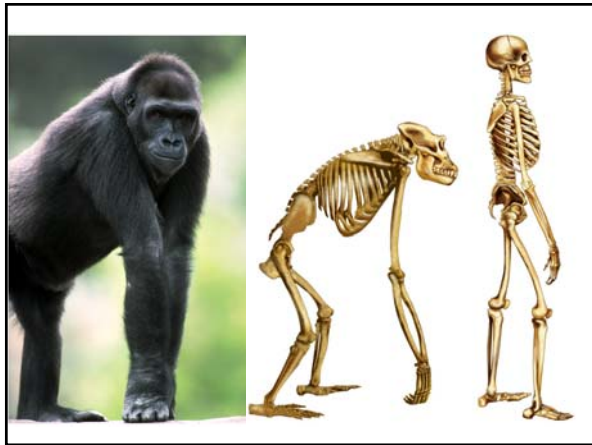
- d. Anthropoids: The Higher Primates
 - iii. Hominoids
 - 1) Great Apes: orangutan, chimpanzee, bonobo, gorilla
 - a) Sagittal crest in gorilla, orangutan
 - b) Chimpanzees omnivorous
 - c) Humans characterized by skeletal structure for bipedalism
 - 2) Lesser apes: gibbon, siamang
 - a) Skilled brachiators

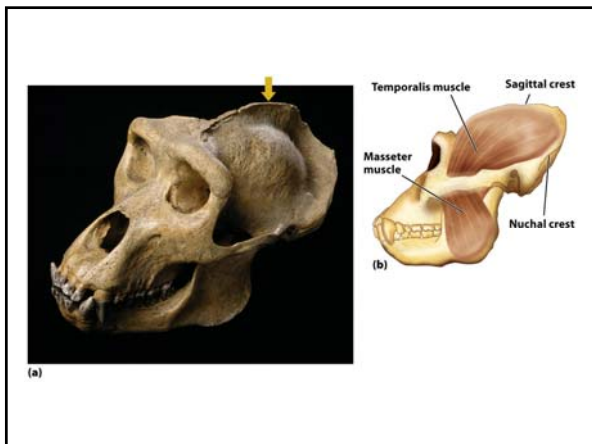












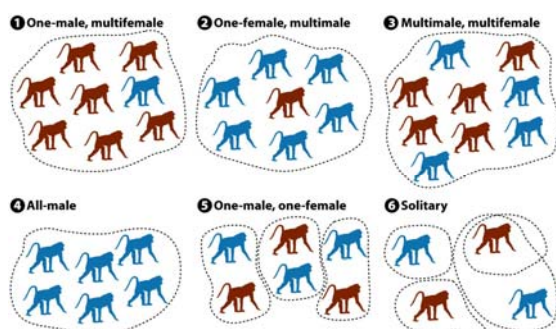
3. Primate Societies: Diverse, Complex, Long-Lasting

- a. Diversity of primate societies
- b. Social Behavior: Enhancing Survival and Reproduction
 - i. Social signals establish and maintain social relationships
 - ii. Primate societies are organized
 - iii. Primates form long-term social relationships
 - iv. Social behaviors in primates enhance survival and reproduction and are thought to be maintained by natural selection



a. Primate residence patterns

- i. Primates have a wide variety of residence patterns, divided according to the number of adult males and females present in the group.

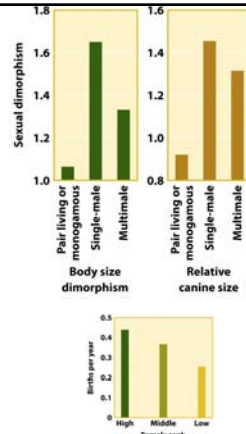


d. Primate Reproductive Strategies: Males' Differ from Females'

- i. Males compete for access to females; this affects male body and canine size
- ii. Females compete with each other for resources to support young; this affects social behaviors.

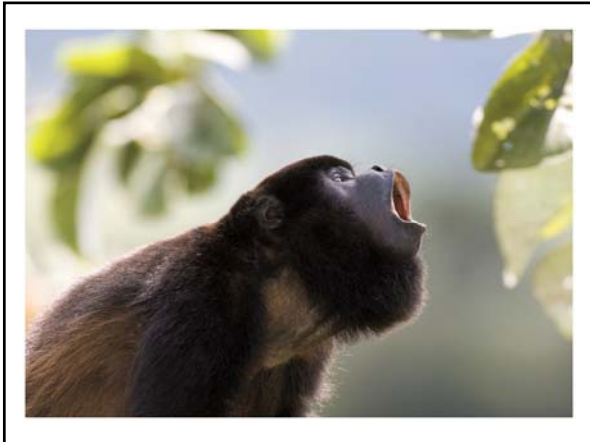
e. The Other Side of Competition: Cooperation in Primates

- i. Cooperative levels in primates are also high
- ii. Altruistic behaviors include alarm calls, grooming, food sharing and caregiving
 - 1) Part of kin selection, or behaviors related to living with relatives who share genetic material
 - 2) Seen most in cercopithecoids and chimpanzees



Category	Pair living or monogamous	Single-male	Multimale
Body size dimorphism	~1.05	~1.65	~1.35
Relative canine size	~0.95	~1.45	~1.35

Female rank	Births per year
High	~0.45
Middle	~0.35
Low	~0.25





- 4. **Getting Food: Everybody Needs It, but the Burden Is on Mom**
 - a. Food resources and the search for them occupy over 50 percent of a primate's waking hours.
 - b. Especially high are the nutritional needs of females with offspring.
 - c. Quality, distribution, and availability all affect a female's success at foraging.
- 5. **Acquiring Resources and Transmitting Knowledge: Got Culture?**
 - a. Notion of nonhuman primate culture can be controversial.
 - b. Jane Goodall was the first to assert that chimpanzees possessed material culture.
 - c. Now, other researchers have also seen behaviors related to the use and alteration of objects as a form of material culture.





