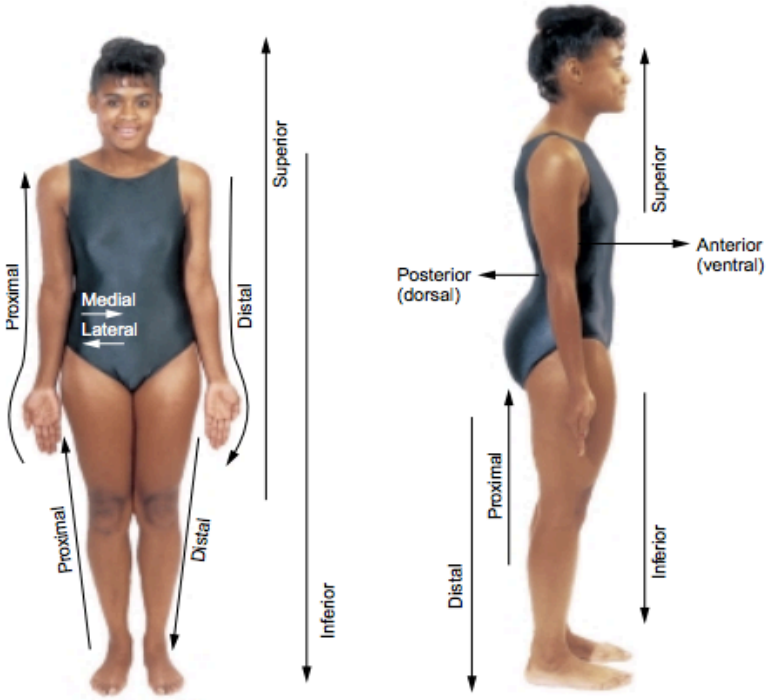
ANAT2009 Lecture Notes

Lecture 1

To be able to use anatomical nomenclature (naming of anatomical specimens - bones and muscles and their features)

Term	Definition
Superior (cranial, cephalic)	Towards head
Inferior (caudal)	Towards the bottom
Anterior (ventral)	Towards the front
Posterior (dorsal)	Towards the back
Medial	Towards the midline
Lateral	Away from the midline
Deep	Away from the surface
Superficial	Towards the surface
Proximal	Towards the trunk of the body
Distal	Away from the trunk of the body

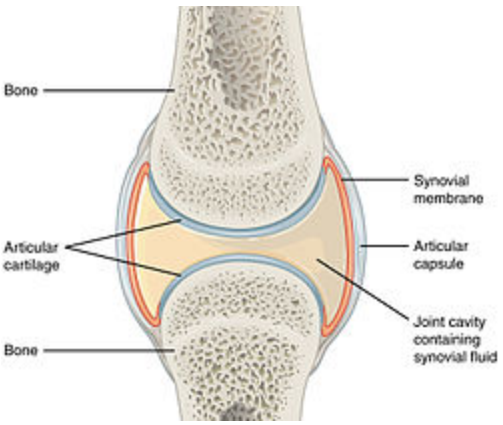


To understand some basic tissues

- Epithelial – cover surfaces e.g. skin
- Connective tissue e.g. skin, fascia, ligament, tendon, cartilage bone
- Muscle – skeletal, cardiac, smooth
- Nervous – brain and spinal cord

To be able to name and describe the different types of joints

- Fibrous (immoveable) e.g. between bones of the skull
- Cartilaginous (slightly moveable) e.g. between vertebrae, in epiphyseal plates
- Synovial (freely moveable)
  - Ball and socket e.g. shoulder, hip
  - Hinge e.g. knee, elbow
  - Saddle e.g. carpal bone and 1st metacarpal bone
  - Ellipsoid e.g. between radius and carpal bones of wrist
  - Pivot e.g. between C1 and C2, proximal radioulnar, distal radioulnar
  - Gliding e.g. between tarsal bones



Lecture 2

To be able to explain the three adaptive trends which are characteristic of all primates

(1) Adaption to living in trees

- Nails instead of claws – large, flat, sensitive tactile pad which requires a flat nail
- Free mobility of digits – long and prehensile digits, opposability of fingers/toes, precision and power grip
- Generalised/primitive limb structure – retention of a clavicle and rotation of shoulder, rotation of wrist and radius and ulna makes the forearm flexible
- Visual adaptations – eye sockets face forward, fine discrimination and colour vision
- Reduction in sense of smell – use of touch to examine, reduction in size of snout
- Trunk uprightedness – preadaptation to bipedalism

(2) Maintenance of dietary variation

- Retention of different types of teeth – allows for unspecialised diet, teeth used to grasp and manipulate the environment
- Reduction in number of teeth

(3) Large amounts of parental care invested in a very small number of offspring

- Offspring learn more
- Chance of survival is high
- Complex and expanded brain – especially in visual and association areas

To be able to describe the range and major characteristics and give examples of the major groups of primates

Prosimians

- Lemur
  - In Madagascar only
  - Long life span
  - Nails on some digits
  - Good eyesight
  - Good grasping ability
  - Long snout

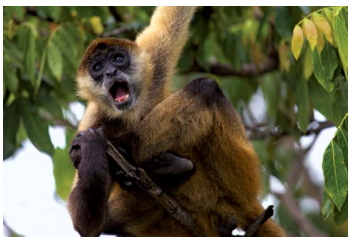
- Tarsier
  - Small area of SE Asia
  - Nocturnal
  - Small, large ears, small snout
  - More parental care
  - Facial expression
  - Larger brain
  - Stereoscopic vision

Old world monkeys – native to Africa/Asia

- Baboon
  - 2 premolars
  - Arboreal and Quadrupedal
  - Prolonged gestation
  - Not prehensile tails
  - Good manipulation
  - Larger brain

New world monkeys – native to Americas

- Spider monkey
  - Broad, flat noses
  - Retain 3 premolars
  - Prehensile tail



Apes

- Gibbon
  - Smaller
  - Larger brain
  - Long gestation
  - Broad trunk, long limbs
  - No tail
  - Brachiate

- Orangutan
  - Asian
  - Knuckle walker
  - Solitary
  - Marked sex differences
- Chimp

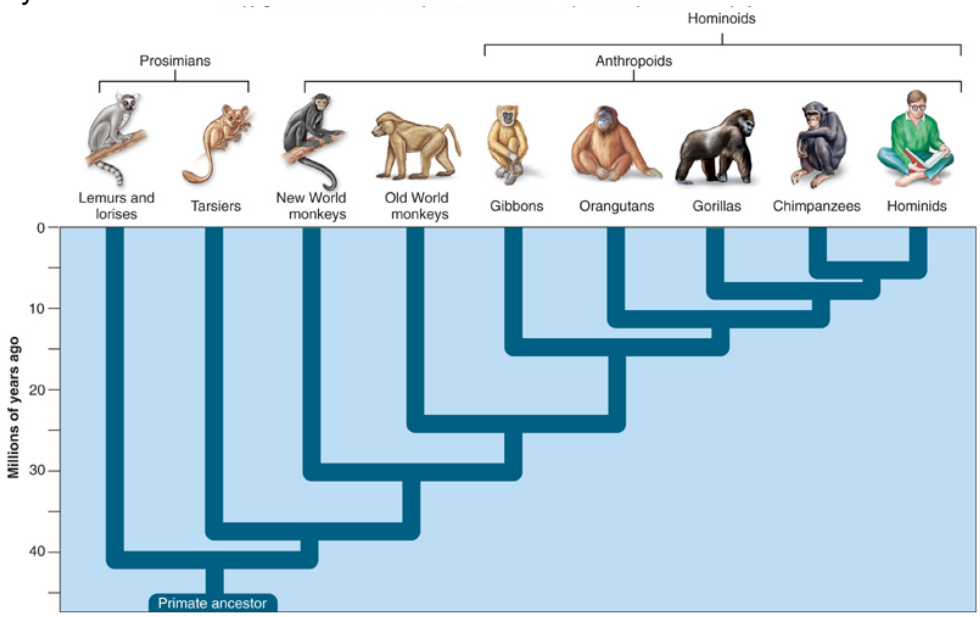
- Africa
- Arboreal
- Terrestrial
- Knuckle walker
- Not marked sex differences

- Pygmy chimp
  - Walks upright 25% of the time
  - Slighter than common chimp
  - Larger breasts
  - More individual facial features

- Gorilla
  - Largest
  - Enormous jaws and teeth
  - Marked sexual differences

To be able to draw a simple evolutionary/phylogenetic tree of primates including a timeline

- Allows us to draw ancestral relationships
- Similarities between organisms can be based on morphology, behaviour, physiology, chromosomes, biochemistry
- Best criteria for assessing the reliability of any evolutionary/phylogenetic tree for primates must be its capacity to absorb new fossil finds



To use scientific nomenclature for naming of primates

- Genus name begins with a capital letter
- Species name begins with a small lertter
- Both italicised or underlined
  Example: *Homo sapiens, Pan troglodytes*

To gain an understanding of primate origins

- Primates were the first group of placental mammals to differentiate
- A very old order
- Living primates = 5% of all primates that have existed (95% are extinct)
- Date from cretaceous period (65 mya) in N America and N Africa
  - Plesiadapids and were mouse sized, fruit eaters, quadruped and not unlike living lemurs
- Earliest evidence of homonioids (ancestors of apes and homonids)
  - Miocene 20 mya
  - Proconsul

- Quadruped with some suspensory ability, no tail, opposable thumb, increased brain size

Lecture 3

To be able to define hominoid, hominid and hominin

- Hominoid = all humans and all apes
- Hominid = all modern and extinct great apes and humans and their ancestors
- Hominin = humans and all their ancestors

To be able to list what are hominin adaptations

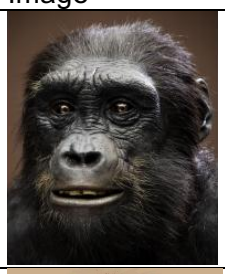
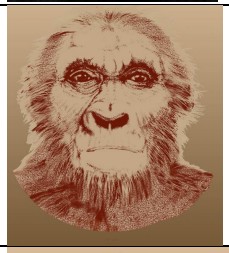
(1) Locomotion
- Trend towards bipedalism
- Advantage in: spotting predators/prey, picking fruits, freeing hands, appear larger/intimidating

(2) Jaws/teeth
- Parabolic dental arcade
- Loss of diasterna (space between teeth)
- Small incisors
- Large posterior teeth, efficient grinding

(3) Reduced jaw
- Orthognathic, rather than prognathic
- Due to reduction in size of teeth

(4) Increased intelligence
- Increased brain size
- Change in structure/organisation of brain

To be able to describe the following hominins in terms of their adaptations, date and location

Hominin	Date	Location	Adaptations	Image
Sahelanthropus	6-7 mya.	Chad (Central Africa)	• Small brain • Sloping face, elongated skull • Prominent brow ridges • Small canine teeth • Short middle part of face • Foramen magnum underneath the skull = bipedal	
Orrorin	5.8-6.2 mya	E Africa	• Chimp size • Small teeth, thick enamel • Long neck of femur (bipedalism)	
Ardipethecus	4.4 mya	E Africa	• Grasping big toes (quadrupedal in trees) • Hands adapted to arboreal life • Reduced canines • Small brain • Bipedal on ground	
Australopithecus afarensis (Lucy)	2.95-3.85 mya	E Africa	• Reach adulthood early = less time for parental guidance • Flat nose • Projecting lower jaw, small canines, large molars • Small brain • Long, strong arms and curved fingers • Adapted for walking upright	

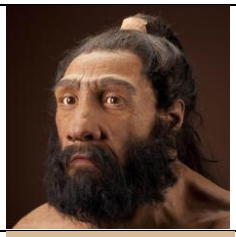
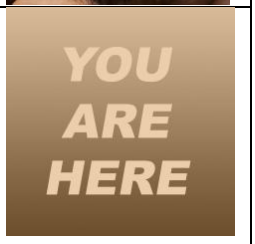
Australopithecus africanus	2.1-3.3 mya	S Africa	• Rounder cranium, sloping face with a larger brain • Smaller teeth • Long arms • Pelvis, femur and foot bones indicate bipedalism • Shoulder and hand bones indicate they were adapted for climbing	
Paranthropus robustus	1.2-1.8 mya	S Africa	• Robust • Large jaw/teeth • Large cheek bones and wide face • Large sagittal crest (anchor muscles) • Moderate sexual dimorphism • Probably not ancestral to humans	
Paranthropus boisei	1.2-2.3 mya	E Africa	• Adaptations for heavy chewing • Strong sagittal crest • Large teeth • Flaring cheek bones = wide face • Flatter, bigger-brained skull • Marked sexual dimorphism • Probably not ancestral to humans	

Lecture 4

Distinguishing features of Homo

- Large brain relative to body size
- Small teeth
- Bipedal
- Manufacture tools
- Slow development
- Foramen magnum under the skull
- Prominent nose
- Short base of skull
- Presence of chin

Name	*Time*	*Location*	*Details*	*Image*
Homo habilis	2.4-1.4 mya.	East and south Africa	• Larger brain • Smaller face and teeth • Long arms	
Homo erectus "Turkana Boy"	1.89m-140 000 ya	N, E, S Africa W and E Asia	• Larger brain • Teeth smaller • Prominent brow ridges • Made tools • Elongated legs, shorter arms • Adaptations to living on the ground • Growth rate similar to ape	
Homo floriensis "Hobbit"	50-100 000 ya	Asia	• Short with a small head and brain, large feet • Large teeth • Shrugged forward shoulders • No chin • Receding hair line • May be a result of island dwarfism (long term isolation)	

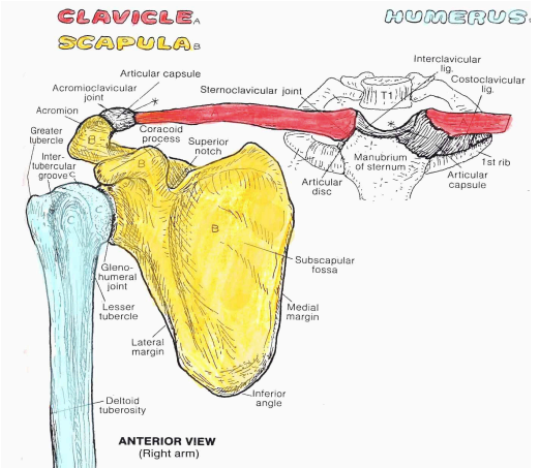
Homo Neanderthals	49– 400 000 ya	Europe and SW Asia	• Large middle part of face • Angled cheek bones with a large nose • Short, stocky bodies (for cold) • Made and used tools (skilled hunters) • Sophisticated behaviours	
Homo sapiens	300 000 ya – present	Evolved in Africa, now world wide	• Lighter build • Very large brains which vary in size • Flat and near vertical forehead • Less heavy brow ridges • Less prognathic • Jaws less developed with smaller teeth	

Lecture 5

Explain why the pectoral girdle and shoulder joint are so mobile

- Main function is manipulation
- Has many mobile joints
- Pectoral girdle = clavicle and scapulae
- Only bony connection of pectoral girdle to the axial skeleton is the sternoclavicular joint
  - Scapula is very mobile
- Humerus articulates with the scapula at the glenohumeral joint (shoulder) and this is also very mobile
- Functions: locomotion, climbing, manipulation, throwing, balance/support

Identify and be able to label features on drawings of the clavicle, scapula and humerus



Clavicle