Lab 1
Introduction to the Vertebrate Skeleton

In this lab you will familiarize yourself with the morphology and terminology of the vertebrate skeleton. Using the skeletons and skulls provided in the lab, locate all of the bones and structures listed later in this handout. There is no specific assignment to turn in today, but we will use the skeletal terms heavily in the next few labs and you are expected to know them. You may want to work in pairs.

Be careful not to mix elements from different boxes or to lose small (or large) bones from the boxes.

Anatomical Directions

Lateral – on the body, away from the midline. E.g., eyes are lateral to the nose
Medial – on the body, toward the midline.
Proximal - along a limb or digit, toward the body. E.g., the elbow is proximal to the wrist.
Distal – along a limb or digit, away from the body
The Mammalian Skeleton

The skeleton of mammals is perhaps the simplest of all the vertebrates in terms of numbers of bones. Our skeleton has fewer bones in the skull, shoulder girdle, and ankles than reptiles, amphibians, or fish. Mammals have comparatively more muscles than these other groups, however, most of which have insertion points on the bones, which add to their complexity. Insertions of muscles or ligaments are left as roughened surfaces, tubercles, or ridges on the bone surface where the fibers were anchored in the mineralized bone tissue.

The skeleton is divided into the cranial and post-cranial parts, consisting of the skull (including the mandible) and the rest of the skeleton respectively.

Exercise: Label as many post-cranial bones on the above diagram as you can. You need not label individual members of serial homologs.
Bones of the Skull

(also Evans, Anatomy of the Dog)

(from Kardong 1995, Vertebrates)
Sagittal crest, point of attachment for temporalis muscles which help close the jaw. 
Infraorbital foramen, passage for the branch of the trigeminal nerve that innervates the face, especially the vibrissae. Optic canal, passage from the braincase to the eye carrying the optic nerve. External Acoustic Meatus, opening of the ear canal, which ends in the tympanic membrane. Occipital Condyle, joint surface for attachment of the skull to the first cervical vertebra (atlas). Foramen magnum, opening into the brain case through which the spinal cord passes.

(Evans, Miller's Anatomy of the Dog)
Palatine fissure, opening for passage of nerves onto the palate and related to chemical sensation by the vomeronasal organ. Jugular foramen, large passage through which the jugular vein drains blood from the braincase and through which several cranial nerves pass. Hypoglossal foramen, and easily identifiable opening for the hypoglossal nerve (a cranial nerve).

Bones of the Skeleton

Cervical Vertebrae
Thoracic, Lumbar and Sacral Vertebrae

Scapula

**Humerus**

Radius and Ulna

Manus (forefoot)

Pelvis

A. *Canis familiaris*

B. *Gorilla gorilla*


Femur

A. *Equus caballus*

B. *Canis familiaris*


from Bezuidenhout and Evans, 2005.
Assignment

Work in small groups with the skeletons. Sort the bones into their anatomical layout and try to fit as many together as possible to examine how the joints fit. As you work, try to identify the following bones and structures. Familiarize yourself as much as possible with the terms because they will be used throughout the class. It is often helpful to learn the names of bones of the limbs in order from proximal (near the body) to distal (near the toes). For bones of the skull, it is helpful to start at the foramen magnum (opening through which the spinal cord exits) and work around the midline of the skull, then add the bones that are lateral (to the sides).

The terms in this list specifically apply to the mammalian skeleton, but most of them are homologous to structures in other vertebrate groups, sometimes under the same name, sometimes a different name. Note also that different terms are used in medical human anatomy than in zoology and paleontology. Veterinary medicine and anthropology have largely adopted the medical human-based terms. Some of the alternative terms are listed here in parentheses. Note also that the formal names are in Latin. Some texts use the Latin name whereas others use the Anglicized name (e.g., os frontale vs. frontal).

**Cranial Bones**

1. Alisphenoid
2. Basioccipital
3. Basisphenoid
4. Dentary
5. Entotympanic
6. Ethmoid
7. Exoccipital
8. Frontal
9. Jugal (Zygomatic)
10. Lacrimal
11. Maxilla
12. Nasal
13. Palatine
14. Paraspheniod
15. Parietal
16. Petrosal (periotic)
17. Premaxilla
18. Pterygoid
19. Squamosal
20. Tympanic
21. Vomer

**Cranial Openings**

1. Cribriform plate
2. External acoustic meatus
3. External nares
4. Foramen magnum
5. Foramen ovale
6. Foramen rotundum
7. Hypoglossal foramen
8. Incisive foramen
9. Infraorbital foramen
10. Internal nares
11. Lacrimal canal
12. Mandibular foramen
13. Medial lacerate foramen (Carotid foramen)
14. Mental foramen
15. Optic canal
16. Palatine foramen
17. Posterior lacerate foramen (Jugular foramen)
18. Postglenoid foramen

**Other Cranial Structures**

1. Angular process
2. Coronoid process
3. Glenoid fossa
4. Mandibular condyle
5. Massateric fossa
6. Mastoid process
7. Occipital condyle
8. Paroccipital process

**Postcranial bones**

1. Astragalus (talus)
2. Atlas
3. Axis
4. Calcaneum (calcaneus) 13. Radial head
5. Capitate 14. Semilunar notch
6. Clavicle 15. Spinous process
7. Cuboid 16. Sustentacular process
8. Femur 17. Trochlea of humerus
10. Hamate
11. Humerus
12. Ilium
13. Intermedial cuneiform
14. Ischium
15. Lateral cuneiform
16. Lunate
17. Medial cuneiform
18. Metacarpal
19. Metatarsal
20. Navicular
21. Phalanx, distal
22. Phalanx, medial
23. Phalanx, proximal
24. Pisiform
25. Pubis
26. Radius
27. Sacrum
28. Scaphoid
29. Scapula
30. Sternum
31. Tibia
32. Trapezium
33. Trapezoid
34. Triquetrum
35. Ulna
36. Vertebra, caudal
37. Vertebra, cervical
38. Vertebra, lumbar
39. Vertebra, thoracic

Postcranial Opening and structures
1. Acetabulum
2. Astragalar trochlea
3. Calcaneal tubercle
4. Centrum
5. Cervical canal
6. Deltoid crest
7. Femoral head
8. Glenoid fossa (scapula)
9. Glenoid fossa (squamosal)
10. Greater trochanter
11. Humeral head
12. Lesser trochanter