The Primates

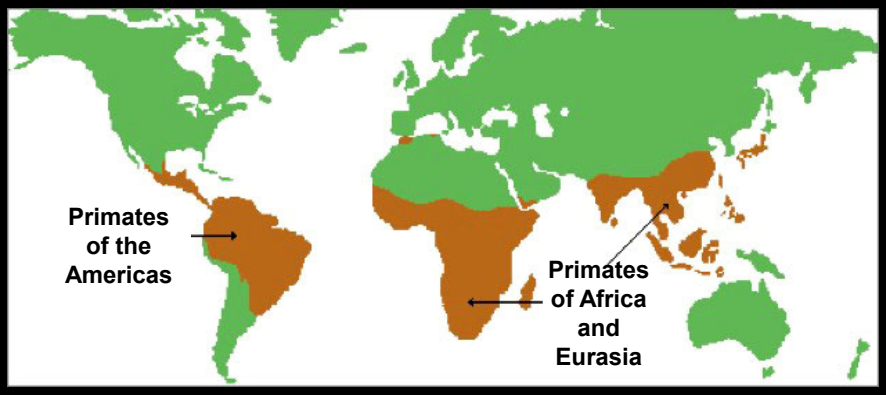
1

Why care about primates?

- You are a primate!
- Other primates are our closest living relatives!
- Humans share many characteristics with other living primates!

2

Where do primates live?



Primates are found in Africa, Asia, South / Central America in tropical and sub-tropical regions (mostly forests).

3

Primate trends

- Emphasis on vision [orbital frontality, stereoscopic vision (depth perception) & color vision]
- De-emphasis on olfaction (smell) by shortening the snout
- Enlargement of cerebral cortex (neocortex) of brain
- Generalized dentition & lack of dietary specialization
- 5 digits (pentadactyly) - ancestral condition for mammals
- Grasping hands & feet, with opposable thumbs & big toes
- Nails, not claws

4

Characteristics of primates

Ancestral traits (symplesiomorphies)

- Five digits in the hand & foot
- "Generalized" postcranial skeleton
- Retention of the clavicle

Derived traits (synapomorphies)

- Postorbital bar
- Nails rather than claws
- Single pair of mammary glands
- Petrosal auditory bulla

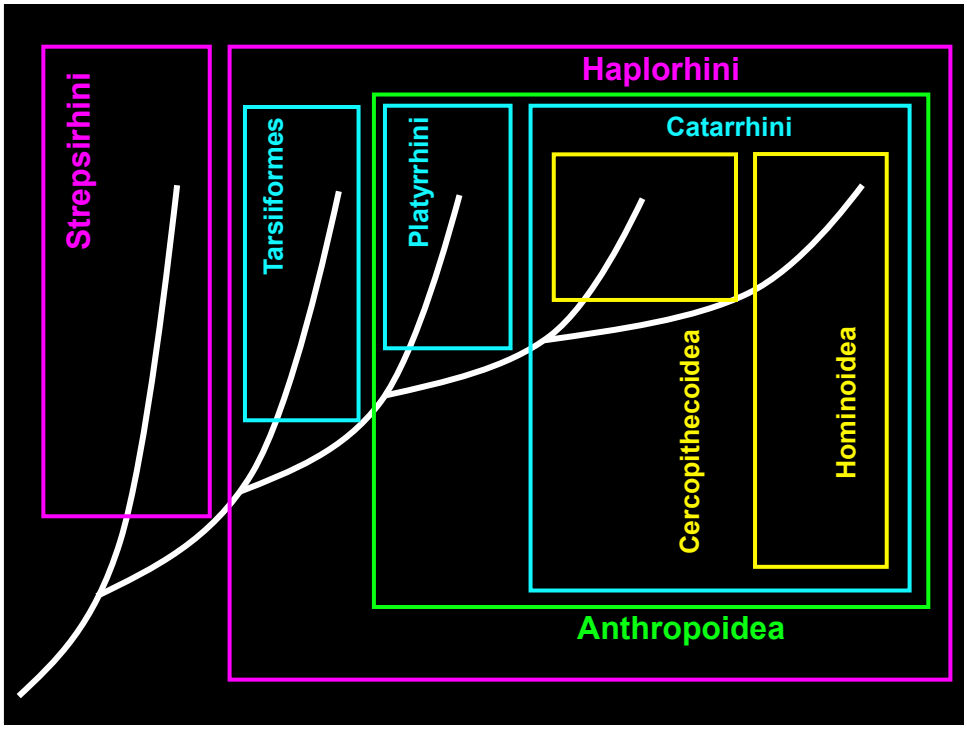
5

ORDER **Primates**

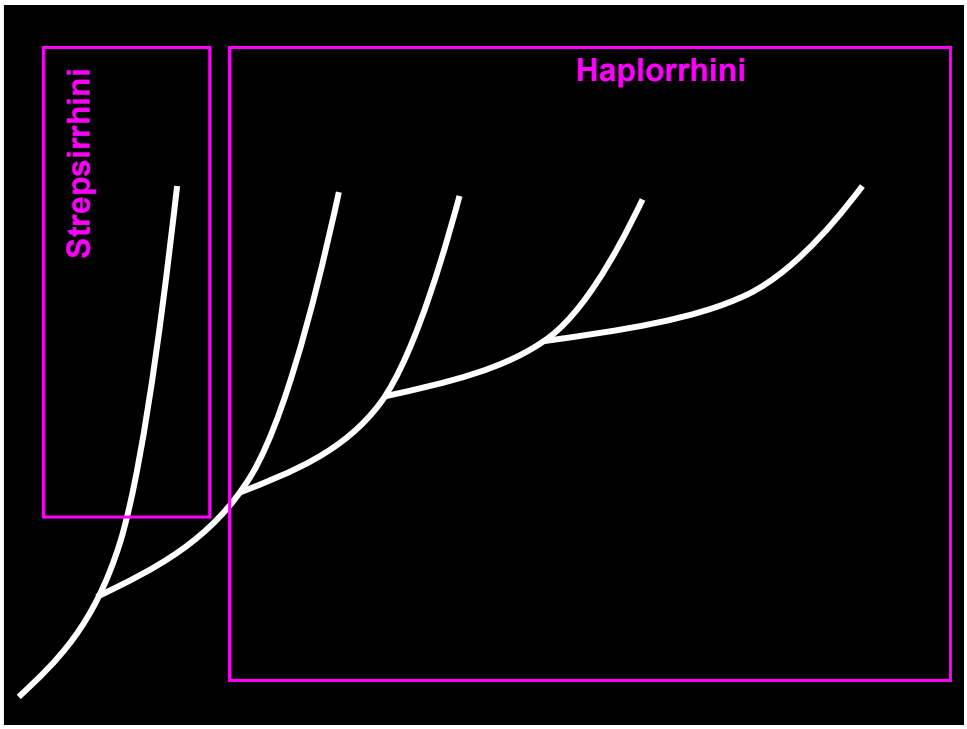
SUBORDER **Strepsirhines** **Haplorhines**

SUPER FAMILY	Lemuroidea	Lorisoidea	Tarsioidea	Ateloidea (New World Monkeys)	Cercopithecoidea (Old World Monkeys)	Hominoidea
FAMILY	**Lemuridae** (True lemurs)	**Lorisidae** (Lorises)	**Tarsiidae** (Tarsier)	**Cebidae** (Capuchins)		**Hylobatidae** (gibbons & siamangs)
	Cheirogalidae (Dwarf lemur)	**Galagonidae** (Galagos)		**Pithecidae** (Sakis)		**Hominidae** (gorillas, chimpanzees bonobos, orangutans & hominins)
	Daubentoniidae (Aye-Aye)			**Atelidae** (Howler & spider monkeys)	SUBFAMILY	
	Indriidae (Indris and sifakas)				**Colobinae** (leaf-eating monkeys)	
					Cercopithecinae (cheek-pouched monkeys)	

6


Strepsirhini
Haplorhini
Tarsiiformes
Platyrrhini
Catarrhini
Cercopithecoidea
Hominoidea
Anthropoidea

7


Strepsirrhini
Haplorrhini

8

Strepsirrhines

- Lemurs (Madagascar)
- Lorises & galagos (tropical Africa & Asia)


Loris


Lemurs


Galago (bush baby)

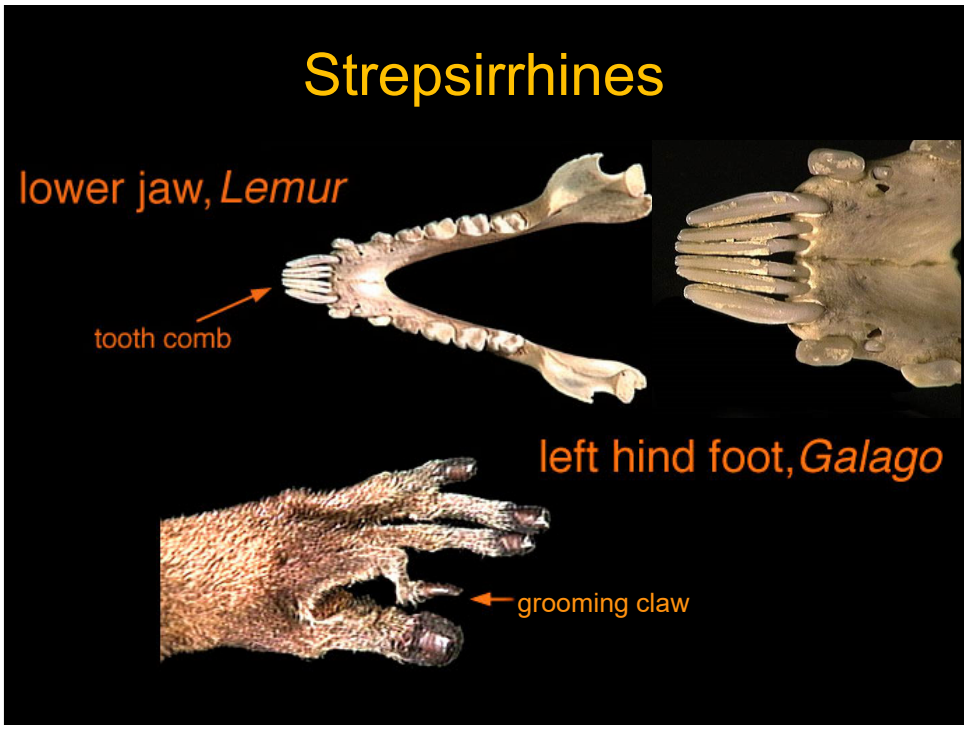
9

Strepsirrhines

- Morphological characteristics
  - Ancestral
    - Naked rhinarium (moist nose), split upper lip
    - Greater emphasis on smell than other primates
    - Ring-like external ear bone
    - Unfused mandible
    - Tapetum lucidum
  - Derived
    - Tooth comb
    - Grooming claw (2nd digit of foot)

10

11


Strepsirrhines
lower jaw, *Lemur*
tooth comb
left hind foot, *Galago*
grooming claw

12

Strepsirrhines

- Behavioral characteristics

– Lemurs
  - Nocturnal or diurnal
  - Solitary & gregarious
  - Arboreal & terrestrial
  - Mainly frugivorous
  - Occupy niches of anthropoid primates

– Lorises & galagos
  - Nocturnal
  - Often solitary
  - Arboreal
  - Feed on fruit, gum & insects

13

Are strepsirrhines primitive?

- Characters can be primitive (aka ancestral) or derived for particular taxa.
- Taxa are NEVER primitive!!! All living taxa have evolved to suit their particular environment, and are just as evolved as all other living taxa.

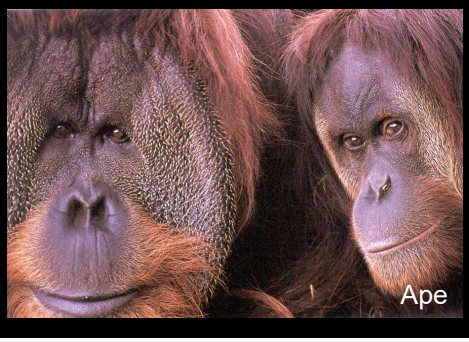
14

Haplorrhines

- Tarsiers (South East Asia)
- Monkeys (Central America, South America, Africa, & Asia)
- Apes (Africa, Asia & humans are worldwide)


Tarsier


Monkey


Ape

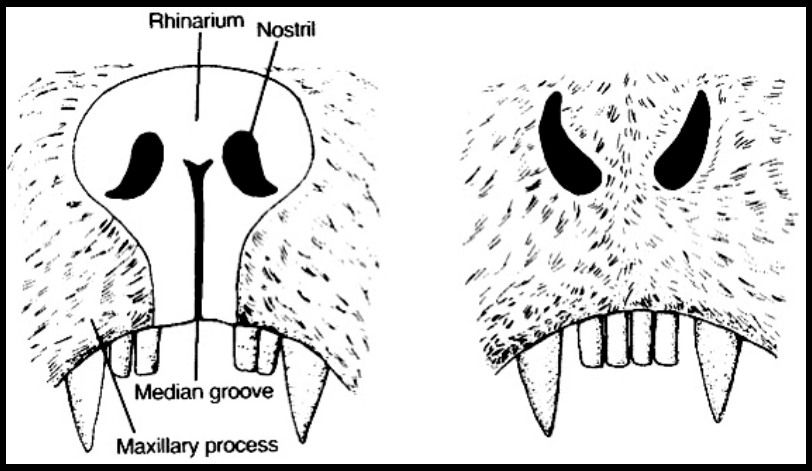
15

Haplorhines

- Morphological characteristics
  - Larger bodies & brains than strepsirrhines
  - Greater orbital frontality
  - Cranial blood flow through promontory artery
  - No naked rhinarium (continuous upper lip)
  - No tapetum lucidum
- Behavioral characteristics
  - More complex behaviors & social relationships

16

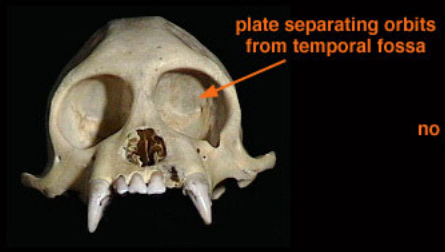
Strepsirrhines vs. haplorrhines



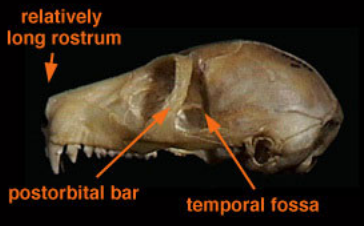
17

Primates

Haplorhini



Strepsirhini



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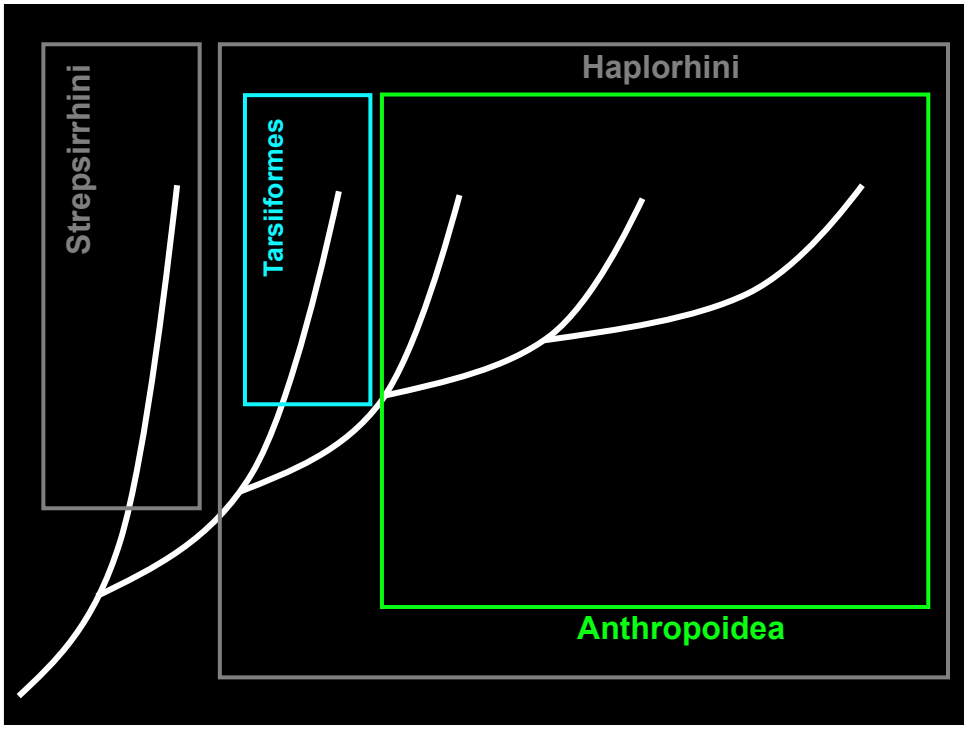
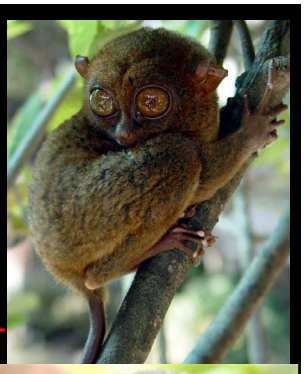


19

Tarsiiformes (tarsiers)



- Morphological characteristics
  - Small bodied
  - Unfused mandible
  - Grooming claw

  } strepsirrhine-like

  - No tooth comb
  - Partial postorbital closure
  - No tapetum lucidum
  - Dry rhinarium

  } haplorhine-like

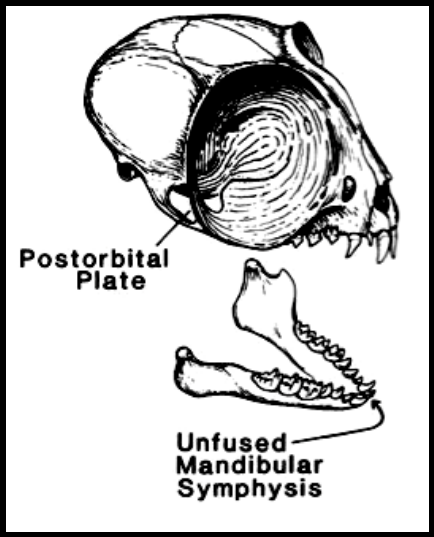
- Behavioral characteristics
  - Nocturnal
  - Arboreal
  - Diet of mainly insects & small vertebrates
  - Some monogamous, some multi-female social groups

20

Tarsiers

21

Tarsiers



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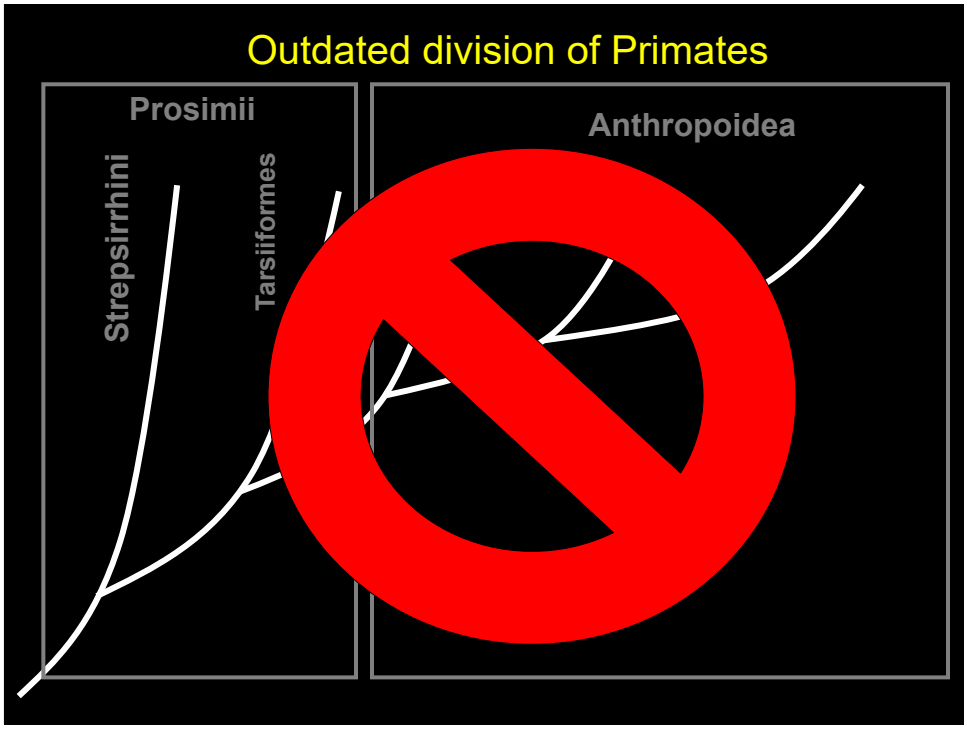
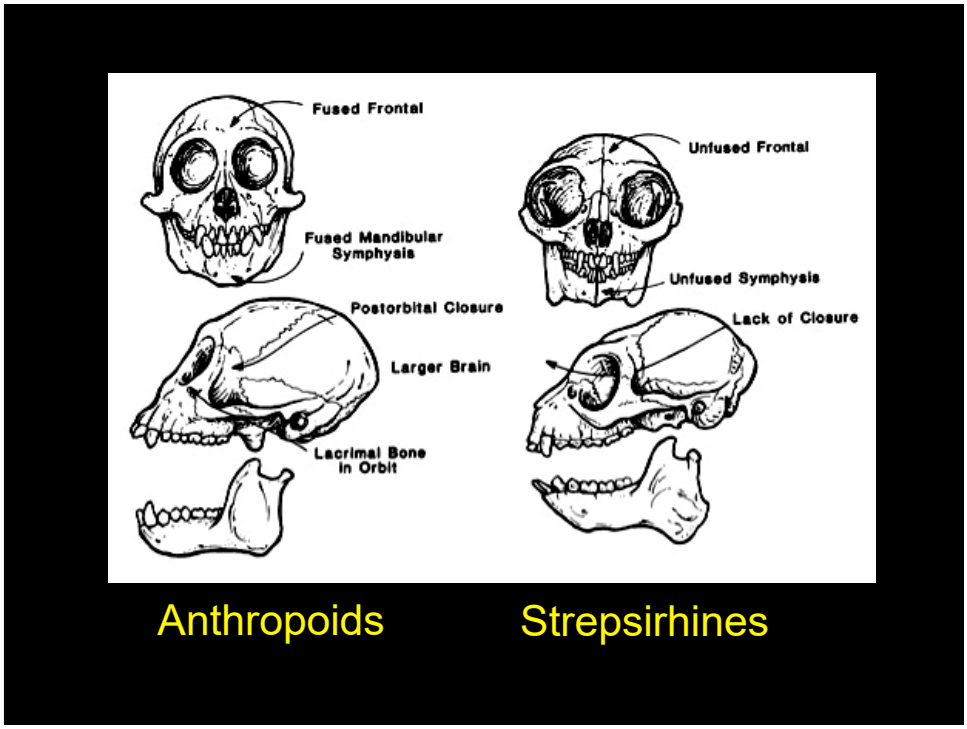


23

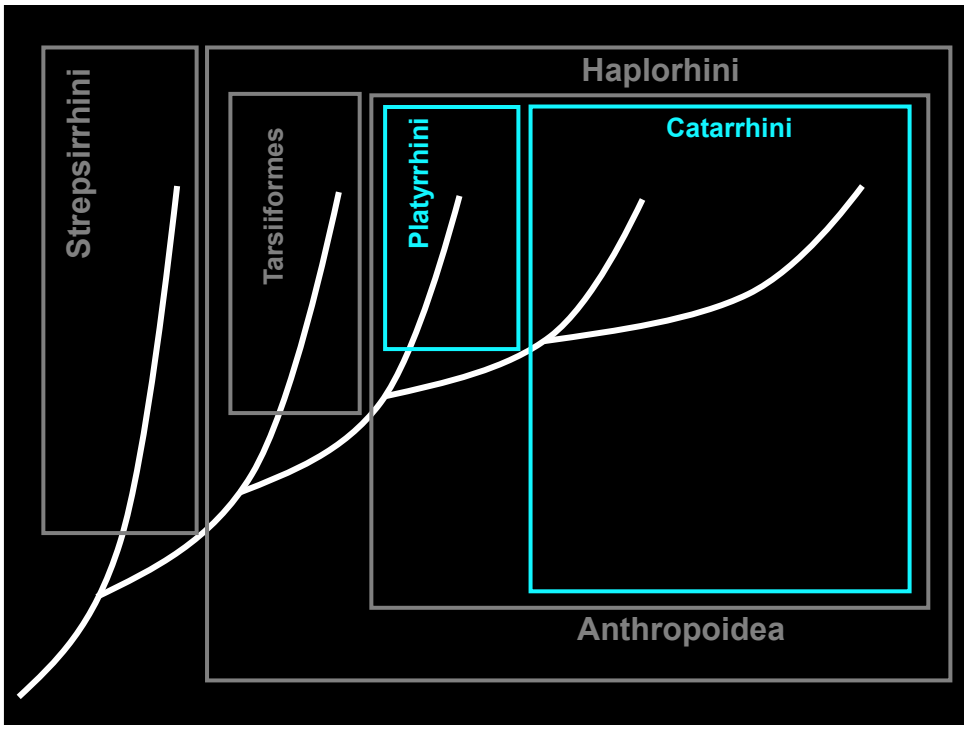
Anthropoidea (monkeys & apes)

- Morphological characteristics
  - Larger bodies & brains than strepsirrhines & tarsiers
  - Greater orbital frontality & degree of color vision
  - Complete postorbital closure
  - Fused mandible
  - Fused frontal bone
- Behavioral characteristics
  - Complex behaviors & social relationships

24


Fused Frontal
Fused Mandibular Symphysis
Postorbital Closure
Larger Brain
Lacrimal Bone in Orbit
Unfused Frontal
Unfused Symphysis
Lack of Closure
Anthropoids
Strepsirhines

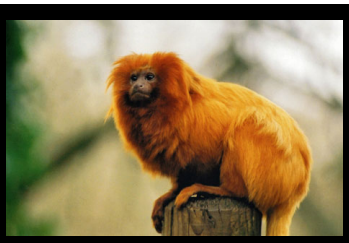
25

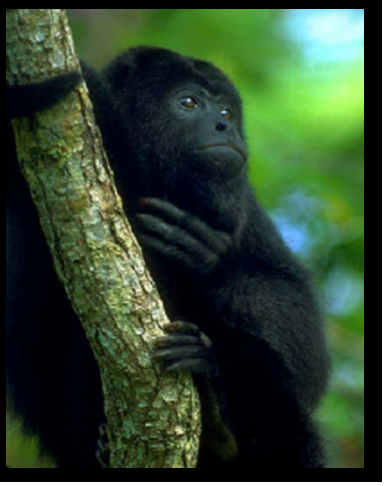

Strepsirrhini
Haplorhini
Tarsiiformes
Platyrrhini
Catarrhini
Anthropoidea

26

Platyrrhini

- Monkeys of the Americas
  - Cebidae
  - Pithecidae
  - Atelidae





27

Platyrrhini (platyrrhines)

- Morphological characteristics
  - Small bodied (a few ounces to 25 lbs)
  - Flat nose with sideways facing nostrils
  - 3 premolars (ancestral) – dental formula 2.1.3.3
  - Ring-like ear (ancestral)
  - Some have prehensile tails (evolved twice!)

28

Platyrrhines (Monkeys of the Americas)

- Behavioral characteristics
  - All diurnal except for *Aotus* (owl monkey)
  - Arboreal (almost exclusively)
  - Social systems & diet vary between species
  - Often referred to as "New World monkeys"

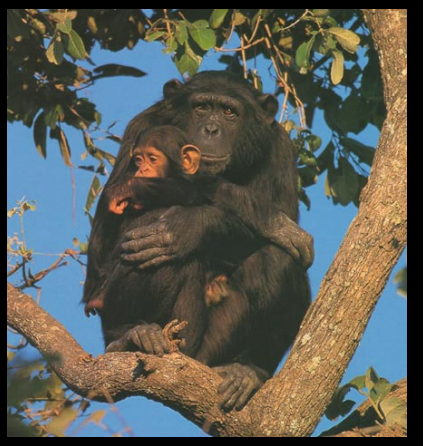
29

Platyrrhines

- Smaller-bodied platyrrhines (marmosets & tamarins)
  - some monogamous, some polyandrous
  - twins
  - eat gum, lack 3rd molar (2.1.3.2)
- Larger-bodied platyrrhines
  - multimale-multifemale or one male, multifemale social groups
  - frugivores (fruit, smaller-bodied) & folivores (leaves, larger-bodied)

30

Catarrhini
Monkeys of Africa and Eurasia & apes (including humans!)



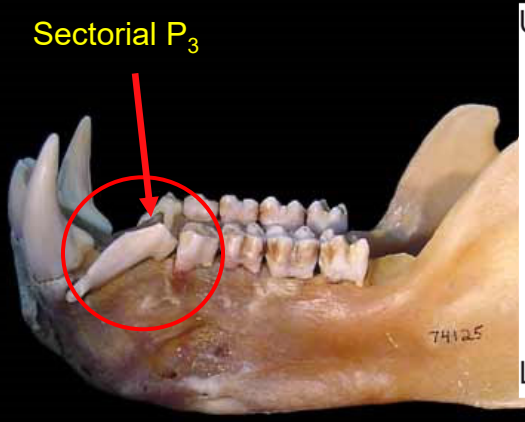
31

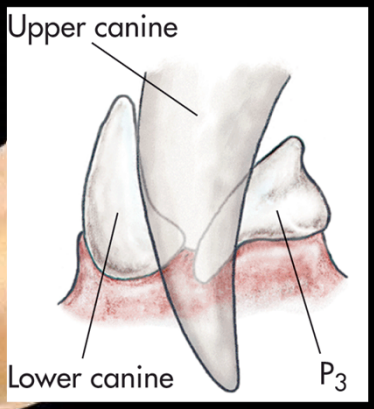
Catarrhini (catarrhines)

- Morphological characteristics
  - Downward facing nostrils
  - 2 premolars (2.1.2.3)
  - Tubular ear
- Behavioral characteristics
  - All diurnal
  - Arboreal or terrestrial
  - Social systems & diet vary between species

32

Canine honing complex



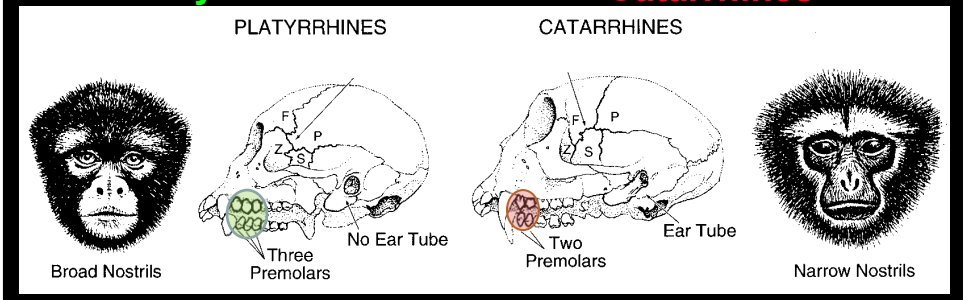


33

Haplorhines

Monkeys of the Americas
Platyrrhines

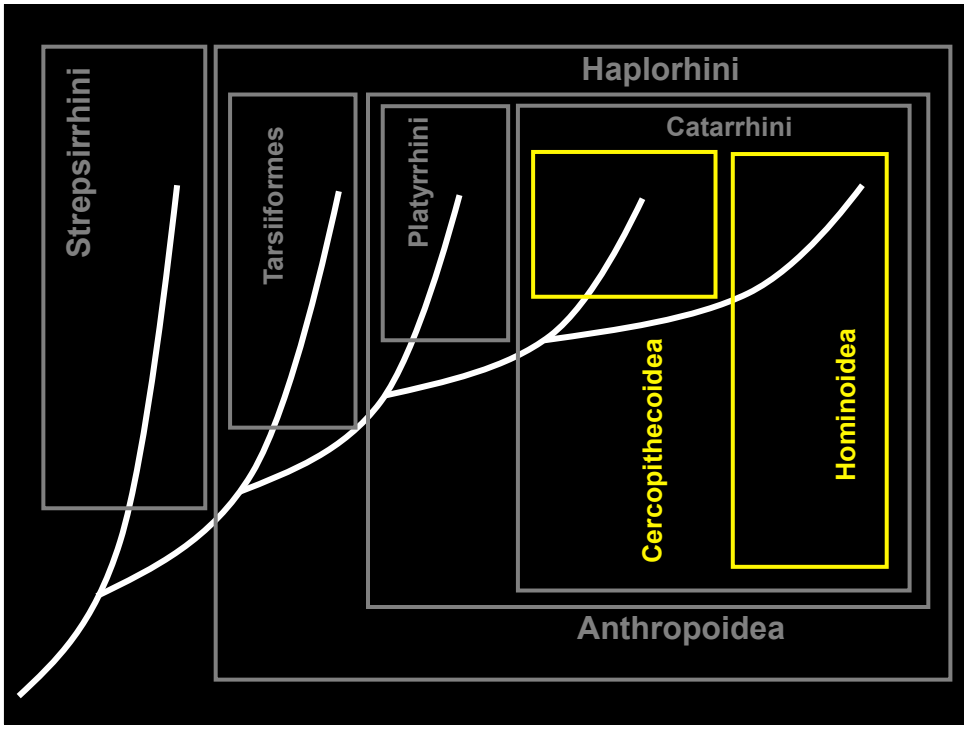
Monkeys of Africa & Eurasia + apes
Catarrhines



Dental Formula
2.1.**3**.3.

Dental Formula
2.1.**2**.3.

34



35

Cercopithecoidea

- Monkeys of Africa and Eurasia (often referred to as Old World monkeys)
- Two major groups:

Colobinae
(Colobines, or leaf-eating monkeys)

Cercopithecinae
(Cercopithecines, or cheek-pouched monkeys)

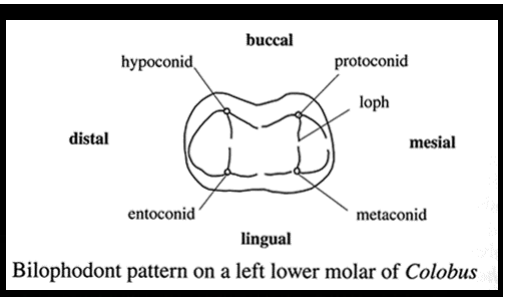
36

Cercopithecoids

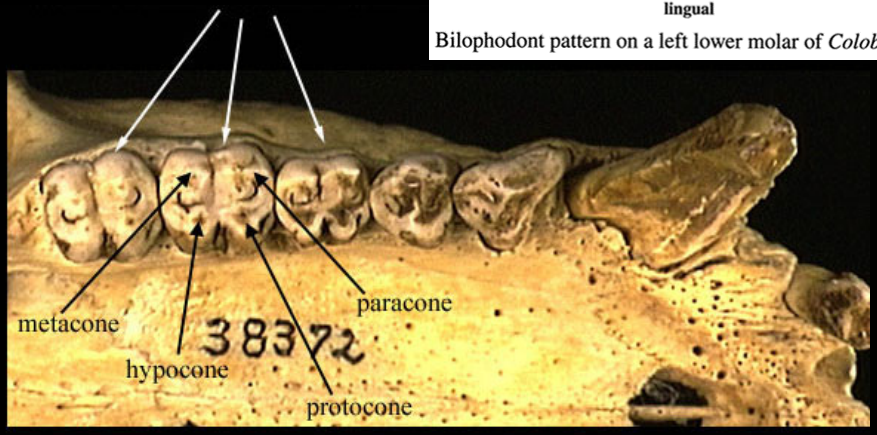
- Morphological characteristics
  - Relatively larger body size than platyrrhines & strepsirrhines
  - Tail (retained ancestral feature)
  - Ischial callosities (butt pads) Derived
  - Bilophodont molars (two ridges) Derived
- Behavioral characteristics
  - Generally social animals
  - Diurnal
  - Both arboreal & terrestrial

37

Bilophodont molars



Bilophodont pattern on a left lower molar of *Colobus*



38

Cercopithecines
aka cheek-pouched monkeys

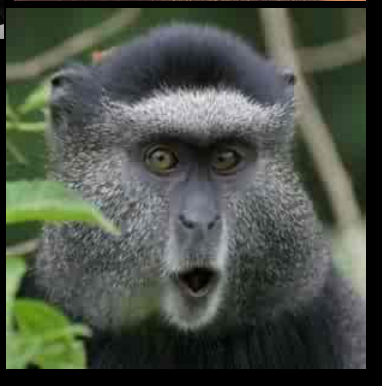
- Morphological characteristics
  - Cheek pouches (food storage)
  - Smaller interorbital distance (space between the eyes)
- Behavioral characteristics
  - Diet & social systems vary
  - Both arboreal & terrestrial

39

Cercopithecines







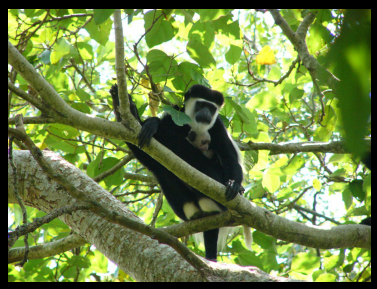
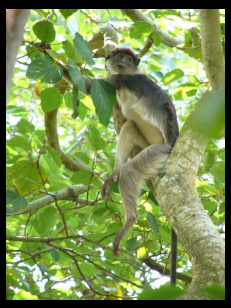
40

Colobines
aka leaf-eating monkeys

- Morphological characteristics
  - Wider interorbital distance
  - Sacculated stomach
  - Reduced or absent thumbs
- Behavioral characteristics
  - Mostly arboreal
  - Mostly folivores

41

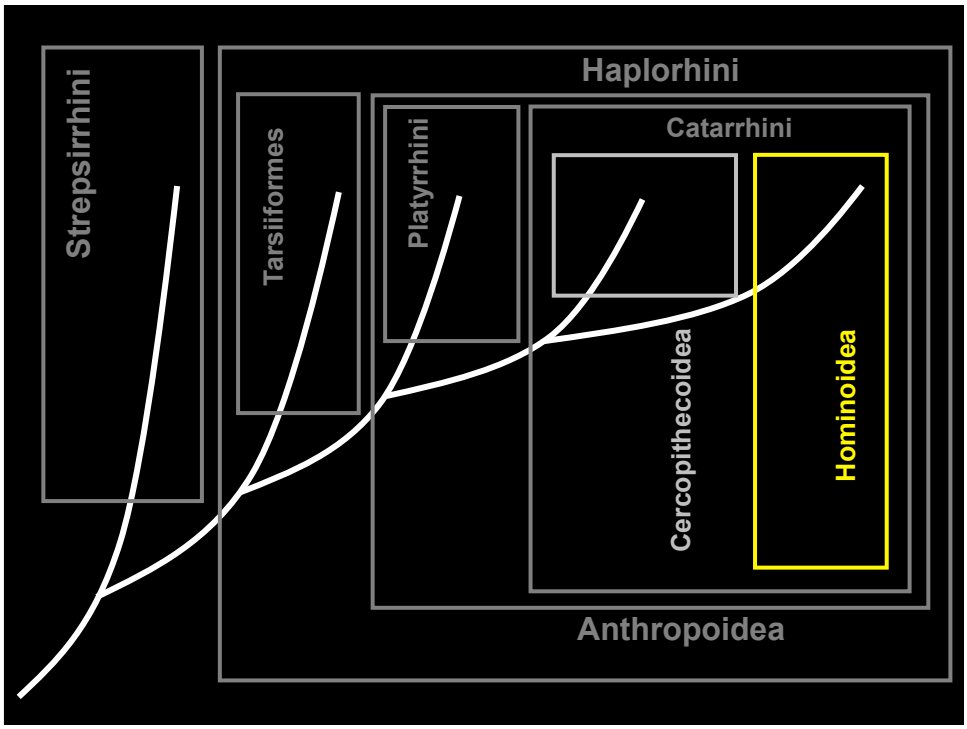
African colobines

42


Asian colobines

43


Strepsirrhini
Haplorhini
Tarsiiformes
Platyrrhini
Catarrhini
Cercopithecoidea
Hominoidea
Anthropoidea

44

Hominoidea (hominoids)

- All apes, including humans!
  - Gibbons & siamangs (*Hylobates, Symphalangus, Nomascus)*
  - Orangutans (*Pongo*)
  - Gorillas (*Gorilla*)
  - Chimpanzees & bonobos (*Pan*)
  - Humans (*Homo sapiens*)

45

Hominoids (apes)

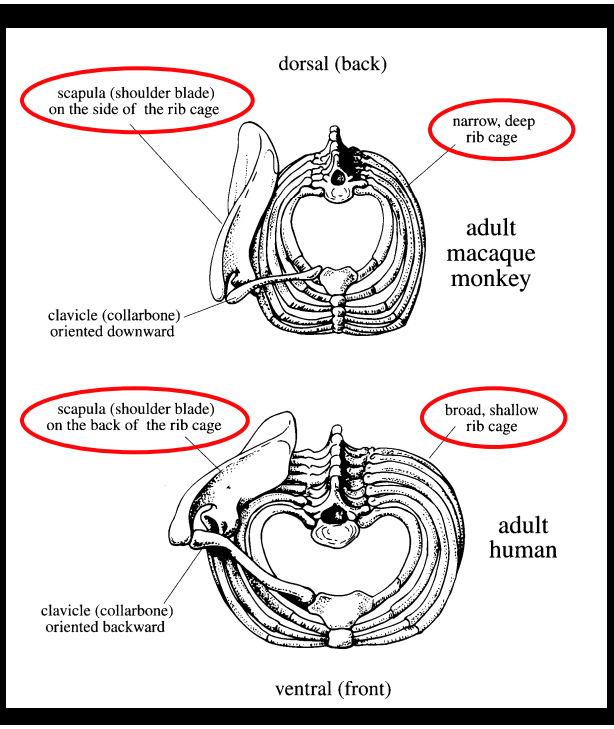
cercopithecoids

- Lateral scapula
- Narrow, deep rib cage
- Long lumbar region
- Smaller brain
- Bilophodont molars (derived)
- Tail (ancestral)

hominoids

- Dorsal scapula
- Broad, shallow rib cage
- Short lumbar region
- Larger brain
- Y-5 molars (ancestral)
- No tail (derived)

46



Monkeys of Africa and Eurasia (cercopithecoid)

Apes (hominoids)

47

Monkeys of Africa and Eurasia
Bilophodont molars - derived

Non-human apes
Y-5 lower molars - ancestral

Humans
Y-5 lower molars - ancestral

48

Life history variables

- Primates & especially apes:
  - Long life spans
  - Small litter sizes
  - Old age at 1st reproduction
  - Long time between births
  - Long infant dependency

} Long time to learn complex social behaviors

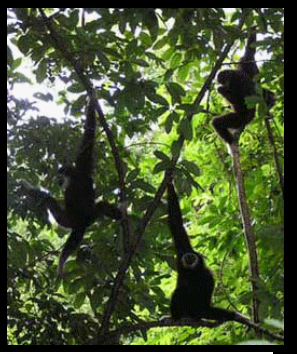
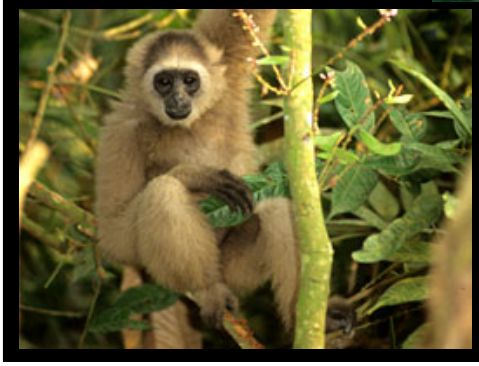
49

Apes: gibbons & siamangs

- Found in Asian tropical & subtropical forests
- Genera *Symphalangus* and *Hylobates*
- Smallest of the apes
- Almost 100% arboreal
- Brachiators (long arms, elongated fingers, shortened thumbs & specialized shoulder)
- Monogamous social groups
- Mainly frugivorous (fruit-eating)
- One of the most vocal primates (throat sacs)
- Retain ischial callosities (ancestral)

50

Apes: gibbons & siamangs


51

Apes: orangutans

- Found in the rain forests of Indonesian islands
- Three species (*Pongo pygmaeus, P. abelii, P. tapanuliensis)* and multiple subspecies
- Described as sexually dimorphic in body size, but only flanged males much larger than females (but not unflanged males)
- Highly arboreal
- Suspensory, "quadrumanous" (with long arms & very flexible joints for hanging behaviors)
- Frugivorous
- Noyau (solitary) social structure

52

Apes: orangutans

53

Apes: gorillas

- Found in highly fragmented populations in equatorial Africa
- Two species (*Gorilla gorilla, G. beringei*), each with two subspecies
- Largest living primate
- Highly sexually dimorphic in body size
- Most terrestrial of the apes, knuckle-walkers
- Folivores (although some populations eat a lot of fruit)
- Mostly one male groups with multiple females

54

Apes: gorillas

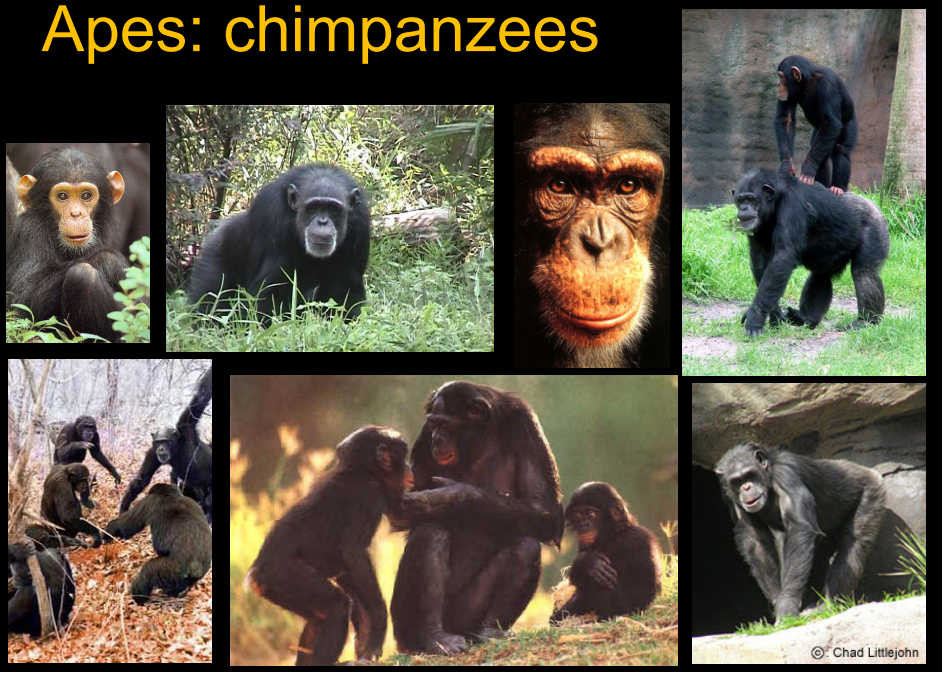
55

Apes: common chimpanzees

- Found across equatorial Africa, from lowland rain forest to open grasslands
- *Pan troglodytes* (w/ three subspecies)
- Medium sized
- Terrestrial (knuckle-walking) & arboreal
- Mainly frugivorous (but diverse diet, including other primates!)
- Multi-male, multi-female social groups
  - fission-fusion structure

56

Apes: chimpanzees

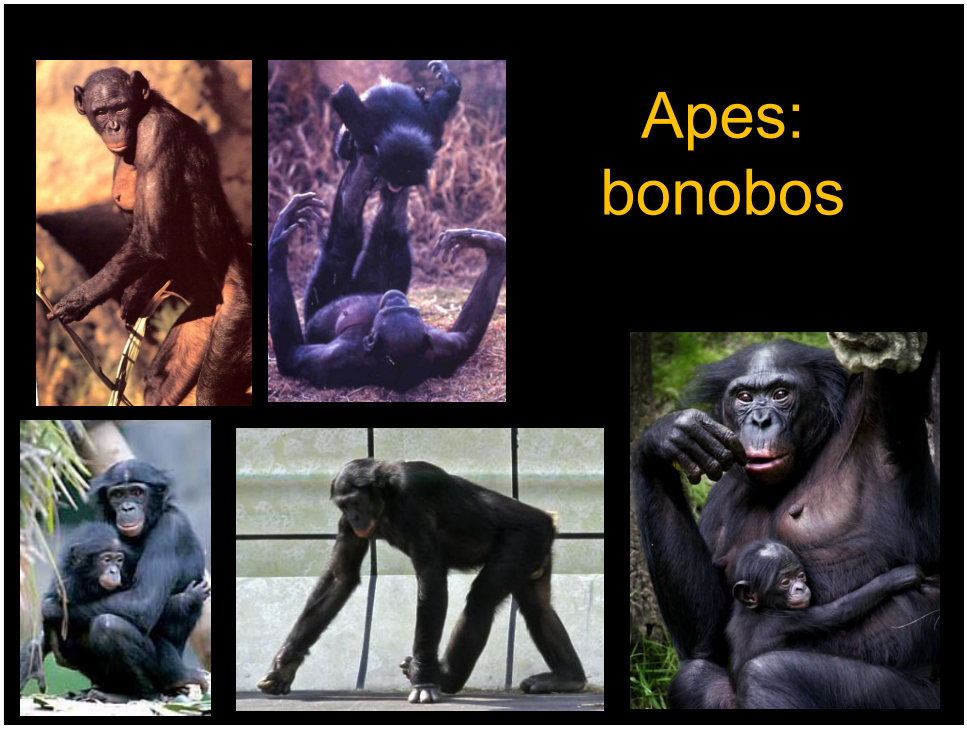


57

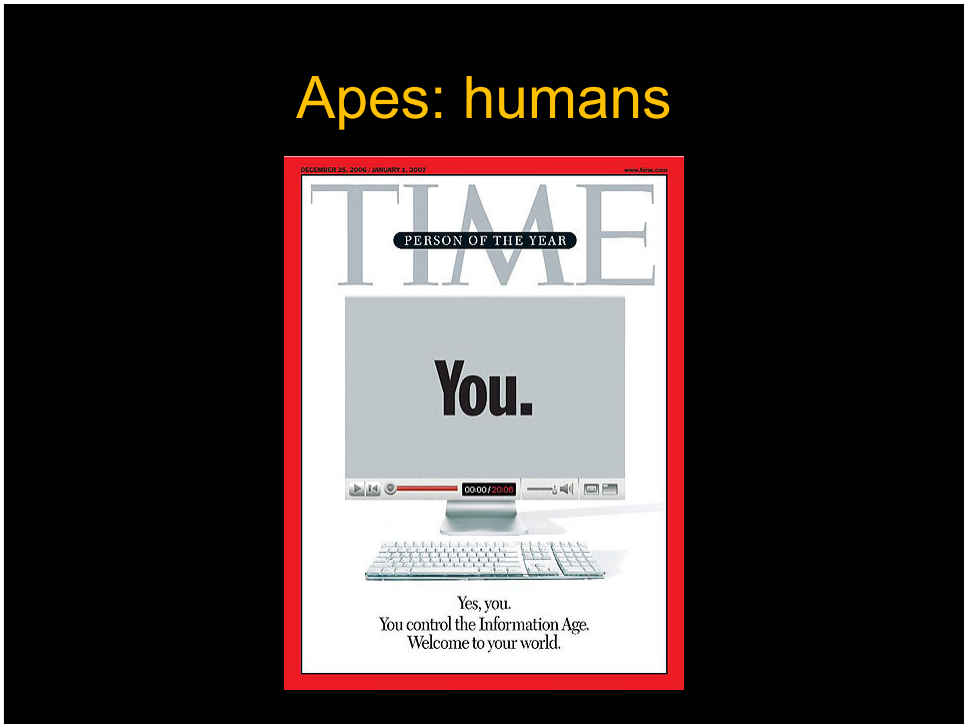
Apes: bonobos

- Also called “pygmy chimpanzees”, *P. paniscus*
- Found in the Democratic Republic of the Congo (DRC, central Africa) in lowland rain forest
- Lower degree of sexual size dimorphism
- Frugivorous (although also rely on leaves)
- Multi-male, multi-female social groups
- Females forge strong bonds with one another
- “Hypersexual” behavior

58


Apes:
bonobos

59


Apes: humans
TIME
PERSON OF THE YEAR
You.
Yes, you.
You control the Information Age.
Welcome to your world.

60