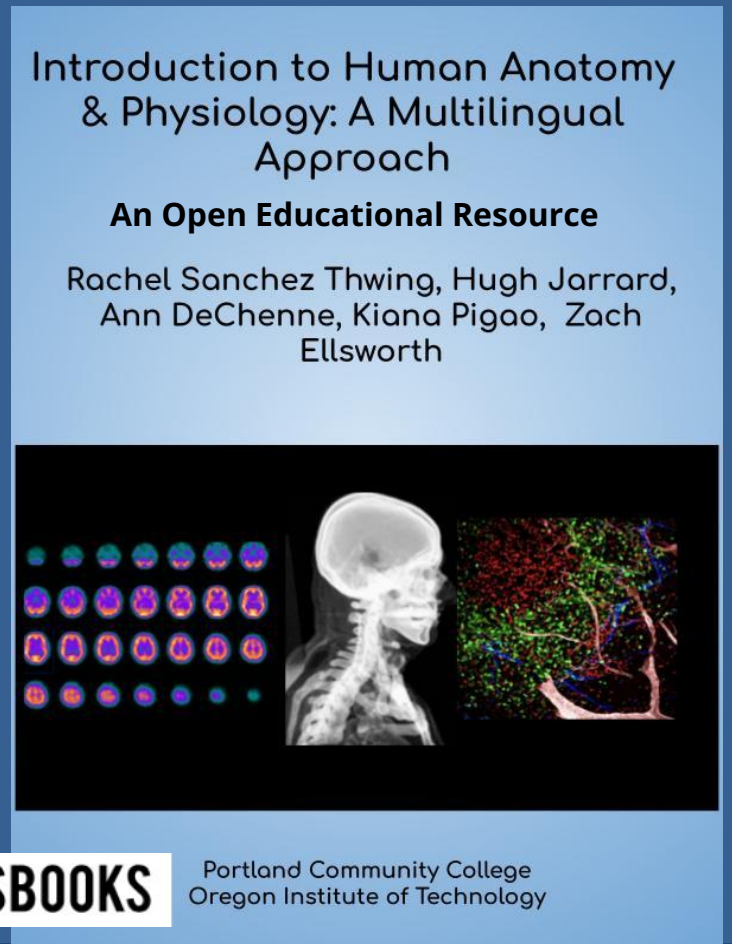
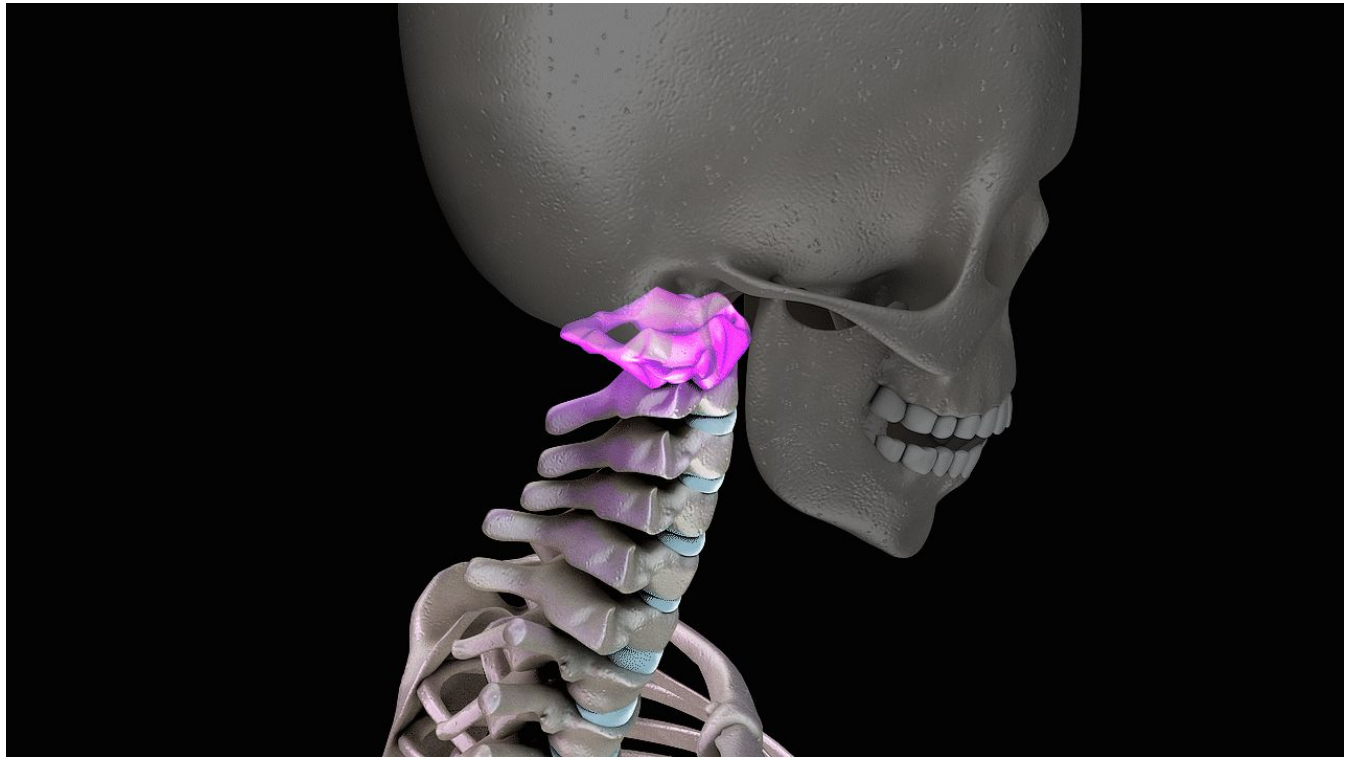
Skeletal System:
Structure and Function





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Lesson 1: Functions of the Skeletal System

Learning Objectives:

- Describe the major functions of the skeletal system
- Describe the two types of bone (compact, spongy) and their microscopic anatomy

See the Skeletal System Wordlist!

- Can be found in accompanying materials to this lecture
- Materials are available in English, Spanish, Russian, Vietnamese, Filipino, East African French, Kiswahili (Swahili) and Chinese.

Module 3 Skeletal System Word List

Microscopic Anatomy
Bone Matrix
Compact Bone
Lacunae (containing Osteocytes)
Lamellae
Osteon
Central canal
Spongy bone

Bone cells:
Osteoblasts
Osteocytes
Osteoclasts

Cranium (Skull):
Occipital Bone
Temporal Bone
Parietal Bone
Frontal Bone
Sphenoid Bone
Nasal Bone
Zygomatic Bone
Maxilla
Mandible
Ethmoid Bone
Vomer Bone
Palatine Bone
Paranasal Sinuses

Axial Skeleton:
Vertebral Column
Intervertebral disc
Atlas (C1)
Axis (C2)
Cervical Vertebrae (C1-C7)
Thoracic Vertebrae (T1-T12)
Lumbar Vertebrae (L1-L5)
Sacrum
Coccyx (3-5 fused vertebrae)

Thoracic Cage:
True Ribs (1-7)
False Ribs (8-12)
Sternum

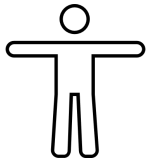
Appendicular Skeleton:
Upper Appendages
Clavicle
Scapula
Humerus
Ulna
Radius
Carpals
Metacarpal (5)
Phalanges of Hand (Proximal, Middle, Distal)

Lower Appendages
Pelvis
Ilium
Pubic bone
Ischium
Femur
Patella
Tibia
Fibula
Tarsals
Metatarsal (5)
Phalanges of Foot (Proximal, Middle, Distal)

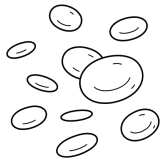
Ossification:
Intramembranous
Endochondral

Homeostatic Imbalances
Osteoarthritis
Osteoporosis

General Functions of the Skeletal System



Supports the body



Formation of blood cells

- Bone marrow

Protects soft organs

- Brain, spinal cord, lungs, heart, pelvic viscera

Mechanical conduction

- Sound vibration to inner ear

Movement

- Provides attachment and leverage for muscles
- Allows for limb movement and breathing

Stores minerals and fats

- Calcium and phosphorus
- Fat in the bone marrow for stored fuel

Function: Supporting the body

The skeleton provides a rigid frame to support the body against the pull of gravity

Menelaus supporting the body of Patroclus, CC BY-SA 2.5, via Wikimedia Commonss

Function: Protecting soft organs

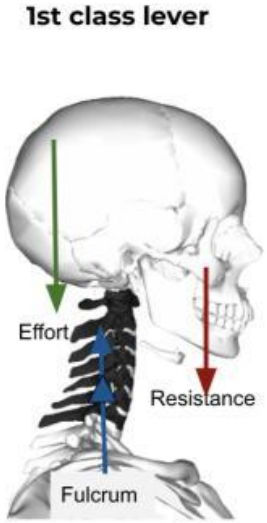
The brain, spinal cord, lungs, heart, pelvic viscera are all protected by the skeleton

Human Skeleton on Exhibit at The Museum of Osteology By Sklmsta - Own work, CC0, via Wikimedia Commons

Function: Movement

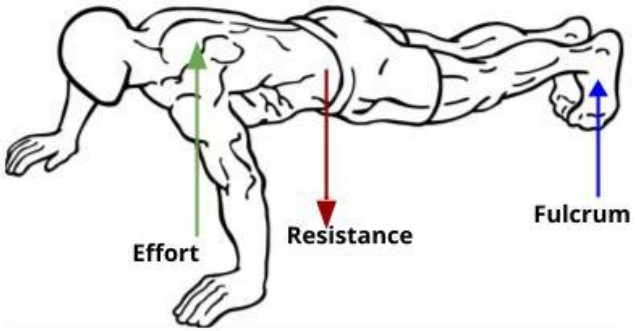
The skeleton provides attachment and leverage for muscles

Allows for limb movement and breathing



1st class lever

1st class levers have the fulcrum in the middle with the effort and resistance on either side



2nd class lever

2nd class levers have the resistance in the middle with the effort and fulcrum on either side

3rd class lever

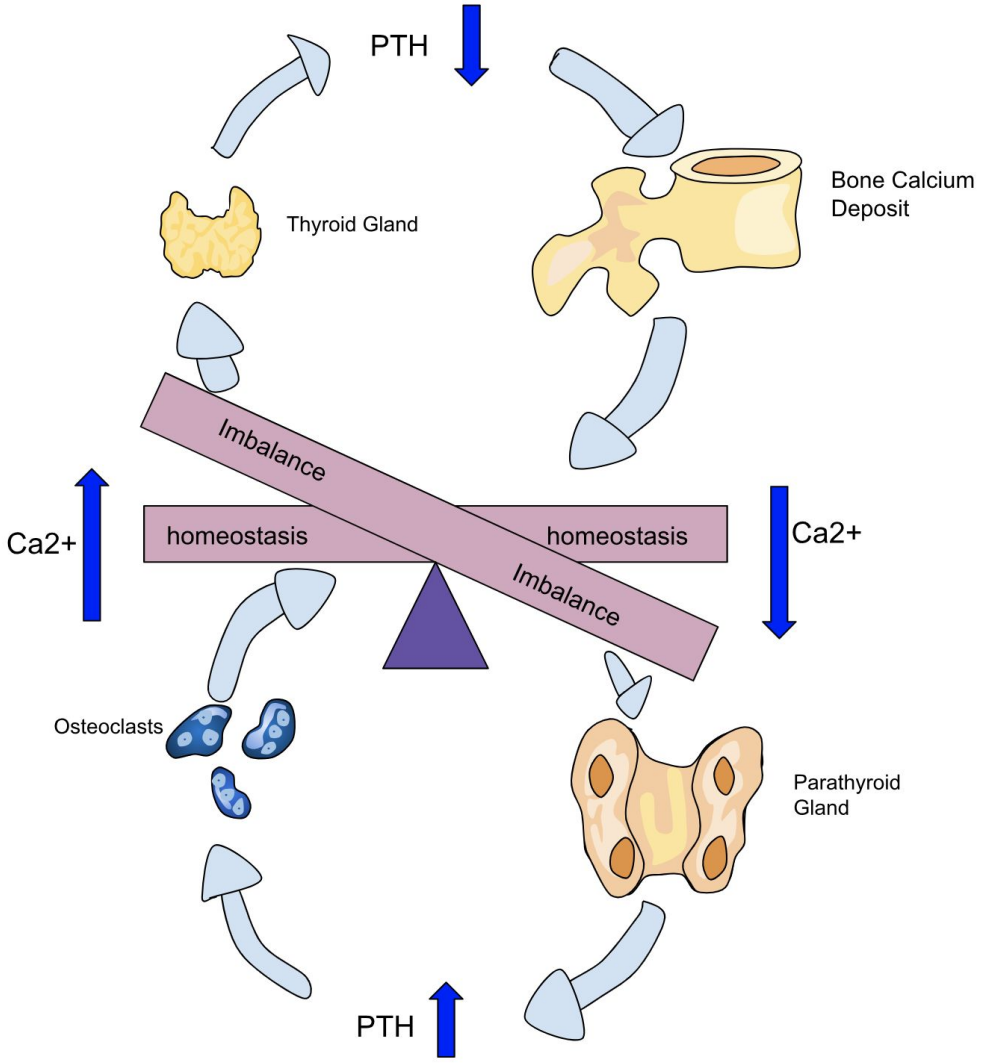
3rd class levers have the effort in the middle with the fulcrum and resistance on either side

Lever Classes with Examples By Rachel Sanchez Thwing - Own work, CC BY 4.0, via Wikimedia Commons

Function: Stores Minerals and Fats

Stores minerals and fats

- Calcium and phosphorus
- Fat in the bone marrow for stored fuel

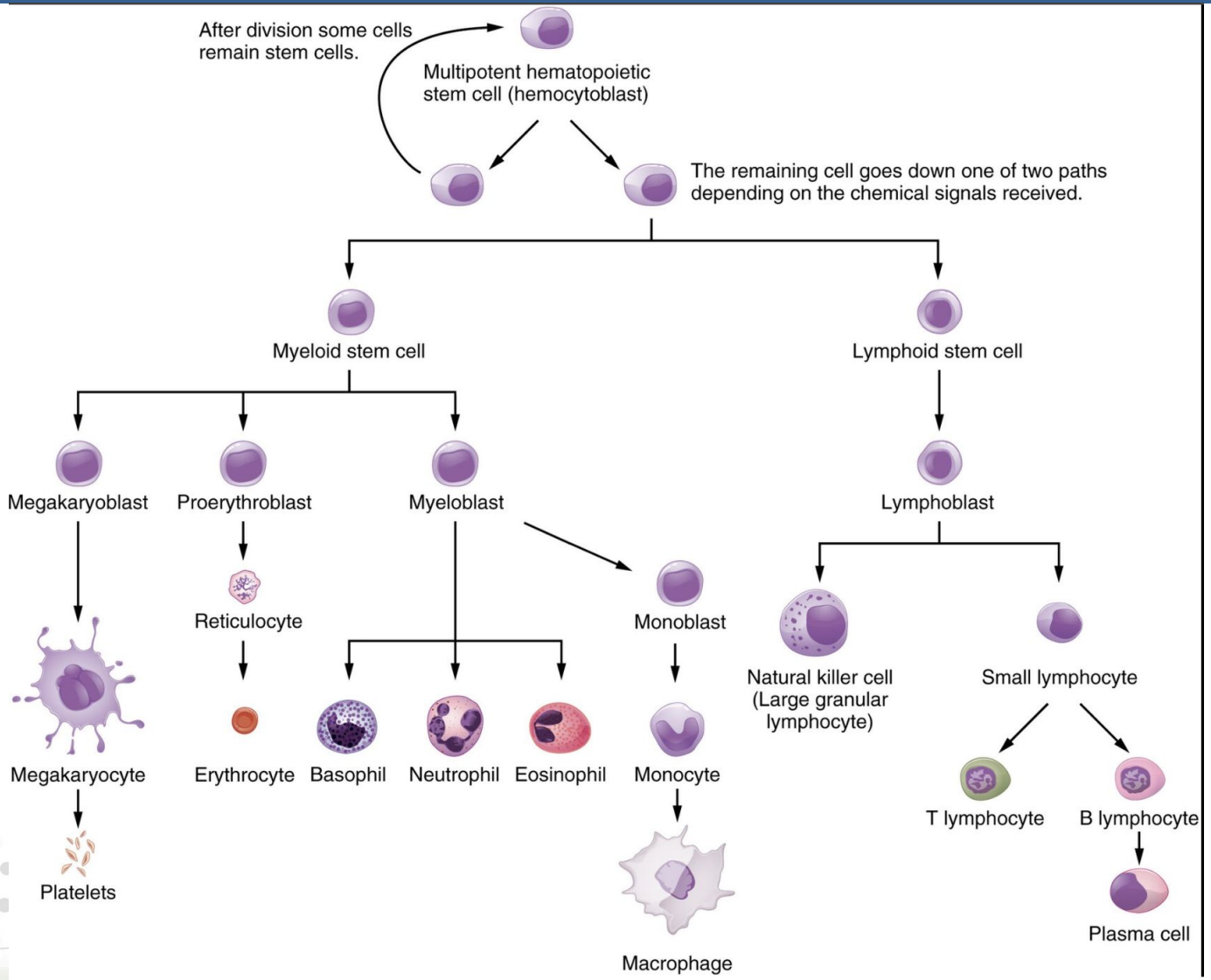


Parathyroid Cycle and Calcium Levels By Mkaram19 - Own work, CC BY-SA 4.0, via Wikimedia Commons

Function: Formation of Blood Cells

Formation of blood cells

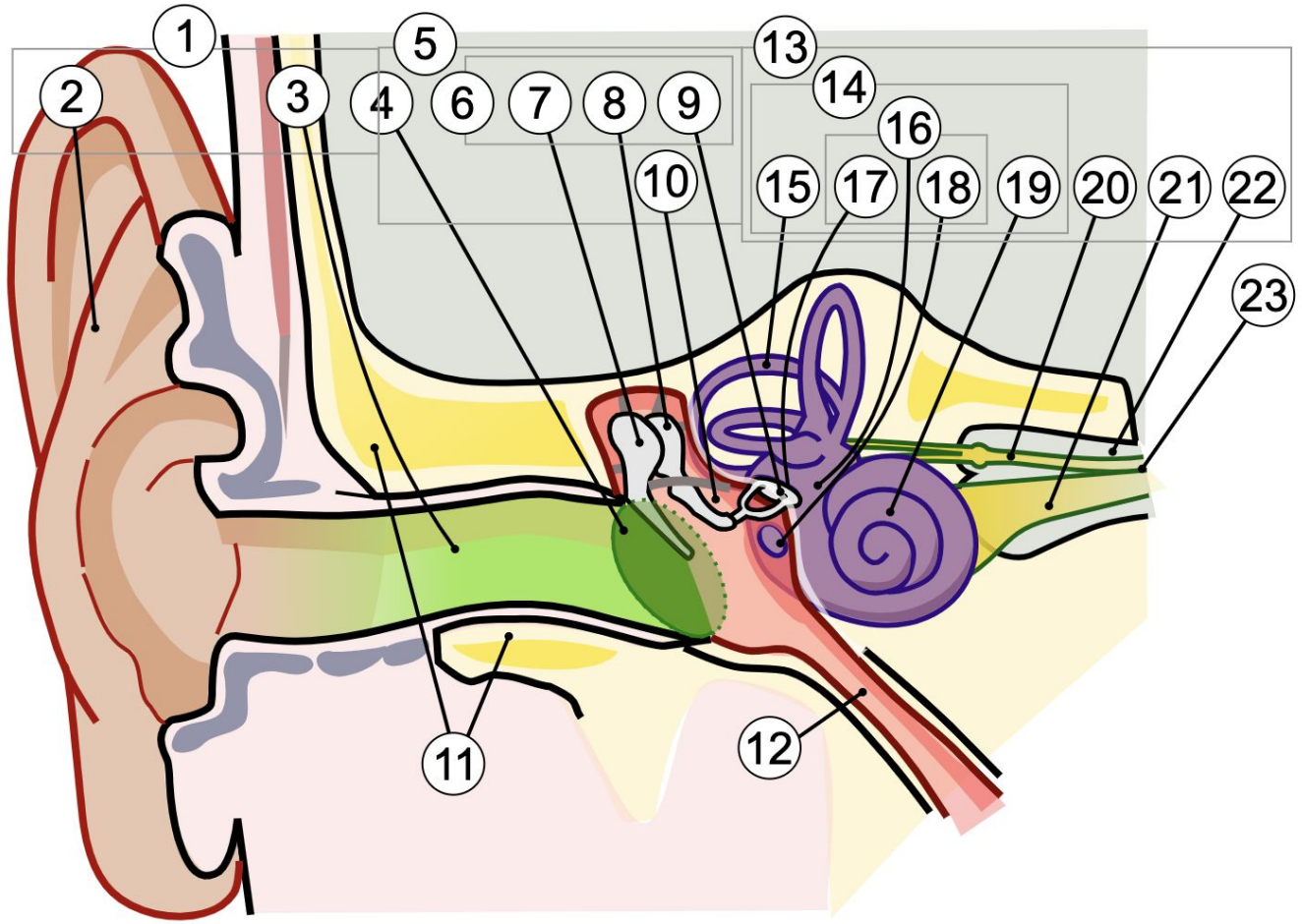
- Occurs in bone marrow



Flow chart of hematopoietic cell divisions in the bone marrow By JulieJenksButteCollege - Own work, CC BY-SA 4.0, via Wikimedia Commons

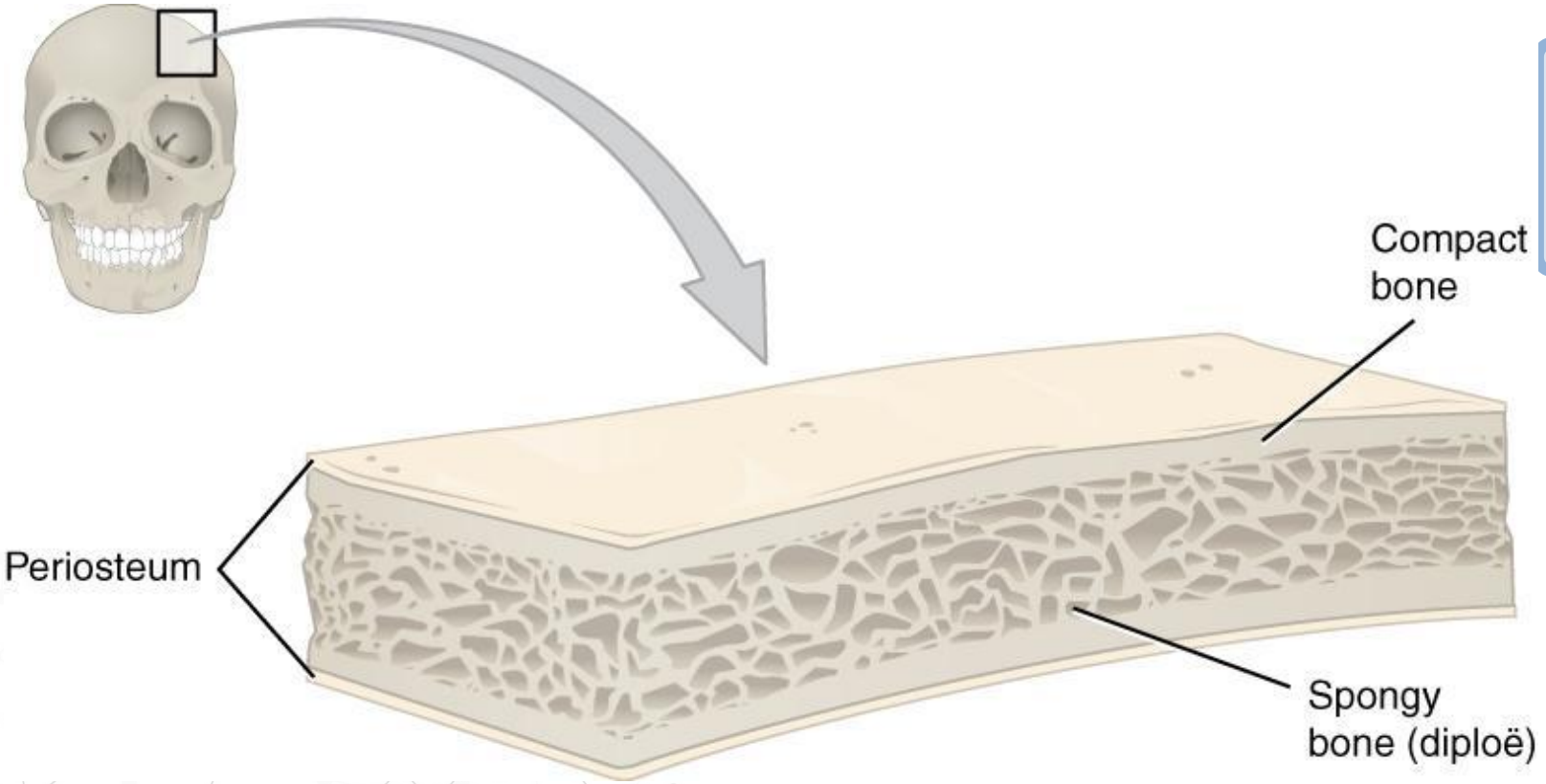
Function: Mechanical Conduction of Sound

Bones of inner ear help to transduce vibration of air (sound) into action potentials



Anatomy of the Human Ear 1 Intl By Jmarchn - Own work, CC BY-SA 3.0, via Wikimedia Commons

Bone Tissue Types



Anatomy of a Flat Bone, A&P, 2e

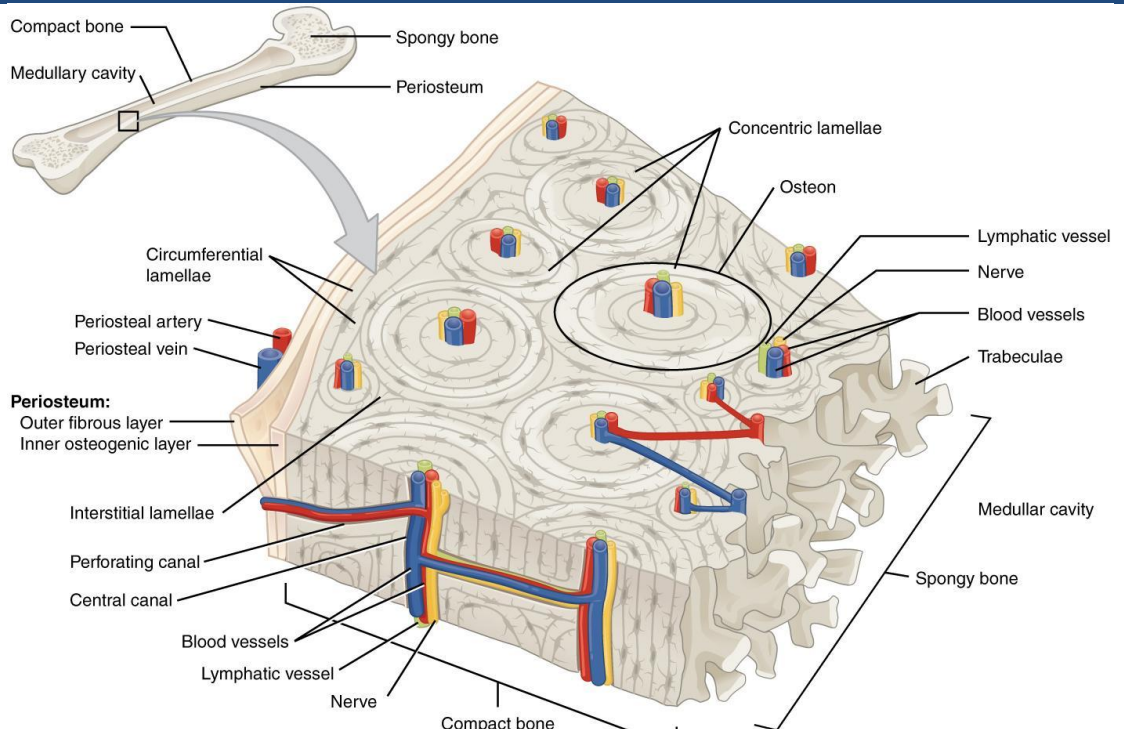
Compact bone:
solid, on exterior

Spongy bone:
porous lattice, on interior

Bone Morphology: Compact Bone

Compact Bone:

- Osteons with lamellae arranged around central canals containing blood vessels and nerves, osteocytes in lacunae
- Provides solid attachments for muscles, tendons, and ligaments
- Cross section shows **OSTEON**
- Photomicrograph of osteon showing **concentric lamellae** and **central canals.** LM x 40



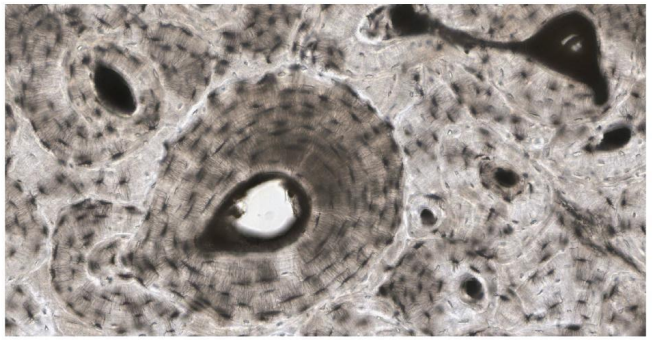
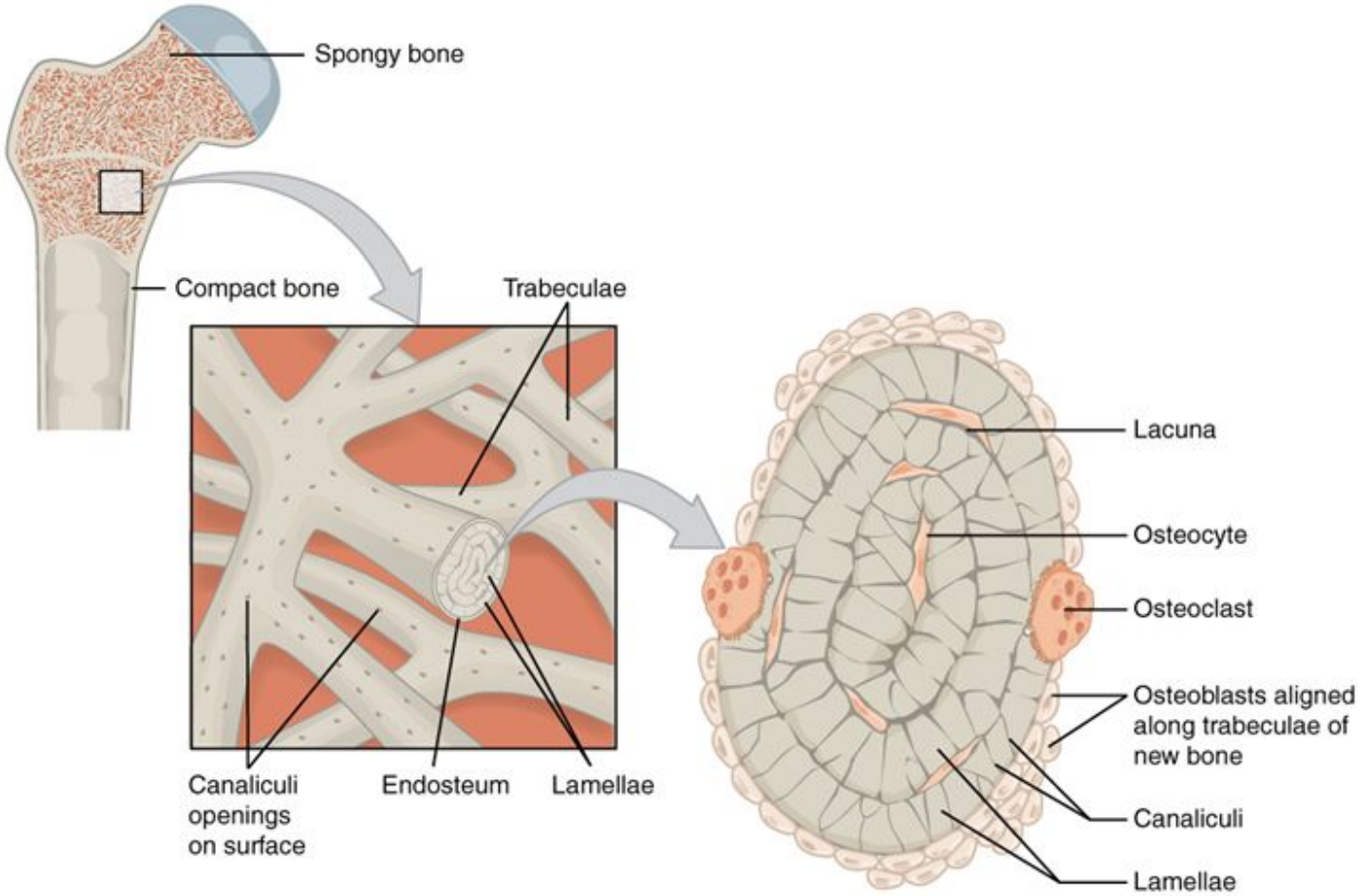


Diagram of a Compact Bone, A&P, 2e

Bone Morphology:: Spongy Bone

Spongy Bone:

- Trabeculae + open spaces filled by marrow, blood vessels, and nerves
- Lightweight



Spongy bone is composed of trabeculae that contain bone cells

Periosteum and Endosteum, A&P, 2e

Lesson 1: Structure and Function

Summary:

- Described the major functions of the skeletal system
- Described the two types of bone (compact, spongy) and their morphology