


INTRODUCTION



- 
- I. What's histology?**
 - II. Why we study it ?**
 - III. How to study it ?-Histological study methods.**

I. What's histology?

Histology (Greek words):

histo-tissue

logia-study of ,or knowledge of

So, histology means the knowledge of tissue, is a branch of Anatomy.

Structures related to function. So, exactly, Histology is a science which study the microstructure and the relationship between the structure and function of human being.

Cell: smallest unit of structure and function of body



tissue: group of cell & extracellular ground substance

four basic tissue:

---epithelium

---connective tissue

---muscular tissue

---nervous tissue

organ: made up of tissue, have special shape, structure and function

system: organs Which have related function get together.

- It is the bases of other subject in medicine ?.

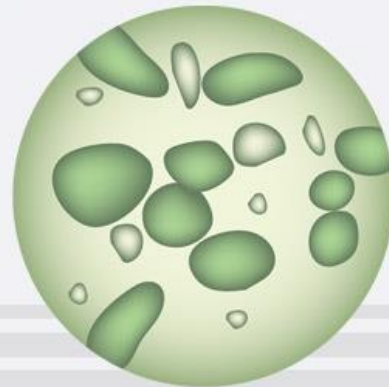
YES

It intertwines the disciplines of cell biology, biochemistry, physiology, and pathology.

Students will recognize the importance of this subject as they refer to the text later in your careers.

Microscope

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MICROSCOPE

- ❖ A **microscope** is an instrument used to see objects that are too small for the naked eye.
- ❖ The science of investigating small objects using such an instrument is called **microscopy**.
- ❖ **Microscopic** means invisible to the eye unless aided by a microscope.



Parts and Functions of a Compound Microscope



Light Microscope

SIMPLE

Uses single lens

COMPOUND

Uses set lenses or a lens system



Compound Microscope



Mechanical Parts

Magnifying Parts

Illuminating Parts

Adjustments and Support

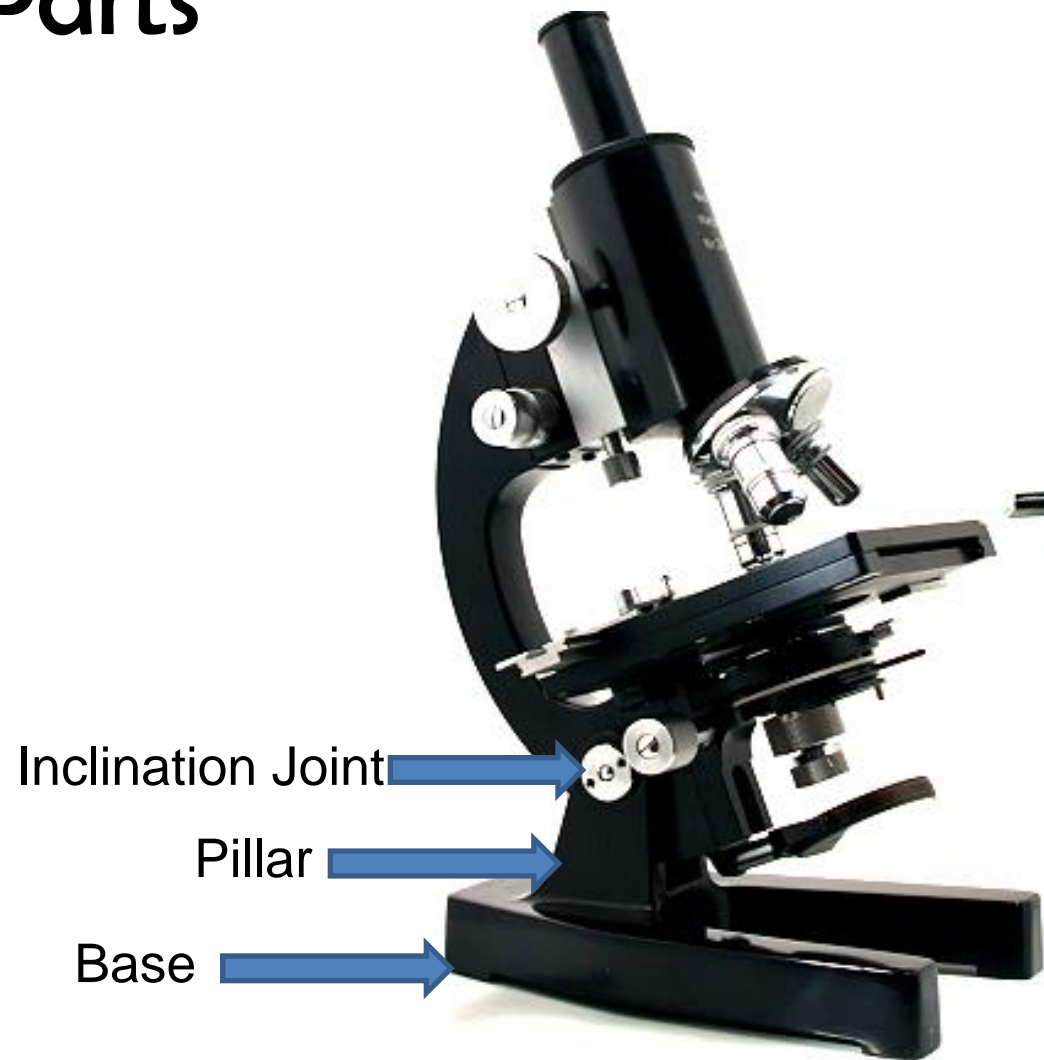
Enlarge the specimen

Provide the light



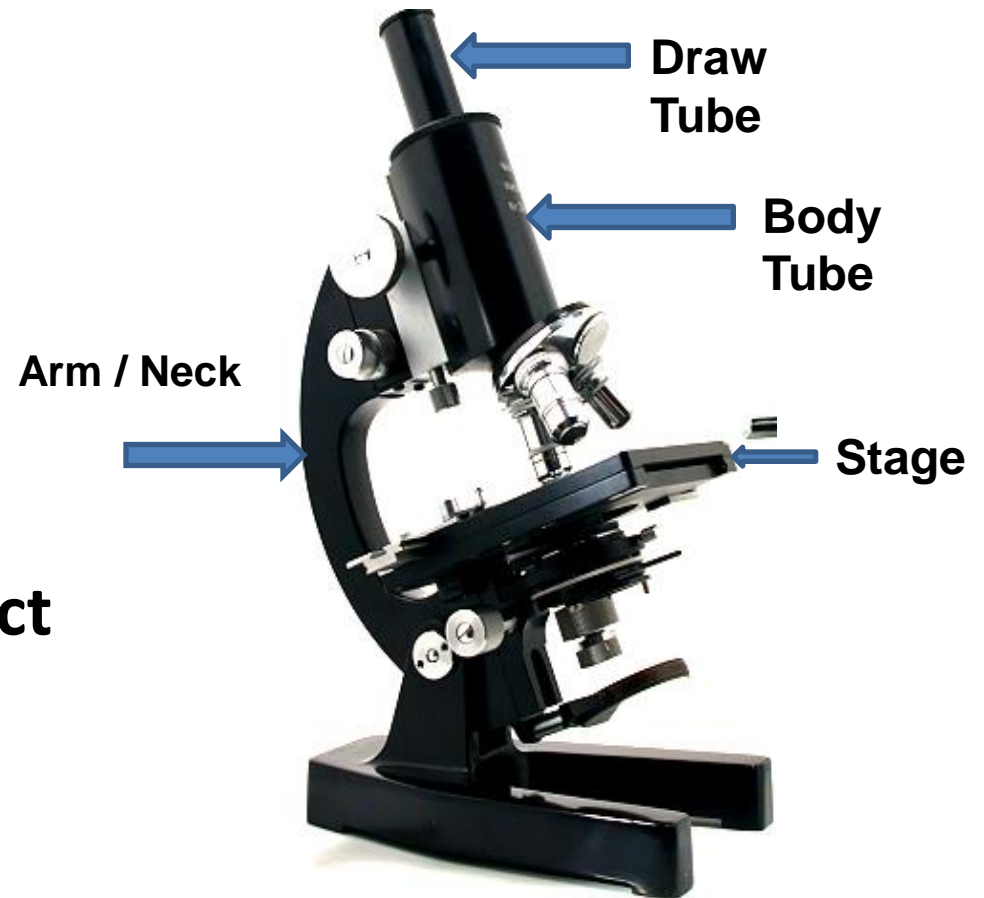
Mechanical Parts

- **Base**
 - **Bottommost portion that supports the entire/lower microscope**
- **Pillar**
 - **Part above the base that supports the other parts**
- **Inclination Joint**
 - **Allows for tilting of the microscope for convenience of the user**



Mechanical Parts

- **Arm/Neck**
 - Curved/slanted part which is held while carrying the microscope
- **Stage**
 - Platform where object to be examined is placed
- **Stage Clips**
 - Secures the specimen to the stage



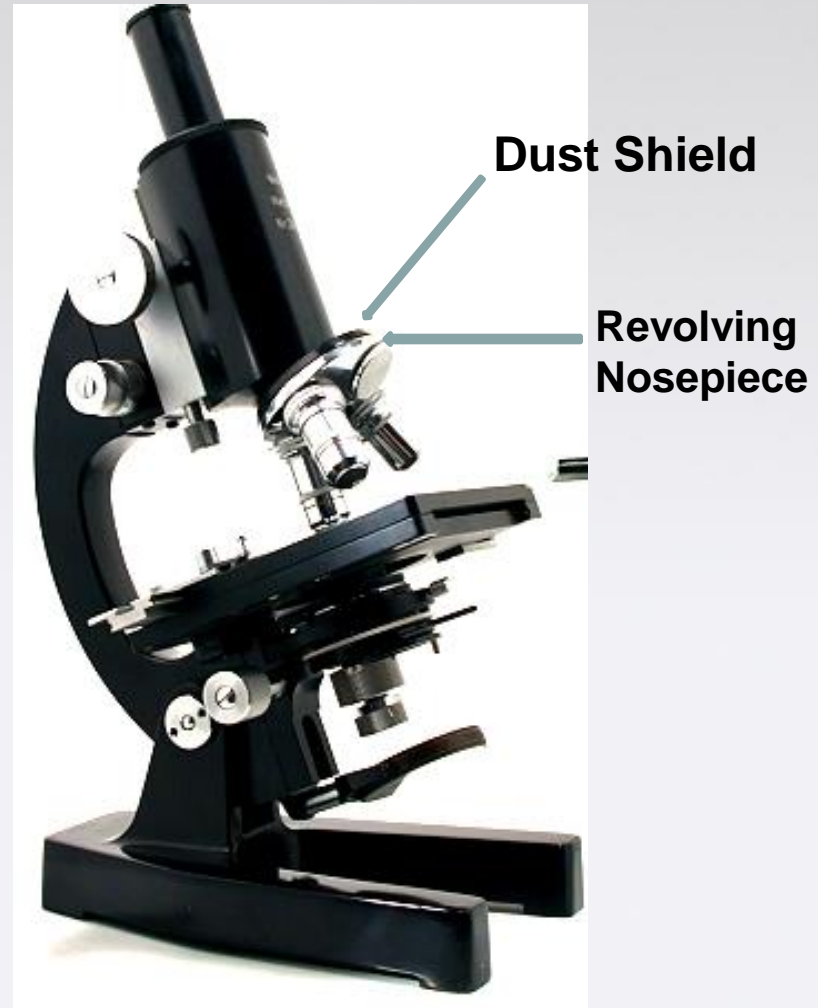
Mechanical Parts

- Stage Opening
- Body Tube
 - Attached to the arm and bears the lenses
- Draw Tube
 - Cylindrical structure on top of the body tube that holds the ocular lenses



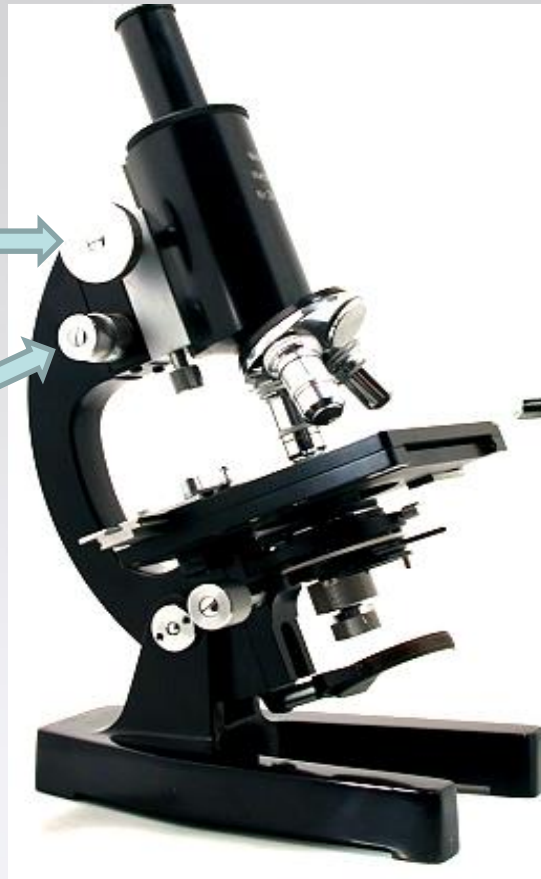
Mechanical Parts

- **Revolving/Rotating Nosepiece**
 - Rotating disc where the objectives are attached
- **Dust Shield**
 - Lies atop the nosepiece and keeps dust from settling on the objectives



**Coarse
Adjustment
Knob**

**Fine
Adjustment
Knob**



- **Coarse Adjustment Knob**
 - Geared to the body tube which elevates or lowers when rotated bringing the object into approximate focus
- **Fine Adjustment Knob**
 - A smaller knob for delicate focusing bringing the object into perfect focus



Mechanical Parts



**Iris
Diaphragm
Lever**

**Condenser
Adjustment Knob**

- **Condenser Adjustment Knob**
 - Elevates and lowers the condenser to regulate the intensity of light
- **Iris Diaphragm Lever**
 - Lever in front of the condenser and which is moved horizontally to open/close the diaphragm

Illuminating Parts

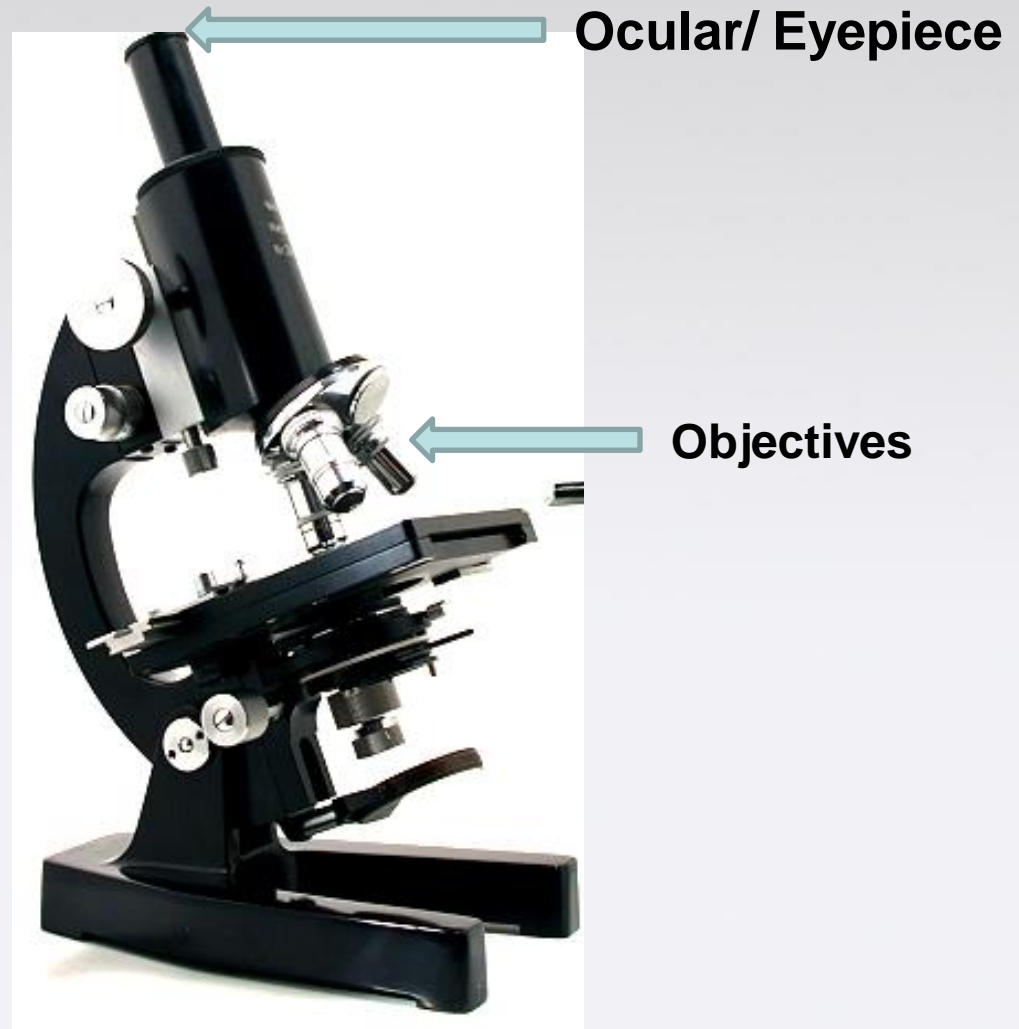


Mirror /
Electric Lamp

- **Mirror**
 - Located beneath the stage and has concave and plane surfaces to gather and direct light in order to illuminate the object
- **Electric Lamp**
 - A built-in illuminator beneath the stage that may be used if sunlight is not preferred or is not available

MAGNIFYING PARTS

- **Ocular / Eyepiece**
 - Another set of lens found on top of the body tube which functions to further magnify the image produced by the objective lenses. It usually ranges from 5x to 15x.



MAGNIFYING PARTS

- Objectives

- Metal cylinders attached below the nosepiece and contains especially ground and polished lenses

- LPO / Low Power Objective

- Gives the lowest magnification, usually 10x

- HPO / High Power Objective

- Gives higher magnification usually 40x or 43x

- OIO / Oil Immersion Objective

- Gives the highest magnification, usually 97x or 100x, and is used wet either with cedar wood oil or synthetic oil



Total Magnification

Magnification = Objective lens X Eyepiece lens

e.g. What is the total magnification if the objective lens is twenty times (X20) and the eyepiece lens five times (X5)?

Magnification = 20 X 5 = X100

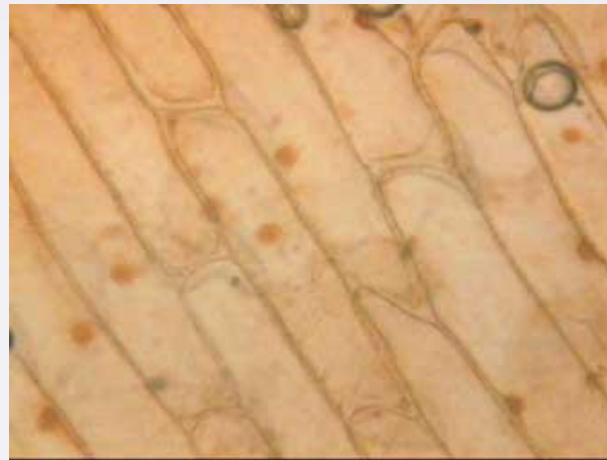


As magnification increases, detail increases but

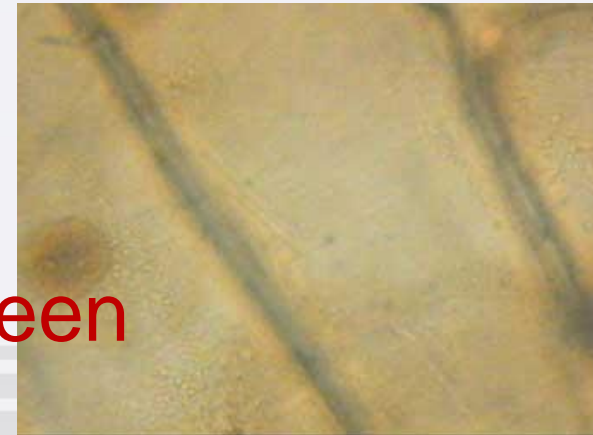
Onion cell



Onion cell 100x



Onion cell 400x



less of the cell is seen



Caring for the Microscope

1. Do not let any liquids to come in contact with the microscope.
2. Always store the microscope inside a box after use.
3. Return the objective lens onto low power after use.
4. Carry the microscope by the arm.
5. Use a soft clean tissue to wipe the lenses



Electron Microscopy

- Electron beam as source ($\lambda \sim 0.005 \text{ nm}$)
- Operate under vacuum
- Electromagnets instead of glass lenses
- Detect by fluorescent screen or photographic emulsion
- Destructive
- Two major types
 - Transmission (TEM) and scanning (SEM)



TEM

Cellular ultrastructure

Bright portion – e⁻ pass through

Dark portion – e⁻ absorbed
or scattered

Sections – 50 – 150 nm

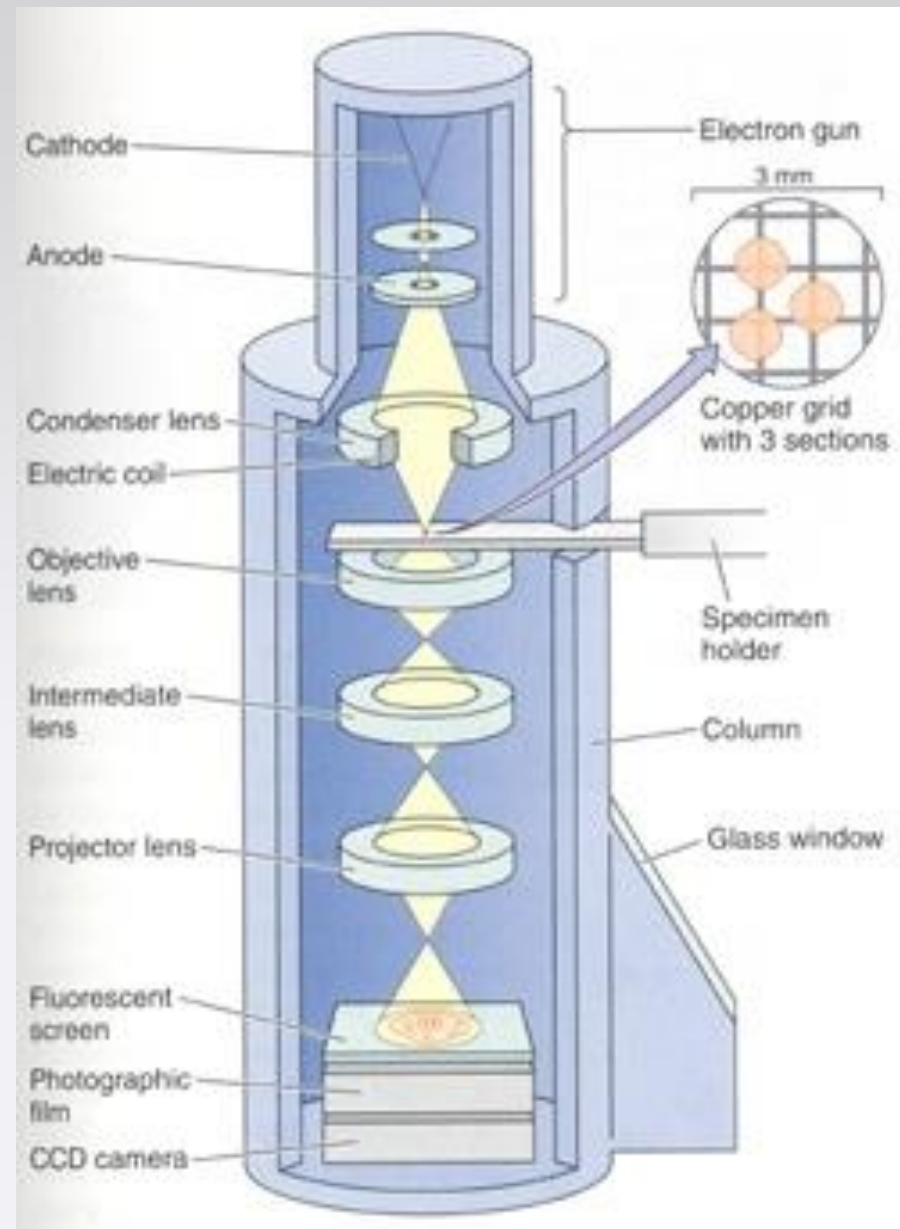
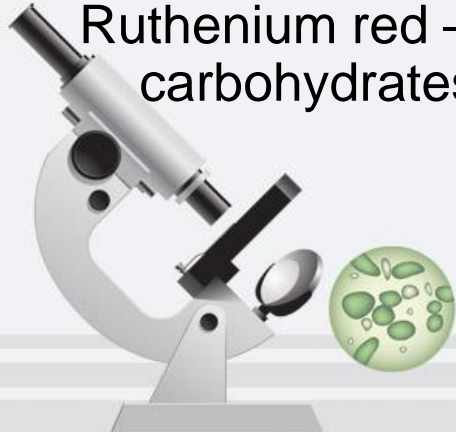
Fix – glutaraldehyde

Stains (e⁻ dense; heavy metals)

Osmium tetroxide (OsO₄) – lipids

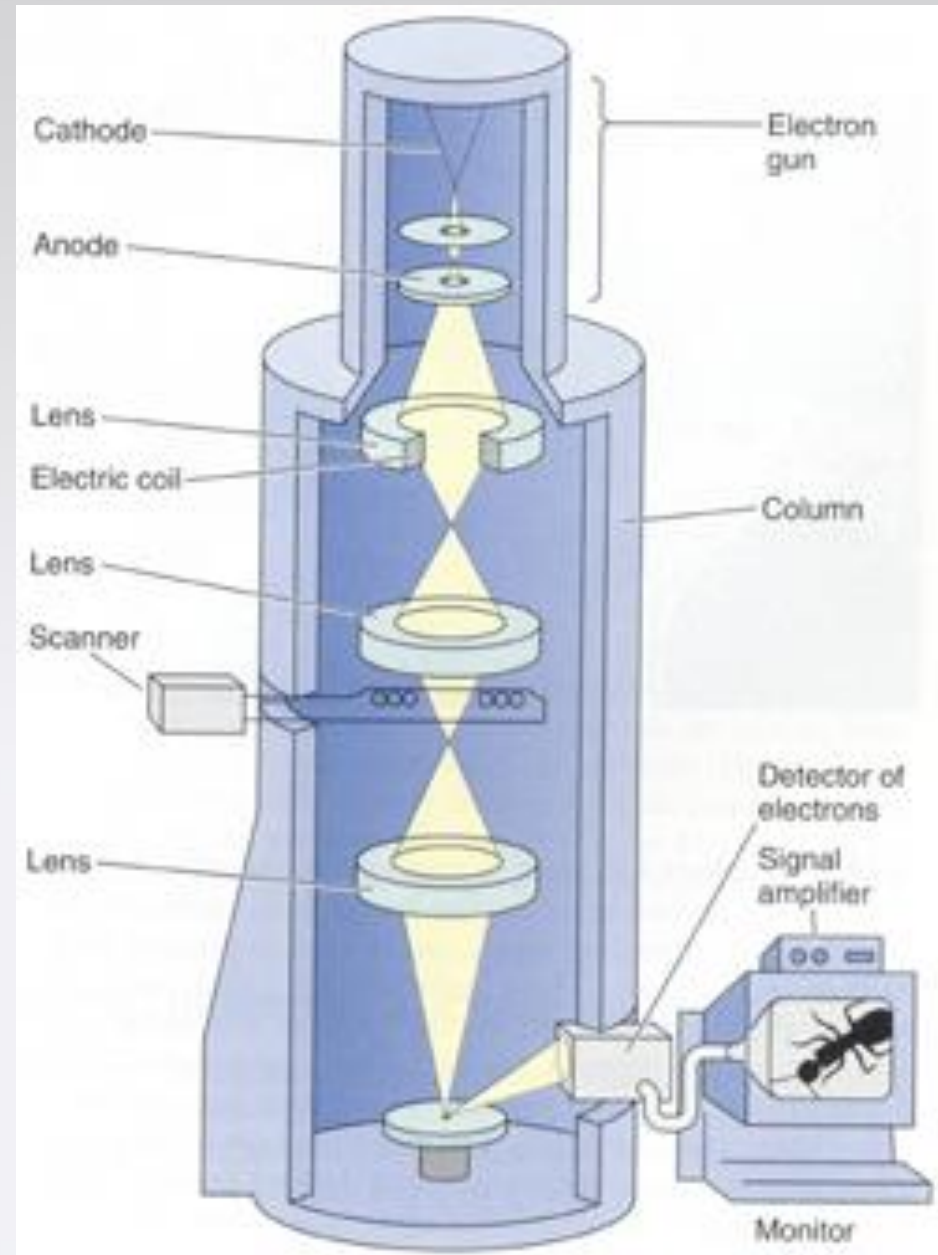
Uranyl acetate, Lead citrate – non-specific (surface adsorbed)

Ruthenium red – complex carbohydrates



SEM

- Surface ultrastructure
- Fixed, dried, coated with gold before imaged
- e^- reflected from surface
 - Results in 3-D like image

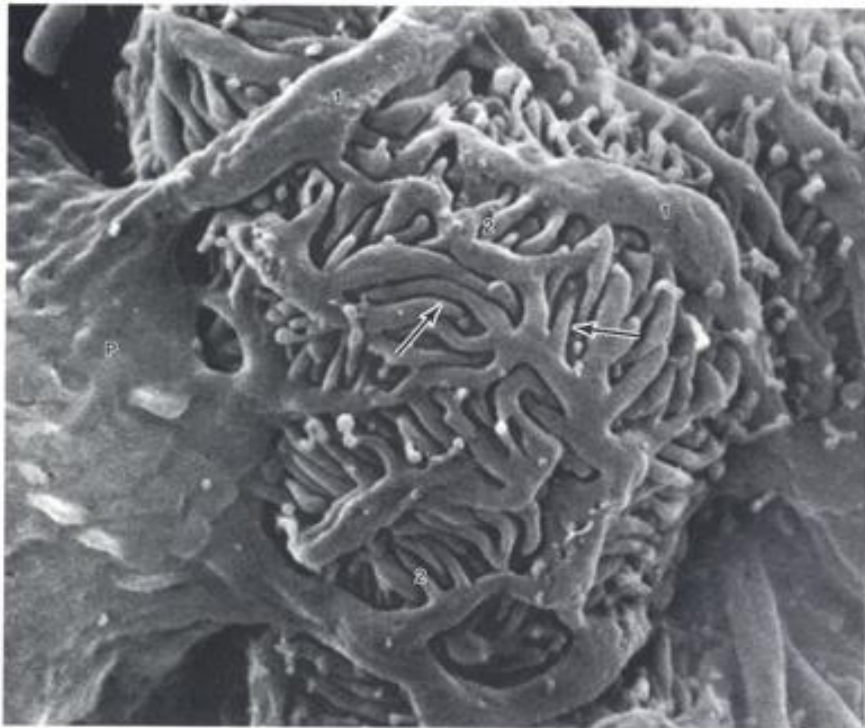


1. structure of Microscope

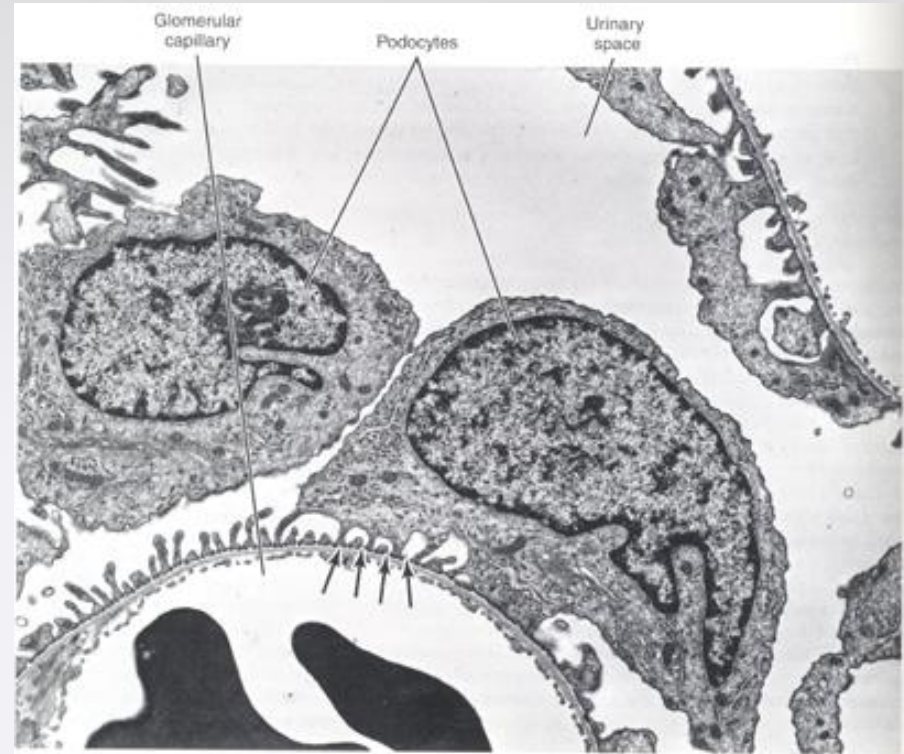
	LM	EM
---useful magnification:	1500X	800,000X
---resolution:	0.2 μ m	0.2nm



SEM image



TEM image



Problems & Pitfalls

- Shrinkage – fixation and embedding
 - Appearance of empty spaces
- Empty spaces due to loss of material
 - Improper fixation and dehydration
- Wrinkling
- Precipitation of stains (may appear as dark spots all over the section)
- Do not memorize images - learn morphological criteria
- Do not rely on color



