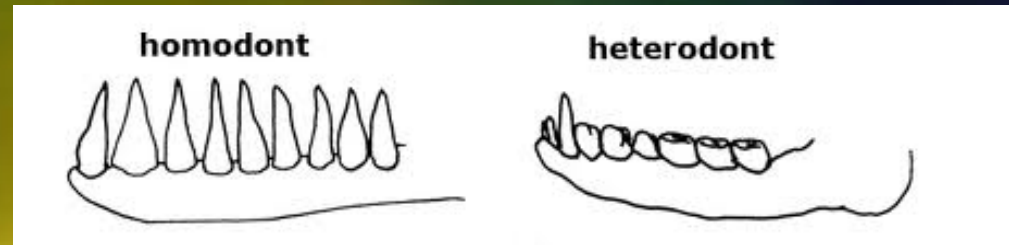


# Comparative Osteology and Biological Classification

# Classification

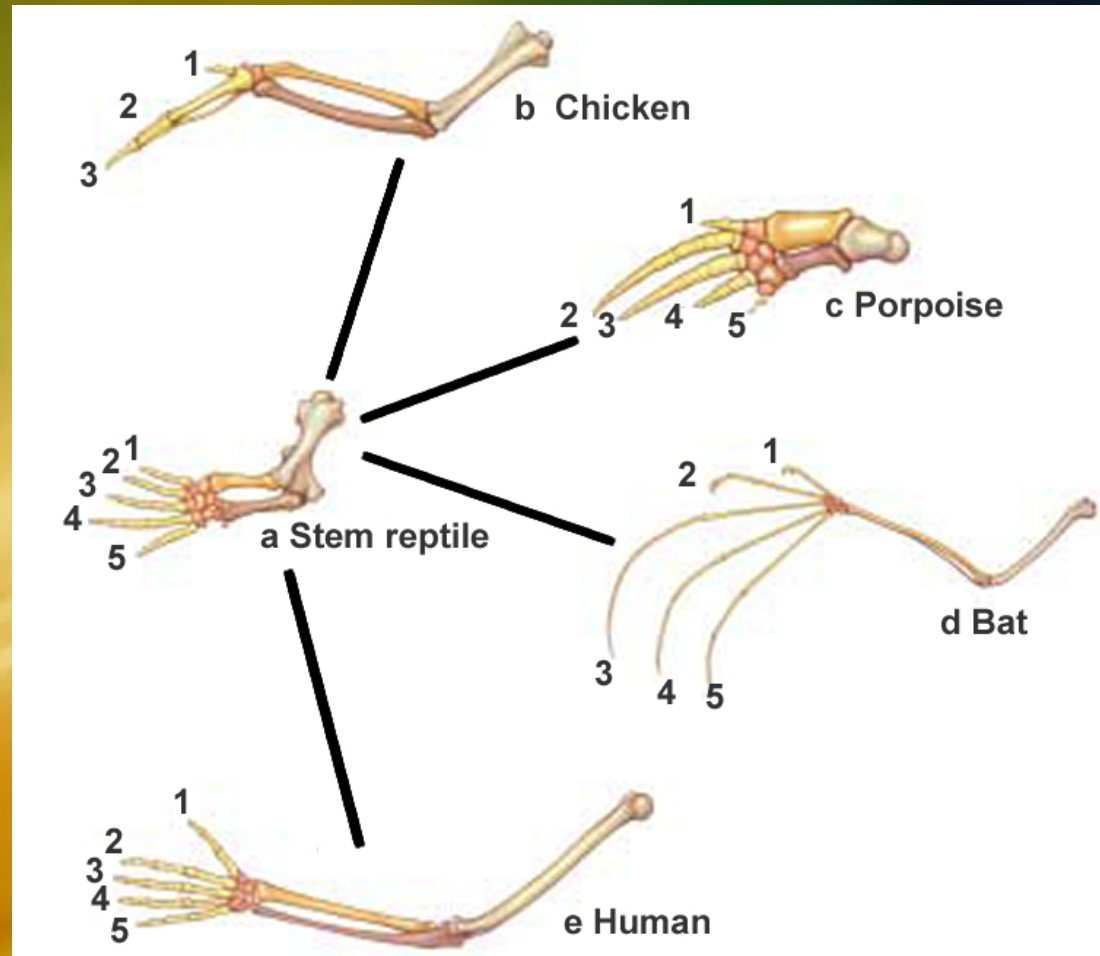


- The field that specializes in establishing the rules of classification is called **taxonomy**.
  - Organisms are classified on the basis of physical similarities.
    - Example: Dentition
- Example - human classification
  - Kingdom: **Animalia**
  - Phyla: **Chordata**
  - Class: **Mammalia**

# Evolutionary Relationships

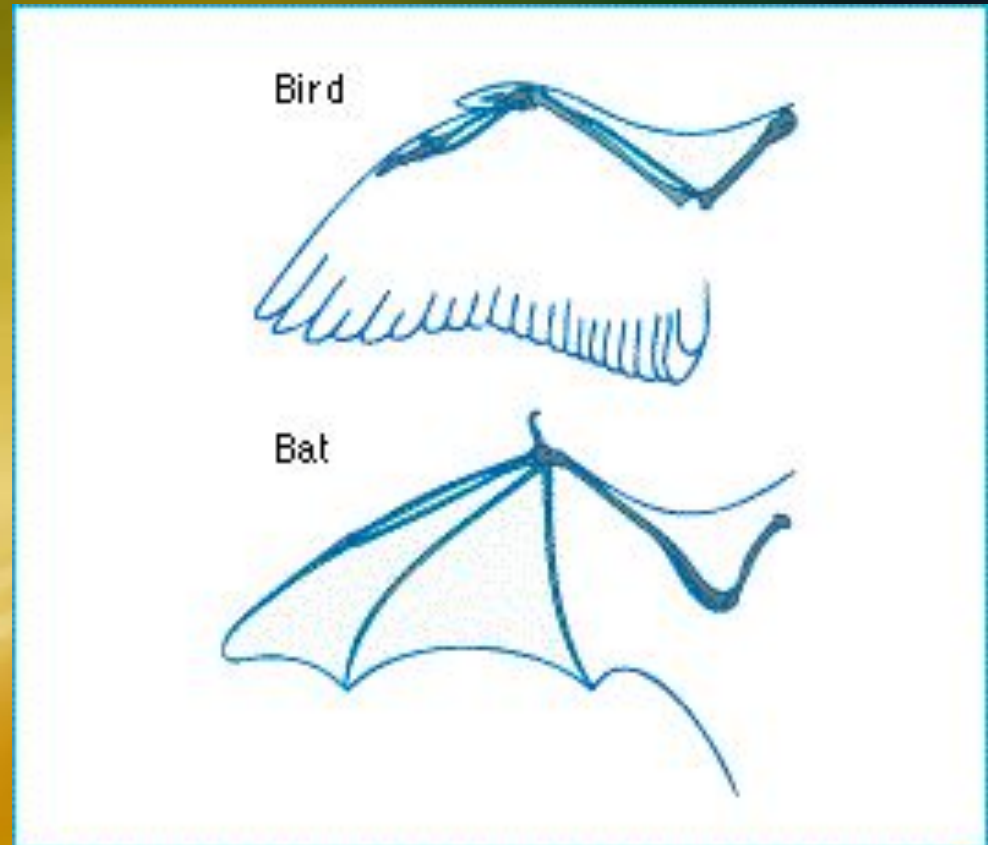
- **Homologies**

- Physical similarities based on descent from a common ancestor.



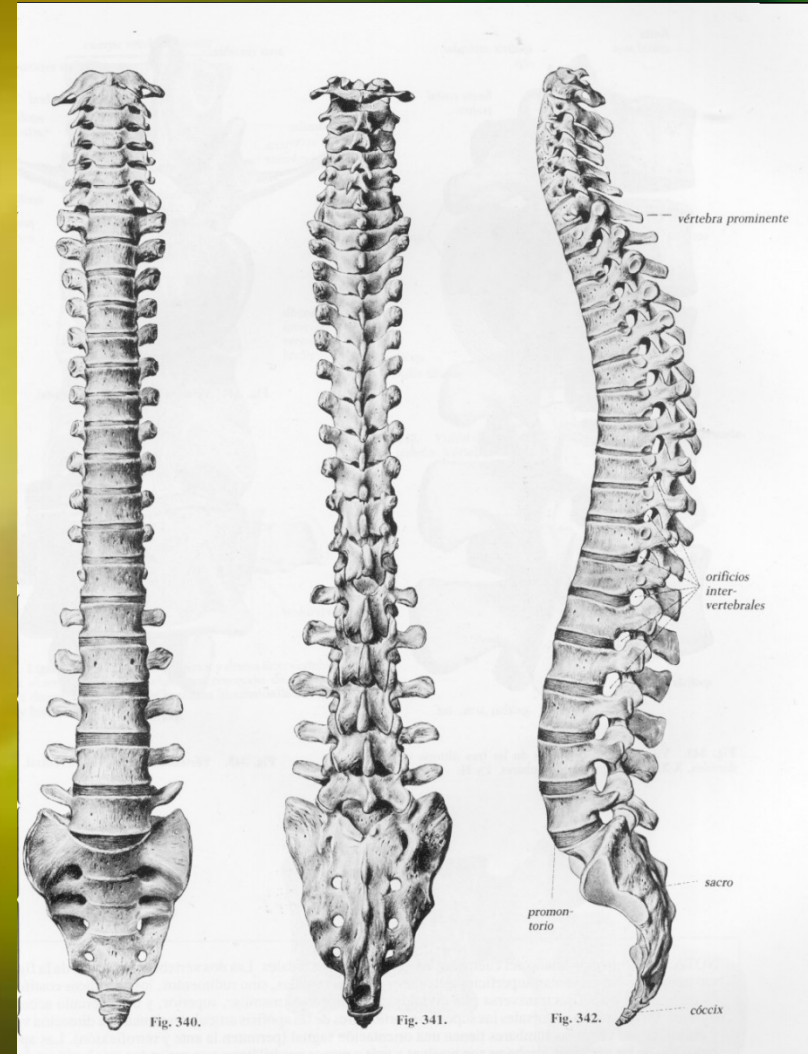
- ***Analogies***

- Physical similarities based on common function, with no assumed common evolutionary descent.

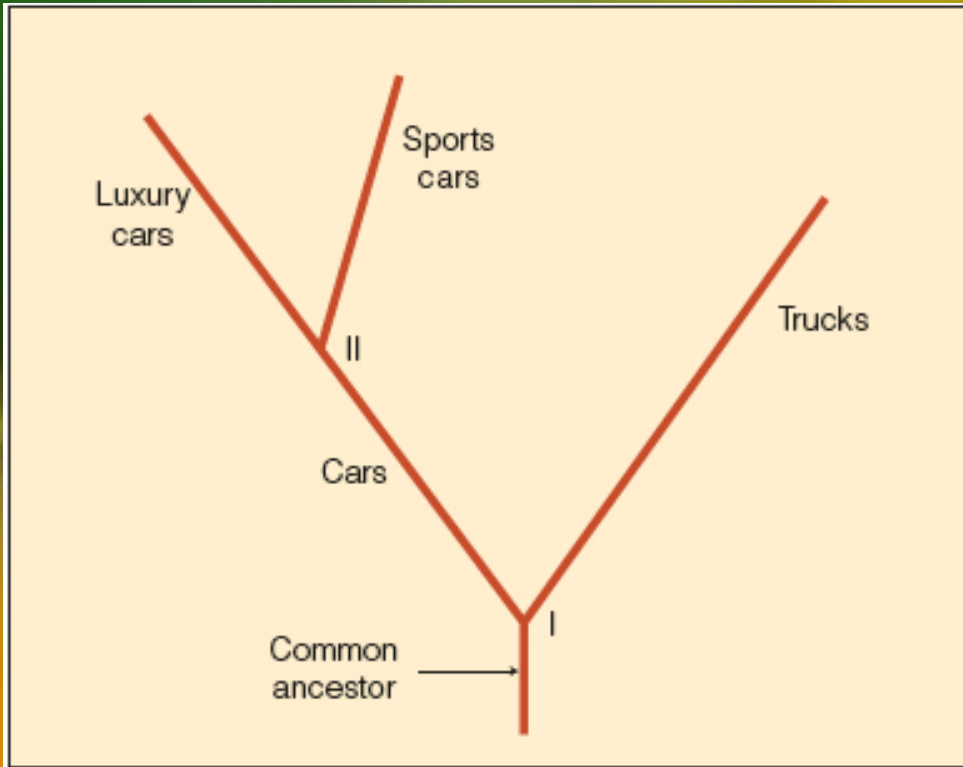


# Ancestral and Modified Features

- Ancestral (primitive) features
  - Refers to features inherited by a group of organisms from a remote ancestor
- Derived features
  - Refers to features that are modified from the ancestral environmental



# Evolutionary “Trees”



- Phylogeny vs. Cladogram
- Example: Development of Passenger Vehicles
  - Automobiles
  - Population divergence
    - Cars vs. Trucks
    - Car “divergence”
      - Luxury vs. Sport

ORDER

Primates

SUBORDER

Prosimii\*  
(all prosimians: lemurs,  
lorises, galagos, and tarsiers)

Anthropoidea  
(monkeys, apes,  
and humans)

INFRAORDER

Lemuriformes  
(all lemurs)

Lorisiformes  
(all lorises  
and galagos)

Tarsiiformes\*  
(the tarsiers)

Platyrrhini  
(all New World  
monkeys)

Catarrhini  
(all Old World monkeys,  
apes, and humans)

SUPERFAMILY

Ceboidea  
(all New World  
monkeys)

Cercopithecoidea  
(all Old World  
monkeys)

Hominoidea  
(apes and humans)

FAMILY

Callitrichidae†  
(marmosets and  
tamarins)

Atelidae  
(howlers, spider  
monkeys, and  
muriquis)

Cebidae  
(squirrel  
monkeys,  
capuchins,  
owl monkeys, etc.)

Cercopithecidae  
(all Old World  
monkeys)

Hylobatidae  
(gibbons and  
siamangs)

Pongidae  
(the great apes)

Hominidae  
(humans)

SUBFAMILY

Cercopithecinae  
(baboons, macaques,  
guenons, etc.)

Colobinae  
(colobus species,  
langurs)

GENUS

*Pongo*

*Gorilla*

*Pan*

*Homo*

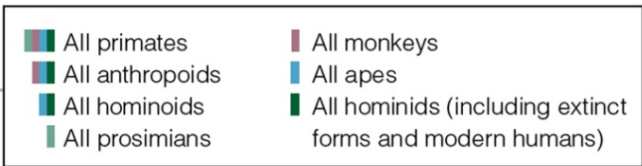
SPECIES

*pygmaeus*  
(orangutans)  
(2 subspecies)

*gorilla*  
(3 subspecies)

*troglodytes*  
(chimpanzees)  
(3 subspecies)  
*paniscus*  
(bonobos)

*sapiens*



# Primate Characteristics

- Fur (body hair)
- Long gestation followed by live birth
- Homeothermy
  - the ability to maintain a constant body temperature
- Increased brain size
  - Capacity for learning and behavioral flexibility.





# EVIDENCE FROM TEETH AND SKULL

- **Agnathans:** first vertebrates, had no teeth or jaws
- Because we're mammals, we have **heterodont** teeth
- Form of teeth reflects function of animal's diet
- Teeth are most common fossil found and tell:
  - Age
  - Sex
  - Health
  - Mating systems
  - Behaviors
  - Evolutionary relationships
  - Diet

# Physical Features of Primates

- Types of Teeth

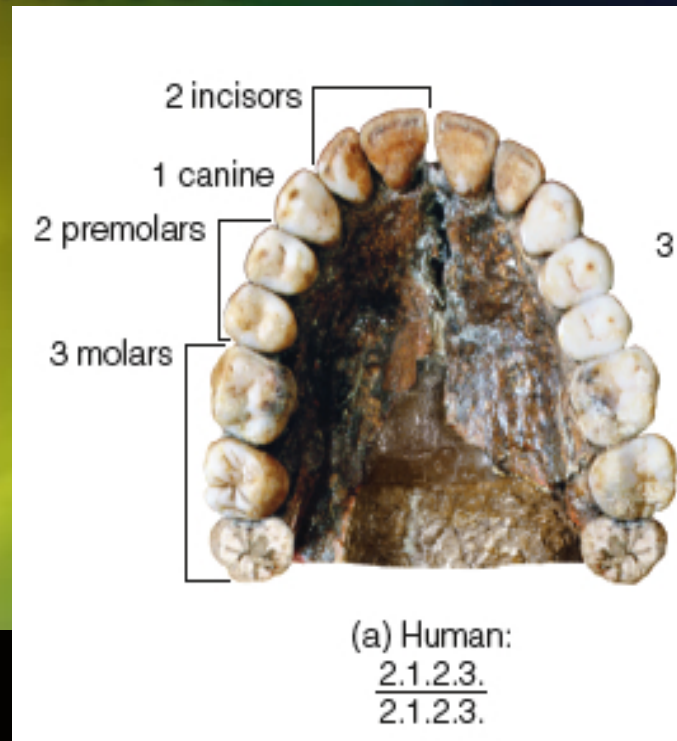
- Incisor, canine, premolar, molar

- Dental Arcade

- V, U or Parabolic Shape

- Dental Formula

- ¼ of mouth
- Count what kinds of teeth
- Upper Jaw  
Lower Jaw



# TOOTH FUNCTION

- For mechanical digestion, there are 4 types:
  - Puncture/piercing (insects)
    - Small, sharp, needle-like
  - Shearing (leaves)
    - One side of molars is higher and sharper than the other
  - Crushing/grinding (fruit/omnivore)
    - Rounded, worn-down cusps
  - Tearing (meat)
    - Interlocking triangles

# EVIDENCE FROM THE POSTCRANIAL SKELETON

- If we know bones, we can determine size, shape, muscle attachment, etc.
- Form is related to function through **posture and locomotion**
- Different features if **arboreal or terrestrial**
- Or if **quadrupedal or bipedal**

# QUADRUPED VS. BIPED

- **Arboreal quadrupeds** have mobile joints and fewer bony restrictions than terrestrial animals
  - Center of gravity is lower
  - Shorter limbs relative to trunk
  - Legs are longer
- **Terrestrial quadrupeds** have more stable joints and limited range of motion
  - Center of gravity is a bit higher
  - All limbs are similar length
  - “Table-top” back



# QUADRUPED VS. BIPED

- **Brachiators** have very long, strong arms and long, hooked fingers

- Swing through trees
- Gibbons



- **Knuckle-Walkers** have longer arms and an angled back.

- They are able to walk on 2 legs some times
- Great apes



# QUADRUPED VS. BIPED

- **Vertical Clinging and Leaping (VCL)**
- Used by Prosimian/Strepsirrhines
- Cling to tree, twist and leap, and land on another tree



# QUADRUPED VS. BIPED

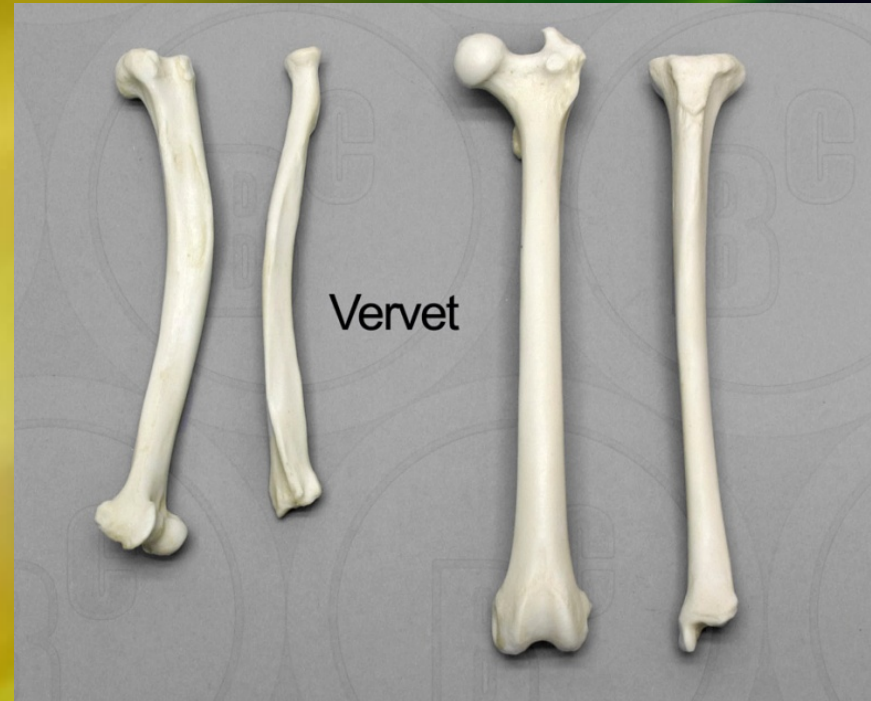
- **Bipeds** have stable joints with ball-and-socket joints for some motion
  - Center of gravity is low, by pelvis
  - Legs are very long
  - Spine has double S curve





# Locomotion

- Type of locomotion can be determined by the anatomy
  - Look at Humerus, Radius, Tibia, Femur



# Example: The Intermembral Index

- *What is it?* **Forelimb/hindlimb x 100**
- *What does it tell us?*



Terrestrial  
Quadruped

Aboreal  
Quadruped

Clingers/  
Leapers

Brachiation

Biped

# LAB

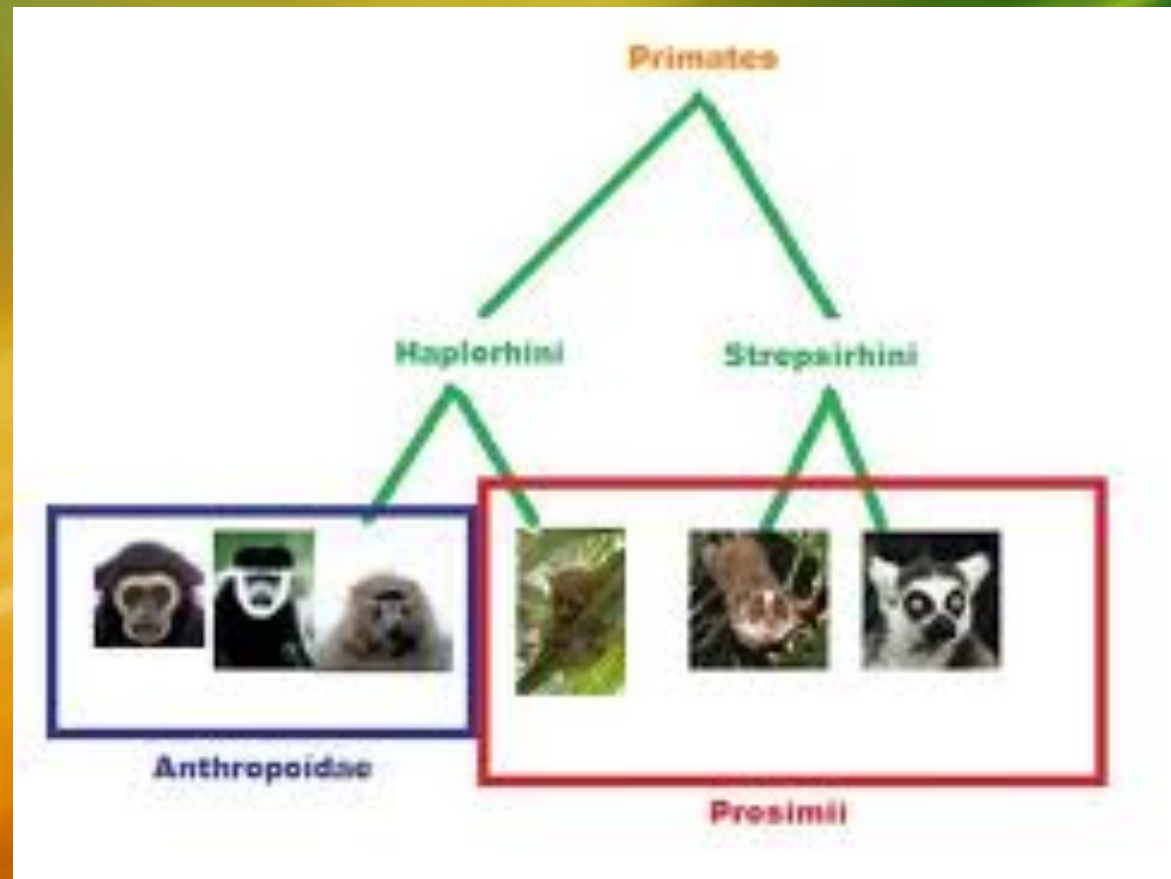
- Lab 9.1 #1, use page 223
- Do lab 9.2 #1-3
- use table 9.1 on page 226:
- It shows different bones (femur, humerus, scapula and ulna) and how they differ in arboreal and terrestrial animals
- Self-test 9.1
- One Step Further

# Zoo Day Saturday.....

- Don't forget to give me cash if you are rolling
- Today, we dig into the different kinds of Primate and do Zoo prep

# Primate Classification: Page 245-246

- PROSIMIAN VS. ANTHROPOID
  - *STREPSIRHINE VS. HAPLORHINE*

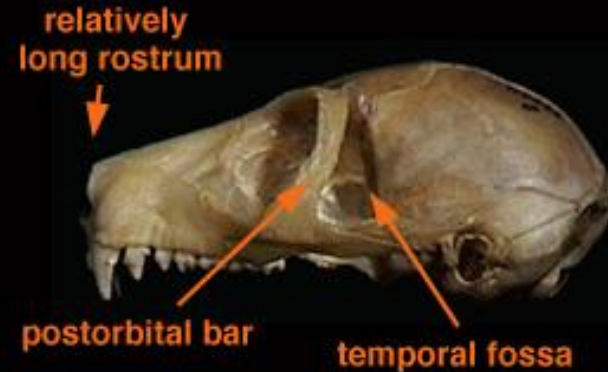


# Primates

## Haplorhini



## Strepsirhini



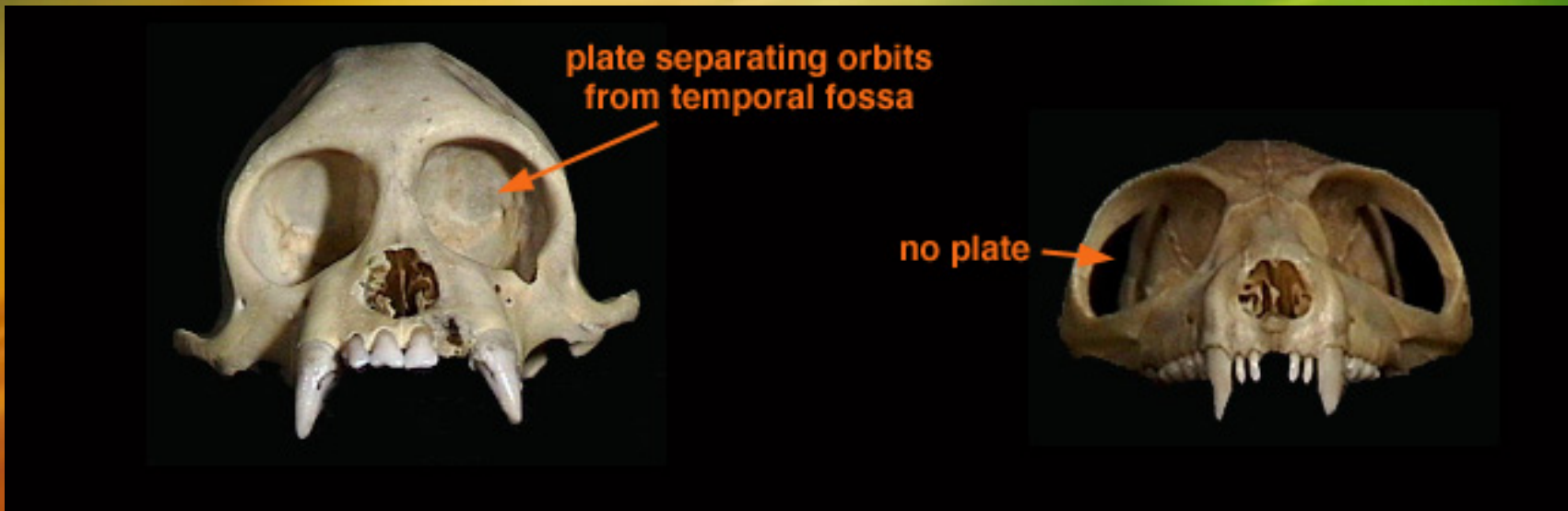
## Strepsirhines: *Prosimians*

- Smaller brain
- Emphasis on smell
- Unfused mandible



## Haplorhines: *NW Monkey, OW Monkey, Apes, Humans*

- a fused mandibular symphysis
- the region behind the orbit is enclosed within the skull (post orbital bar/closure)
- an increased emphasis on vision and reduced reliance on smell



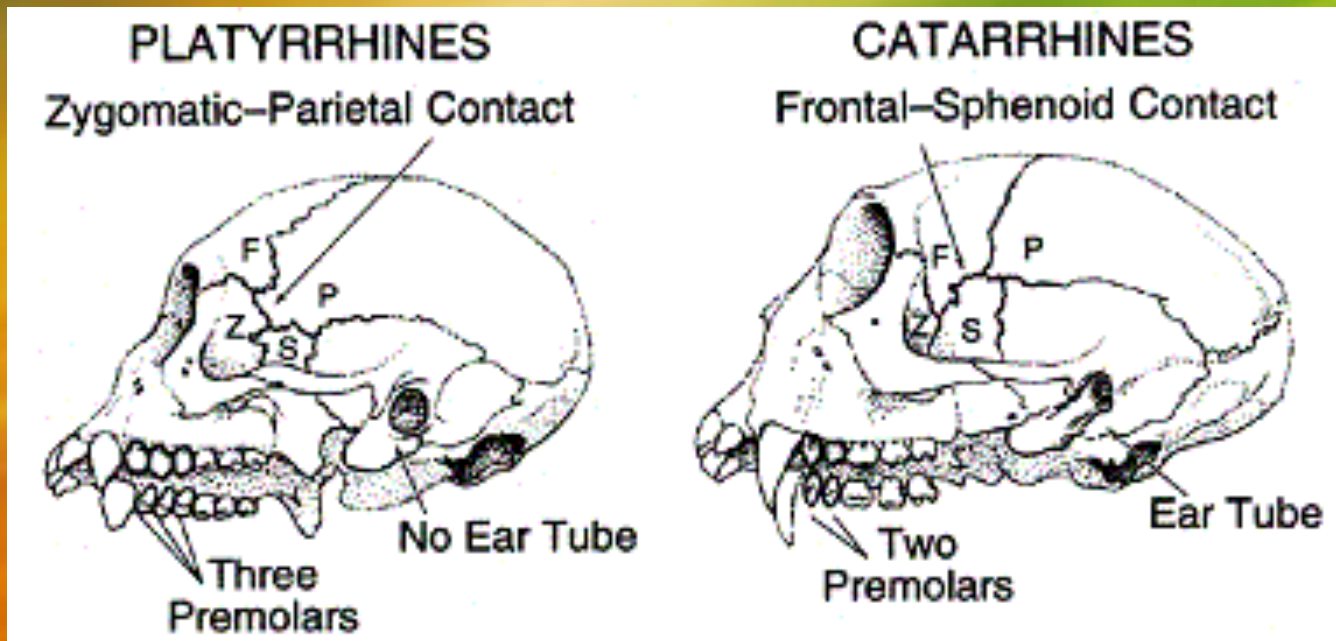
# Anthropoids.....

Platyrrhines: NW Monkeys

- 2:1:3:3

Cattarhines: OW Monkey, Apes, Humans

- 2:1:2:3
- a bony ear tube





- Hominoids share the following derived characteristics
  - lack of a tail
  - broad palates and nasal regions



# Primate Limbs

- Hands and feet possess grasping ability.
- Features of the hands and feet:
  - 5 digits on hand and feet
  - Opposable thumb
  - partially opposable great toe
  - Tactile pads enriched with sensory nerve fibers at the ends of digits

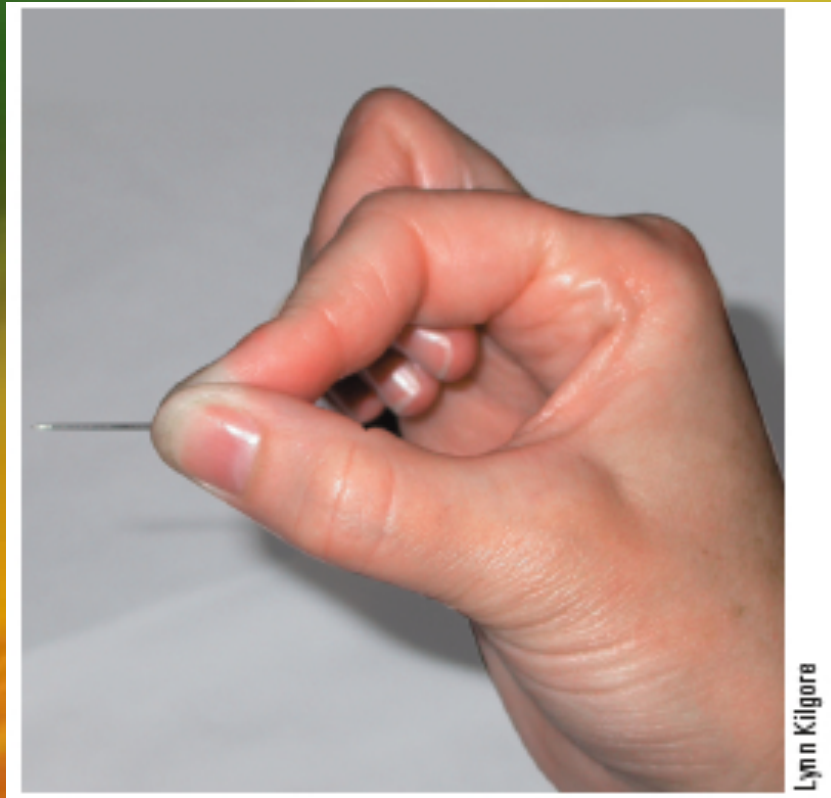


# Primate Limbs



- Many monkeys are able to grasp objects with an opposable thumb, while others have very reduced thumbs.

# Primate Limbs



- Humans are capable of a “precision grip.”

# Lab Exercises

- Zoo Project handout
  - Lets Check it out
  - I need to sign this before you go
- Lab Primate handout
- Lab 10.1, 10.2, 10.3
- Self Test 10.1