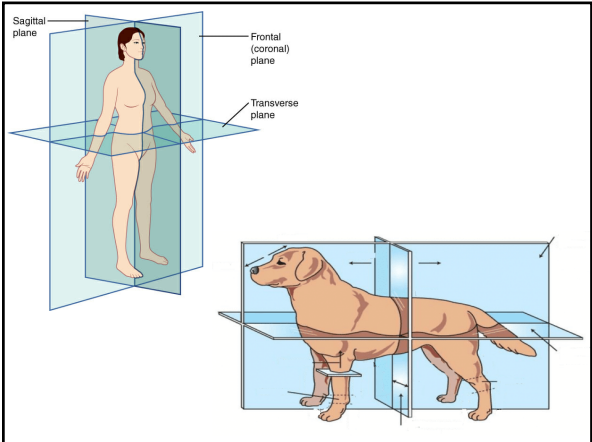


**TEXAS STATE**  
 FORENSIC ANTHROPOLOGY  
 CENTER

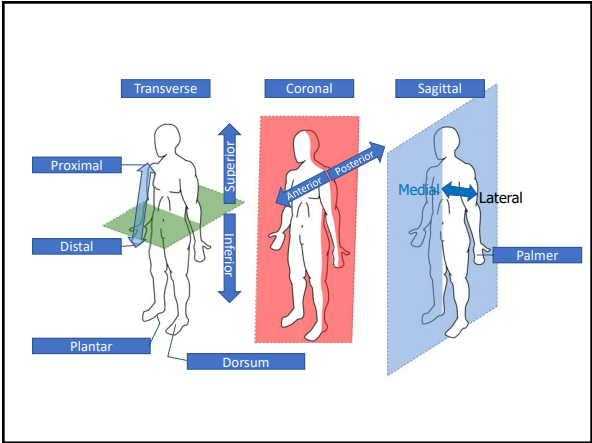
## Identifying human from non-human bone

Danny Wescott

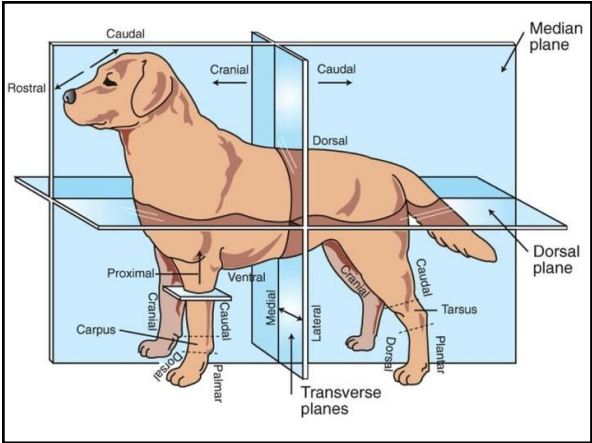
1



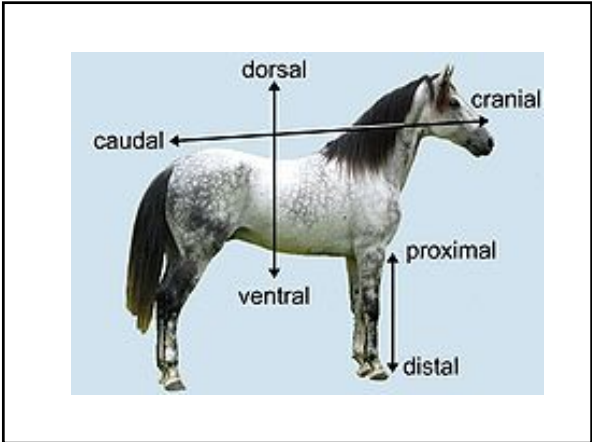
2



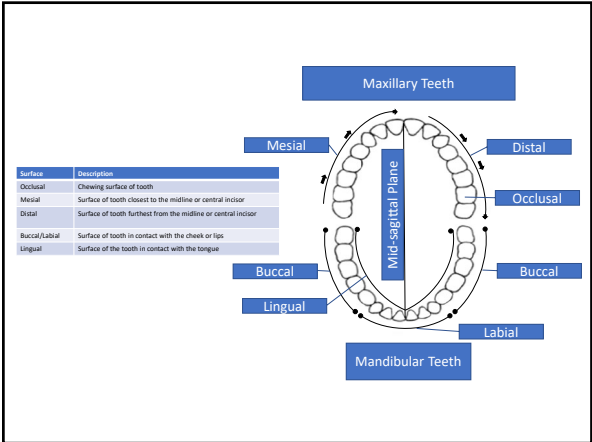
3



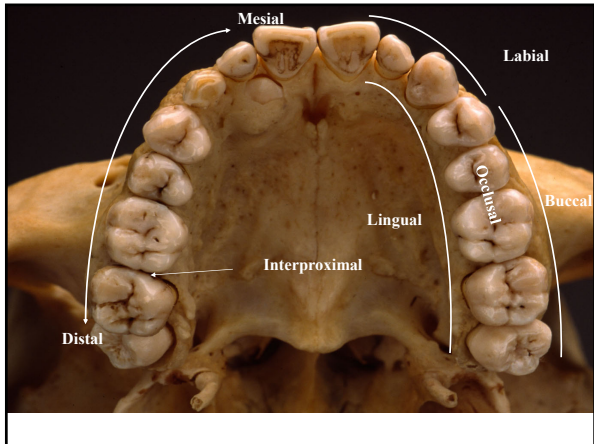
4



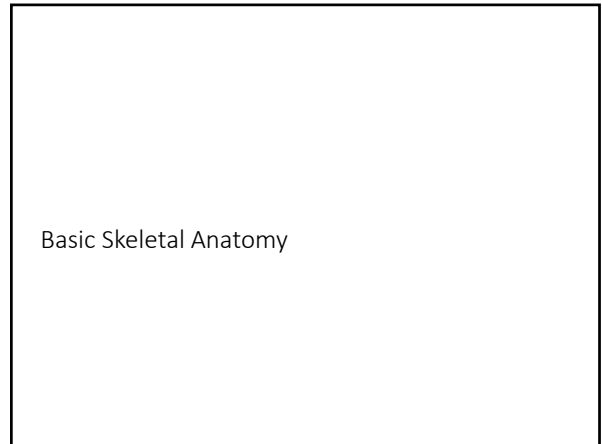
5



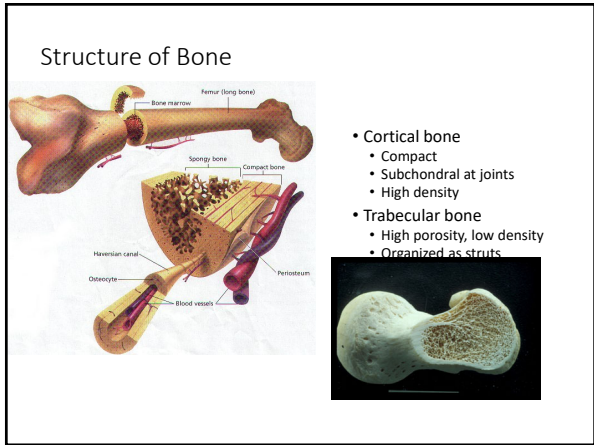
6



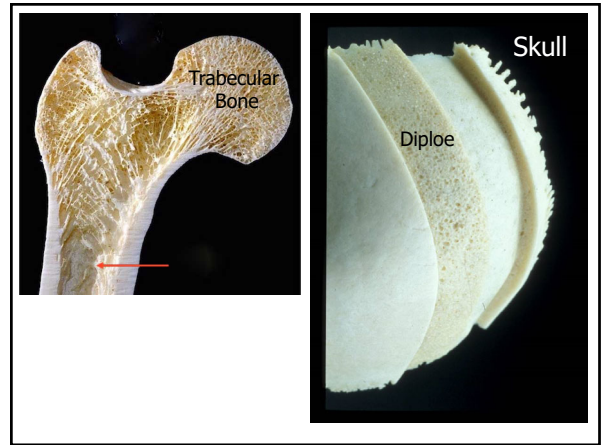
7



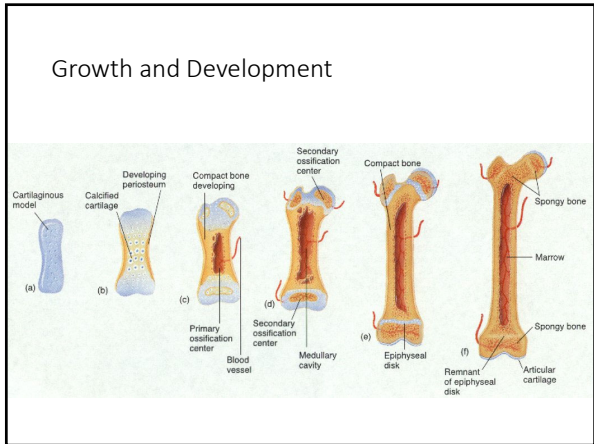
8



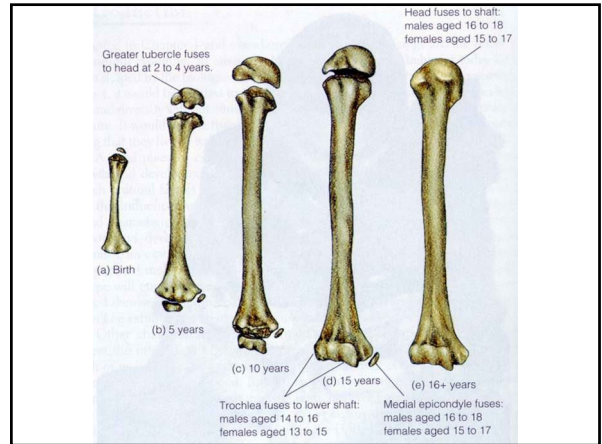
9



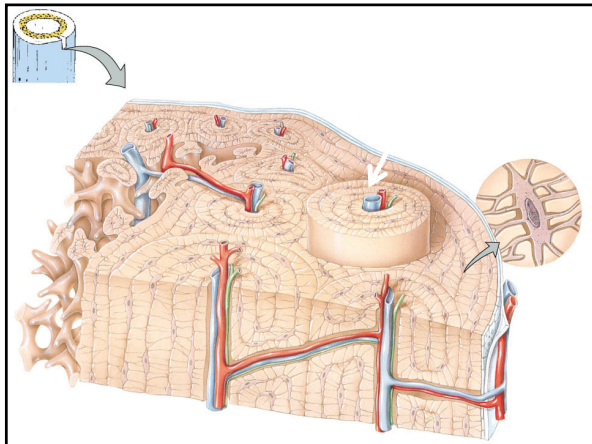
10



11



12



13

### Types of Bone

Plexiform Bone

Woven Bone

Haversian Bone

14

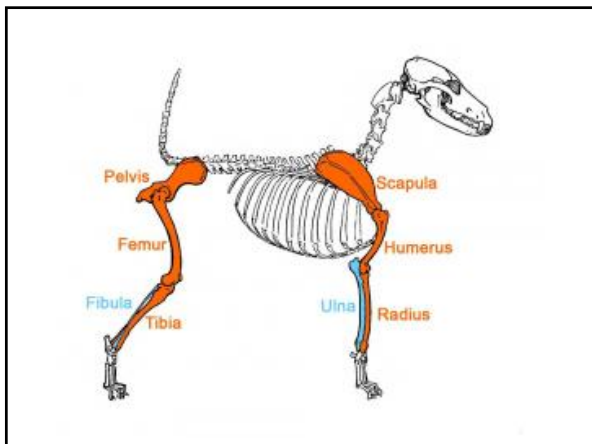
### Overview of the Skeleton

- 206 bones
- **Axial Skeleton**
  - Skull
  - Hyoid
  - Vertebrae
  - Ribs
  - pelvis
- **Appendicular Skeleton**
  - Upper limbs
  - Lower limbs

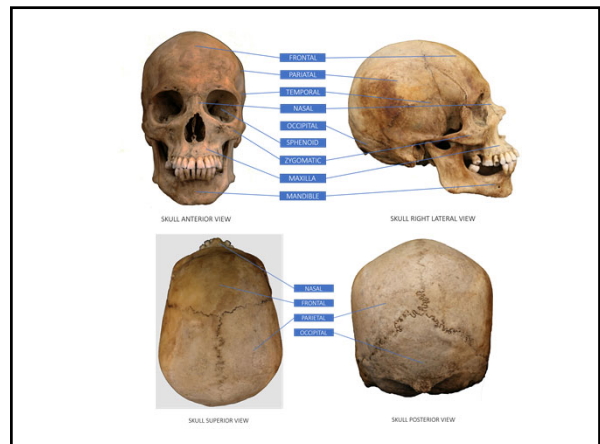
15

AXIAL SKELETON		APPENDICULAR SKELETON	
Skull	28	Clavicles	2
Hyoid	1	Scapula	2
Sternum	1	Humerus	2
Ribs	24	Radius	2
Vertebrae	32	Ulna	2
Cervical	7	Carpals	16
Thoracic	12	Metacarpals	10
Lumbar	5	Phalanges	28
Sacral	5	Hip bone	2
Coccygeal	3-4	Femur	2
		Patella	2
		Tibia	2
		Fibula	2
		Tarsals	14
		Metatarsals	10
		Phalanges	28

16



17



18

**Dental Formula: 2:1:2:3**

- incisors – 2
- canine – 1
- premolars – 2
- molars – 3

**Numbering: right maxillary molar to right mandibular molar**

19

Side	Tooth	Maxilla		Mandible	
		Universal System	ISO System	Universal System	ISO System
R	3 <sup>rd</sup> molar	1	18	32	48
R	2 <sup>nd</sup> molar	2	17	31	47
R	1 <sup>st</sup> molar	3	16	30	46
R	2 <sup>nd</sup> premolar	4	15	29	45
R	1 <sup>st</sup> premolar	5	14	28	44
R	Canine	6	13	27	43
R	Lateral incisor	7	12	26	42
R	Central incisor	8	11	25	41
L	Central incisor	9	21	24	31
L	Lateral incisor	10	22	23	32
L	Canine	11	23	22	33
L	1 <sup>st</sup> premolar	12	24	21	34
L	2 <sup>nd</sup> premolar	13	25	20	35
L	1 <sup>st</sup> molar	14	26	19	36
L	2 <sup>nd</sup> molar	15	27	18	37
L	3 <sup>rd</sup> molar	16	28	17	38

20

### HYOID

- The “floating bone”
- Broken hyoid CAN mean asphyxial death
- Possibly unfused
- Often overlooked during recovery

21

### VERTEBRAL COLUMN

- 33 bones total
  - 24 vertebrae
  - Sacrum
  - Coccygeal elements (4)
- Protects spine
- Stabilizes rib cage
- 3 kind of Verts
  - Cervical
  - Thoracic
  - Lumber
- Sacrum and coccyx may fuse in adult form

22

The cervical curvature develops secondarily as the infant learns to hold the weight of its head

The thoracic curvature is a primary curvature

The lumbar curvature develops secondarily as the infant learns to stand and walk

The sacral curvature is a primary curvature

Cervical (C1-C7)

Thoracic (T1-T12)

Lumbar (L1-L5)

Sacral (S1-S5 fused)

Coccygeal

23

Cervical vertebrae have transverse foramina

The facets of the thoracic vertebrae are obtuse relative to the spinous process while the facets of the lumbar vertebrae are acute

The lumbar vertebrae bodies are large and kidney-shaped

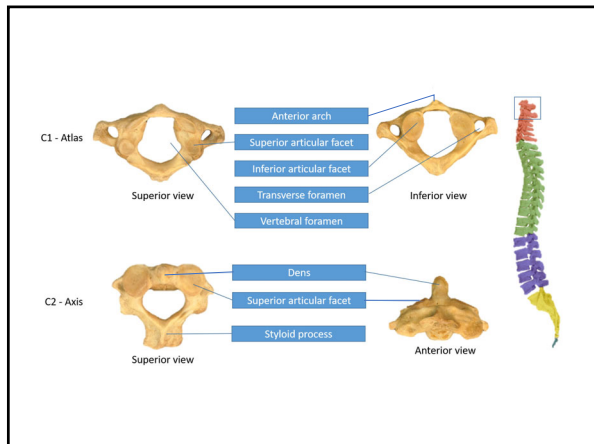
Cervical vertebrae have short often bifurcated spinous processes

Thoracic vertebrae have articular facets for the ribs on the body and transverse processes

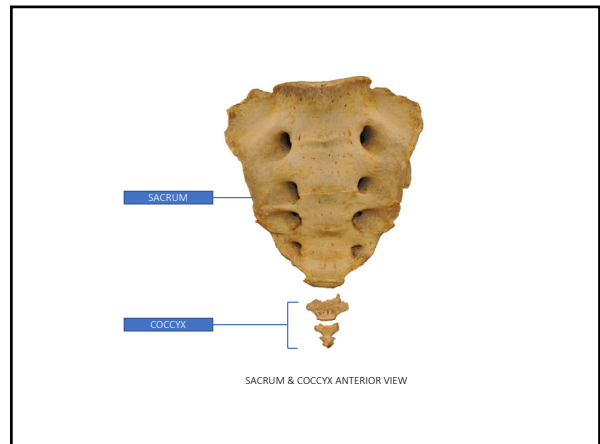
The spinous process of the lumbar vertebrae are hatchet-shaped and point posteriorly

24





25

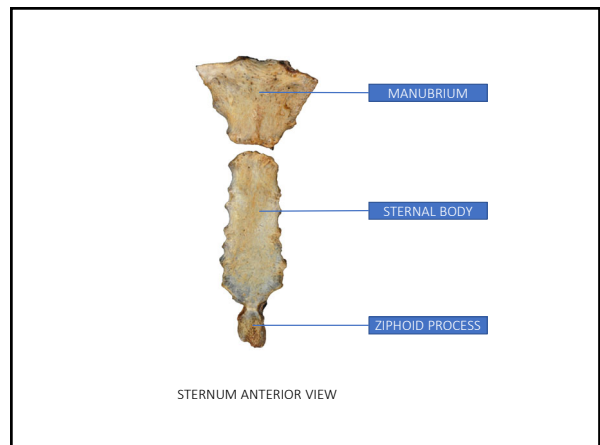


26

### THORAX: STERNUM AND RIBS

<ul style="list-style-type: none"> <li>▪ <b>Thorax</b> <ul style="list-style-type: none"> <li>▪ Protects and encloses organs of circulation and respiration</li> </ul> </li> <li>▪ <b>Sternum</b> <ul style="list-style-type: none"> <li>▪ Breastbone</li> <li>▪ 3 parts           <ul style="list-style-type: none"> <li>▪ Manubrium</li> <li>▪ Sternal body</li> <li>▪ Xiphoid process</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Ribs</b> <ul style="list-style-type: none"> <li>▪ 12 on each side, 24 total</li> <li>▪ Total number can vary</li> </ul> </li> </ul>
---	---

27



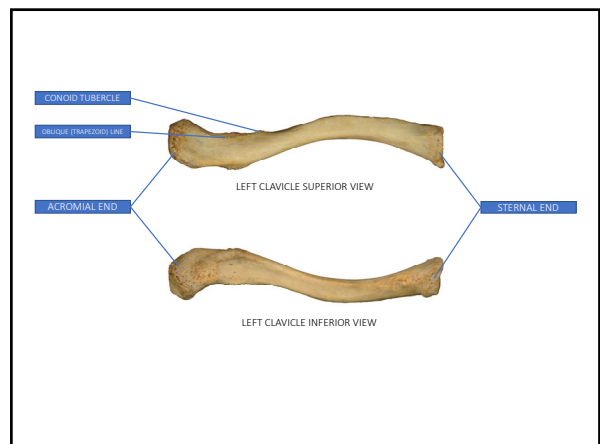
28

### THORAX: STERNUM AND RIBS

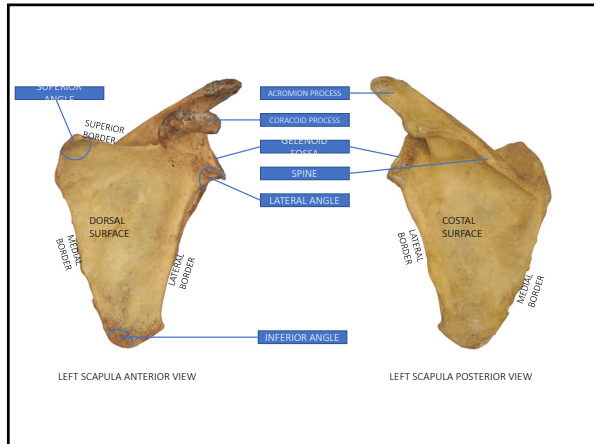


- Human Ribs are curved
- Can be confused with animal ribs, sticks, or twigs

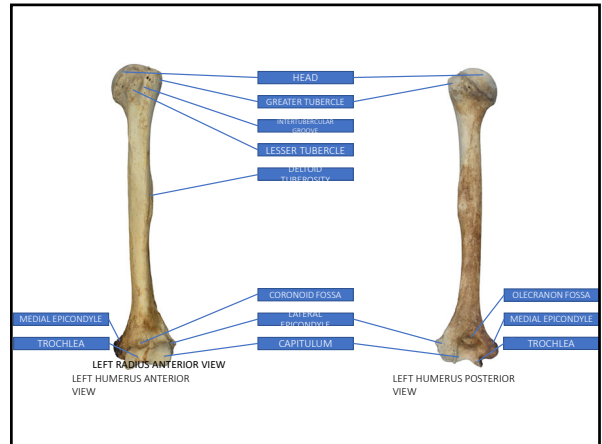
29



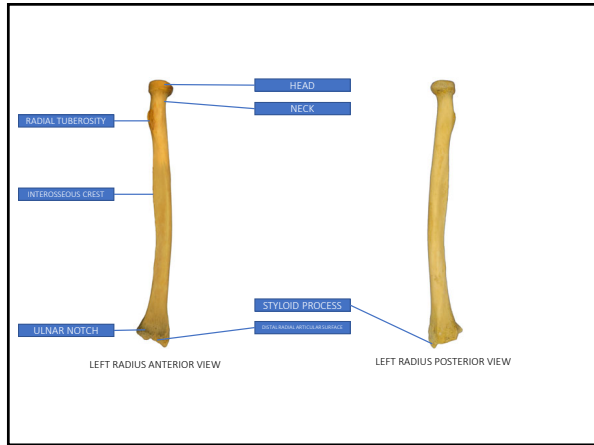
30



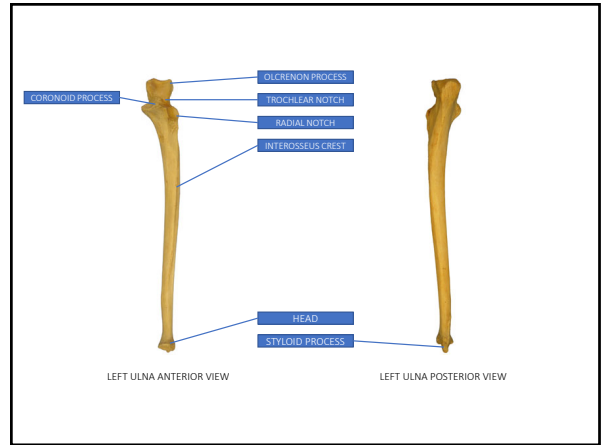
31



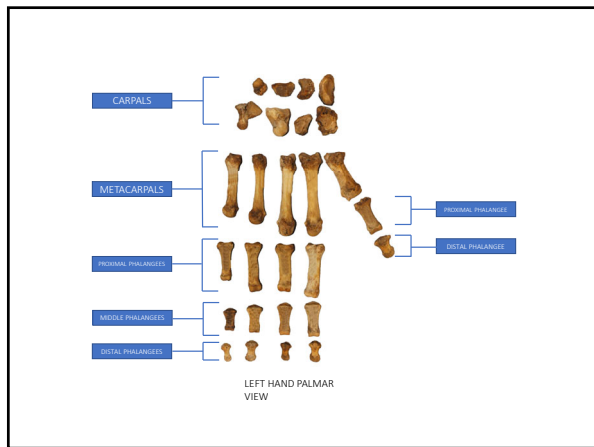
32



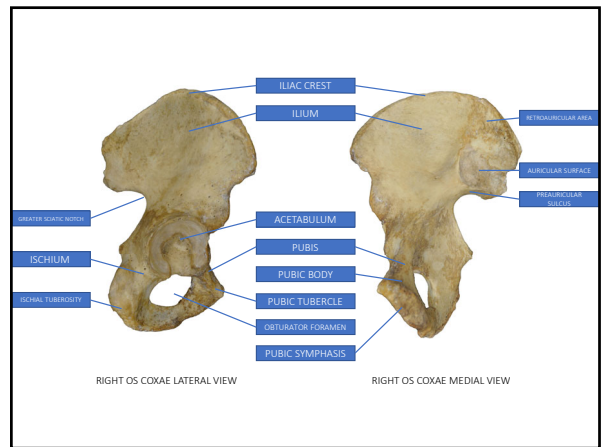
33



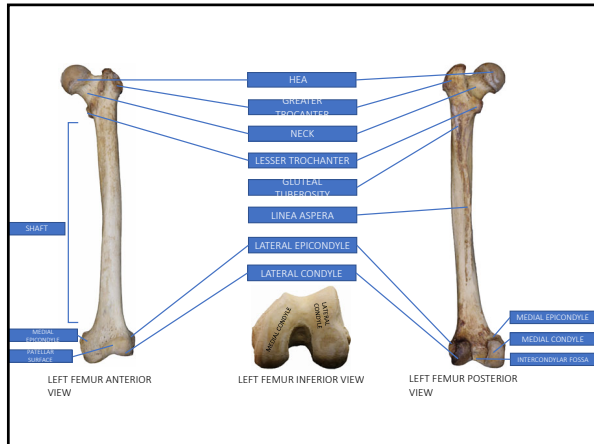
34



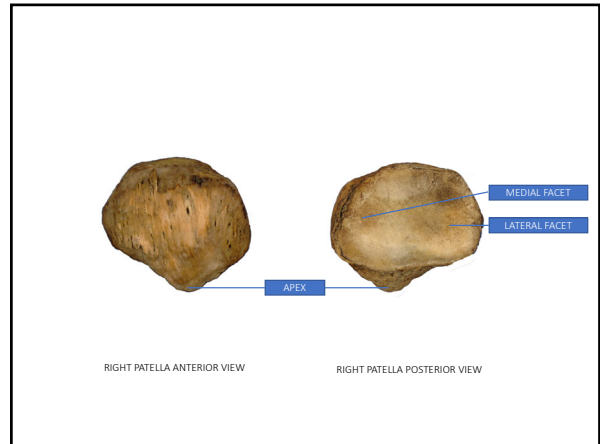
35



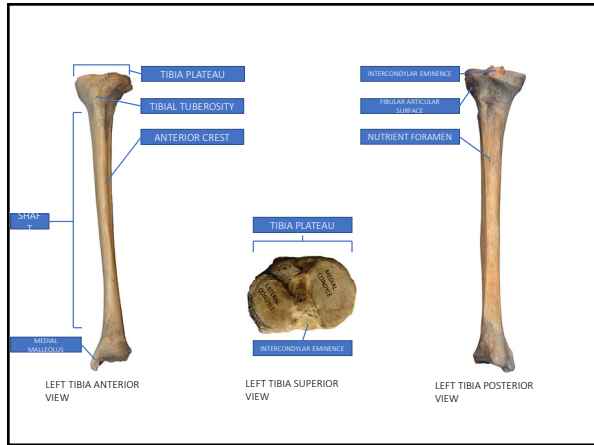
36



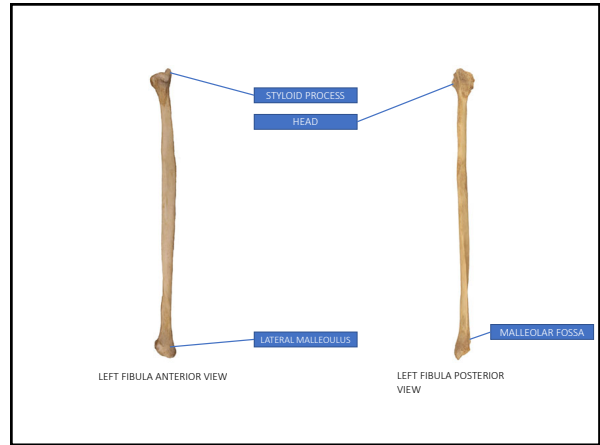
37



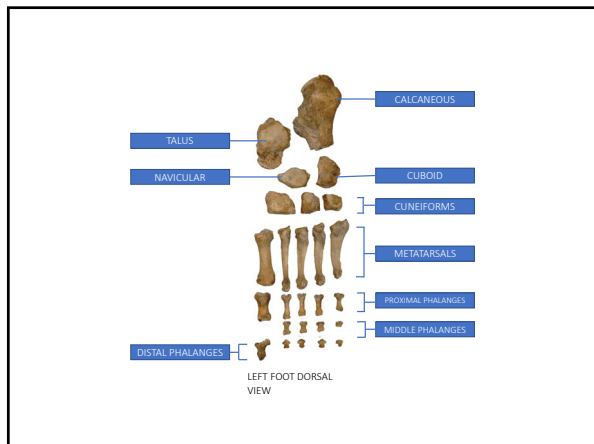
38



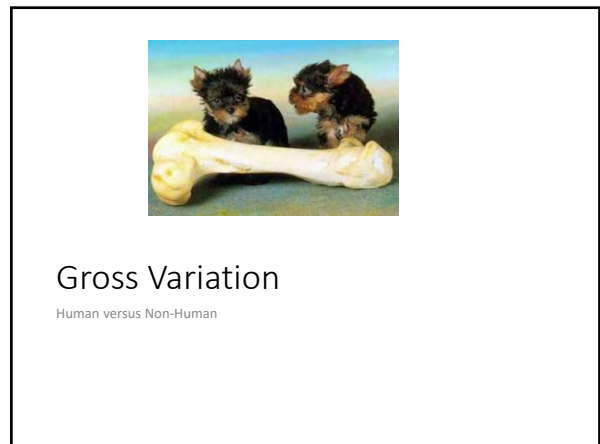
39



40



41



42

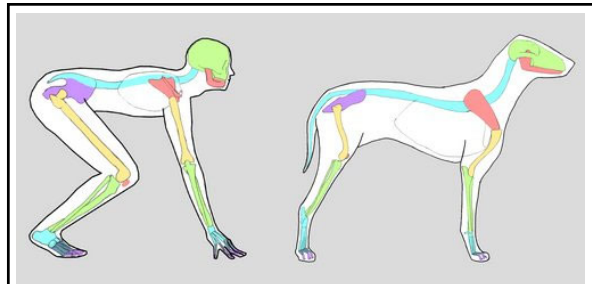
## Human vs. Nonhuman

- Nonhuman mammals
  - Short and curved long bones
  - Very robust bones
  - Very dense bone
  - Dental formulae and cusp morphology dependent on diet
  - Smaller brain for body size

43

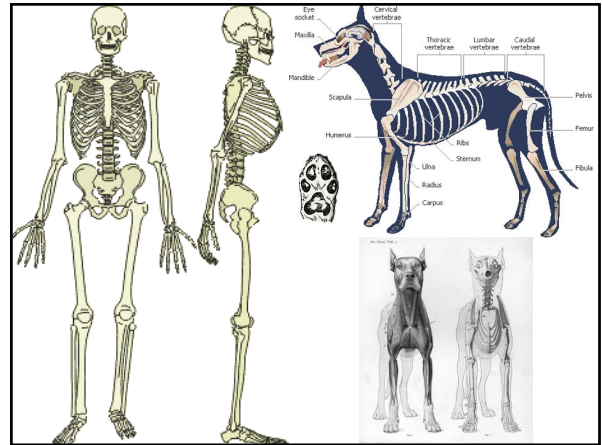


44

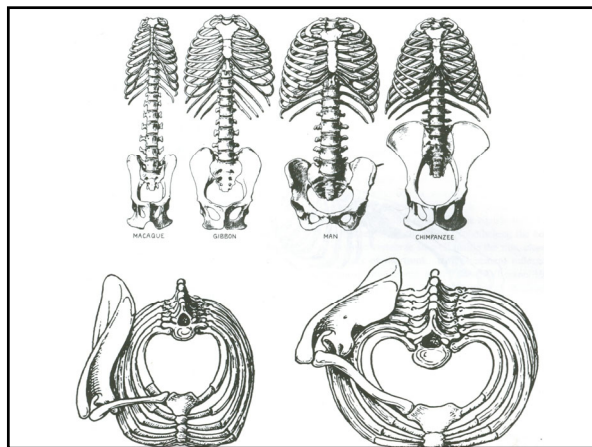


- Position of foramen magnum
- Neck length
- Vertebral column – body, spinous process, and transvers process length
- Rib shape
- Scapula shape
- Pelvis shape
- Front/back limb bone ratio
- Proximal/Distal limb bone ratio
- Calcaneus

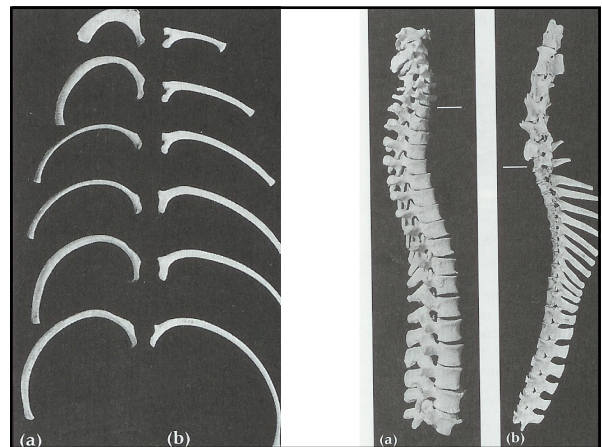
45



46



47

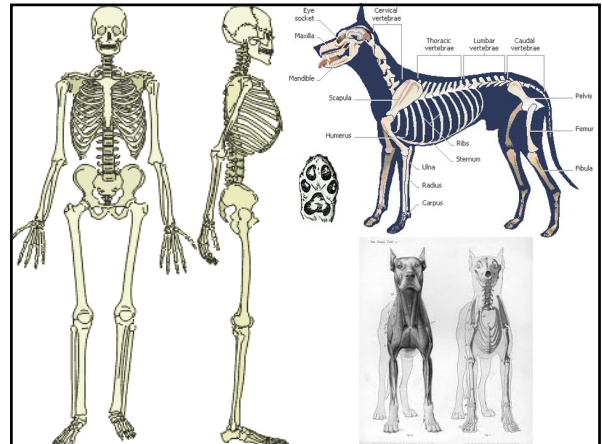


48

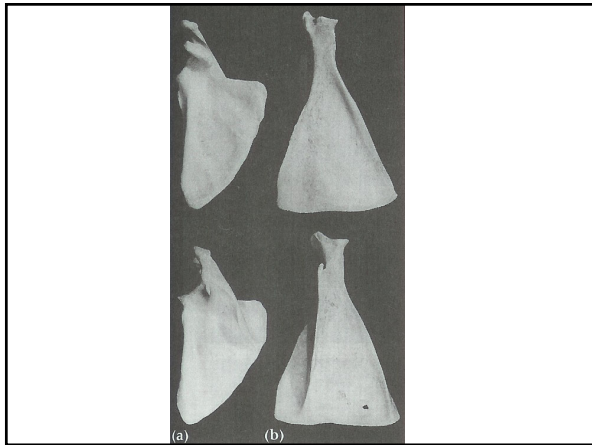




49



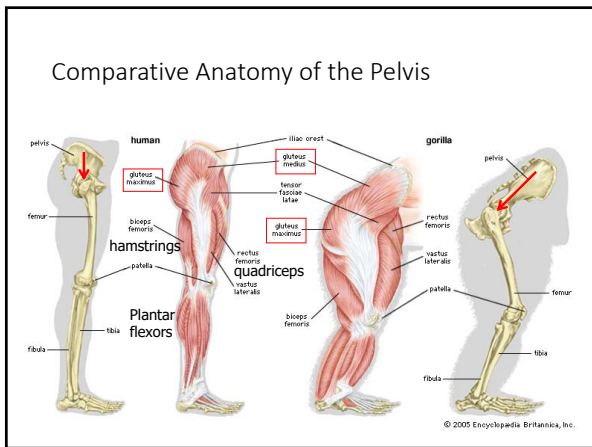
50



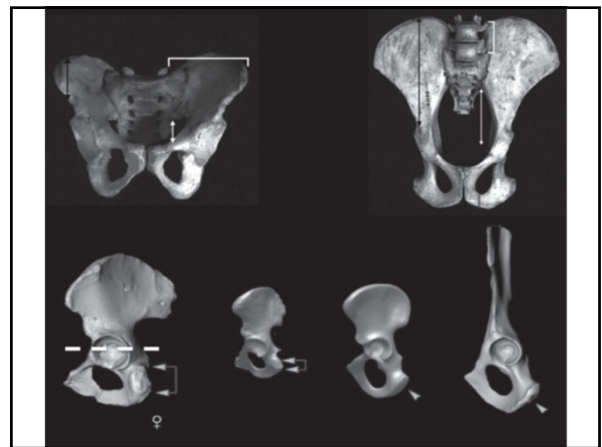
51



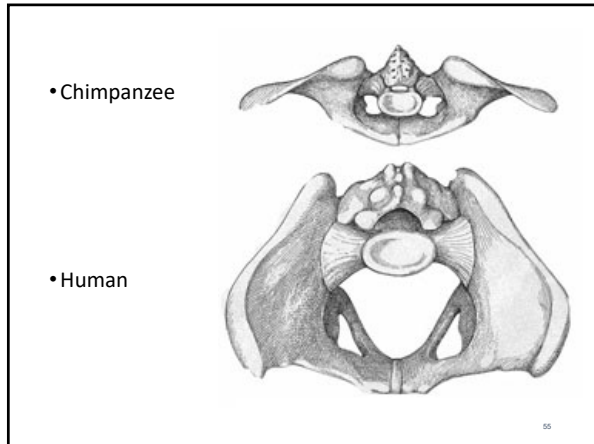
52



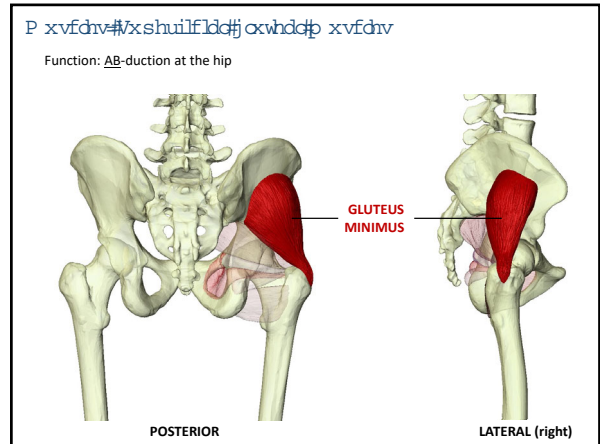
53



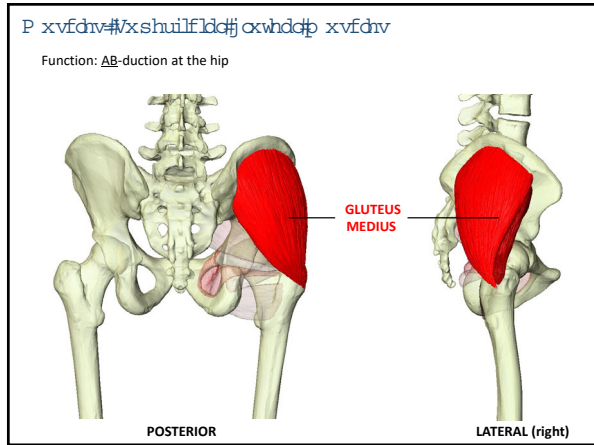
54



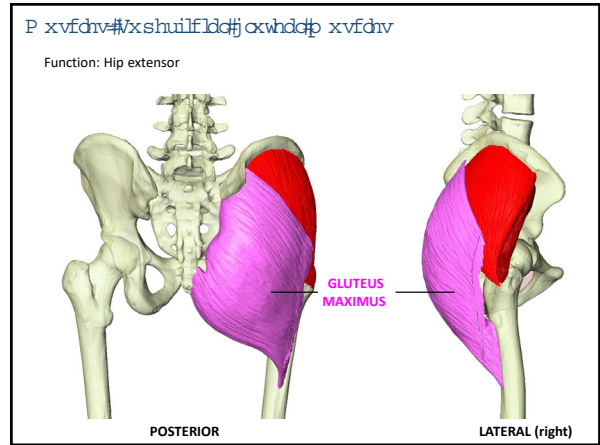
55



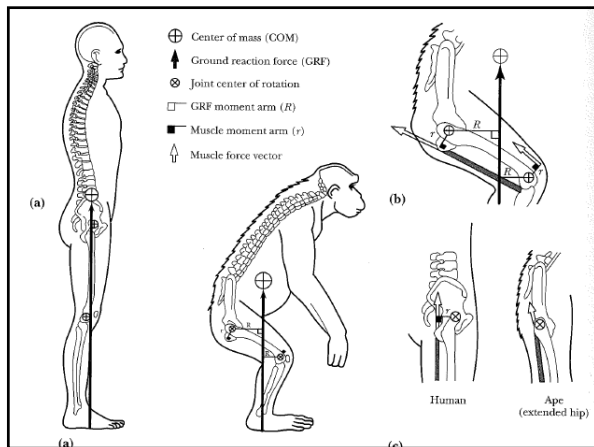
56



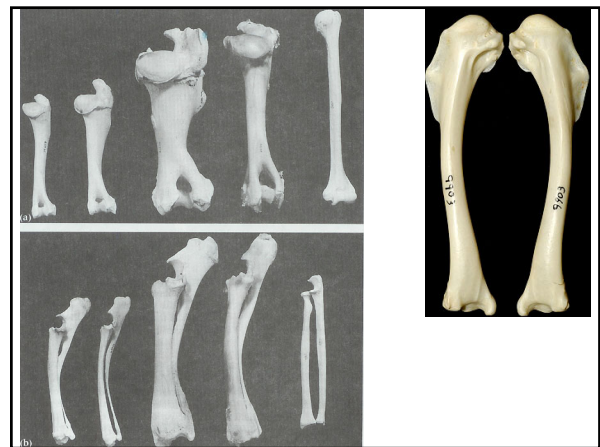
57



58



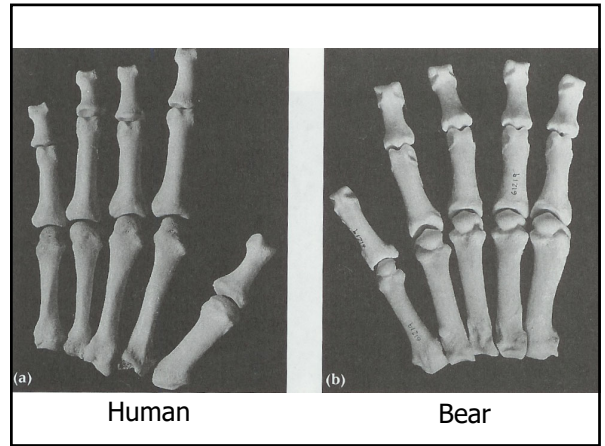
59



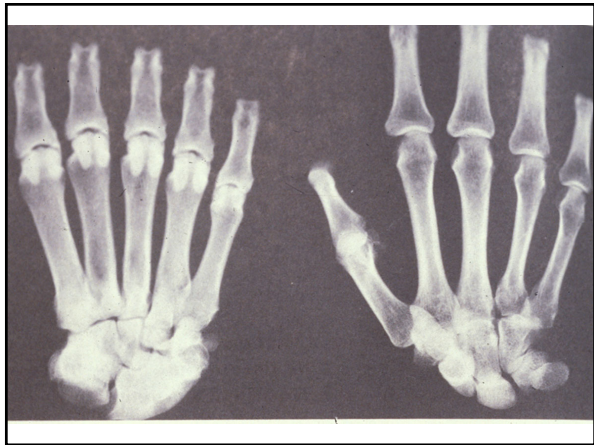
60



61



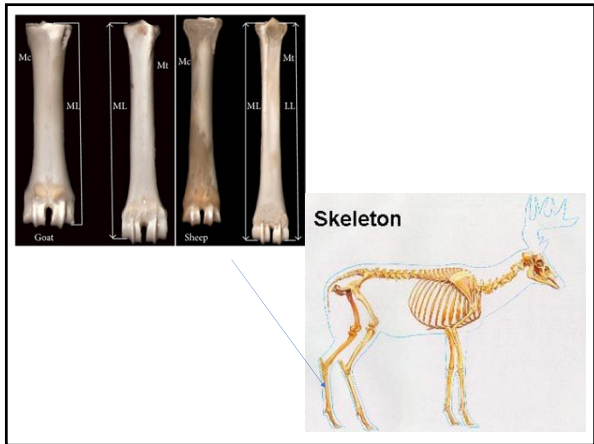
62



63



64

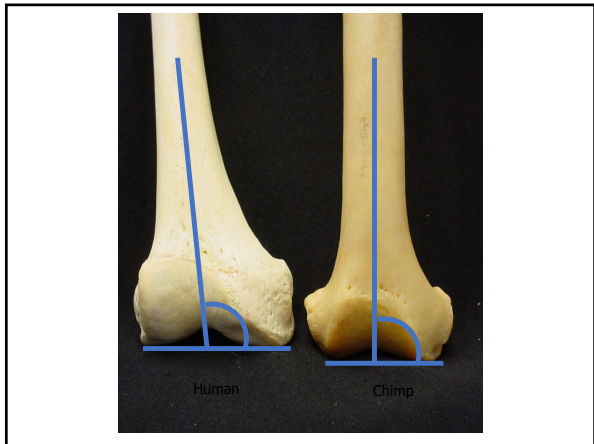


65



66

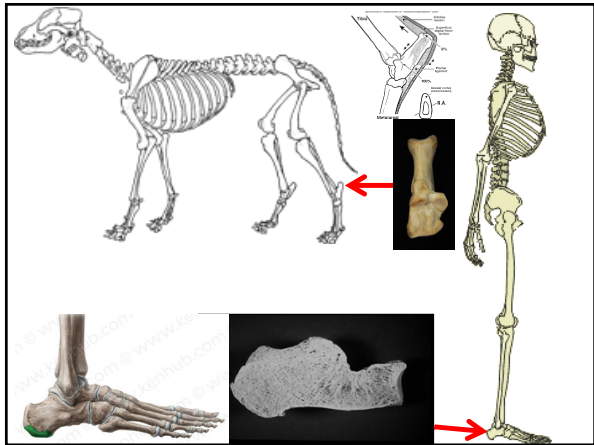




67



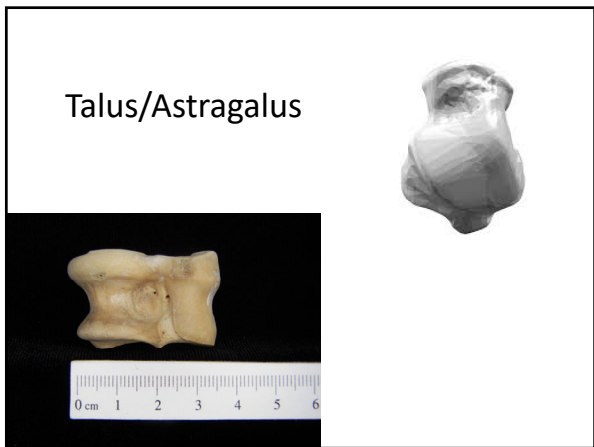
68



69



70



71

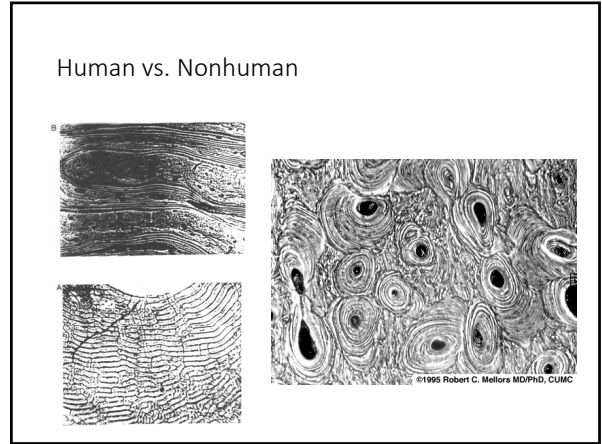


72

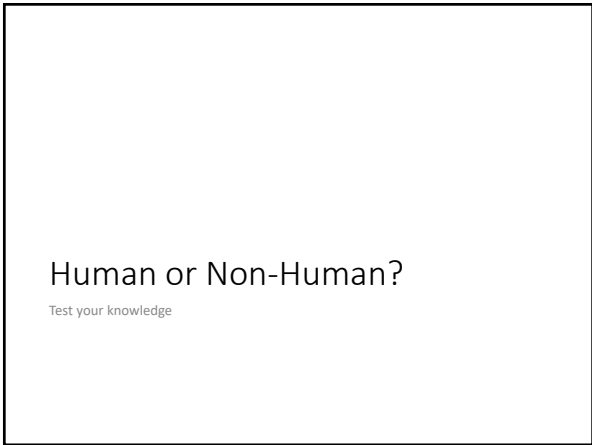




73



74



75



76



77



78



79



80



81



82



83



84





85



86



87



88



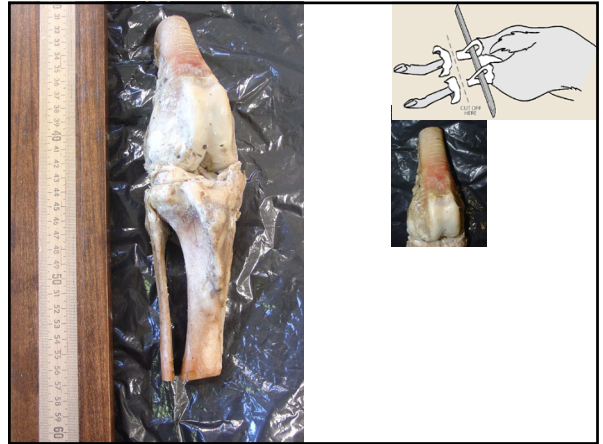
89



90



91



92



93



94

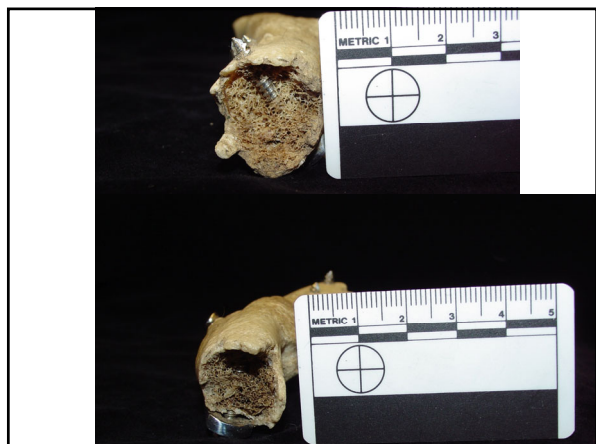


95



96





97



98



99



100



101



102



103