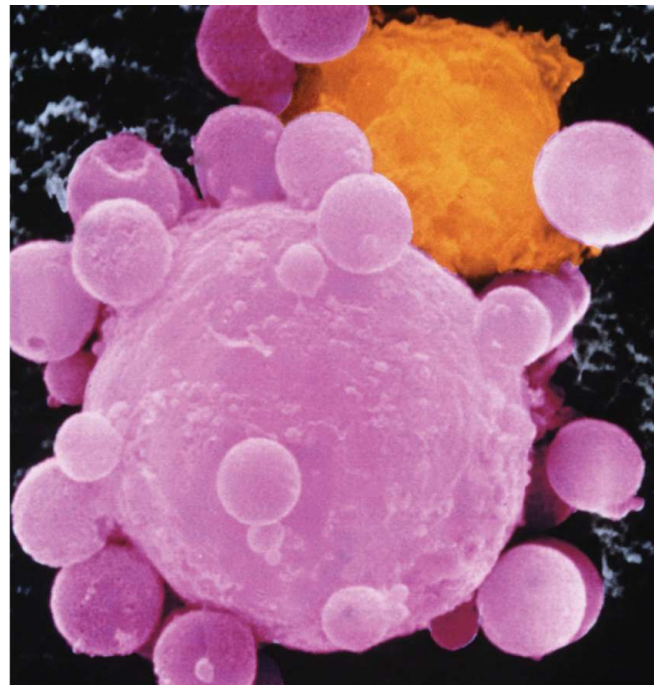


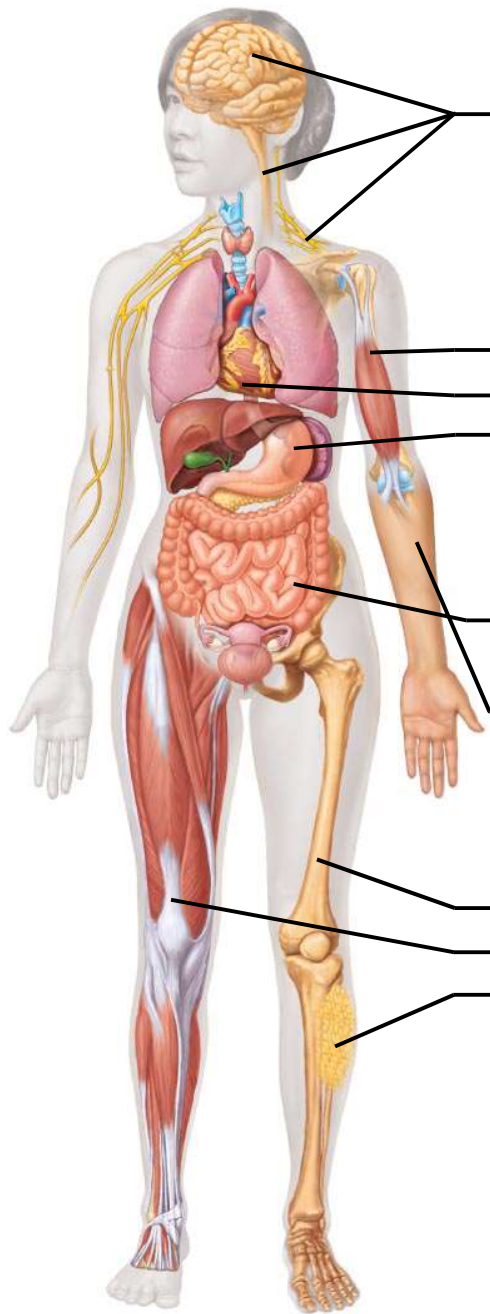
Chapter 4.1

An Introduction to Histology and Tissue Types & How to Interpret Tissue Sections



Histology

- Histology is the study of **microscopic anatomy** and how tissue is arranged into organs
- Structural Hierarchy of the Human Body // Review = atoms - molecules - organelles - cells - tissues - organs - systems
- Tissue
 - a group of similar cells and their cell products
 - arise from the same region of the embryo
 - these similar cells work together to perform a specific structural or physiological role in an organ.
- Four tissue type: epithelial / muscle / nervous / connective



Nervous tissue: Internal communication

- Brain
- Spinal cord
- Nerves

Muscle tissue: Contracts to cause movement

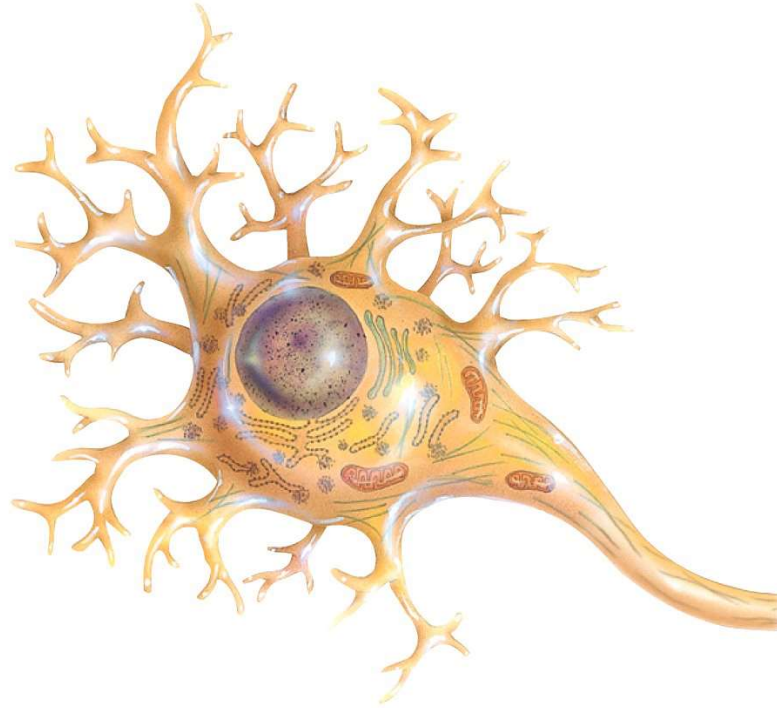
- Muscles attached to bones (skeletal)
- Muscles of heart (cardiac)
- Muscles of walls of hollow organs (smooth)

Epithelial tissue: Forms boundaries between different environments, protects, secretes, absorbs, filters

- Lining of digestive tract organs and other hollow organs
- Skin surface (epidermis)

Connective tissue: Supports, protects, binds other tissues together

- Bones
- Tendons
- Fat and other soft padding tissue

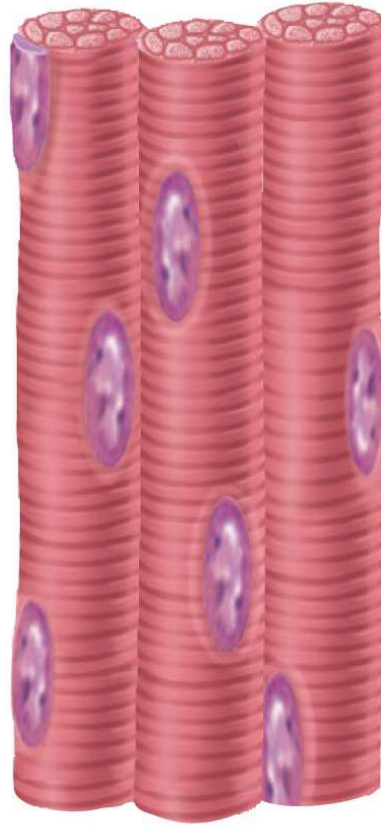


(d) Nervous tissue

Nervous tissue is excitable tissue / supported by “glial cells”

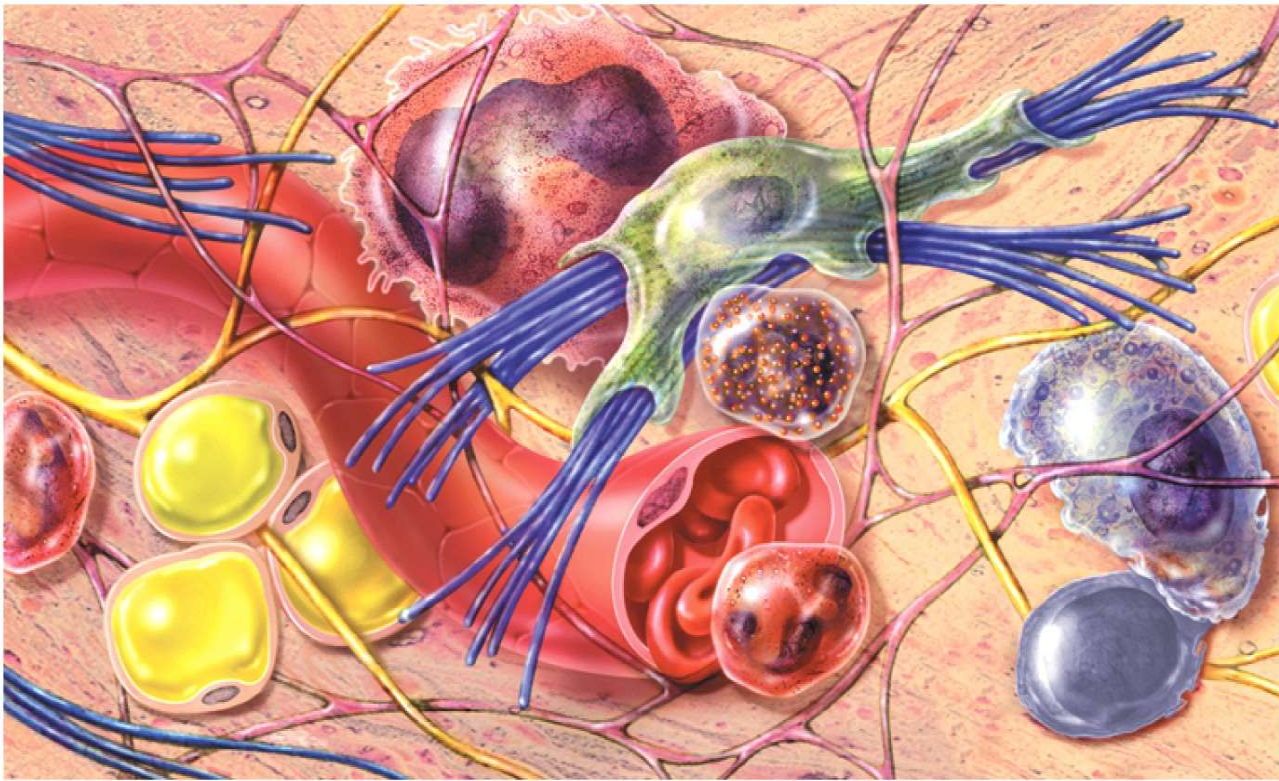
All cells have a resting membrane potential

Only nervous and muscle tissue are able to generate “action potentials” // this is what we mean by “excitable tissue”



(c) Muscular tissue

Excitable tissue / three muscle types – skeletal, smooth, cardiac



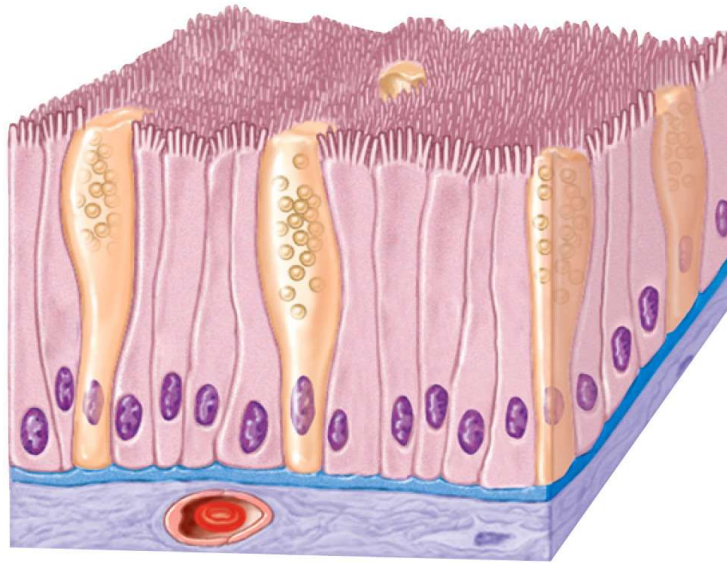
(b) Connective tissue

Most varied and widely distributed tissue in human body

Highly vascular

More matrix volume than cellular volume

Tissue characteristic due to content of extra cellular material



(a) Epithelial tissue

The lining (inside surfaces) and covering (outer surfaces) of our body

Basal surface supported by basement membrane with connective tissue below basement membrane

Always has a apical “free surface” (the covering and lining surfaces of our body)

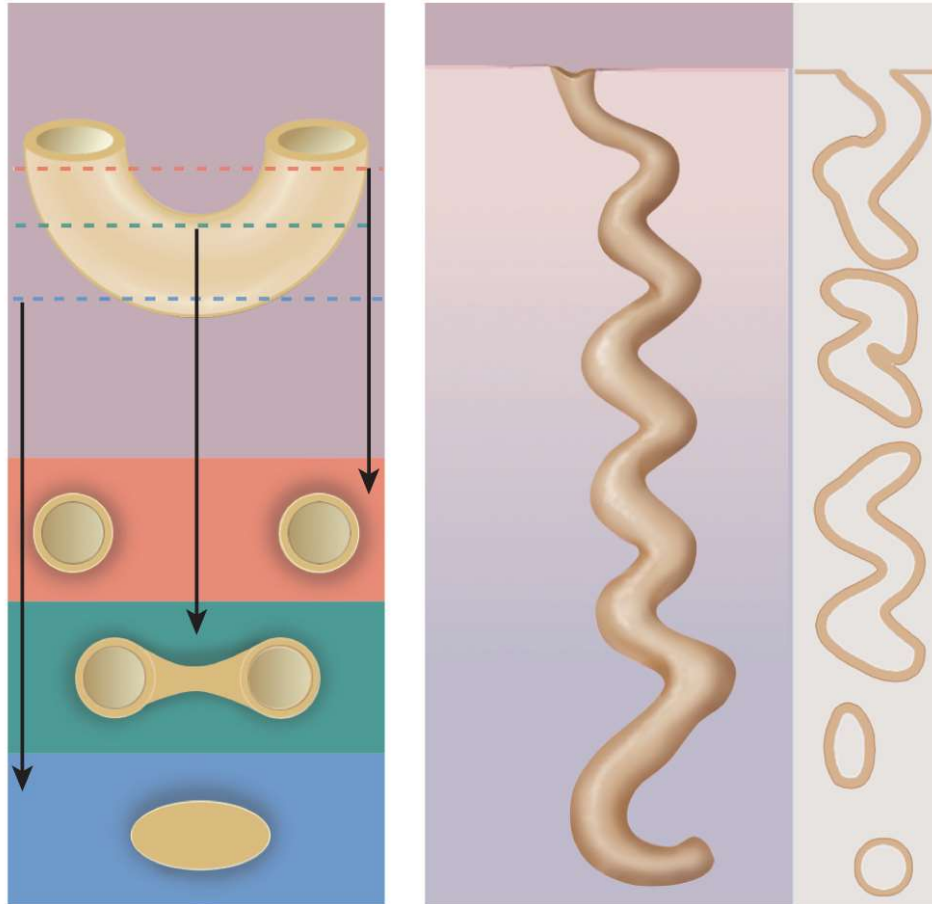
Avascular

No matrix between epithelial cells

Cells vs Matrix

- The four primary tissues **differ from one another** by
 - types and functions of their cells
 - the characteristics of the matrix (material made by cells and excreted outside of the cell)
 - **the relative amount of space occupied by the cells and matrix**
- the **matrix** is composed of // “hydrated” fibrous proteins = clear gel substance
 - Matrix also called:
 - ground substance
 - tissue fluid
 - extracellular fluid (ECF)
 - interstitial fluid
 - tissue gel

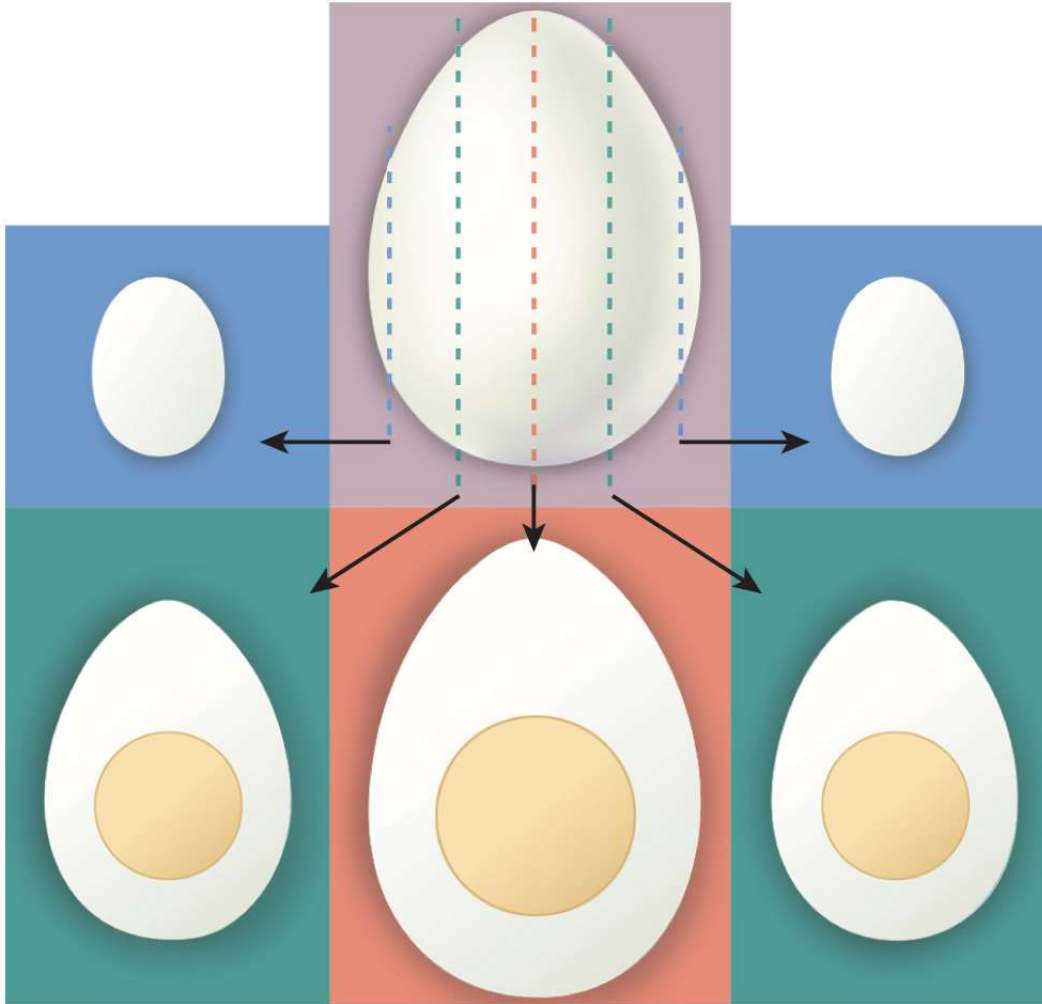
How to Interpreting Tissue Sections



Interpreting Tissue Sections

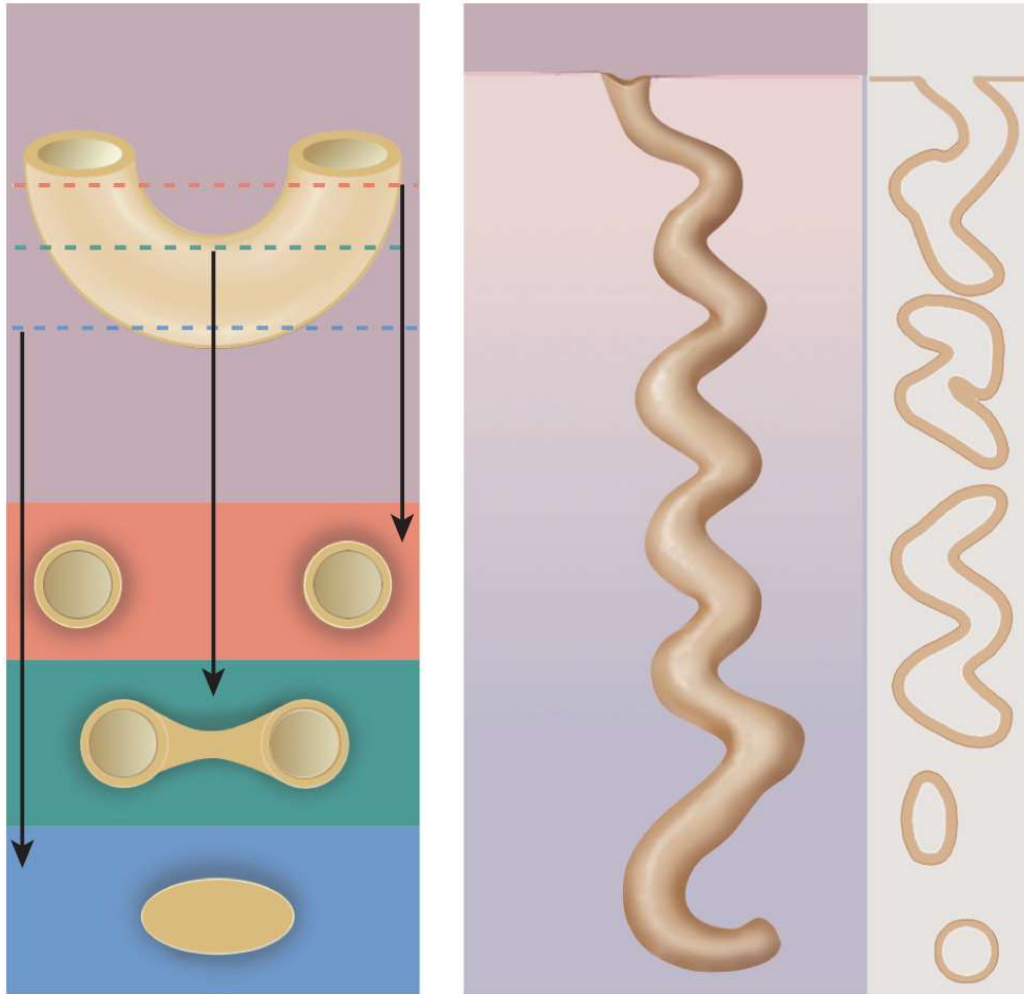
- Sectioning converts a **three-dimensional structure into a two-dimensional slice**
- Preparation of histological specimens
 - fixative prevents decay (e.g. formalin)
 - histological sections – tissue is sliced into thin sections one or two cells thick
 - stains – tissue is mounted on slides and artificially colored with histological stain - increases contrast // stains bind to different cellular components and increases contrast

Sectioning Solid Objects



- sectioning a cell with a centrally located nucleus
- some slices miss the cell nucleus
- in some sections the nucleus looks smaller than other sections

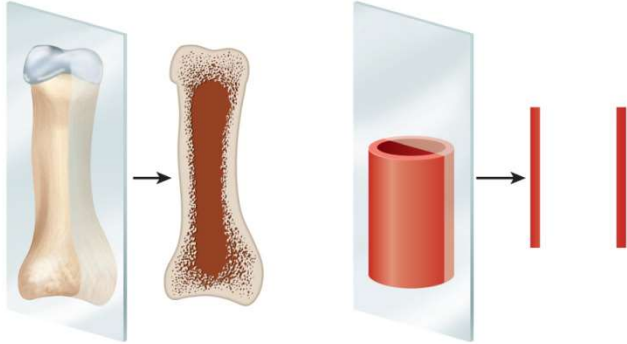
Sectioning Hollow Structures



- **cross section** of blood vessel, gut, or other tubular organ.
- **longitudinal section** of a sweat gland /// notice what a single slice could look like.

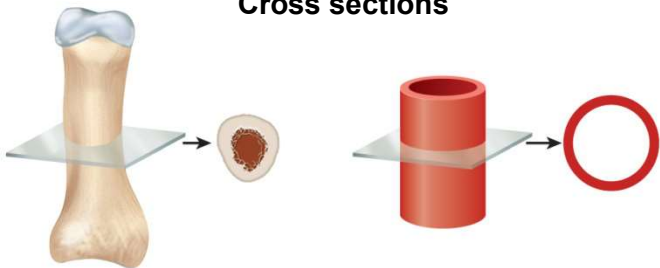
Types of Tissue Sections

Longitudinal sections



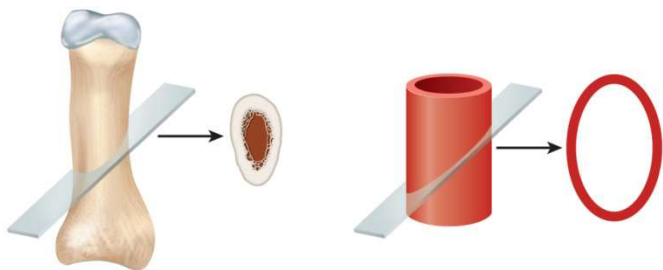
- **longitudinal section (l.s.)**
 - tissue cut along long direction of organ

Cross sections



- **cross section (c.s. or x.s.) or transverse section (t.s.)**
 - tissue cut perpendicular to length of organ

Oblique sections



- **oblique section**
 - tissue cut at angle between cross and longitudinal section

Non-sectioned Preparation

- **Smear** – tissue is rubbed or spread across the slide and often a cover slip is placed over the tissue sample /// E.g. blood smear to identify formed elements
- **Spread** – cobwebby tissue is laid out on a slide without cover slip /// E.g. areolar tissue