

Anthro 101:
Human Biological Evolution

Lecture 8: Primate Comparative Anatomy

Prof. Kenneth Feldmeier
Office hours BEFORE CLASS

The Plan

- Finish Locomotion
 - handouts due Wednesday
 - Next exam Monday (1/25)

Hominoids: Homininae: Hominini

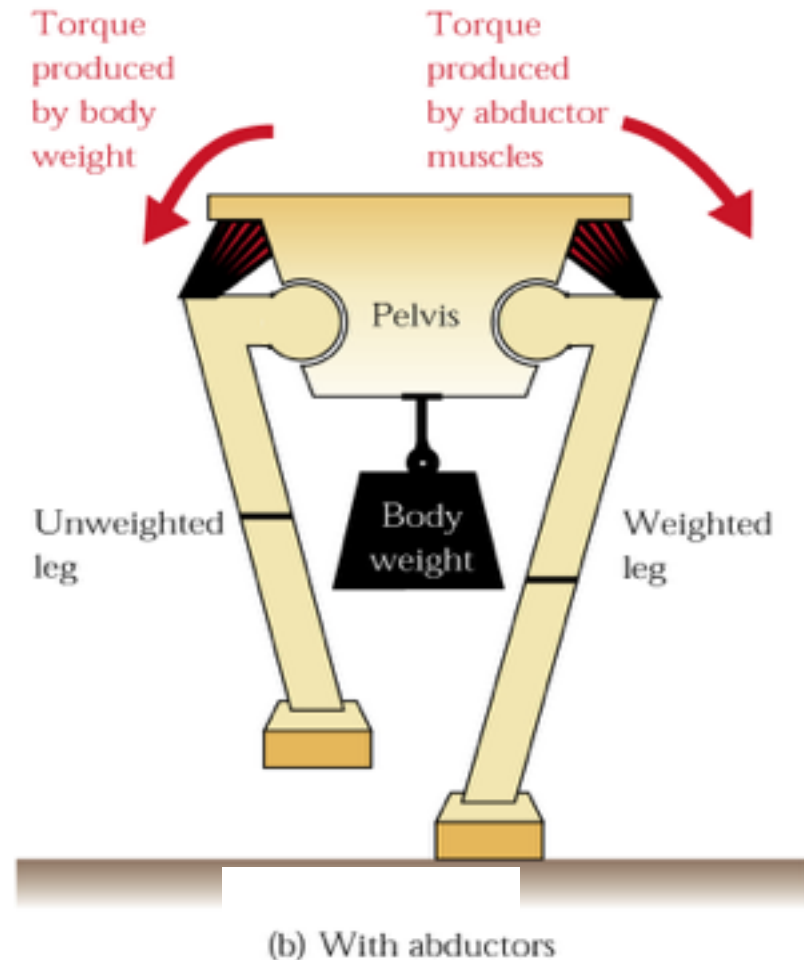
Bipedalism

- Unique to humans (hominins)
- Modifications to pelvis & feet



One leg at a time: Why don't we fall over?

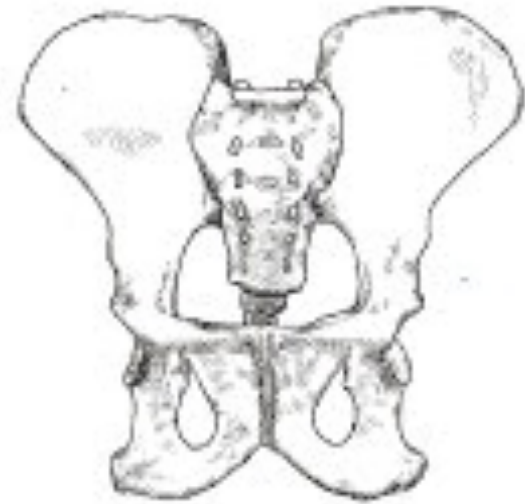
- Torque (twist and downward pull at hip) is opposed by abductor muscles
- Abductors tighten during each stride and keep you upright
- Abductors attach to ilium and to the neck femur
- **Wider, thicker ilium and longer neck of femur increase surface area for muscle attachment**



Changes in the pelvis

Human pelvis is a bowl

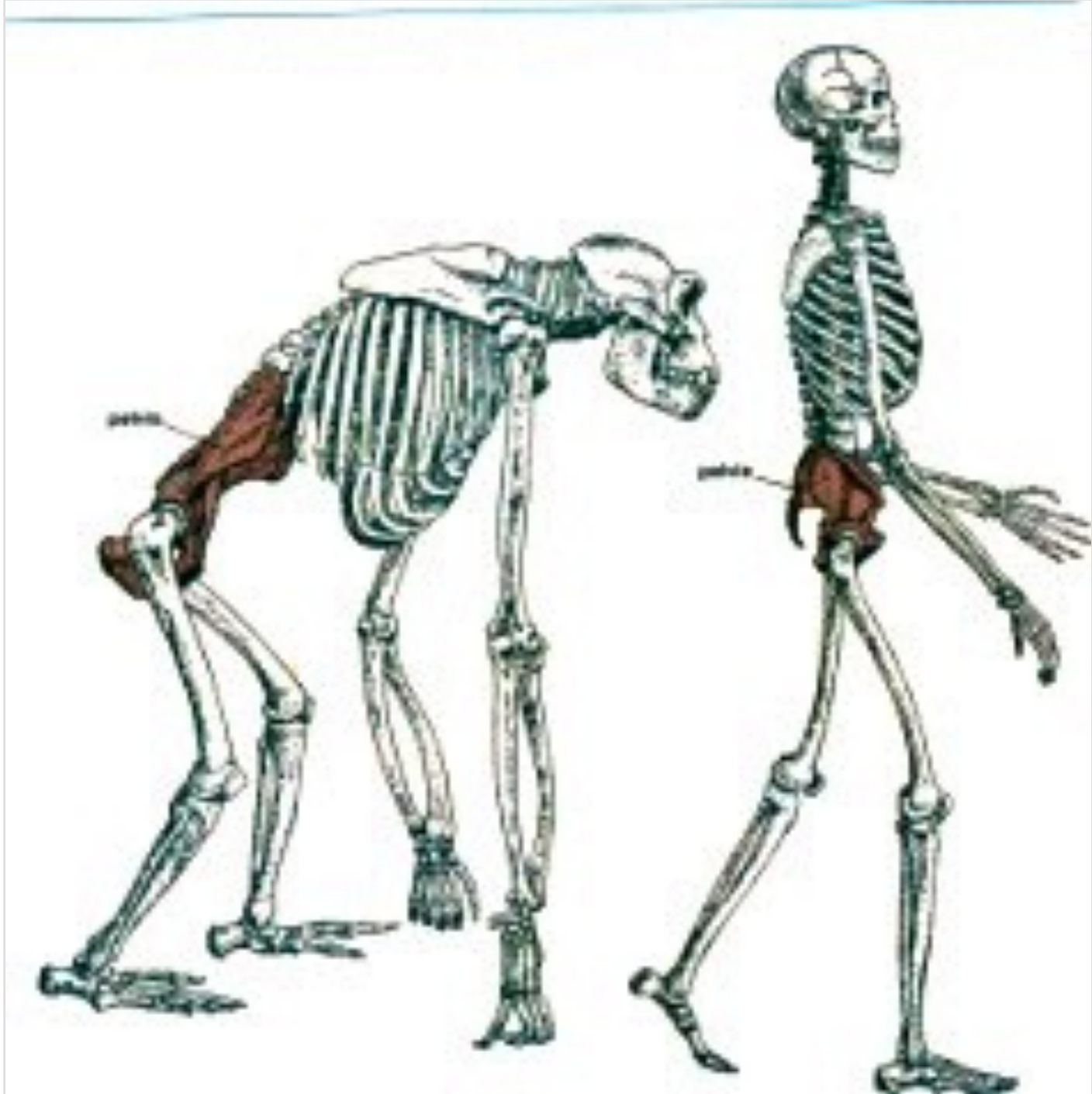
- ◆ Supports internal organs
- ◆ **Short and broad ilium**
- ◆ Shorter ischium
- ◆ **abductor muscles attach to wide surface of ilium**
- ◆ **Maintains the center of gravity over one foot while walking**
- Chimp pelvis is longer and narrower
 - ◆ Organs “hang” below
 - ◆ Strong muscles on ischium



(c) Chimpanzee



(a) Human

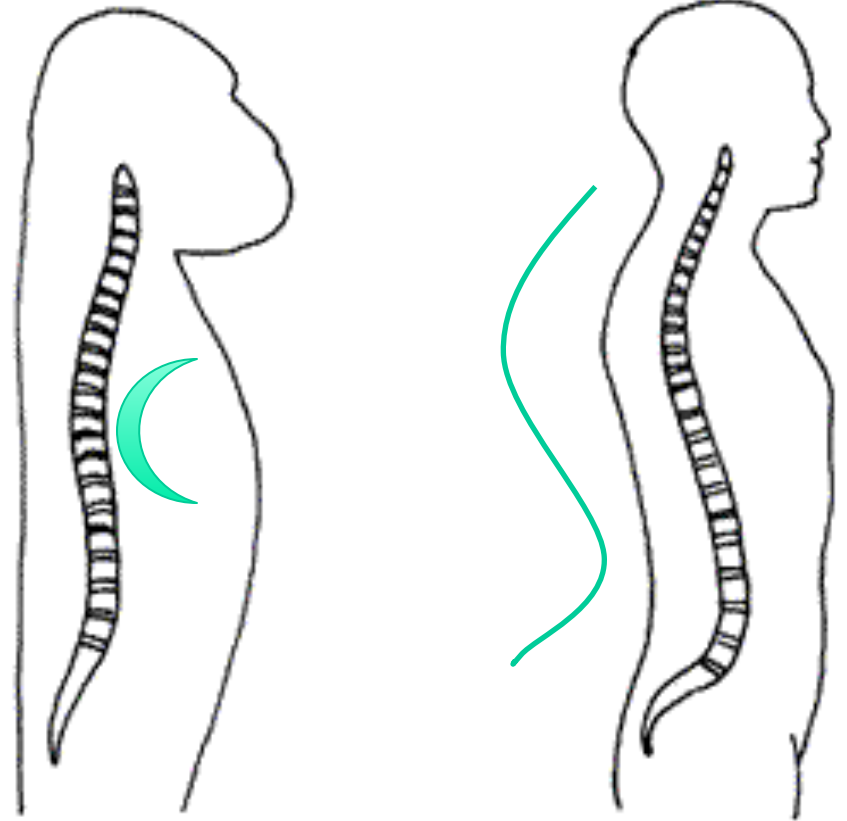


Sweet Website

- <http://www.evoanth.net/2012/03/17/lets-twist-again/>

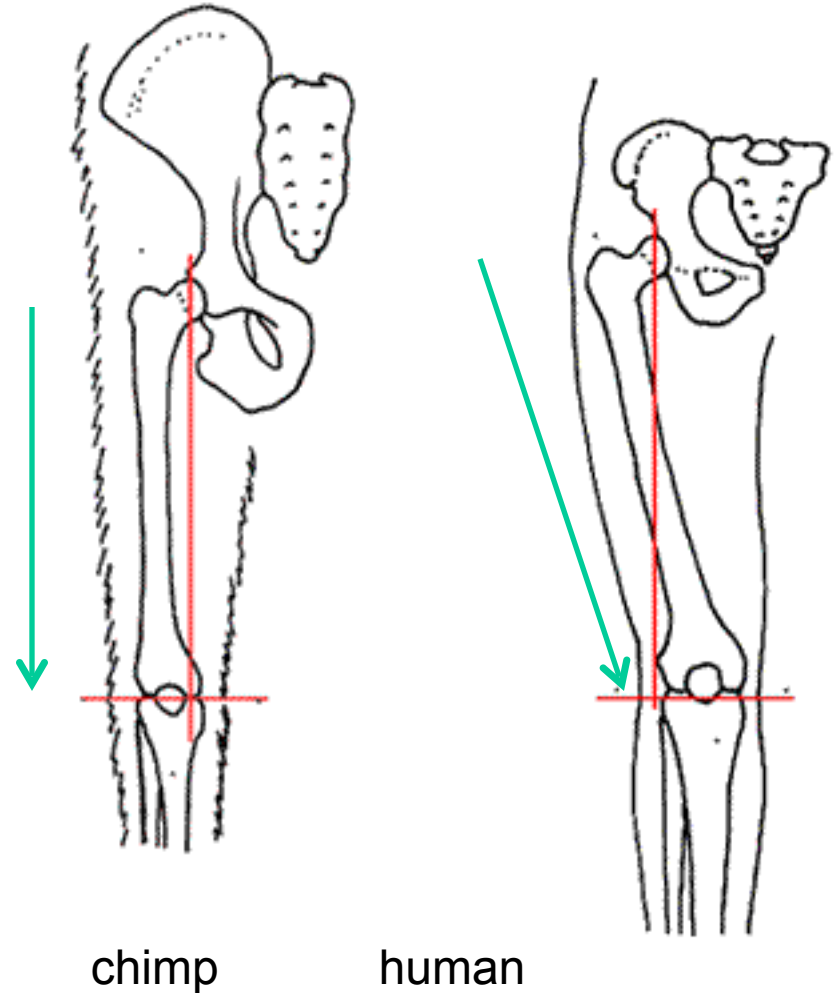
Changes in the Spine

- “S-shaped” curves in spinal column keep trunk centered over pelvis
- Lumbar curve
- C-shaped curve in chimps more



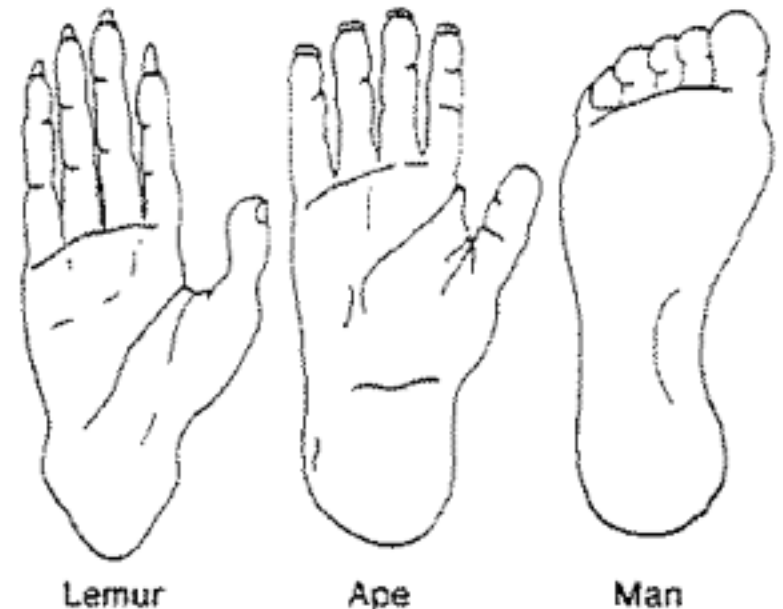
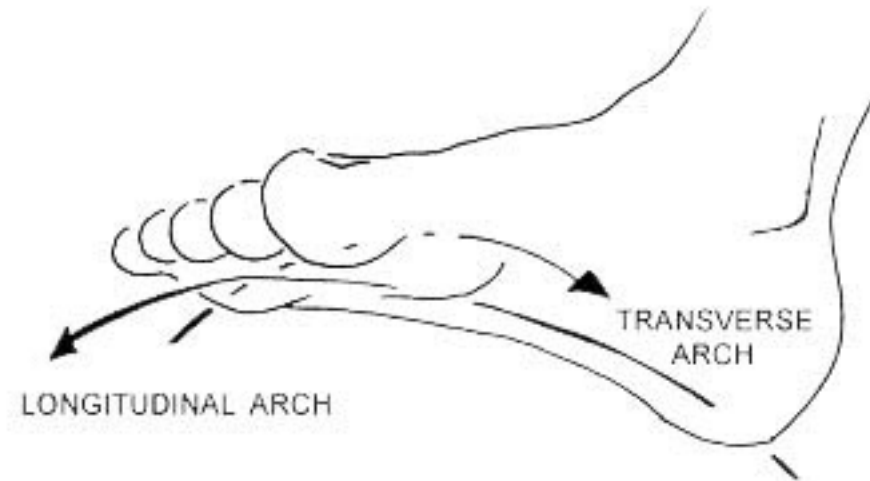
To walk efficiently, knees must be close to center line of body

- Pelvis wider and shorter
- Femur slants inward from wide pelvis
- Close-knee stance
- Centers weight for balance and efficiency (less muscle work to hold upright)
- Longer leg bones
 - ◆ Increased stride



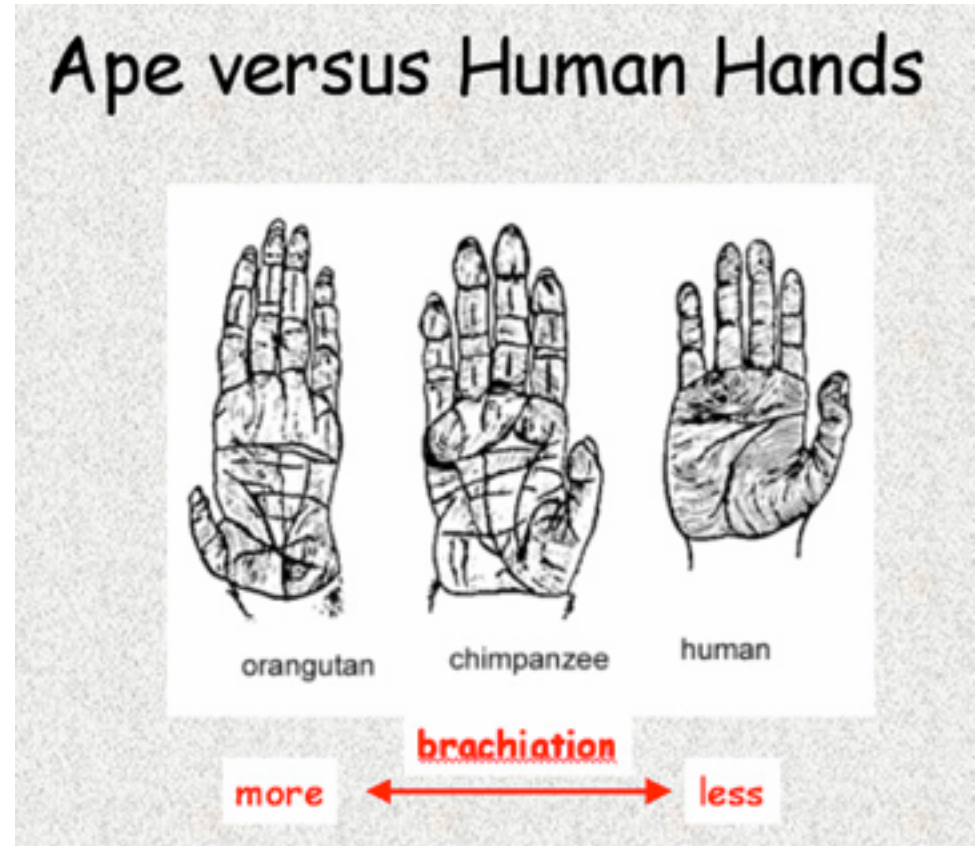
Bipedality also causes changes in the feet

- Arched foot
 - ◆ “spring”-like shock absorbers
 - ◆ Return energy to the next push
 - ◆ Heel-toe stride
- Loss of opposable toe necessary to act as a platform for body - big toe in-line
- Stiff foot makes better platform



Changes to limbs: forelimbs

- Support the body in quadrupeds
- Suspend the body in brachiators
- Manipulate objects in bipeds – precision grip (vs. power grip)



Comparative anatomy of manipulation

- Apes long curved fingers & short thumb
- Humans shorter fingers & longer thumb
 - ◆ Allows precision grip and greater opposability of hand
 - ◆ Bones in palm rotate more to allow finger tips to meet the thumb

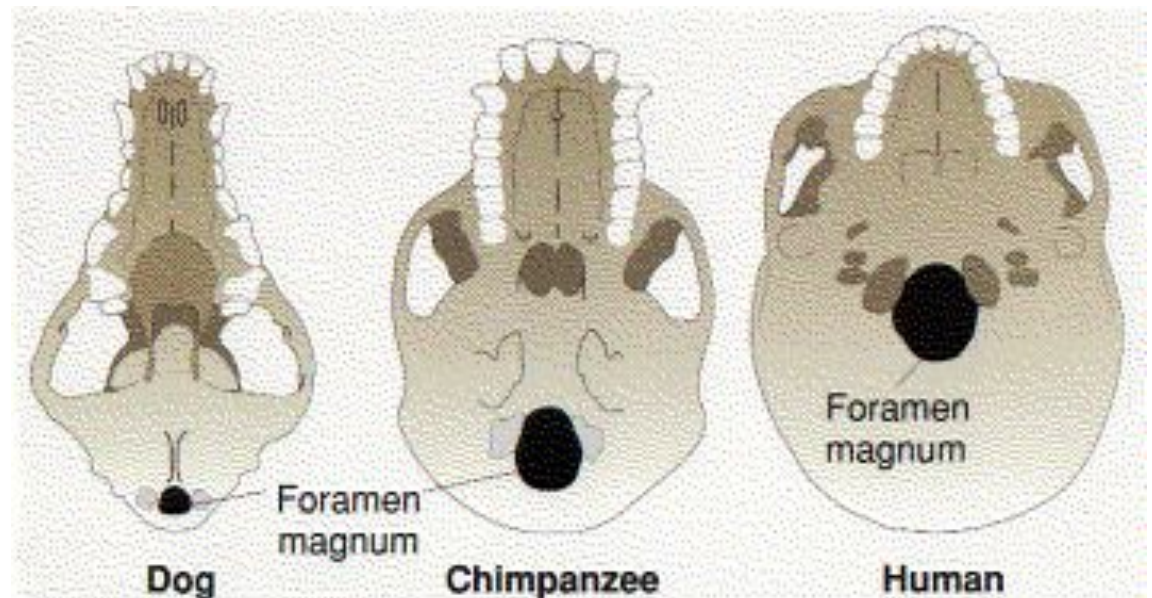


Human hand

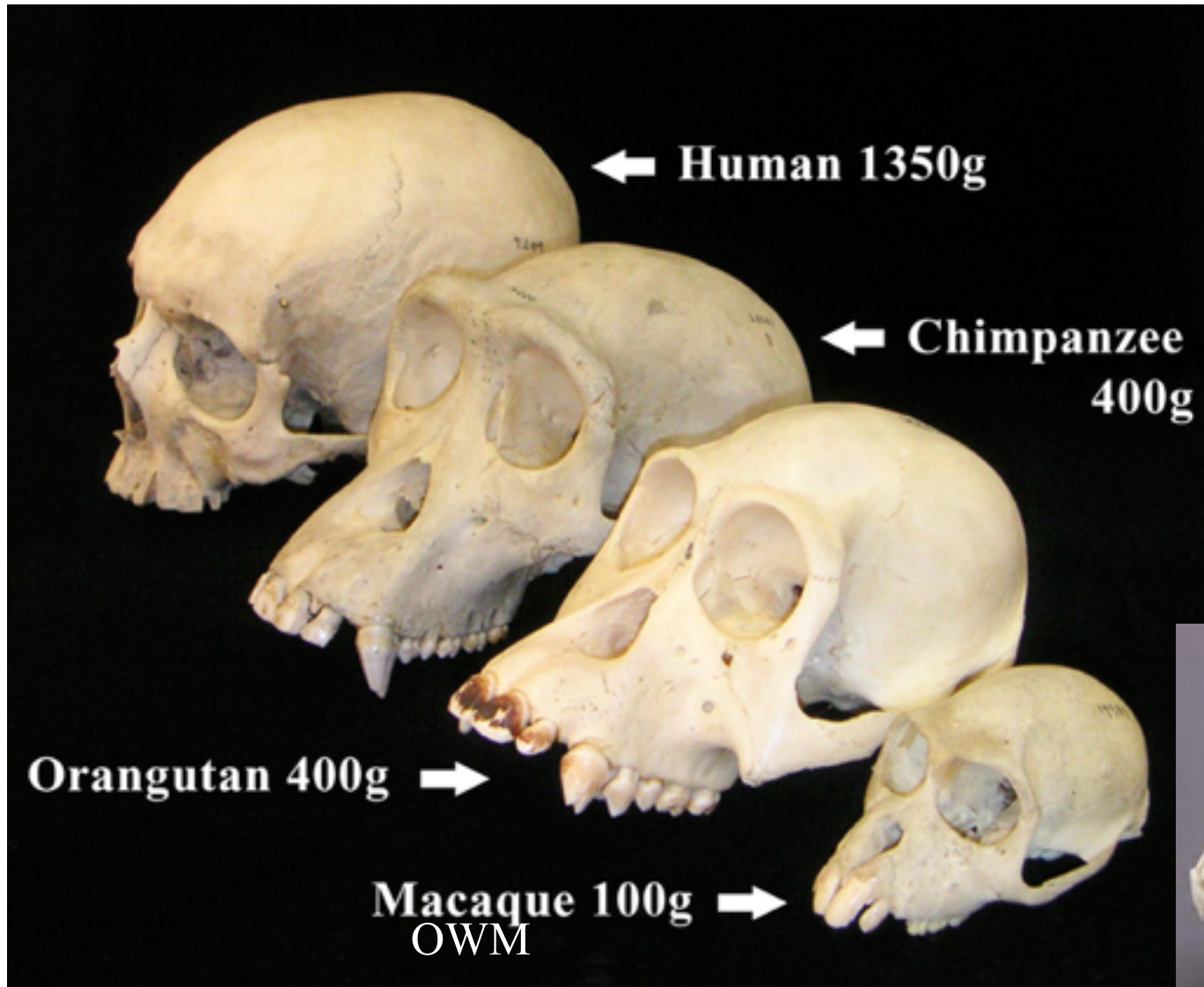
Changes in the skull: Foramen magnum

- Hole in skull where spinal cord and brain connect
- Position indicates body posture
- Nuchal ridge on back of skull (occipital bone) show where muscles attach

Human skull is balanced on top!



Brain Size



Lemur



Howler monkey (NWM) →

Lets talk about this stuff

- How are forms of locomotion impacted by our environments?
- What changed with our environment?

Homework

- Finish the locomotion packet, due tomorrow