

Part 1

The Skeletal System

PowerPoint® Lecture Slide Presentation by Jerry L. Cook, Sam Houston University



ESSENTIALS OF HUMAN ANATOMY & PHYSIOLOGY

EIGHTH EDITION

ELAINE N. MARIEB

The Skeletal System

- Parts of the skeletal system
 - Bones (skeleton)
 - Joints
 - Cartilages
 - Ligaments
- Divided into two divisions
 - Axial skeleton
 - Appendicular skeleton

Functions of Bones

- Support of the body
- Protection of soft organs
- Movement due to attached skeletal muscles
- Storage of minerals and fats
- Hemopoiesis

Bones of the Human Body

- The adult skeleton has 206 bones
- Two basic types of bone tissue
 - Compact bone
 - Homogeneous
 - Spongy bone
 - Formed from dissolved compact bone
 - Many open spaces

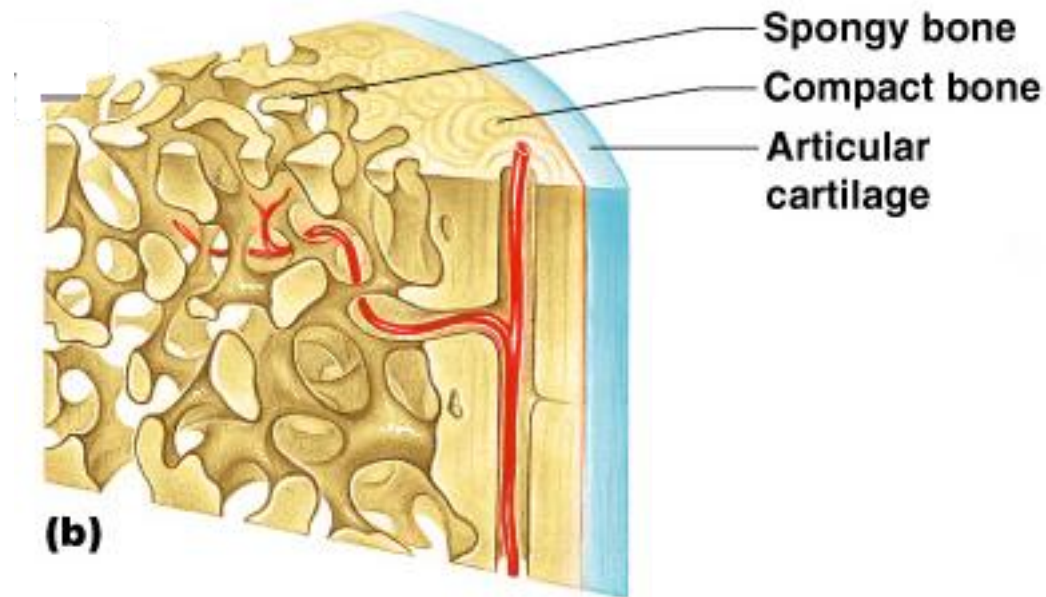


Figure 5.2b

Classification of Bones on the Basis of Shape

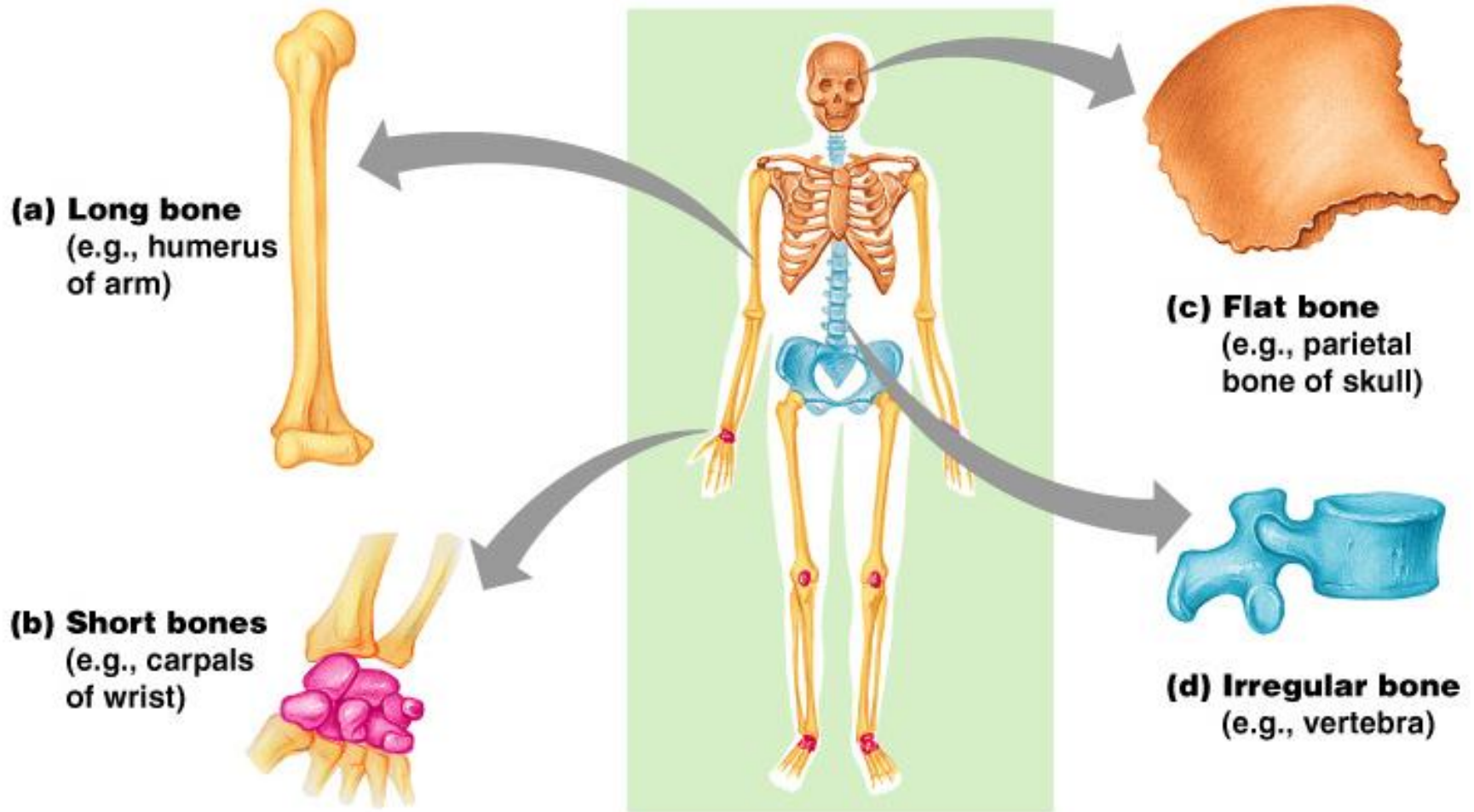


Figure 5.1

Classification of Bones

- Long bones
 - Typically longer than wide
 - Have a shaft with heads at both ends
 - Contain mostly compact bone
 - Examples: femur, humerus

Classification of Bones

- Short bones
 - Generally cube-shape
 - Contain mostly spongy bone
 - Examples: carpals, tarsals

Sesamoid Bone

- Example: patella

Classification of Bones

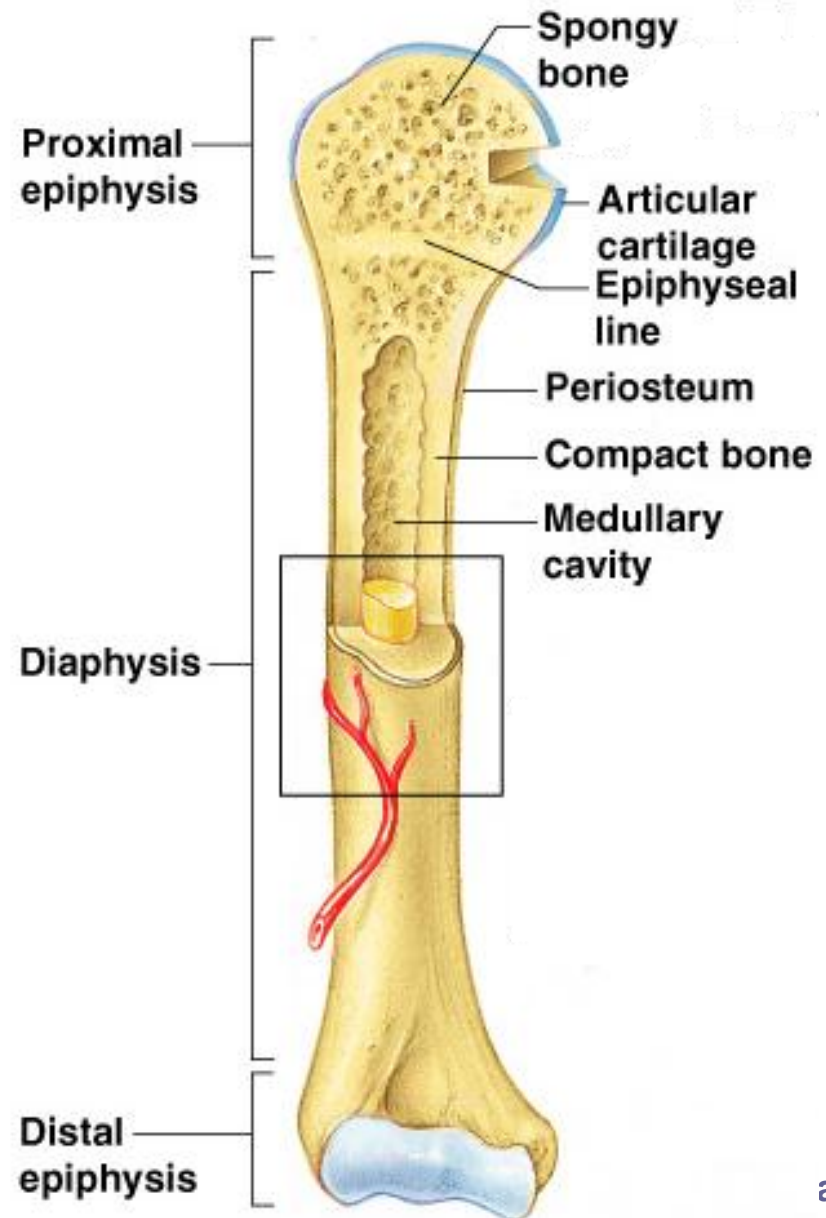
- Flat bones
 - Thin and flattened
 - Usually curved
 - Thin layers of compact bone around a layer of spongy bone
 - Examples: skull, ribs, sternum

Classification of Bones

- Irregular bones
 - Irregular shape
 - Do not fit into other bone classification categories
 - Example: vertebrae and hip

Gross Anatomy of a Long Bone

- Diaphysis
 - Hollow shaft
 - Composed of compact bone
- Epiphysis
 - Ends of the bone
 - Composed mostly of spongy bone



(a)

Structures of a Long Bone

- Periosteum
 - Outside covering of the diaphysis
 - Fibrous connective tissue membrane
- Endosteum
 - Inside covering of the diaphysis
 - Delicate connective tissue membrane

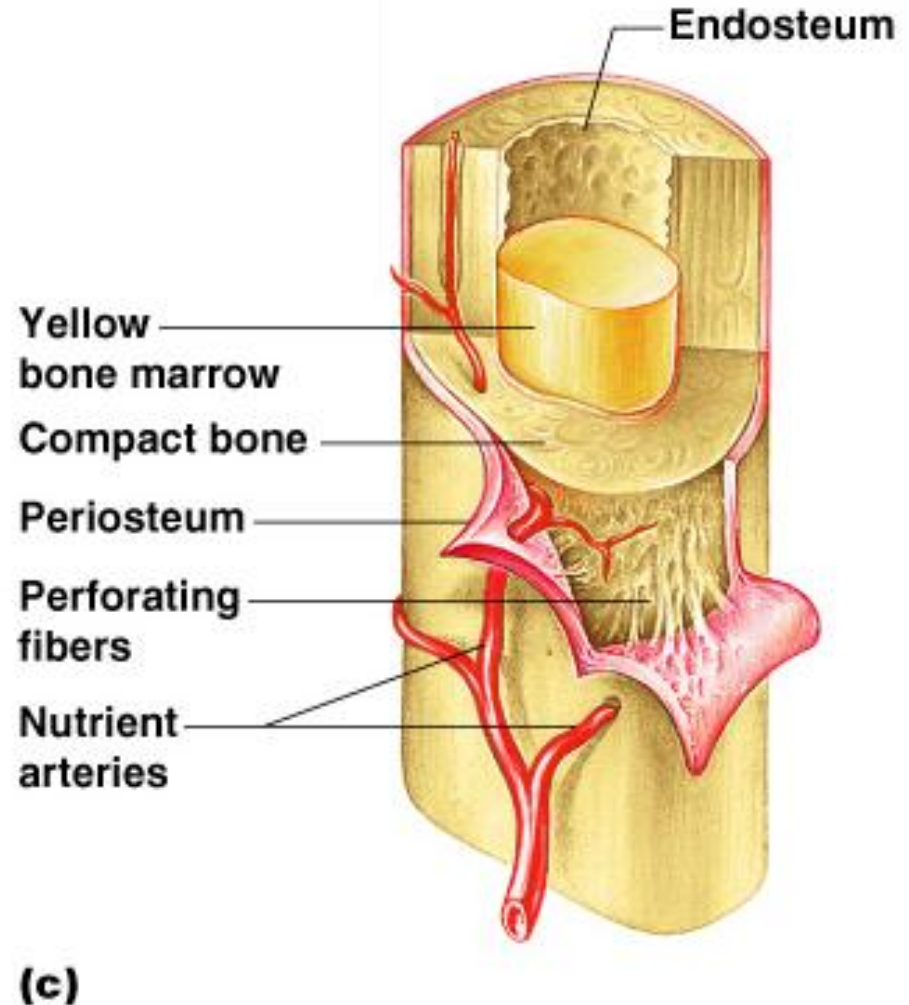
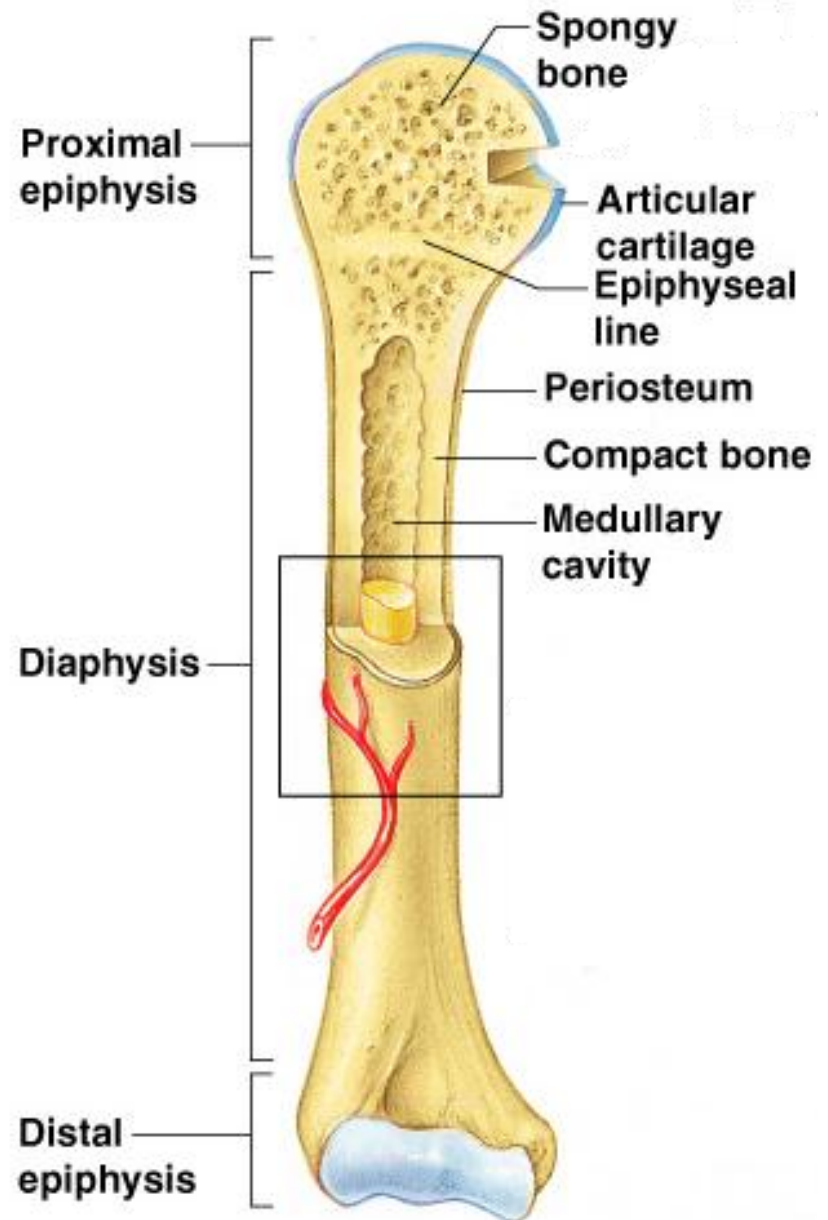


Figure 5.2c

Structures of a Long Bone

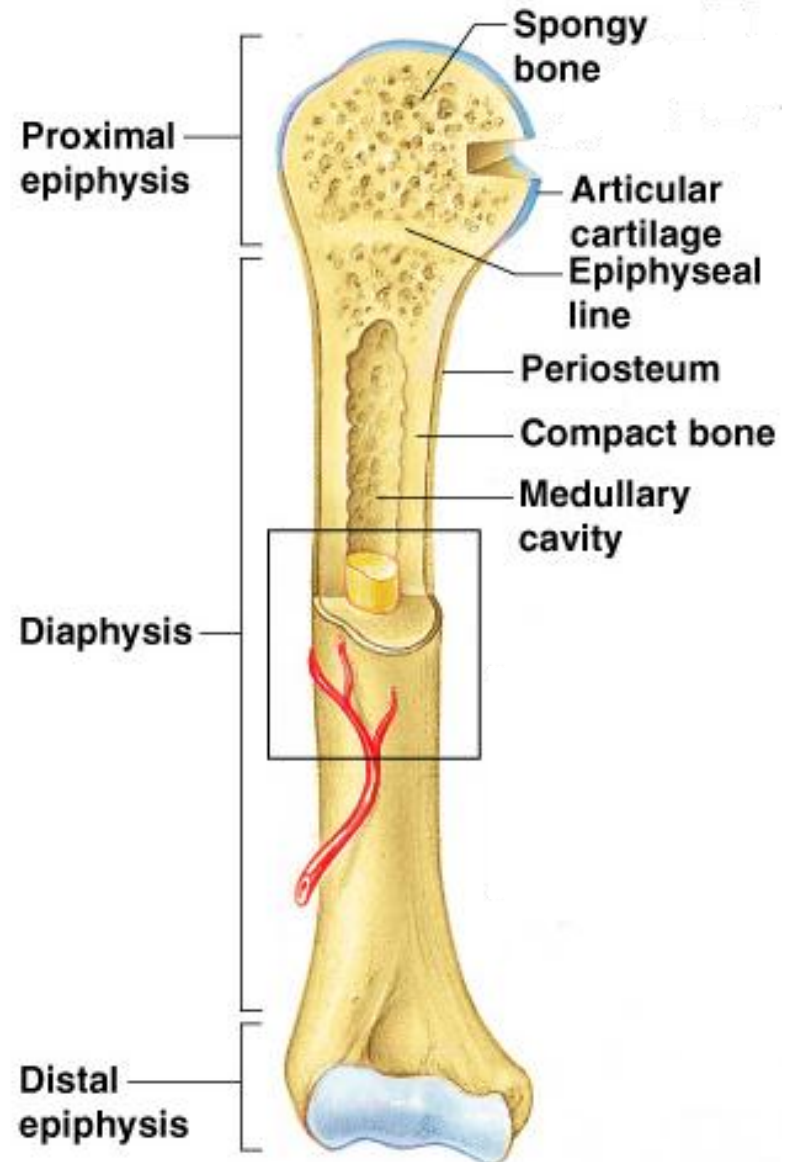
- Articular cartilage
 - Covers the external surface of the epiphyses
 - Made of hyaline cartilage
 - Decreases friction at joint surfaces



(a)

Structures of a Long Bone

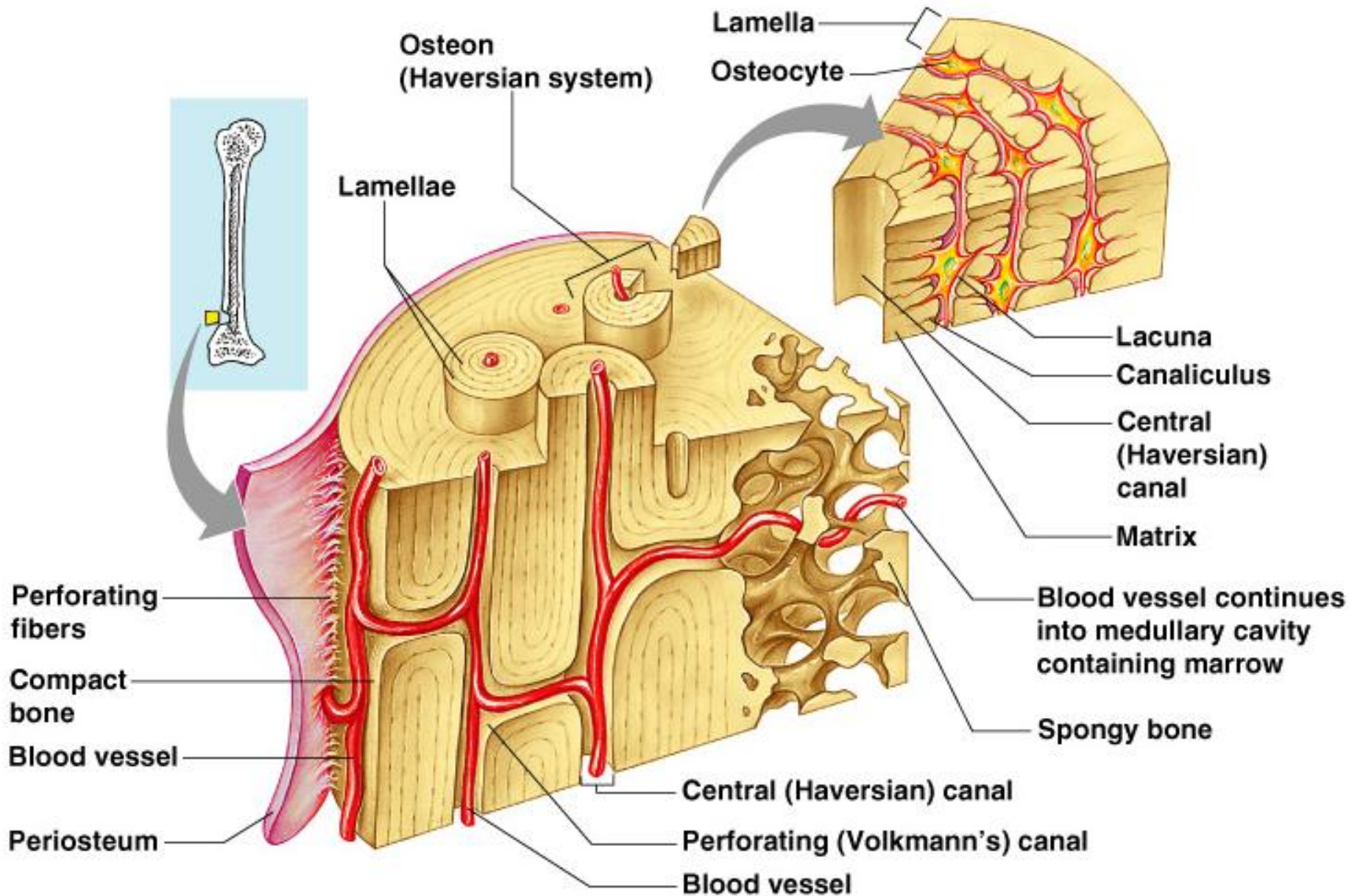
- Medullary cavity
 - Cavity of the shaft
 - Contains yellow marrow (mostly fat), blood vessels & leukocytes in adults
 - Contains red marrow (for blood cell formation) in infants



Microscopic Anatomy of Bone

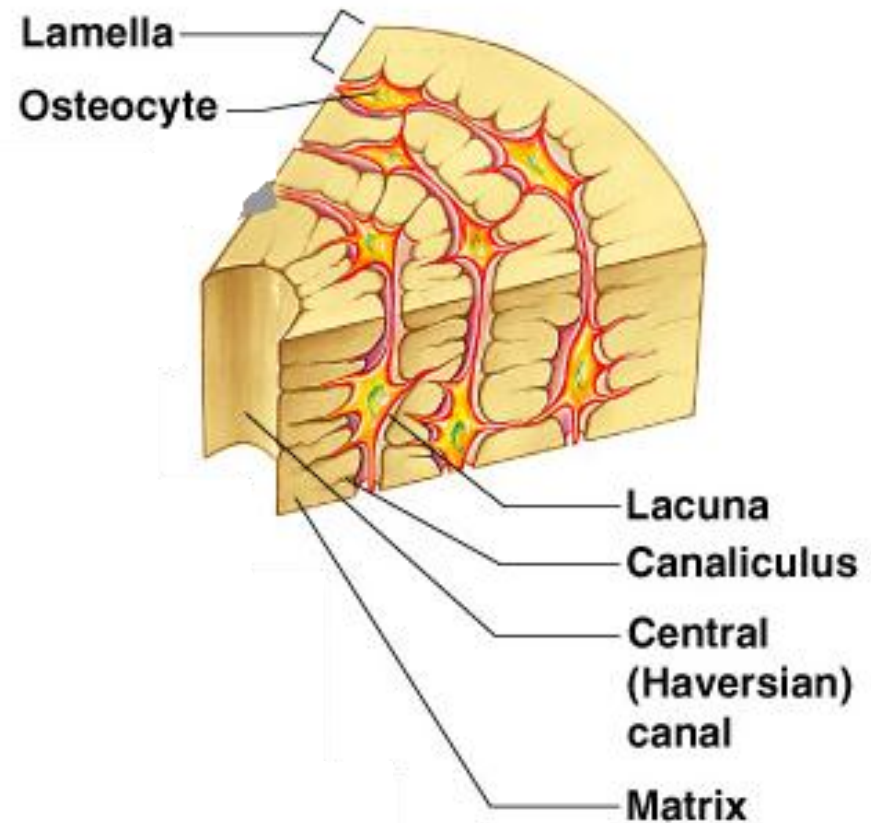
- Osteon (Haversian System)
 - A unit of bone
- Central (Haversian) canal
 - Opening in the center of an osteon
 - Carries blood vessels and nerves

Microscopic Anatomy of Bone



Microscopic Anatomy of Bone

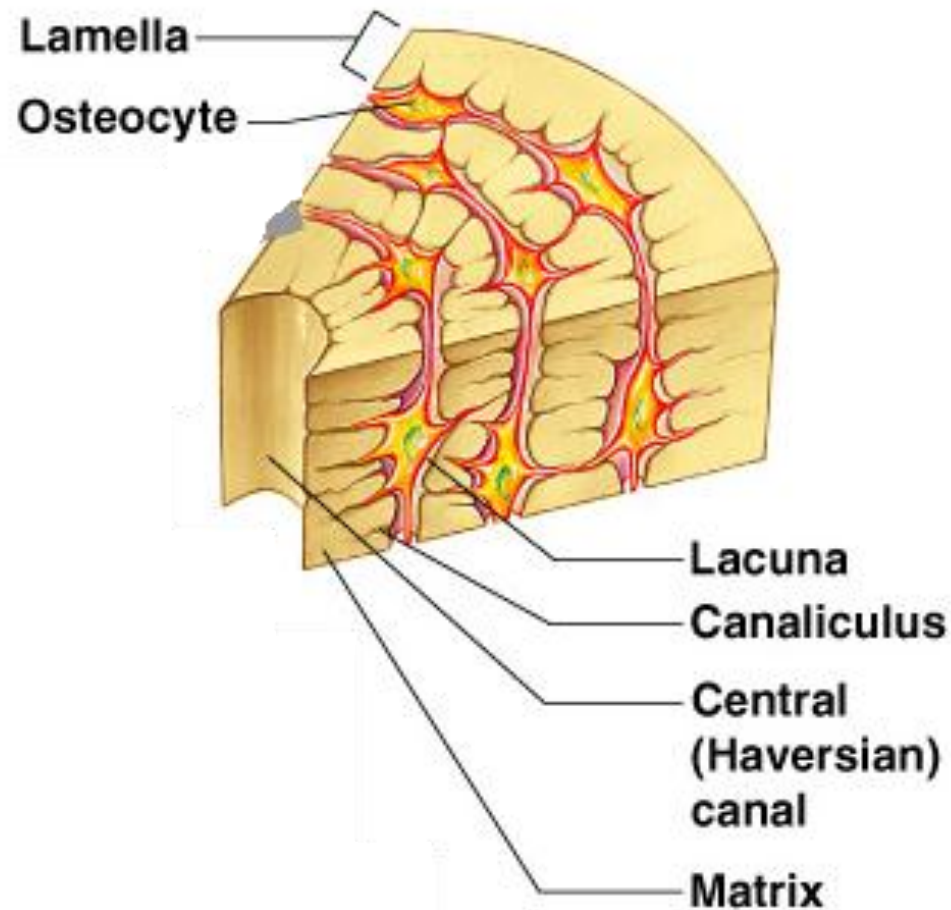
- Lacunae
 - Cavities containing bone cells (osteocytes)
 - Arranged in concentric rings
- Lamellae
 - Rings around the central canal
 - Sites of lacunae



Detail of Figure 5.3

Microscopic Anatomy of Bone

- **Canaliculi**
 - Tiny canals
 - Radiate from the central canal to lacunae
 - Form a transport system



Detail of Figure 5.3

Changes in the Human Skeleton

- In embryos, the skeleton is primarily hyaline cartilage
 - During development, most cartilage is replaced by bone (ossification)
- At birth, the skull bones are incomplete
 - Bones are joined by fibrous membranes – fontanelles
 - Fontanelles are completely replaced with bone within two years after birth

Changes in the Human Skeleton

- Cartilage remains in isolated areas
 - Bridge of the nose
 - Parts of ribs
 - Joints

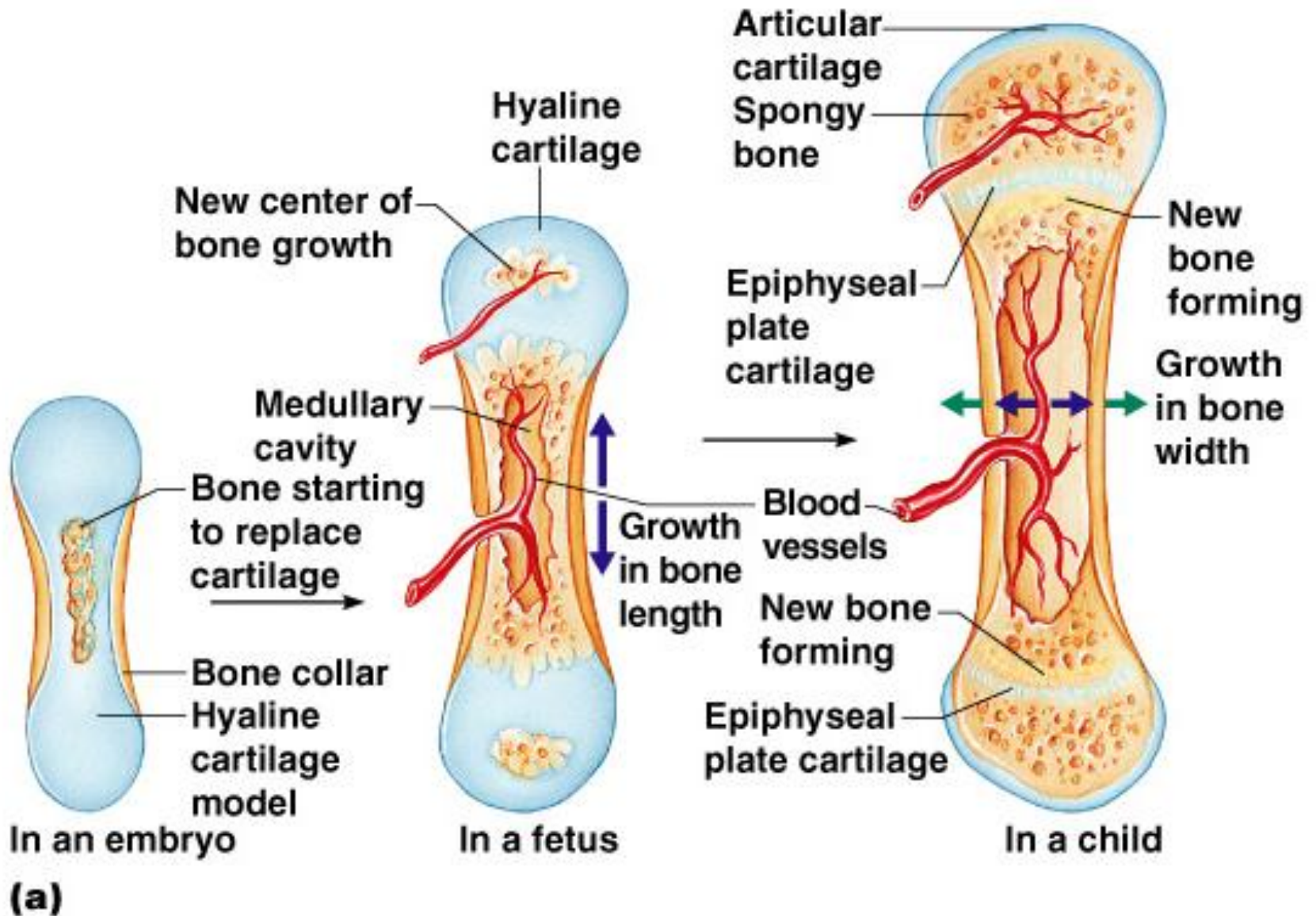
Bone Growth

- Epiphyseal plates allow for growth of long bone during childhood
 - New cartilage is continuously formed
 - Older cartilage becomes ossified
 - Cartilage is broken down
 - Bone replaces cartilage

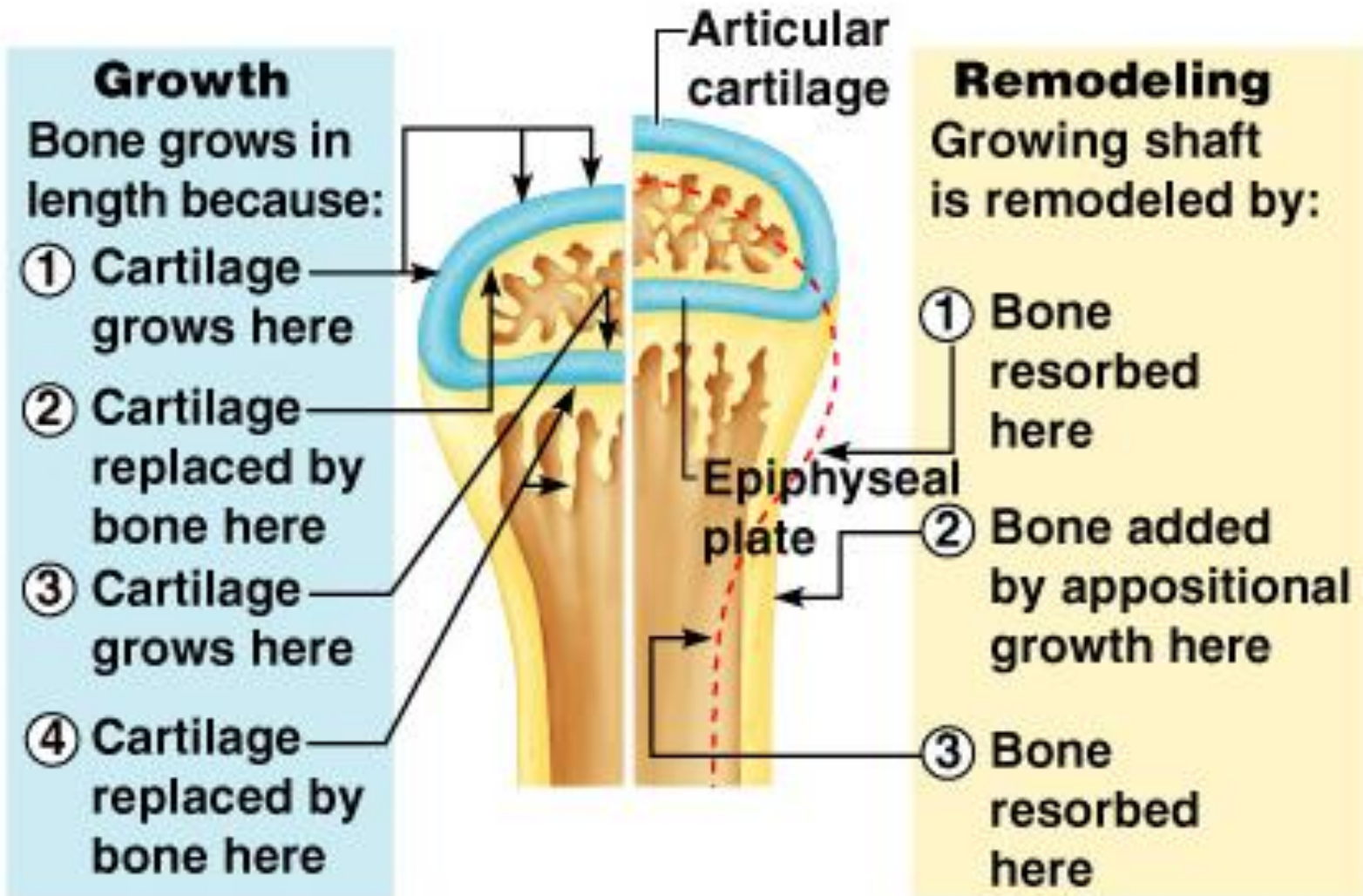
Bone Growth

- Bones are remodeled and lengthened until growth stops
 - Bones change shape somewhat
 - Bones grow in width

Long Bone Formation and Growth



Long Bone Formation and Growth



(b)

Figure 5.4b

Types of Bone Cells

- Osteocytes
 - Mature bone cells
- Osteoblasts
 - Bone-forming cells
- Osteoclasts
 - Bone-destroying cells
 - Break down bone matrix for remodeling and release of calcium
- Bone remodeling is a process by both osteoblasts and osteoclasts