Histology

Histology: meaning the study of the tissue, itś the study of the fundamental tissues of the body. The term **histology** is derived from two Greek words:

Histos : Tissue Logos : Science

Histology : deals with the study of minute structure of tissue in general.

Micro-anatomy : deals with the fine structure of all the tissue present in particular organ.

Cytology : deals with the detailed study of individual cell and it is internal components .

The Microscope

The microscope: is an instrument which is used for examination of fine structure of objects . Micro = small . Scope = to view. It enlarges of the images of the objects which then can be seen by the eye .

Types of Microscope:

1. Simple microscope :

It is made of single or combination of lenses which act as single position convex lens.

2. Compound microscope :

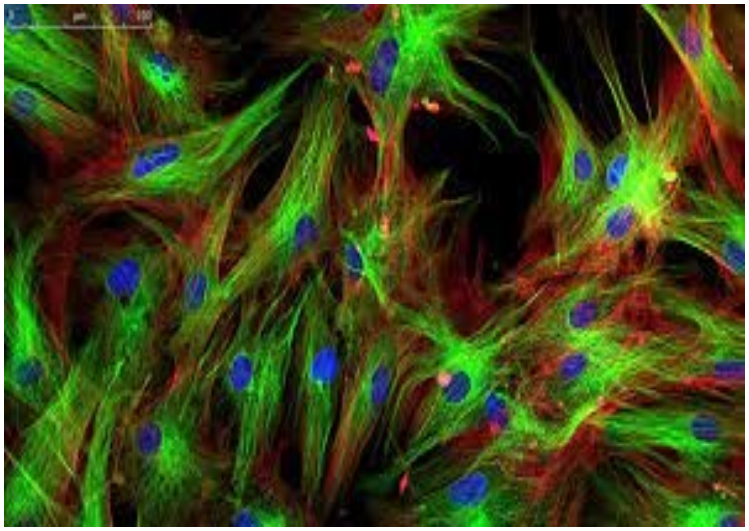
It is made up of 2 lenses which are fitted in a brass tube, one of the tubes can be slides into the other so that the distance between lenses can be changed and adjusted.

Other types of microscopes :

A. Bright field. is the simplest of all the optical microscopy illumination techniques. and the most common used microscope in the laboratories.

1. Phase – contrast. is used in biology to view unstained specimens. It is one of the types of microscopes used to study cells and cell parts like mitochondria, lysosomes and Golgi bodies.

2. Fluorescent. Fluorescence microscope uses high-energy, short-wave length light that excites the electrons of certain molecules present within the sample.



Fluorescence microscope – image

Electron microscope: is a microscope that uses a beam of accelerated electrons as a source of illumination. As the wavelength of an electron can be up to 100,000 times shorter than that of visible light photons, electron microscopes have a higher resolving power than light microscopes and can reveal the structure of smaller objects.

1. Transmission electron microscopes (TEM) are microscopes that use a particle beam of electrons to visualize specimens and generate a highly-magnified image. TEMs can magnify objects up to 2 million times. In order to get a better idea of just how small that is, think of how small a cell is. It is no wonder TEMs have become so valuable within the biological and medical fields. magnifications of up to about 10,000,000× whereas most light microscopes are limited by diffraction to about 200 nm resolution and useful magnifications below 2000×.

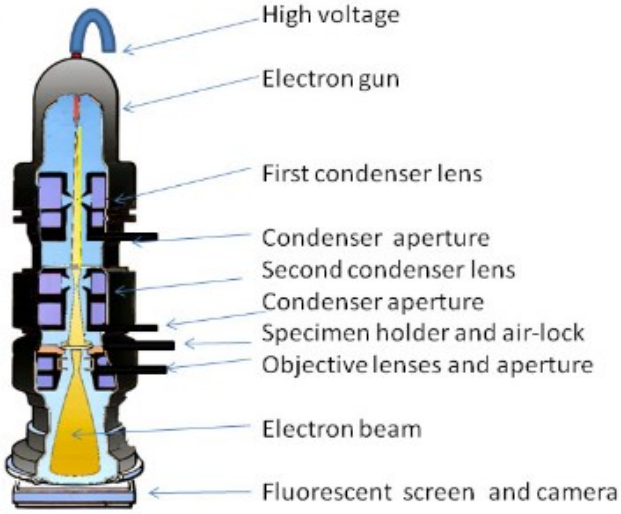
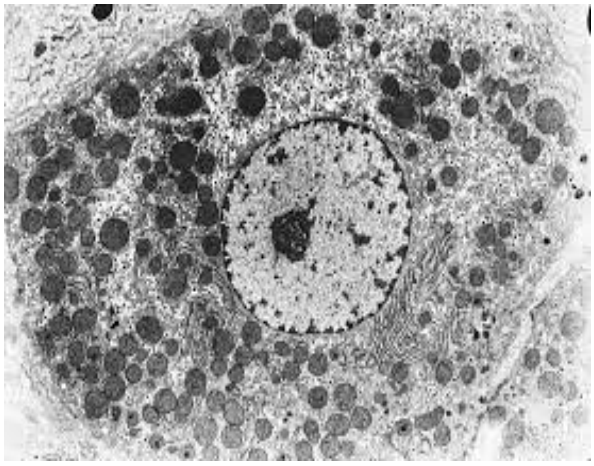


Fig. 1 Simplified diagram of a transmission electron microscope. Drawing by Graham Colm, courtesy of Wikimedia Commons.

Transmission electron microscopes (TEM)

External face of baker's yeast

2. Scanning electron: A scanning electron microscope (SEM) is a type of electron microscope that produces images of a sample by scanning the surface with a focused beam of electrons. The electrons interact with atoms in the sample, producing various signals that contain information about the surface topography and composition of the sample. Some SEMs can achieve resolutions better than 1 nanometer.

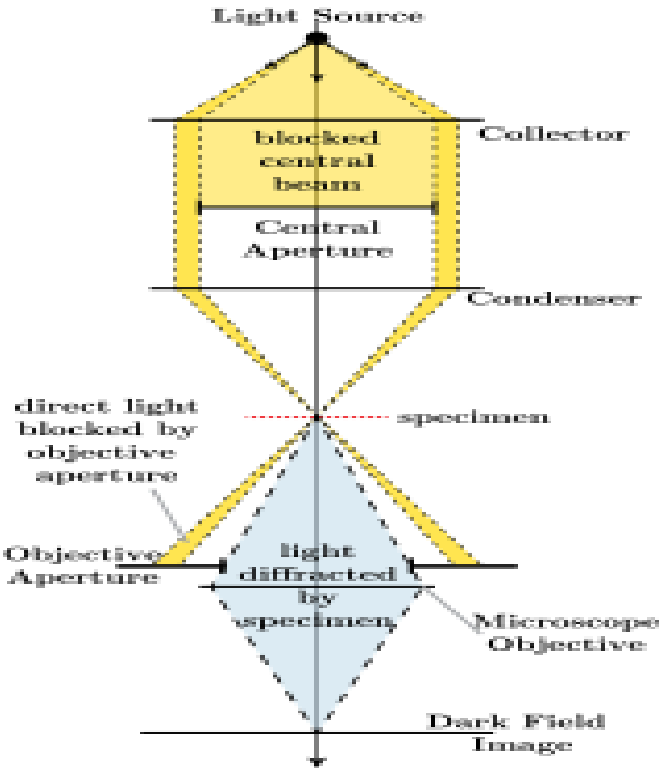


Liver cell

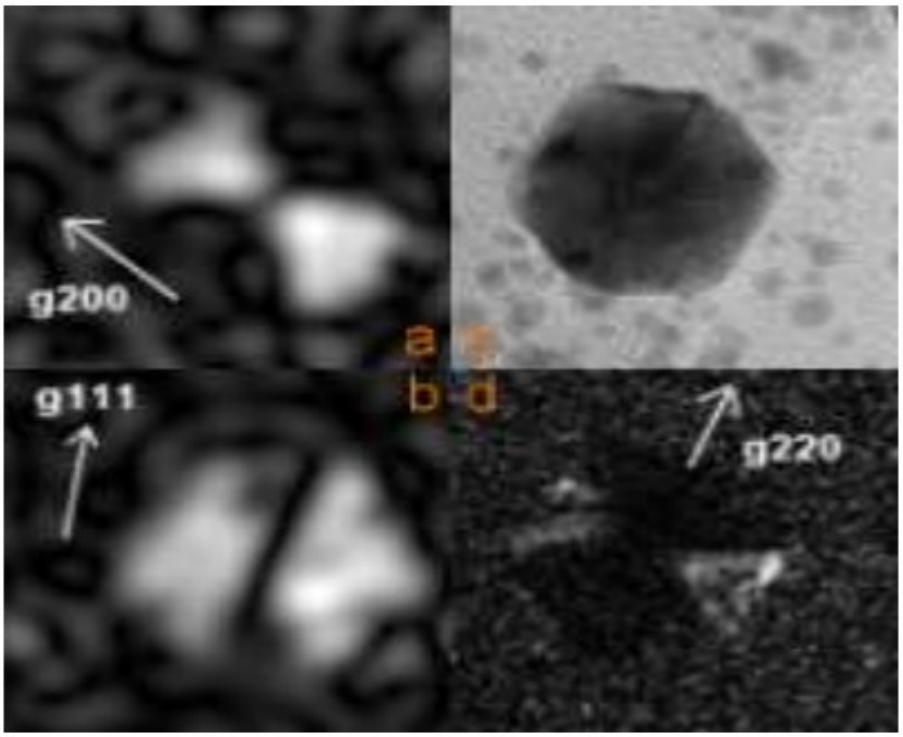
Golgi apparatus

Scanning electron

B. **Dark-field microscope** is used to observe live spirochetes.



Dark-field microscope



Dark-field microscope – image

Parts of light microscope:

The compound microscope is a delicate instrument composed of many parts that are accurately filled together.

1.Eyepiece lens.

The lens at the top that you look through. They are usually 10X or 15X power.

2.Body tube.

Body tube is the optical housing for the objective lenses.

3.Objective lenses.

The objective lenses are a set of three to four lenses mounted on a rotating turret at the bottom of the body tube. The four objective lenses of your microscope and their magnifications are:

Scanning lens	X magnification
Low power lens	10X magnification
High power lens	40-45X magnification
Oil immersion lens	100X magnification

The magnification of the objective lens is written on the lens.

4.Stage

The horizontal surface on which the slide is placed is called the stage. It may be equipped with simple clips for holding the slide in place or with a mechanical stage, a geared device for precisely moving the slide. Two knobs, either on top of or under the stage, move the mechanical stage.

5. Condenser lens

Condenser lens system, located immediately under the stage, contains a system of lenses that focuses light on your specimen.

6. Iris diaphragm

Iris diaphragm is located below the condenser or immediately below the stage in microscopes without a condenser. More light is required at higher magnification.

7.Light source

The light source has an (ON/Off) switch & may have adjustable lamp intensities & color filters.

8. Base

The bottom of the microscope, used for support.

9. Body Arm

The body arm is used when carrying the instrument.

10. Nose piece

Nosepiece is the mounting for the objective lenses which rotates to bring the desired objective into position.

11. Coarse adjustment

Coarse adjustment knob is a large knob located at either side of the microscope which functions in controlling the distance between the objectives and the stage. Use the coarse adjustment only with the scanning (4X) & low- power (10X) objectives.

12. Fine adjustment

Fine adjustment is a small knob located at either side of the microscope. This is used for the control of the object, precise focusing you should use just the fine adjustment knob with the higher magnification objective lenses; Because using the coarse adjustment knob with the higher objective lenses may damage the lens &/or the slide you are observing.

Part Function

Part	Function
Eyepiece (Ocular Lens)	part you look through, magnifies the object 10X
Body tube	holds lenses and nose piece
Revolving piece	moves around in order to change the power of the objective lenses
Objective Lenses	the lenses closest to the object , they magnify the object 4X, 10X , 40X and 100X
Stage	supports or holds the slide (it is on show there).
Stage Clips	hold the slide onto the stage
Lamp	shines light through the object
Iris Diaphragm	alters the amount of light going through the Stage to the lenses
Base	supports the instrument
Coarse Adjustment	focuses the low and medium objective lenses
Fine Adjustment	fine tunes the focus to give a clear - is only adjustment used for high power 40

Microscope safety cautions:

1. Always carry the microscope in an upright position using both hands.

2. Keep the microscope away from the edge of the table.

3. Always examine a slide first with the low-or medium power objective, never use the high - power objective to view thick specimens.

4. Remove slide only after low-power objective has been rotated into viewing position, never when high – power objective is in position.

5. Keep the stage dry at all times. A wet stage will prevent the slide from being accurately positioned.

6. When returning your microscope to its proper place in the cabinet always:

- Remove the slide from mechanical stage.
- Clean all lens surface and the stage.
- Rotate the nosepiece that the scanning lens is in place.

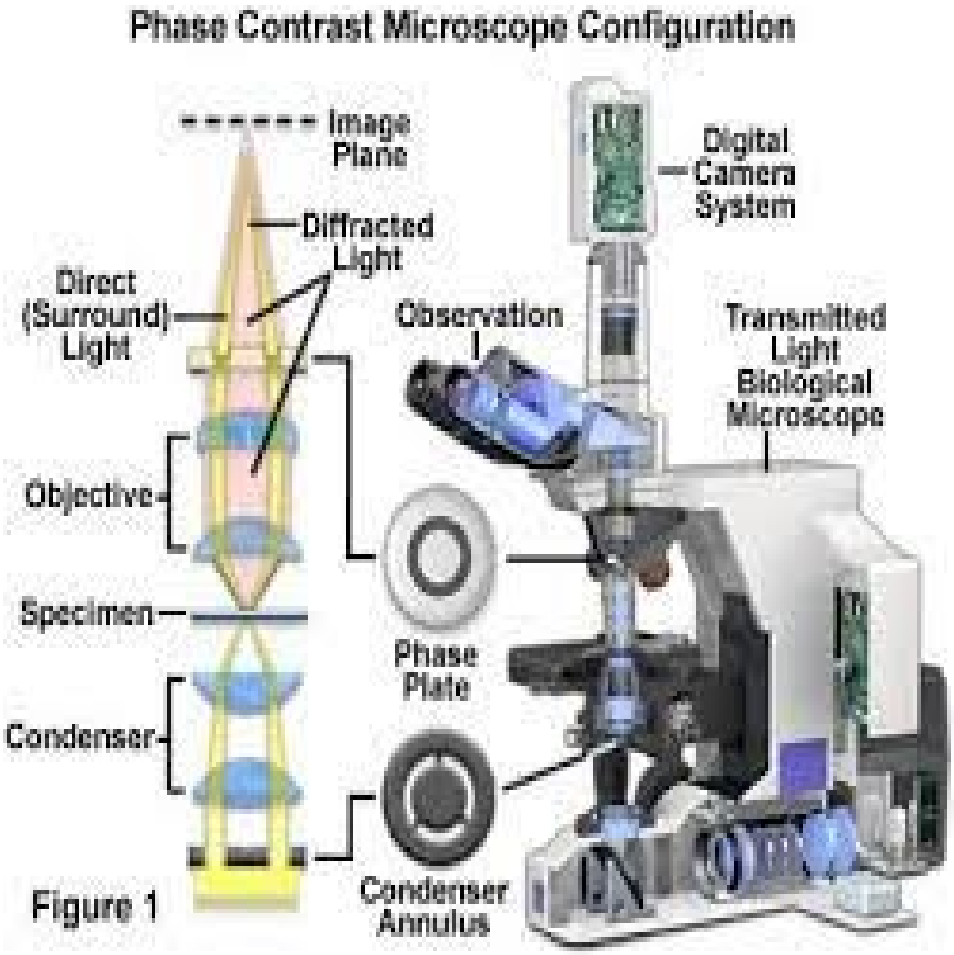
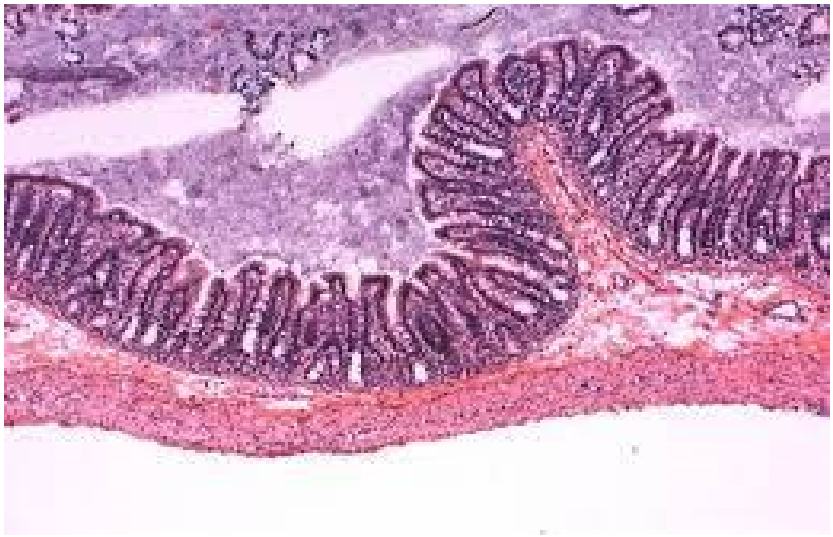
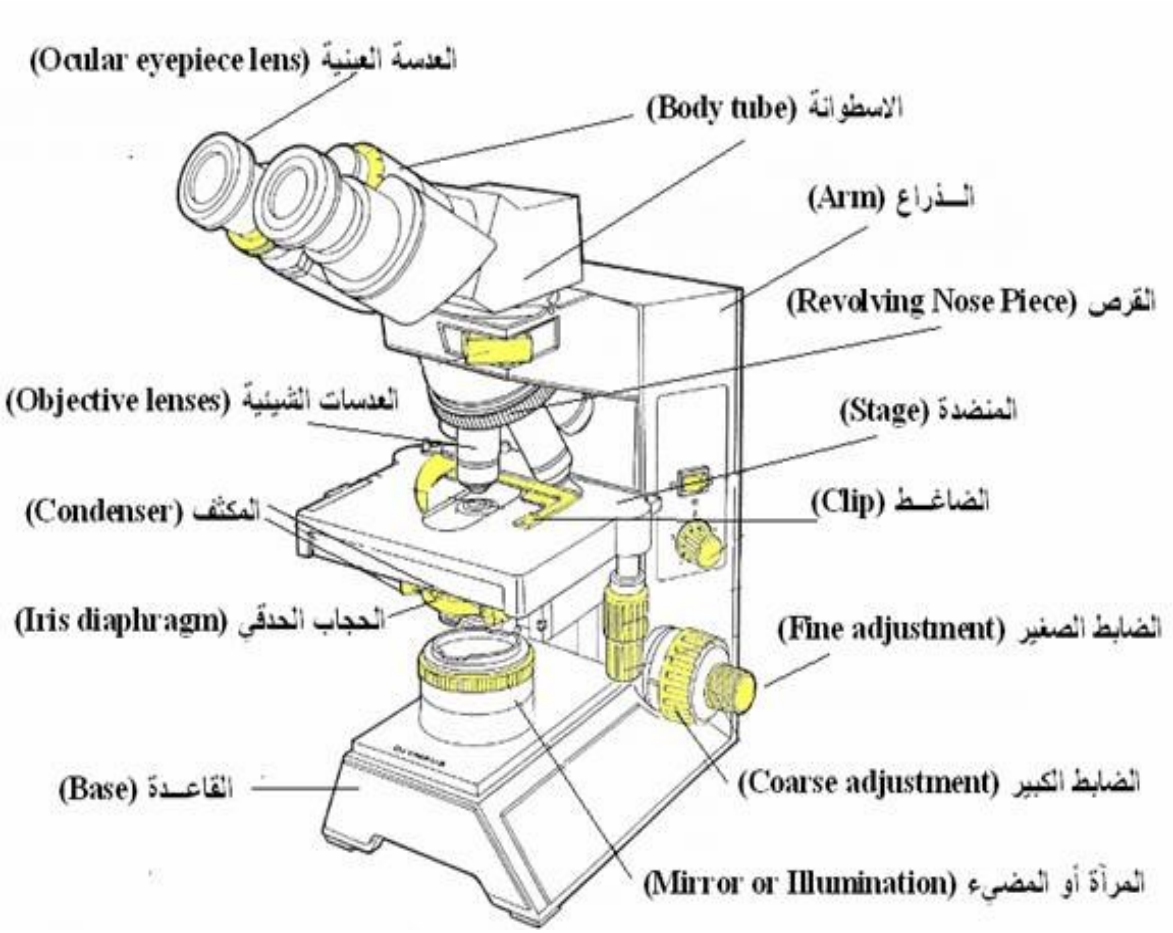


Figure 1



Light -field microscope – image



light microscope