Human Osteology

What is it?

What can it tell us?

Where will we start?

- Human Osteology- the study of bones
- What can bones tell us?
- They are the only surviving record of life on earth- they are durable

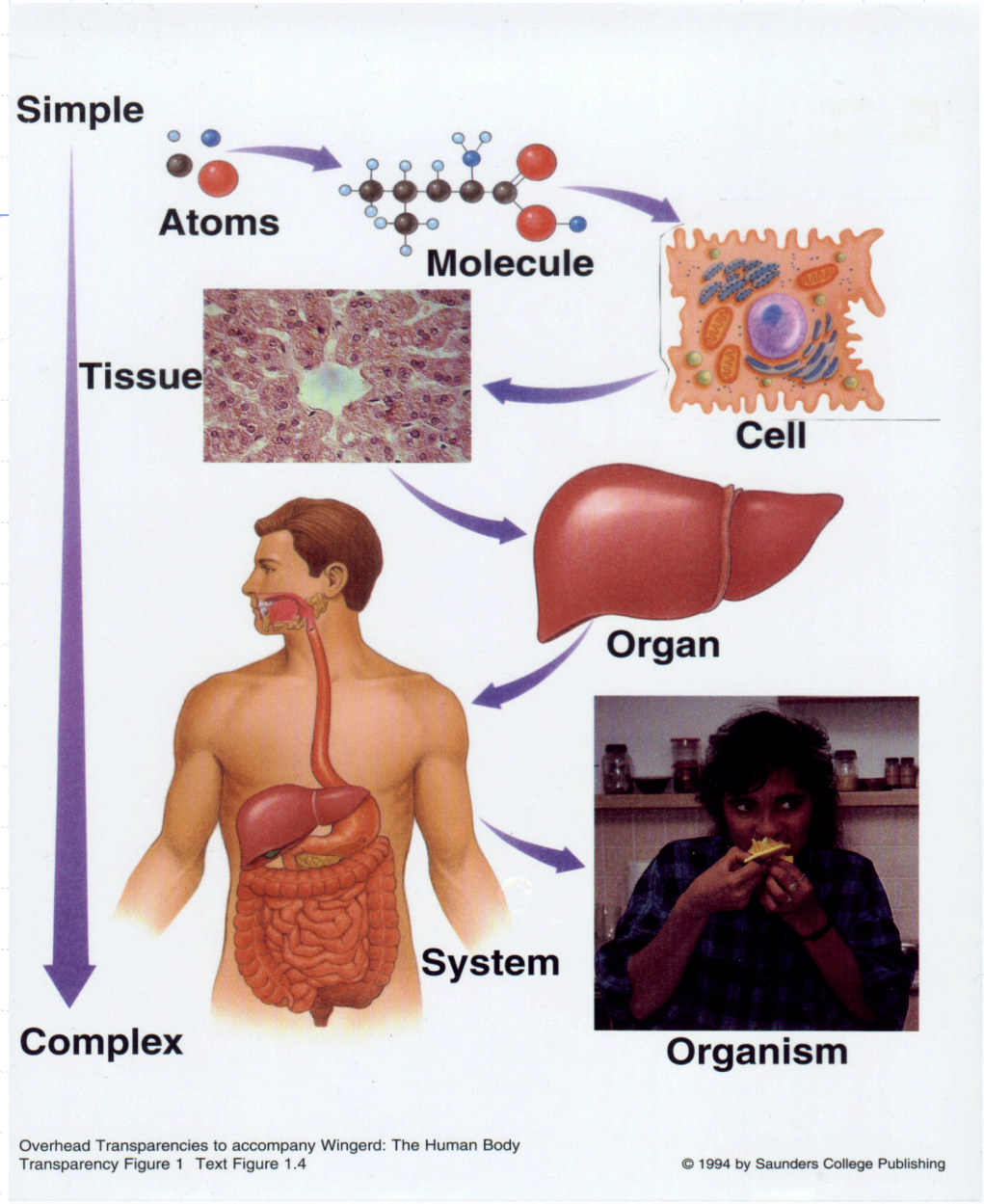
Practical Applications of Osteology

- Description of living person
- An evaluation of the health of the deceased
- Recognition of habitual activities
- ID of the deceased
- Recognition of the cause and manner of death
- Determination of approx. time of death
- Information about post mortem events

- Bones also allow us to tell if a body was moved
- Bones also tell us if “others” may have been feeding on the body

Allllllllllrighty then……..

- Atoms- smallest piece
- Cells- made of atoms
- Tissues- made of cells
- Organs- made of tissues
- Organ systems- made of organs
- Organisms- made of organ systems



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Tissues

- What are they? A group of cells that are similar in structure and in function.
- There are four types of tissues:
  - epithelium
  - connective
  - nervous
  - muscle
- These 4 interweave to form the fabric of the body

Epithelium

- The word means upon- laid on- a covering or a lining
- Cover the free surfaces
- **FUNCTIONS**
  - protection- give me an example
  - absorption
  - filtration
  - secretion

Special Characteristics

- Fit closely together to form sheets
- Always have one free surface- unattached side
  - called the apical surface- on the outside or the cavity of an internal organ
- Lower surface rests on a basement membrane
- Are avascular- rely on diffusion
- If well nourished, they regenerate easily

Simple Epithelium

- Absorption, secretion, filtration- usually very thin
- Simple Squamous epithelium
  - single layer- flat-skin
- Simple cuboidal epithelium
  - single layer-cube shaped-glands
- **SIMPLE COLUMNAR EPITHELIUM**
  - single layer-column shaped cells- digestive tract
- Pseudostratified columnar epithelium
  - looks like layers- but is not
- Pseudostratified ciliated columnar epithelium- line respiratory system

Stratified Epithelium (means layered)

- **Stratified squamous epithelium**-areas of high friction
- **Stratified cuboidal and stratified columnar epithelium**
  - two layers
- **Transitional epithelium**
  - highly modified stratified squamous epithelium
  - expandable- stretch
  - bladder

Connective Tissue

- **Common characteristics**
  - Variations in blood supply
  - Extracellular matrix
  - Contain fibers
    - collagen- white
    - elastic- yellow
    - reticular- fine
- Primary job: protection, supporting, binding together other body tissues

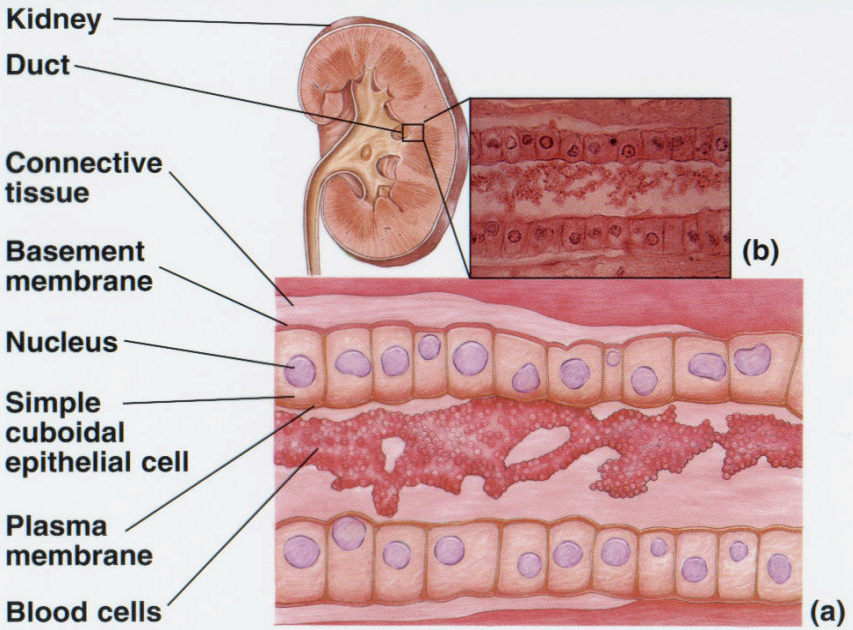
- From the most rigid to softest
  - bone- cartilage-Dense connective tissue-Loose connective tissue and blood
- **Bone-**
  - osseous tissue
  - bone cells sitting in cavities called lacunae surrounded by layers of calcium salts and collagen fibers
  - the above make bone rock hard and provide an exceptional ability to protect and support other body organs

Cartilage

- less hard-more flexible than bone
- most common is hyaline- abundant collagen fibers with a rubbery matrix- blue white appearance
- larynx, trachea, ribs, baby skeleton
- Elastic- highly compressible
  - ear, vertebral disks

- *Dense Connective tissue*- dense fibrous tissue- collagen fibers with fibriblasts
  - forms strong rope like structures
    - tendons, ligaments, lower layers of skin
- **Loose Connective tissue**- softer, more cells, fewer fibers
- *Areolar tissue*- widespread
  - universal packing and connective glue
  - airy tissue- this is the one that fills with fluid and causes swelling

- Adipose tissue- fat
  - areolar tissue in which fat cells are numerous
  - beneath skin
  - cushion, insulation
  - contains fat droplets
- **Reticular Connective tissue**
- *Blood*



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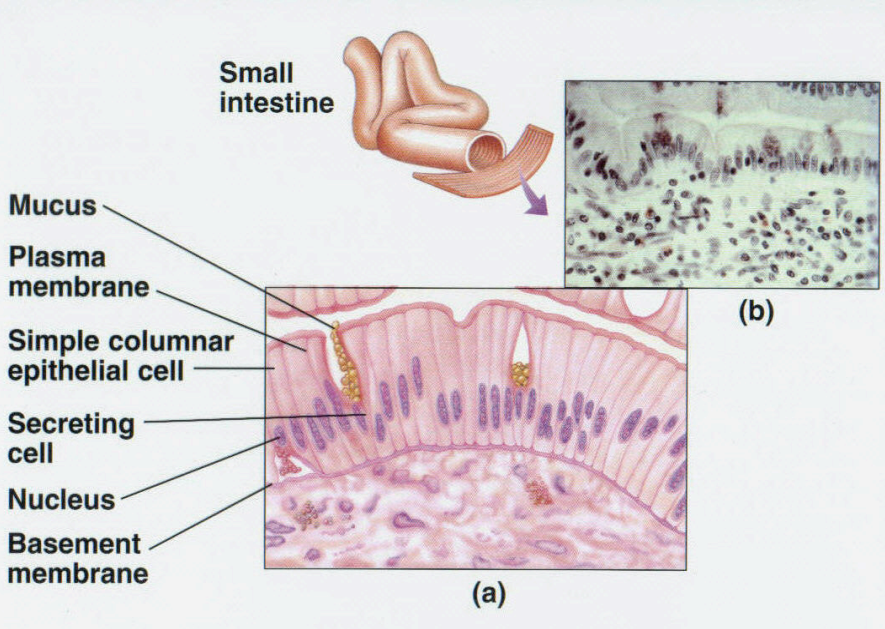

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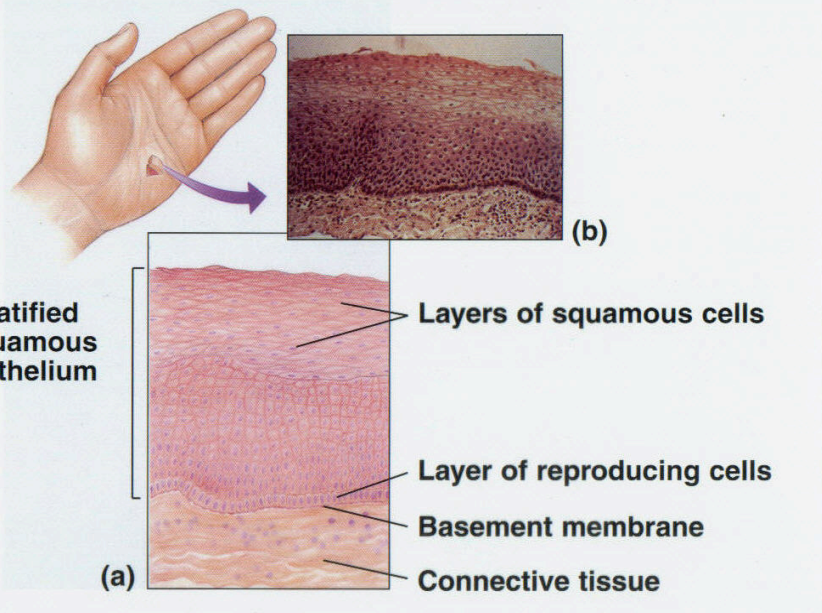

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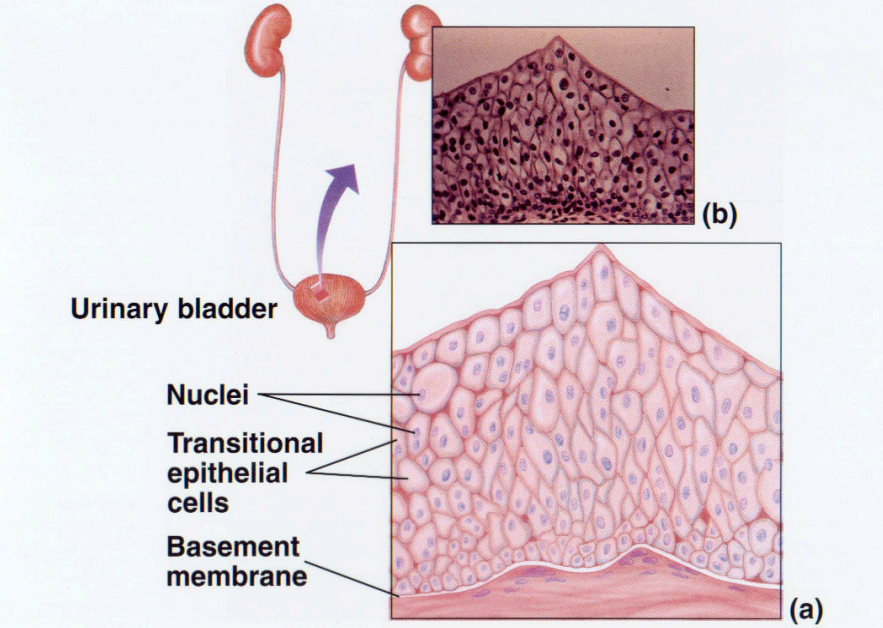

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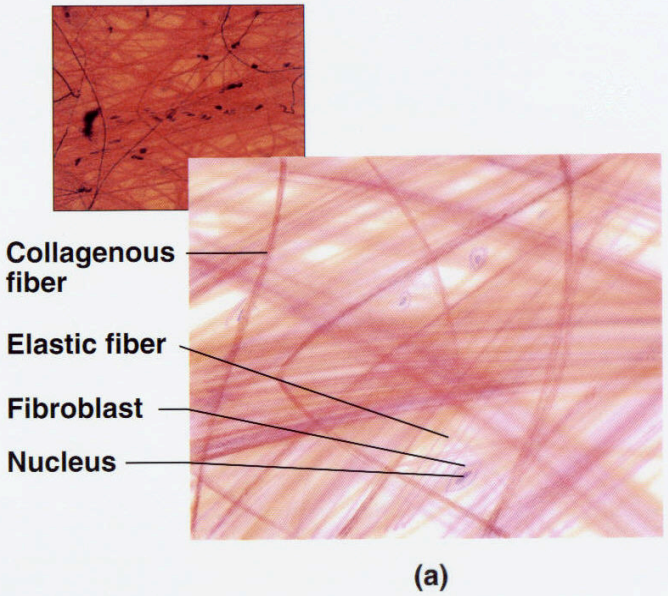

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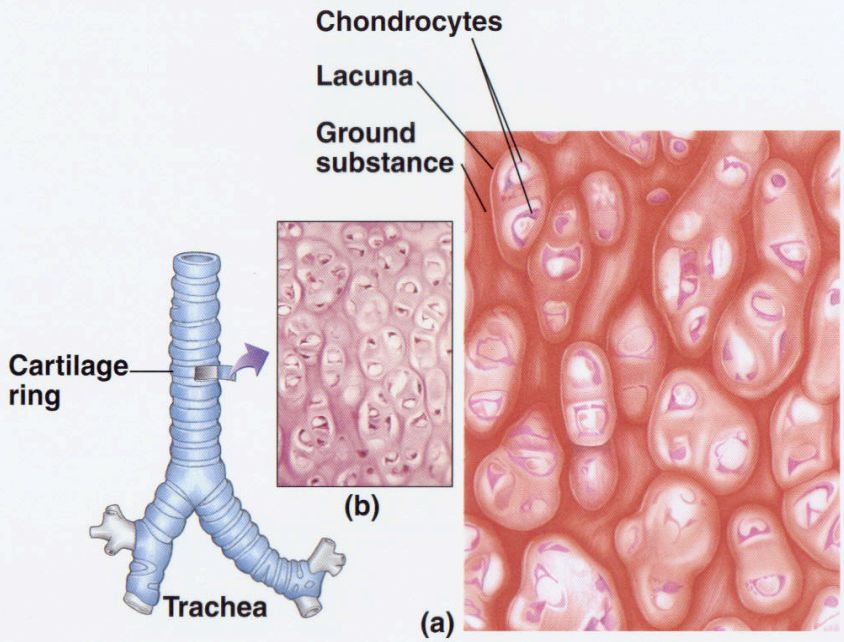

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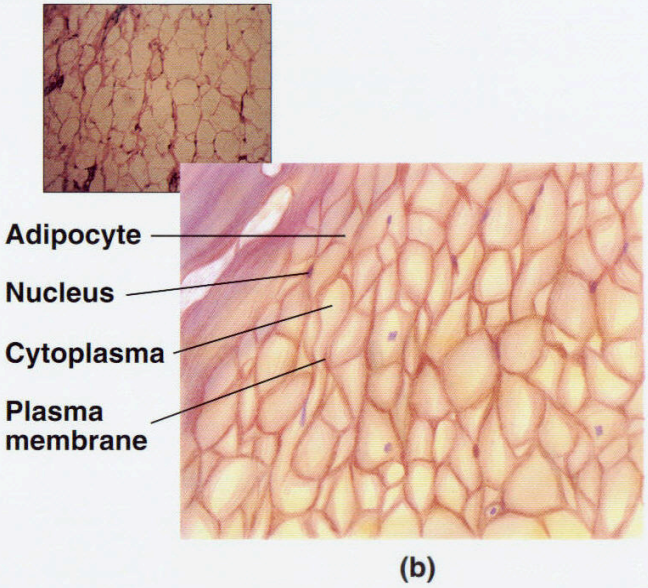

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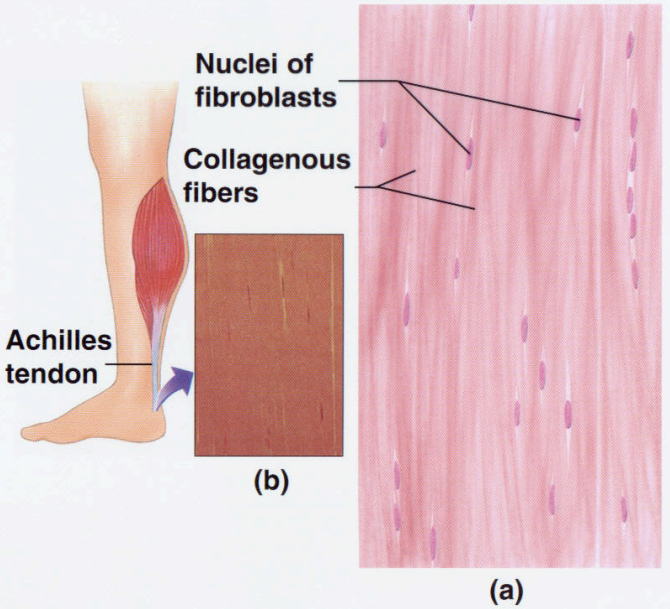

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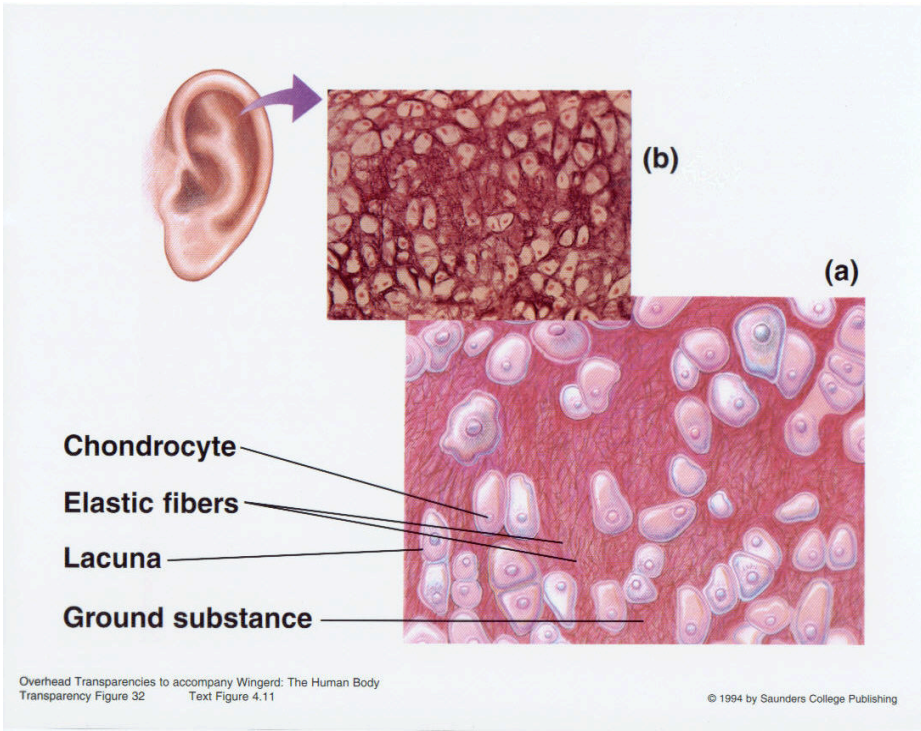

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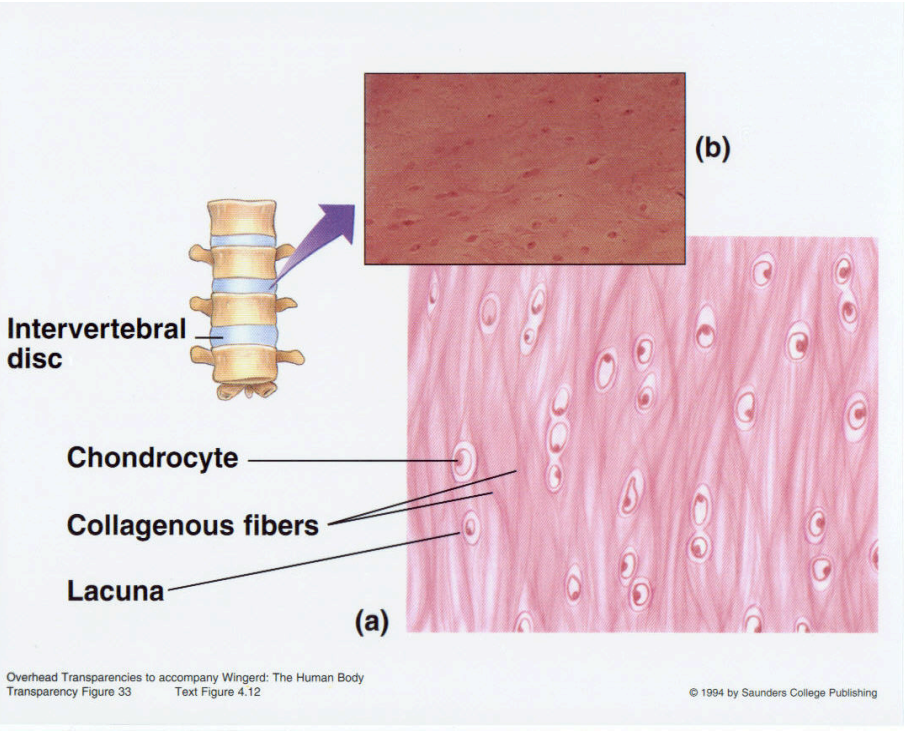

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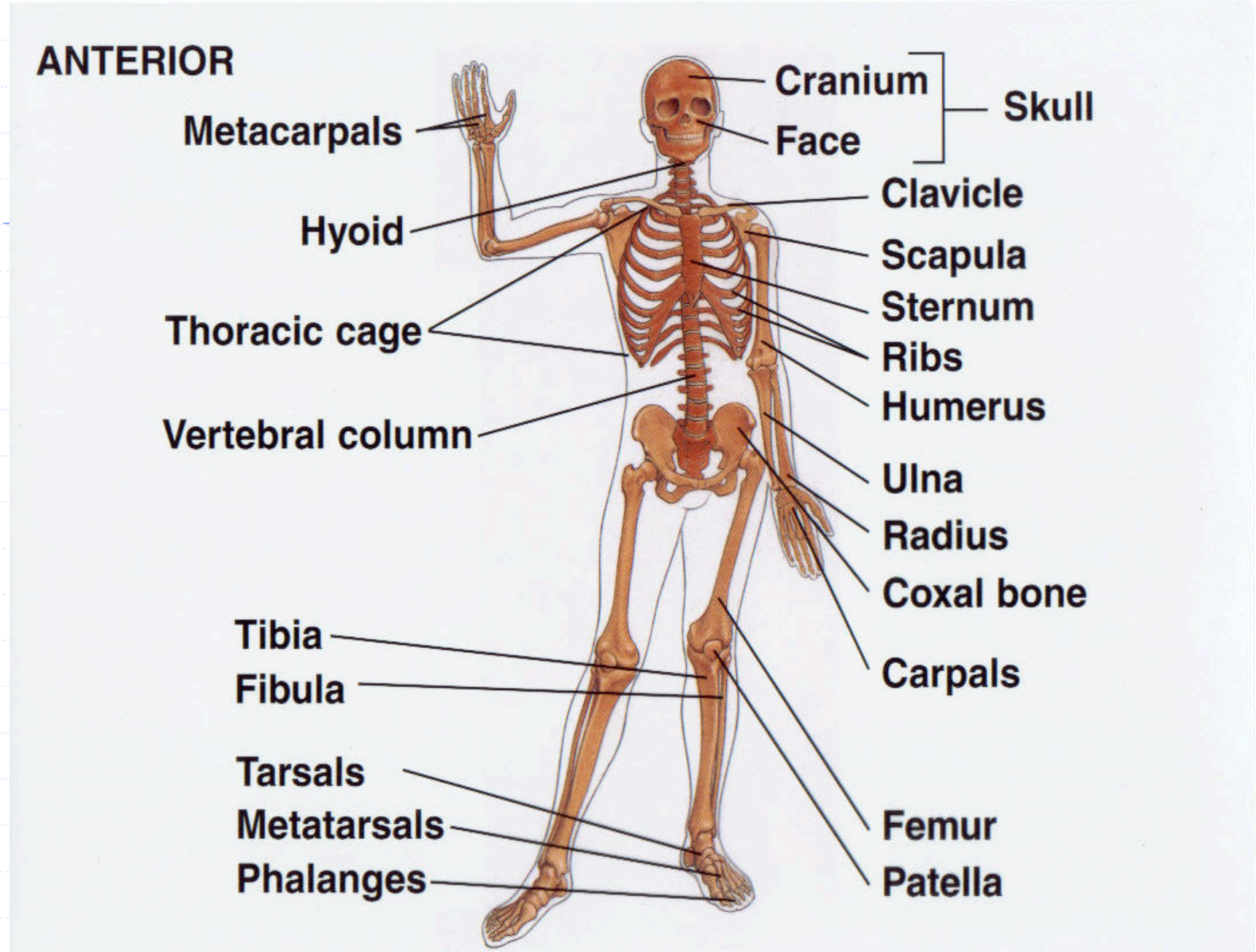
Skeletal System- Your Bones

- Subdivided into 2 division
  - axial-longitudinal axis of body
  - appendicular- limbs and girdles
    - both include the joints, cartilage, and ligaments
- Function
  - support
  - protection
  - movement
  - storage
  - blood cell formation



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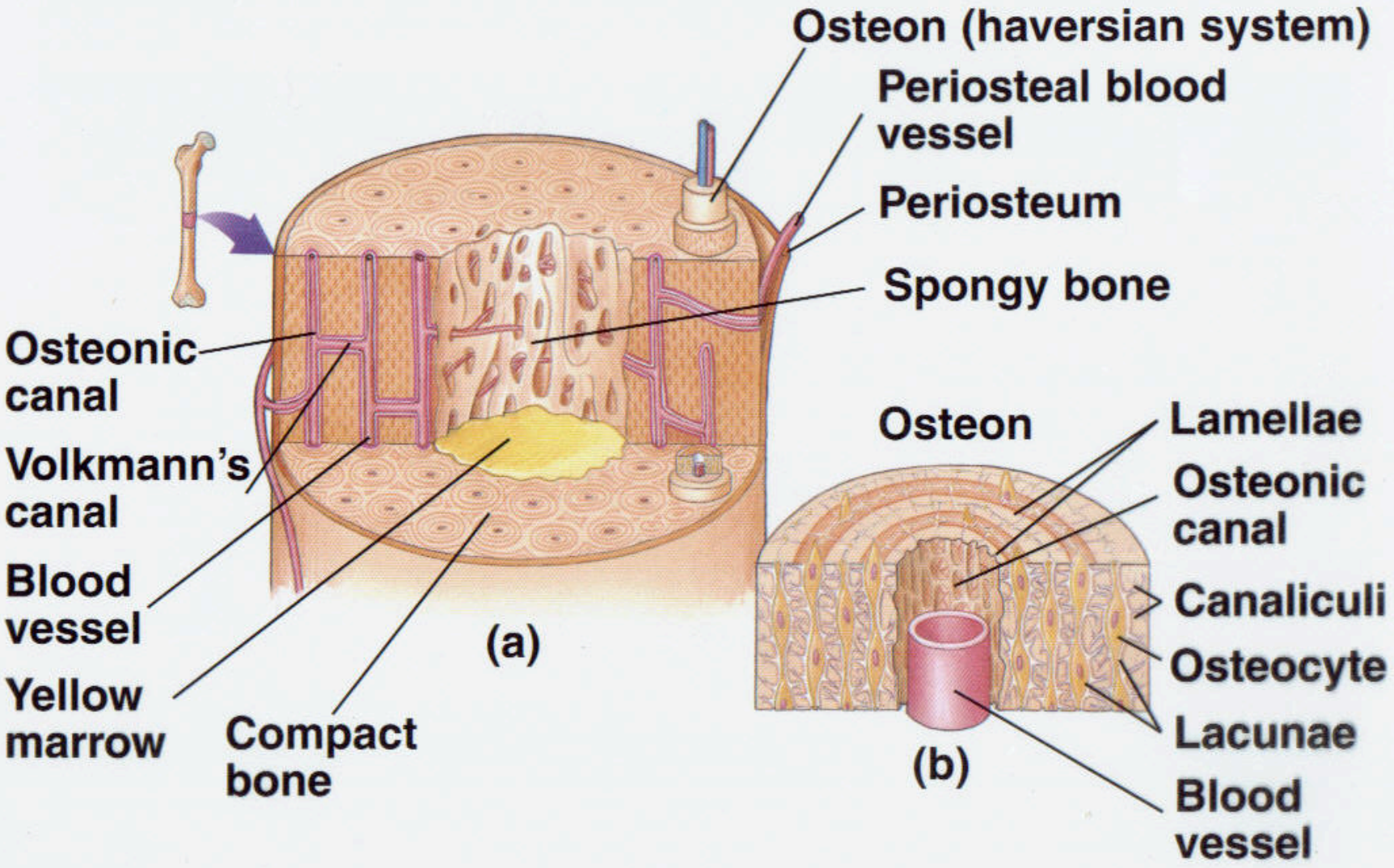
Structure of bones

- Diaphysis- shaft
- Periosteum- membrane covering bone
- Epiphysis- end of the bone
- Articular cartilage- covers the epiphysis
- Epiphyseal line and plate- areas where bone growth occurs
- Yellow marrow- medullary cavity- stores fat
- Red marrow- in epiphysis- blood cell production
- Nutrient Canals- blood vessel passage

Micro Anatomy

- Osteocytes- mature bone cells that are found in tiny cavities in a matrix called the **lacunae-**these are arranged in concentric rings called **lamellae** which are around the **Haversian Canals.** Each one is called an osteon or Haversian system.
- Canaliculi are a system that allows connection for transport. The Volkmann canal perforates inward.



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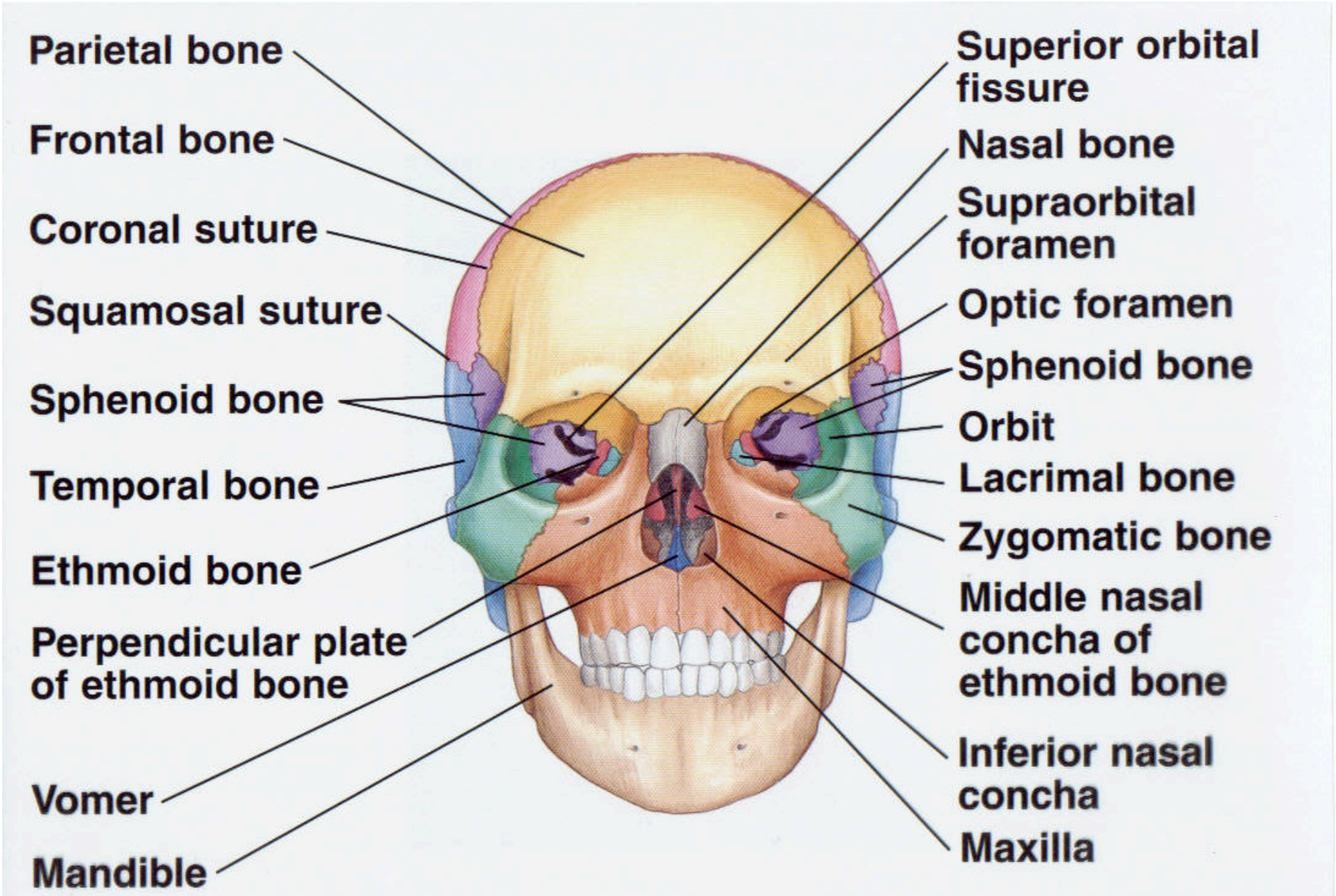

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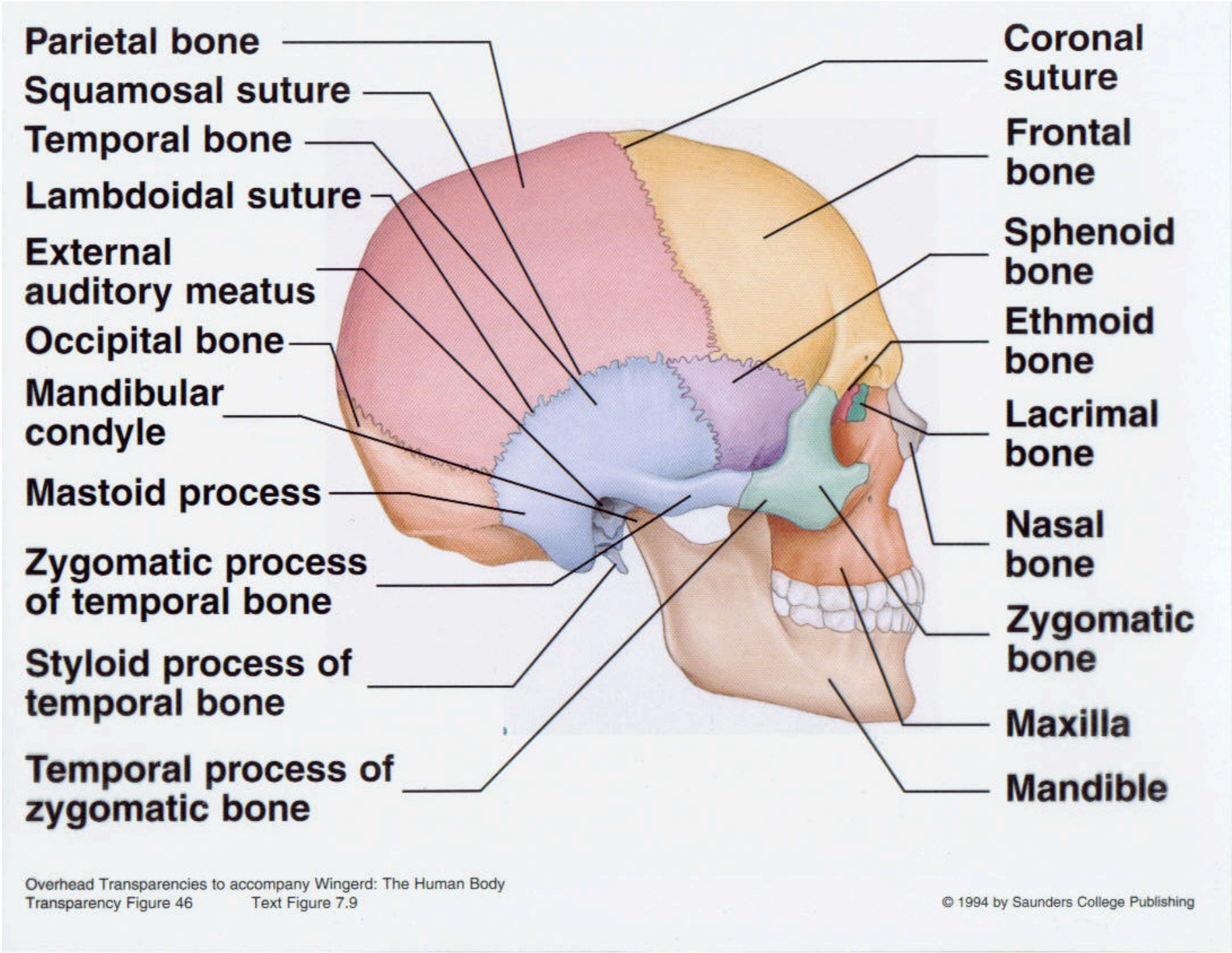

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Building Blocks of Bone

- **35% organic-** Remember what this is???
- Cells
- Collagen
- Ground substance- a material in which structural elements appear
- **65% inorganic-**mineral salts, calcium phosphates-

- **Osteoblasts**- bone forming cells- found at sites of bone growth, repair, remodeling
- **Osteoclasts**- break down bone- repair and remodeling
- **Osteocytes**- long term maintenance

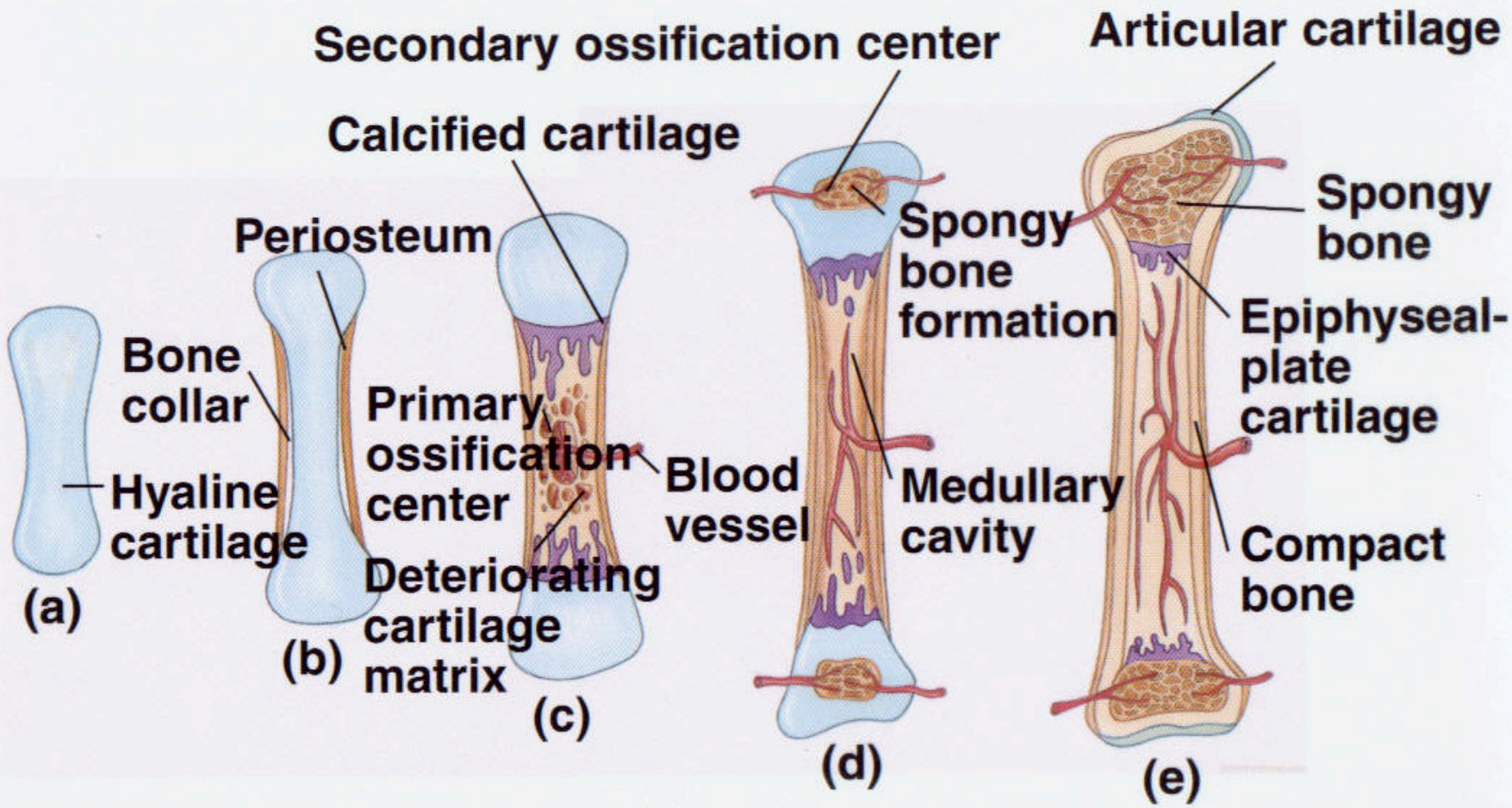
- **Wolff's Law**- form follows function

Bone Formation

- Ossification- cartilage is covered with osteoblast- bone forming cells
  - intramembranous-directly in the fibers
  - endochrondrial
    - most bones develop this way- blood vessel penetrates the perichondrium and stimulates osteoblasts' production
- When the cartilage degenerates cavities develop, osteoblasts lay down bone

Bone Growth

- Result of the epiphyseal plate- it lays down bone cells on the one side that elongate the shaft of the bone- appositional growth
- Bone grows in diameter as a result of the addition of new bone tissue by periosteal osteoblasts around the outer surface of the bone



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Directional Anatomy

- Anatomical position-
- Supine- on your back looking at the sky
- Prone- face down on the ground
- Superior- toward the head- above something
- Inferior- toward the tail- below something
- Anterior- to the front of the body
- Posterior- to the back of the body
- Medial- to the midline of the body
- Lateral- away from the midline

- Proximal- closer to point of attachment
- Distal- away from the point of attachment
- Superficial (External)- close to surface
- Deep (Internal)- below the surface

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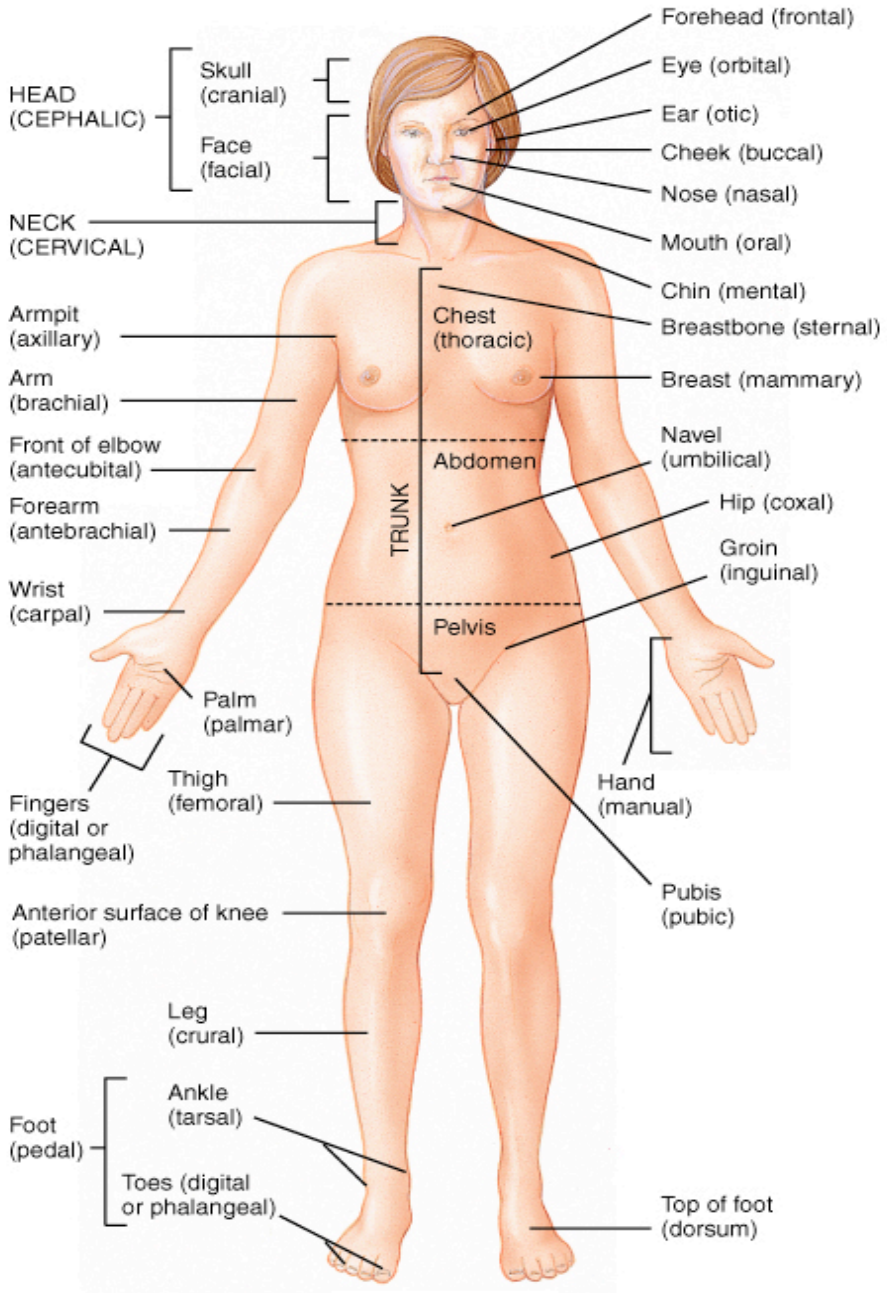
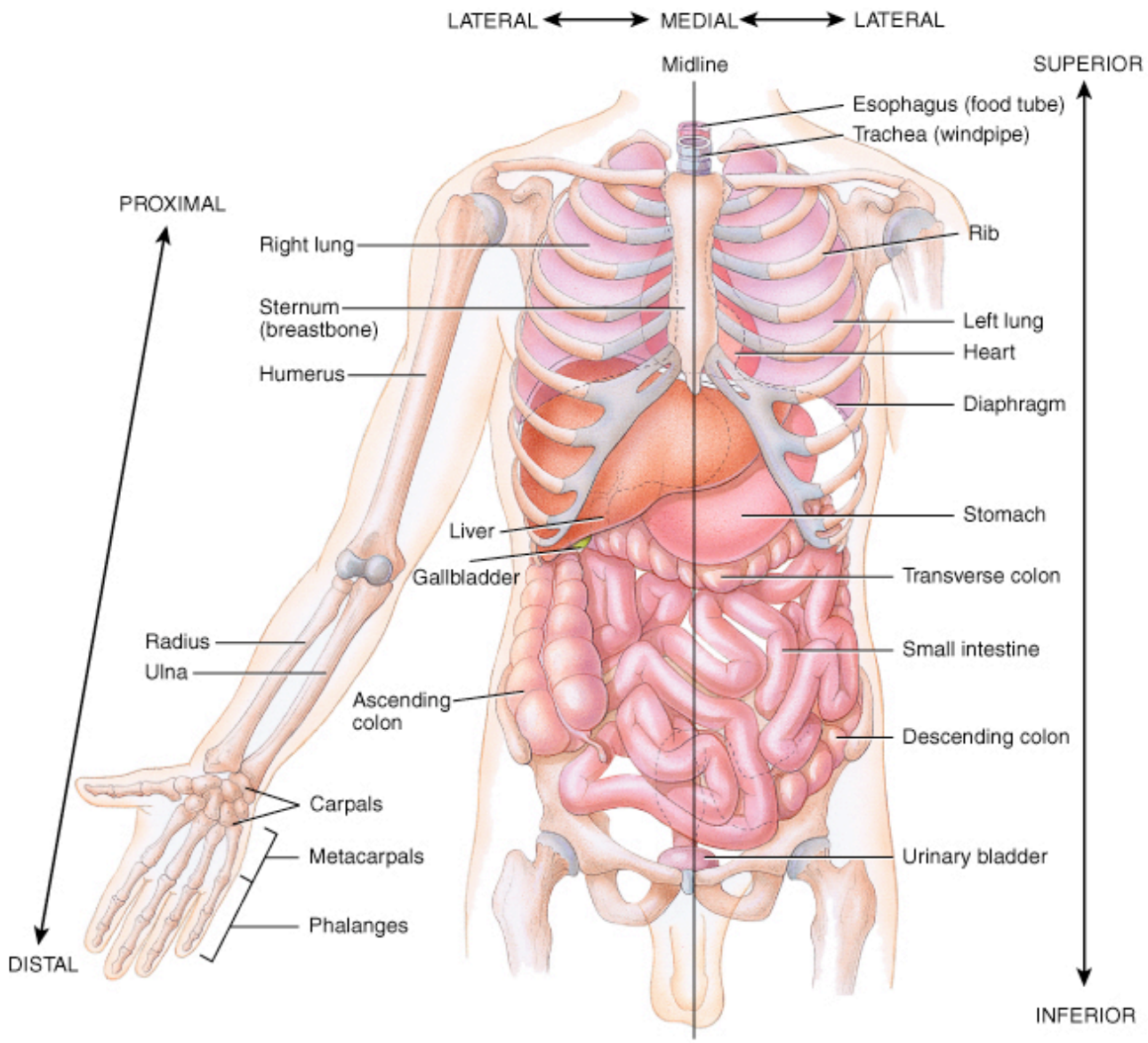
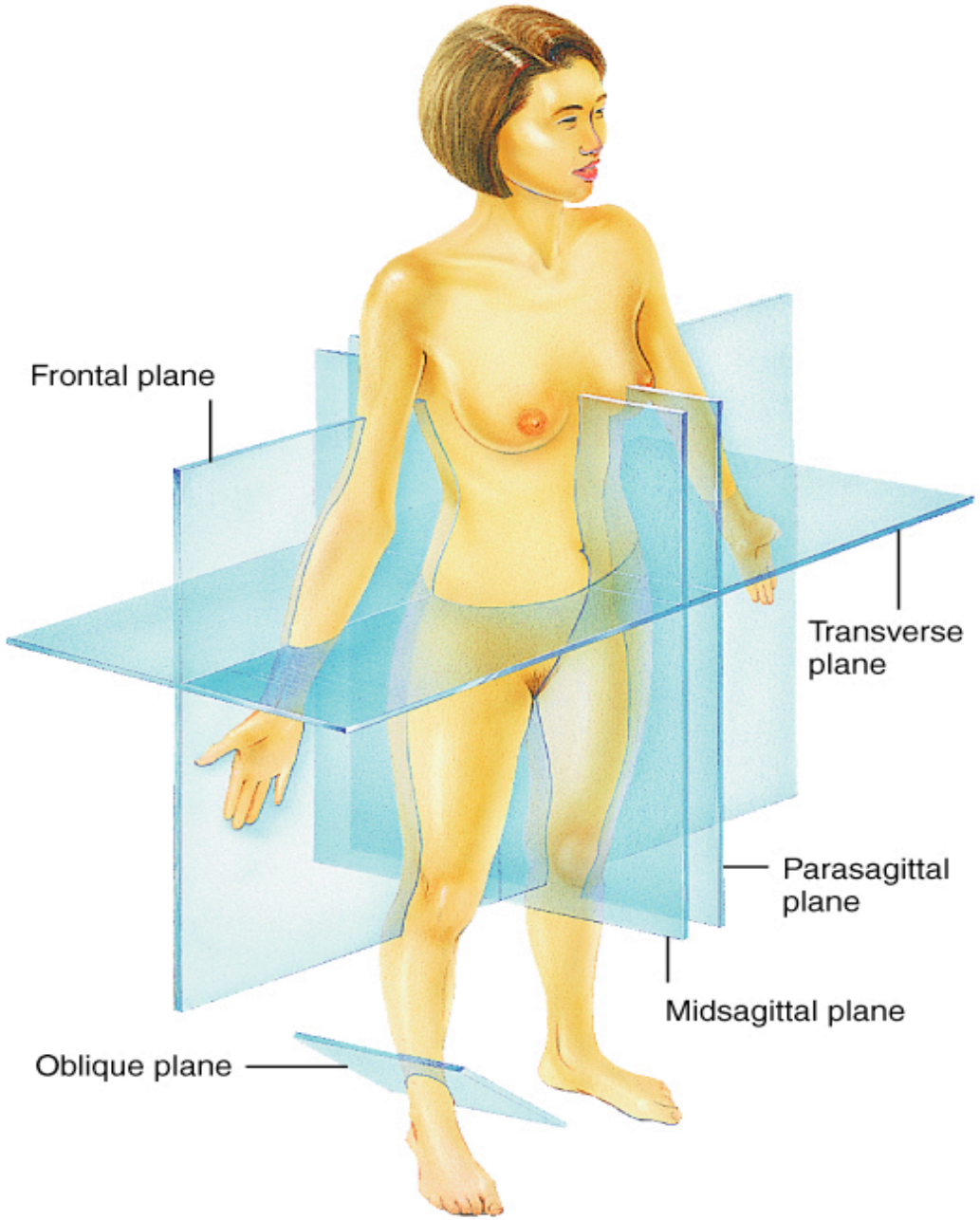


(a) Anterior view

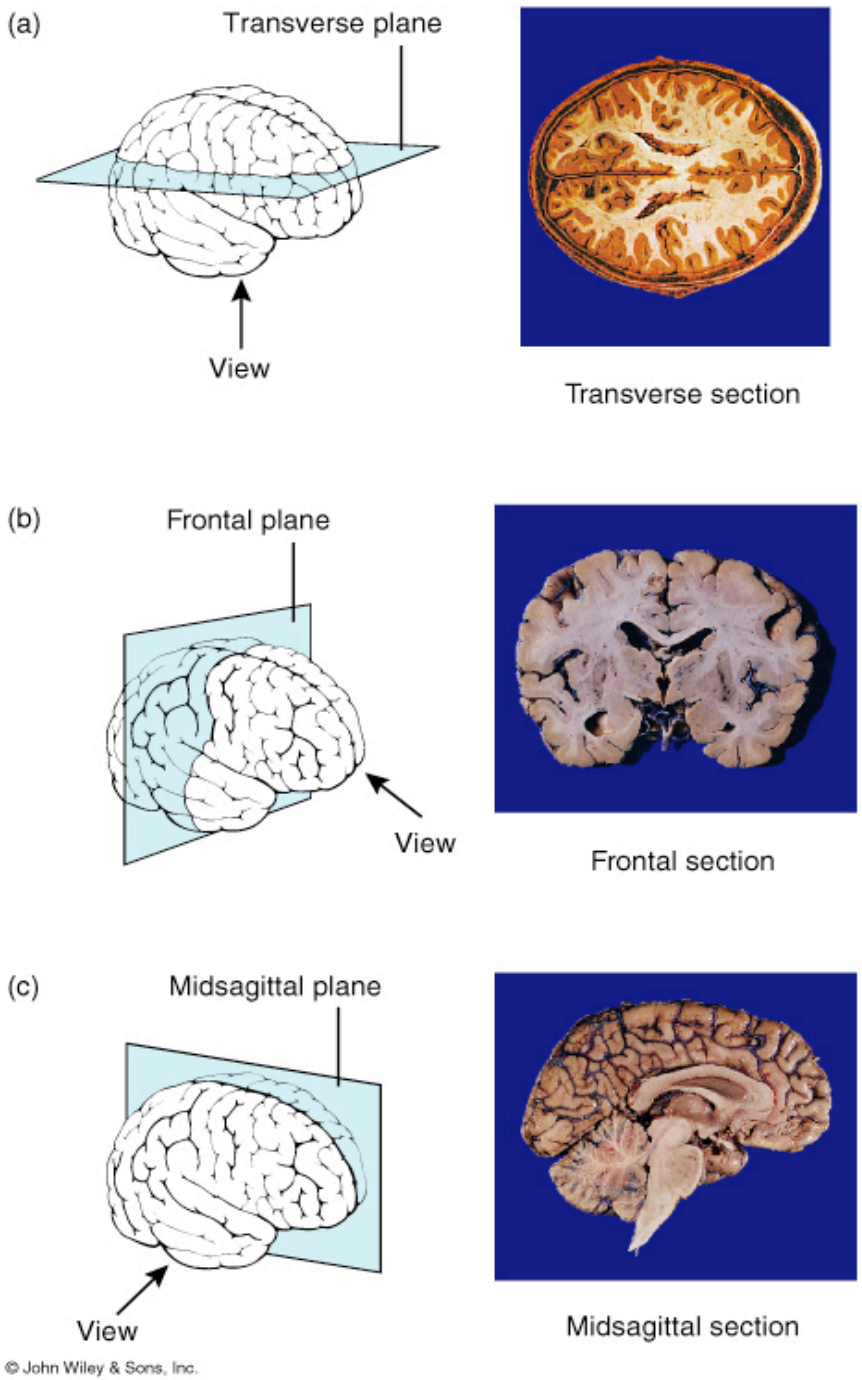


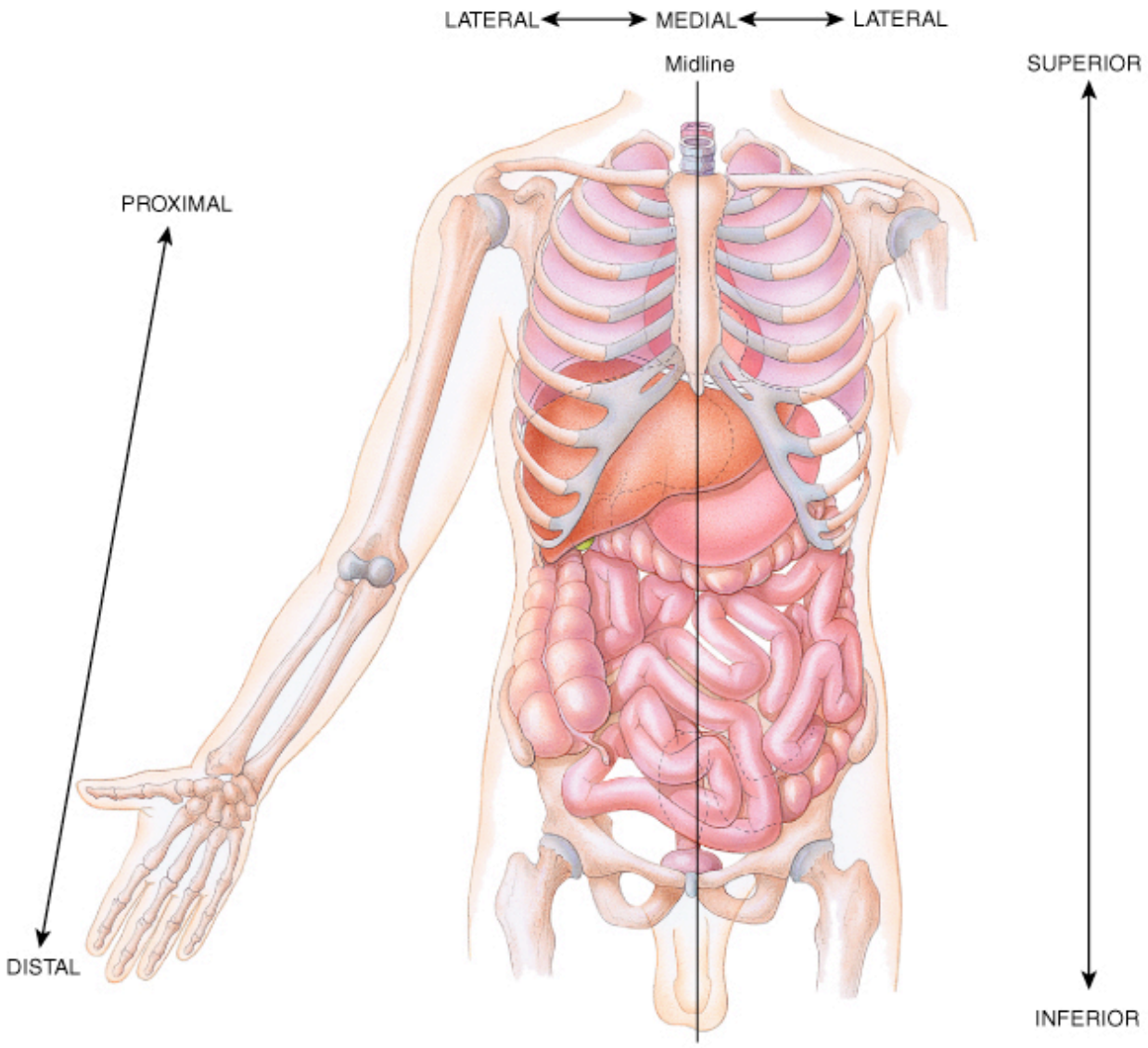
Anterior view of trunk and right upper limb

Coronal is also called Frontal

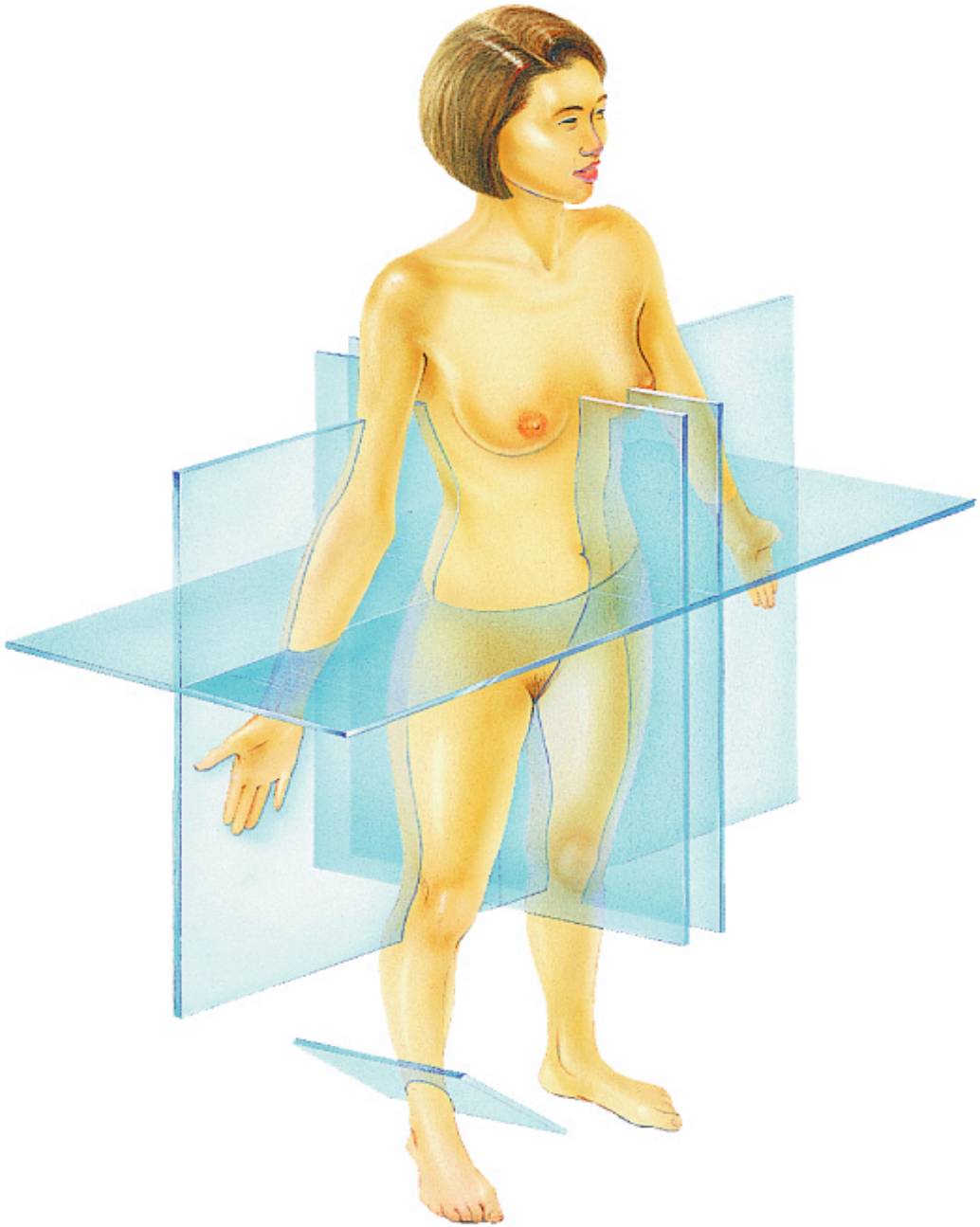


Right anterolateral view





Anterior view of trunk and right upper limb

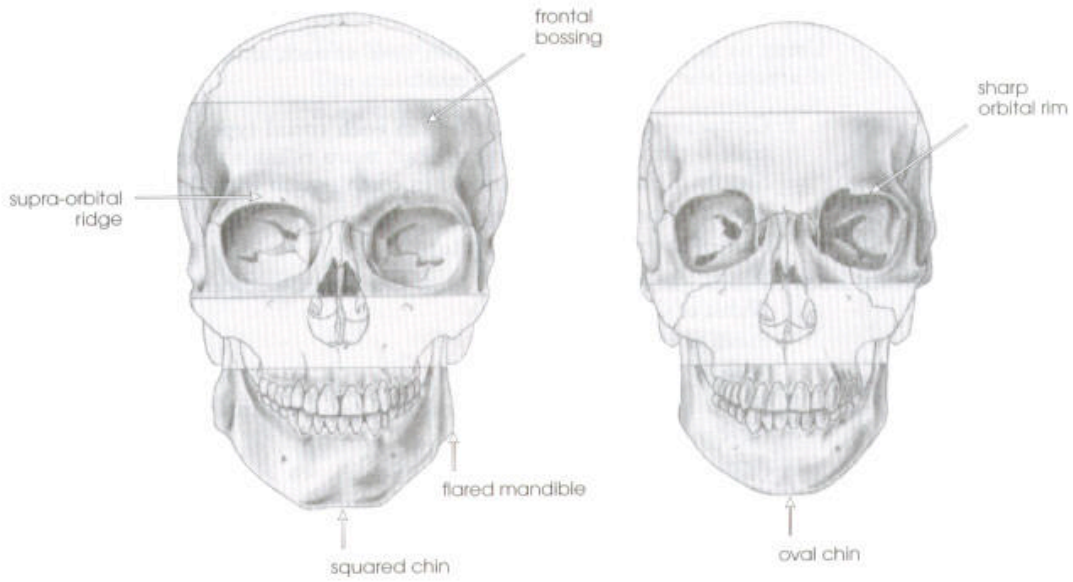


Right anterolateral view

Terms for Communication about Bone

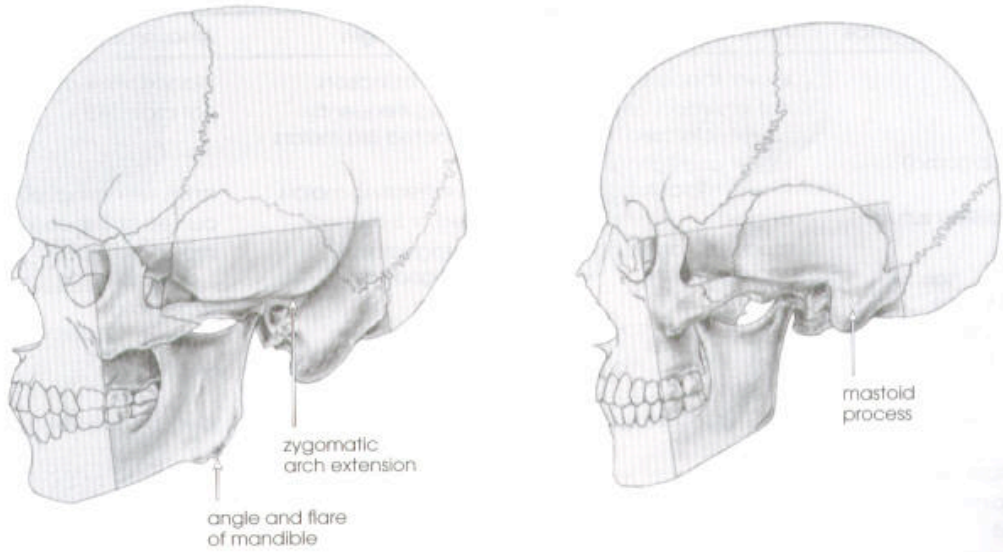
- Articular-
- Attachments
- Projections
- Depressions

Comparison of Male and Female Skulls, Frontal View



Okay, how do we tell male from female?

Comparison of Male and Female Skulls, Lateral View



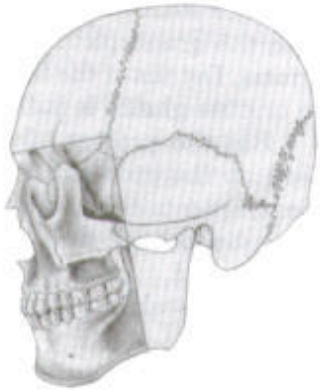
Racial Differences in the Mid-Face, Frontal View

Asian

African

European

Racial Differences in the Face, Lateral View

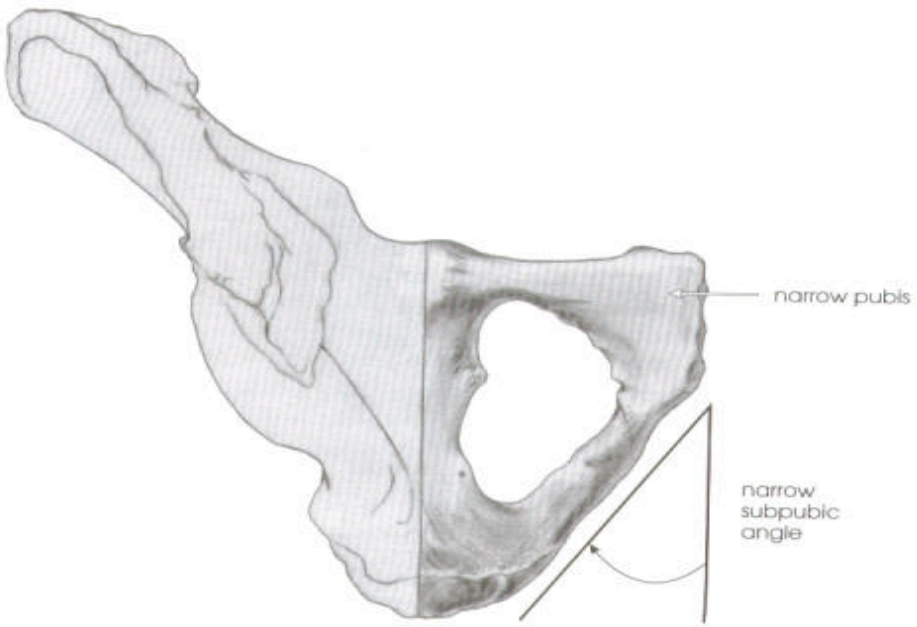


Asian

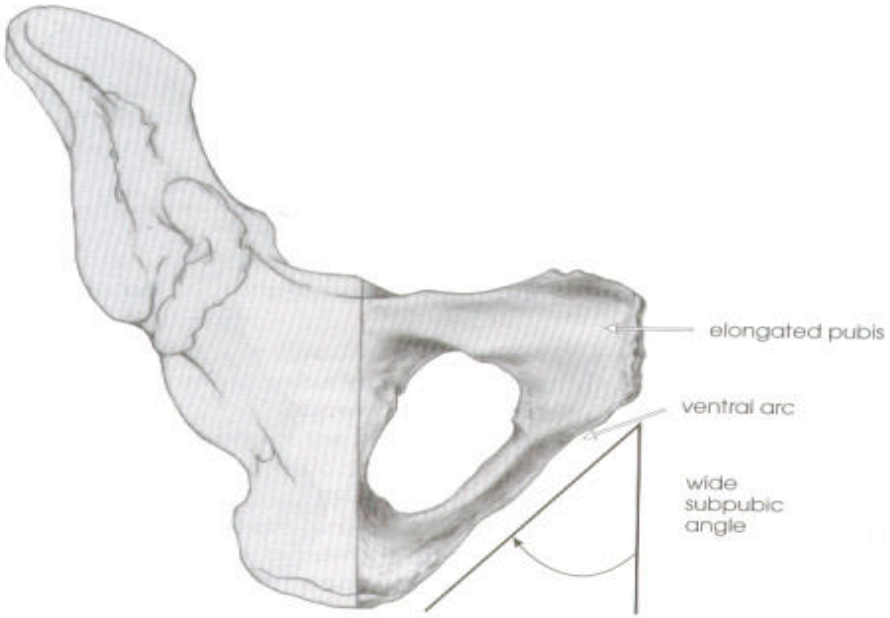
African

European

Male


narrow pubis
narrow
subpubic
angle

Female


elongated pubis
ventral arc
wide
subpubic
angle