

130-132
176-187
197-198/Lab 7.II.

I. PARTIAL TAXONOMIC CLASSIFICATION OF PREHISTORIC AND CONTEMPORARY PRIMATES

Suborder	Infraorder	Superfamily	Family	Genus	Species	Common Name
<i>Prosimii</i> (<i>Strepsirhini</i>) 132-134 188-191						[tree shrew = insectivore] lemur aye-aye loris and bush baby tarsier
<i>Anthropoidea</i> (<i>Haplorhini</i>) 134-138 188-191	<i>Platyrrhini</i> 134-136	<i>Ceboidea</i>		<i>*Parapithecus</i> (basal anthropoid) <i>*Apidium</i> (basal anthropoid)		New World monkey
	<i>Catarrhini</i> 136-138	<i>Cercopithecoidea</i> 124-126	<i>Cercopithecidae</i>	<i>Macaca</i> <i>Papio</i>	<i>*Propliopithecus</i> (basal catarrhine) <i>*Aegyptopithecus</i> (basal catarrhine)	Old World monkey macaque baboon
			<i>Colobidae</i>	<i>Colobus</i> <i>Presbytis</i>		colobus monkey langur
	<i>Hominoidea</i> 138-143 191-193 Lab 7. II. D.		<i>*Proconsulidae</i>	<i>*Proconsul</i>		
			<i>*Oreopithecidae</i>	<i>*Oreopithecus</i>		
			<i>Hylobatidae</i>	<i>Hylobates</i>		gibbon
			<i>*Pliopithecidae</i>	<i>*Pliopithecus</i>		
			<i>Pongidae</i>	<i>*Dryopithecus</i> <i>*Sivapithecus</i> <i>*Gigantopithecus</i> <i>Pongo</i>	<i>*dryopithecus</i> <i>*ramapithecus</i> <i>*kenyapithecus</i> <i>*ouranopithecus</i>	orangutan
			<i>Panidae</i>	<i>Pan</i> <i>Pan</i> <i>Pan</i> <i>Gorilla</i> <i>Gorilla</i>	<i>traglodytes</i> <i>paniscus</i> ? <i>gorilla</i>	chimpanzee bonobo ("pygmy chimpanzee") Mountain gorilla Western lowland g.
		202-204 213-218 228-237 241-245 Lab 8	<i>Hominidae</i>	<i>*Ardipithecus</i> <i>*Australopithecus</i> ¹ <i>*[aka Paranthropus]</i> ¹ <i>*Kenyanthropus</i>	<i>*ramidus</i> <i>*anamensis</i> <i>*afarensis</i> <i>*africanus</i> <i>*garhi</i> <i>*aethiopicus</i> <i>*boisei</i> <i>*robustus</i> <i>*platyops</i>	Lucy / First Family southern ape Zinj
		237-238 245-247 Ch. 11 Lab 10 Chs. 12-13 Lab 12		<i>Homo</i> ¹	<i>*rudolfensis</i> <i>*habilis</i> <i>*erectus</i> <i>sapiens</i>	ER-1470 human Java / Peking "Man" Mary / John

An * marks groups known only through fossils.

Compare: FIGURE 6-7 Primate taxonomic classification, p. 131
FIGURE 6-8 Revised partial classification of the primates, p. 132
FIGURE 8-1 Classification chart, modified from Linnaeus p. 177
FIGURE 8-15 Major events in early primate evolution, p. 191
Virtual Lab 1, section II, parts A-D Primate Classification

¹(Note: *Australopithecus* and *Paranthropus* make up a "Subfamily" called *Australopithecinae*, more commonly known as *Australopithecines*. The genus *Homo* is in the "subfamily" called *Homininae*, more commonly known as *Hominine*.)

II. A COMPARISON OF APES AND HUMANS

Characteristic	Gibbons (<i>Hylobatidae</i>)	Orangutan (<i>Pongo pygmaeus</i>)	Chimpanzee (<i>Pan troglodytes</i>)	Gorilla (<i>Gorilla gorilla</i>)	Human (<i>Homo sapiens</i>)
Number of species	4 species 15 subspecies	1 species 2 subspecies	2 (or 3?) species 3 (or 2?) Subspecies	1 (or 2?) species 2 (or 1?) subspecies	1 species
Average Height	2.3 ft	4.8 ft (male) 3.0 ft (female)	5.0 ft (male) 4.3 ft (female)	6.0 ft (male) 4.3 ft (female)	5.6-5.8 ft (male) 4.11 to 5.3 ft (female)
Average Weight	11 to 24 lbs.	82 to 179 lbs.	73 to 132 lbs.	150 to 450 lbs.	146-200 lbs. (male) 100-126 lbs. (female)
Female body weight as % of male body weight	94%	46%	78%	51%	81%
Social Unit	Small family units of 2 to 6	Small family bands; least gregarious males may live alone	Family bands of about six; often join other bands; very gregarious	Family bands; less gregarious than chimpanzees	Families (bands), clans, tribes, chiefdoms, sovereign states
Group Size	Adult pair and 1 or 2 offspring	2 (mother and offspring)	20-105	2-34	25-500
Home Range	0.08-0.2 mi ² (0.2-0.5 km ²)	2-215 mi ² (0.4-6 km ²)	2-115 mi ² (5-560 km ²)	1.9-3.1 mi ² (4.9-8.1 km ²)	varied
Habitat	Forest	Indonesian jungles; herbivorous (mostly frugiverous) diet	Deciduous woodland; omnivorous (mostly frugivorous) diet	Lowland and mountain rain forest and bamboo forest	varied, tropics to arctic
Diet / Food Habits	Mostly leaves, grass, fruits, also insects, snails, frogs, young birds' eggs	Predominantly fruit eaters; some leaves and bark	Essentially vegetarian; fruits, leaves, shoots, buds	Completely vegetarian; young leaves, berries, bark, roots, grains, fruit	Omnivorous
Cranial Capacity	98-125 cm ³ (103 cm ³ avg.)	276-540 cm ³ (377 cm ³ avg.)	285-500 cm ³ (383 cm ³ avg.)	340-572 cm ³ (505 cm ³ avg.)	1150-1750 cm ³ (1325 cm ³ avg.)
Age at Sexual Maturity	5 to 8 years	10 to 12 years	7 to 12 years	7 to 10 years	10 to 17 years
Gestation Period	200 to 212 days	233 days	202 to 261 days (231 average)	268 days	280 days
Average Longevity (*in captivity)	>30 yrs. (?)*	>55 yrs.*	>50 yrs. (?)	>50 yrs.	75 yrs. (American)
Est. Population	200,000+	5,000-	100,000	15,000- ↓	6 billion (A.D. 2000)

Sources: Bernard G. Campbell and James D. Loy, *Humankind Emerging*, 8th ed., Boston: Allyn and Bacon, 2000, pp. 121, 98, 106, 162; Ruth Moore, *et al. Evolution*. New York: Time-Life Books, 1964, p. 185; John E. Pfeiffer, *The Emergence of Humankind*, 4th ed., NY: Harper & Row, 1985, p. 194.

Compare: "Characteristics of Primates," pp. 120-123
 "Primate Adaptations," pp. 124-130
 "Primate Taxonomy," pp. 130-132
 Ch. 7 "Primate Behavior," pp. 148-169
 Virtual Lab 1, section III, parts A-B Primate Distribution and Habitats
 Virtual Lab 1, section IV, parts A-D Primate Biology
 Virtual Lab 3, sections I-IV, Primate Functional Morphology
 Virtual Lab 4, sections I-III, Primates in Motion
 Virtual Lab 5, sections I-IV, Primate Diets and Feeding Behaviors
 Virtual Lab 6, sections I-IV, Primate Behavior: The Ethogram
 Virtual Lab 7, sections I-IV, Primate Evolution

138-145

III. GENERAL FEATURES AND MAJOR EVOLUTIONARY TRENDS OF APES AND HUMANS

Important Terms: anthropoids hominoids hominids

- As a group the apes have been the subject of much mythology and many misconceptions.
- "Dental Apes" appeared first, in the Oligocene, ca. 33 mya¹. Dental apes are "apes" with monkey-like bodies who did not hang or swing. These include *Apidium* and *Aegyptopithecus*.

	(Began mya. ²)
Holocene	0.01 ²
Pleistocene	1.8
Pliocene	5
Miocene	23
Oligocene	34
Eocene	55
Paleocene	65

- True apes probably originated in the early Miocene period, ca. 20 to 17 mya.

183

191-193

191-193

Apes flourished in the later part of the Miocene, 15 to 5 mya.

191-193

- Well represented in the **fossil record** by such forms as:

191-193

Sivapithecus
(Ramapithecus / Kenyapithecus / Ouranopithecus)
Dryopithecus
Proconsul
Oreopithecus
Pitropithecus
Gigantopithecus
 and others

139-143

- The three "great apes" (chimpanzee, orangutan, and gorilla) probably shared a **common ancestor** with **hominids**, although the approximate **time of separation** and the **physical nature** of the ancestral lineage are still the subject of much scholarly debate. (The split from the *Homo* line was probably ca. 13 mya for the orangutans and 5-7 mya for chimps-gorillas.)

"**hominids**" = modern humans and their nearest predecessors
(Homo sapiens, early Homo, Australopithecus, and Paranthropus)

- As a group, the apes are quite **variable**, physically and behaviorally. (See p. 2 of this handout.)

104-105

Lab 1. IV, B.

- They vary **physically** -- differing in size, for example, from the relatively small gibbon with little **sexual** dimorphism to the huge gorilla with considerable sexual dimorphism.

149-158

Lab 6

- They vary **behaviorally** -- their social structure, for example, includes both the territorial, closed groups of the gibbon and the free-ranging, open groups of the chimpanzee.

- Apes, for the most part, are "**vegetarians**" (actually **frugivores** and **herbivores**, and occasionally **insectivores**), but the chimpanzee has been observed hunting and consuming meat -- including other chimps' children. (So they're really **omnivores**, right?)

124-130

203

507-509

- Many major evolutionary trends relate to **brachiation** and **upright orientation** (the ability to assume a fairly erect posture):

121-122

223-227

203

215-218

223-227

Lab 9,

Lab 3. I.

- Arm swinging and erect (**bipedal**) or semi-erect walking resulted in a number of postcranial (below the head in bipeds, behind the head in quadrupeds) changes:

- 203 a. LEGS AND FEET
- 227, 514
507-509
224
224
227
228
- i. Feet become more foot-like.
 - ii. Leg bones are much stouter and have more pronounced dorsal ridges.
 - iii. Leg muscle structures change.
 - iv. Humans have developed a "closed-knee stance."
 - v. Loss of some mobility and prehensility in feet.
- 223-227 b. PELVIS
- 513
227
138, 512
- i. A number of changes take place in the pelvis. Basically, with bipedalism the pelvis becomes shorter and wider, has a "distinct pelvic bowl," and the ridges where the leg muscles attach become heavier. Humans also have a deep sciatic notch. These changes will be reviewed later with the discussion of *Australopithecines* ("southern apes").
 - ii. External tails are lost.
- c. UPPER BODY
- 226, 512
507-509
507-509
507
- i. Spine has become more massive and rigid, with fewer vertebrae. And humans developed an S-curve backbone rather than one with a simple curve.
 - ii. Chest has become wider and more barrel-like.
 - iii. Shoulders have broadened.
 - iv. Relatively longer necks developed.
- d. ARMS AND HANDS
- 120-123
129
507-509
121-122
513
123
510-511
Lab. 5
- i. The forelimbs of the apes have become elongated and strengthened relative to the length of the body.
 - ii. Hands become more hand-like:
 - power grip (**prehensility**)
 - precision grip (**opposability**)
- e. SKULL
- 511
226
224-226
230, 511
122-123
237
243-245
249
Lab 5.II.C.
508
510
510
- Many changes take place in the skull:
- i. The **occipital condyles** (the hinges on which the skull articulates with the atlas of the spine) have moved from a position far back on the occipital bone forward to an intermediary position.
 - ii. The related **foramen magnum** (the opening through which the spinal cord passes from the cranium) has also moved forward and downward.
 - iii. The eyes are placed at the front of the head, resulting in stereoscopic vision and depth perception. (Humans also have color perception.)
 - iv. In some adult male apes the heavy chewing and neck musculature is attached to a bony ridge that forms a sharp crest along the top of the skull (**sagittal crest**).
 - v. Most apes have a **supraorbital ridge** (a marked bulge of bone across the region over the eyes).
 - vi. Modern adult humans have a cranial base flexure (bend). [This seems to be related to a low **larynx**, which is associated with a longer **pharynx**. See next item.]
 - vii. Humans have a longer **pharynx**, a feature associated with human speech.
 - viii. Noses are elevated in humans, and are separated by the septum into two chambers.
 - ix. In comparison with apes, human upper lips are relatively short; human's lips are never as thin as apes.

122 f. BRAINS

105-106
186, 203
164-168

Apes and humans have a **large head and brain** relative to body size. The large brains are also **developed more** than those of other animals:

234 size
186 complexity
243 brain weight / body weight ratio

510 i. Humans have larger brain cases (for their larger brains), with highly developed frontal and occipital regions. Skull is more developed in the frontal and **occipital** (curved back and base of the skull) regions as the **cerebrum** (large rounded structure of the brain) becomes increasingly larger.

186 ii. **Cerebral cortex** (thin layer of grey matter covering the cerebrum, also known as the **neocortex**)
240 increases in area. In humans this lies in folds or convolutions over the entire surface of the cerebral hemisphere. This can often be seen in **endocasts** (fossilized casts of the interior of a skull).

iii. Humans have developed "**association**" **areas** (regions of the cerebrum surrounding the sensory area).

165-166 -- cognition
340-341 -- language

262 iv. The brain weight / body weight ratio increases.

122 g. TEETH / JAW AND DIET

203
Lab 1.IV.C.
Lab 5

125 Important changes take place in **dentition**:

508-509 i. In apes jaws slant outward and downward (**prognathism**).

510, 322 ii. Human's lower jaw is comparatively small, but always has a **distinct chin**.

125 iii. Apes have cusp patterns for the lower molars similar to those of humans.
(They have a "**Y-5**" **pattern** rather than the "**plus-4**" **bilophodonty** characteristic.)

231 iv. Apes still possess conical, daggerish canines projecting well beyond the surface level of the
Lab 5.II.2 lower teeth and overlapping them, with corresponding **diastemata** (singular is **diastema**).
[A **diastema** is a space in the toothrow that accommodates one or more teeth in the opposite jaw when the mouth is closed.]

v. Both apes and humans have:

125 8 incisors, 4 canines, 8 premolars, 12 molars : **dental formula** = $\frac{2-1-2-3}{2-1-2-3}$
Lab 5.III.B

230 vi. In humans the palate is arched and curves outward at back (parabolic arch).
263-265

10. Other Changes:

158-161 a. Trend: multiple → single births.

122 b. Longer periods of pregnancy.

122-123 c. Longer periods of growth to adult size and status, with corresponding prolonged periods of
160-161 dependence.

And thus a greater dependence on flexible, *learned* behavior.

162-164
203
350-351
267-269
276-279
296, 298
307
328-331
Lab 11

d. Tool making (Note: Tool *making* and tool *using* are different features.)

123
149-158
123

e. The tendency to live in social groups and the permanent association of adult males with the group.

f. The tendency to diurnal (daytime) activity pattern.

331-337

g. The beginnings of art and ritual.

11. Future:

144-145
172-173

Extinction of native habitats and poaching may mean many apes will survive only in places like zoos and laboratories.

12. For the remainder of the semester pay special attention to major areas of change related to:

bipedal walking
stereoscopic vision
grasping hand
brain development
language and speech
hunting
tool manufacture
art and ritual
agriculture
the development of early civilizations