# Microscope

# What is Microscopy?

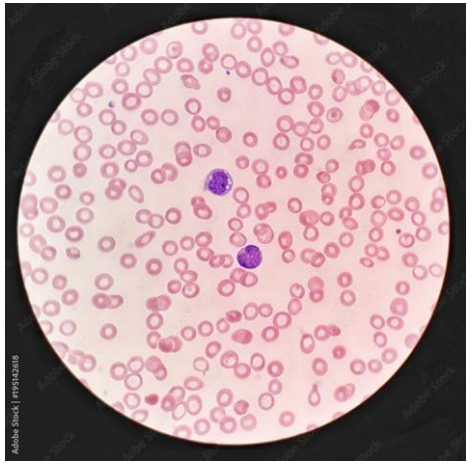
- Microscopy: The science of investigating small objects.
- Allows us to see structures and details not visible to the naked eye.
- Essential tool in various fields, from biology to material science.

# Types of Microscopes

There are several types of microscopes, each with its own principle of operation and specific uses.

## 1-Optical Microscopes:

- Principle: Optical microscopes, also known as light microscopes, use visible light and a series of lenses to magnify the image of a specimen. They rely on the interaction of light with the specimen to produce an image.
- Uses: Optical microscopes are widely used in biology, microbiology, and materials science. They are suitable for observing live specimens and examining details of relatively transparent or semi-transparent samples.

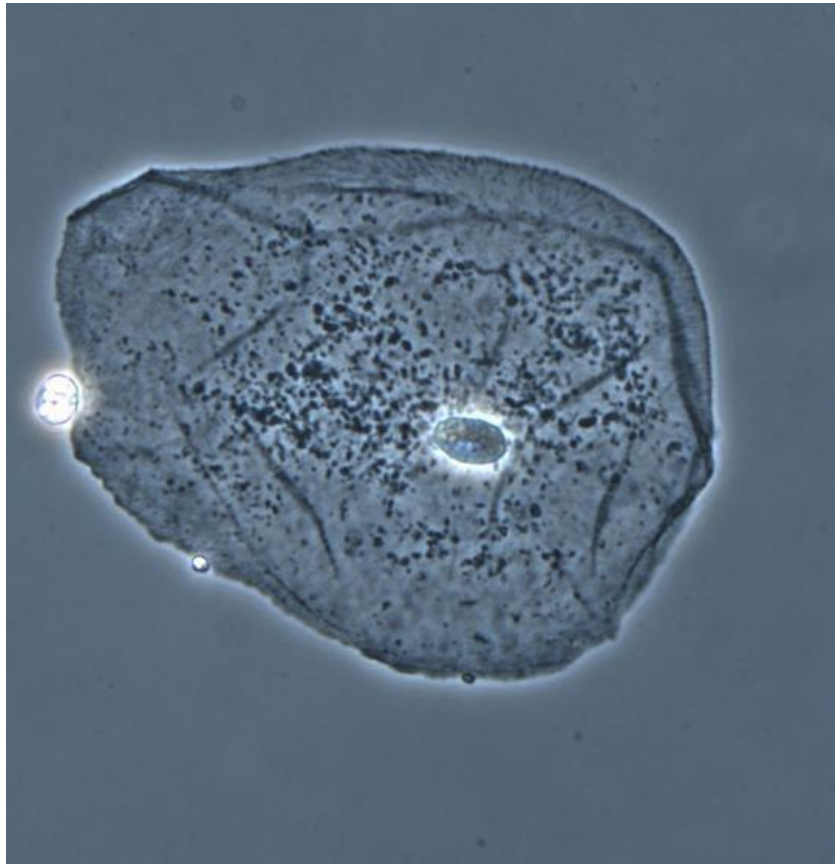


# Part of light microscope

| Part | Function |
|---|---|
| Eyepiece (Ocular Lens) | Magnifies the image from the objective lens and directs it to the viewer's eye. |
| Objective Lens | Primary lens that magnifies the specimen. Multiple objectives provide various levels of magnification. |
| Nosepiece (Revolving Turret) | Holds multiple objective lenses and allows you to switch between them. |
| Stage | Platform where the specimen is placed for observation. Often includes a mechanical stage for precise movement. |
| Condenser Lens | Focuses light onto the specimen, improving illumination. Adjustable for optimal lighting conditions. |
| Illuminator (Light Source) | Provides the light that passes through the condenser and specimen for illumination. |
| Diaphragm (Iris Diaphragm) | Controls the amount of light reaching the specimen by adjusting its size. |
| Coarse Adjustment Knob | Used for rapid focusing by moving the stage up and down. |
| Fine Adjustment Knob | Allows precise and small adjustments to achieve a sharp focus. |
| Base | Provides stability and support for the microscope. |
| Arm | Connects the head to the base and aids in carrying and positioning the microscope. |
| Stage Clips or Mechanical Stage Controls | Secure the specimen in place and enable precise movement on the stage. |
| Rheostat or Light Intensity Control | Adjusts the brightness of the light source to control illumination. |

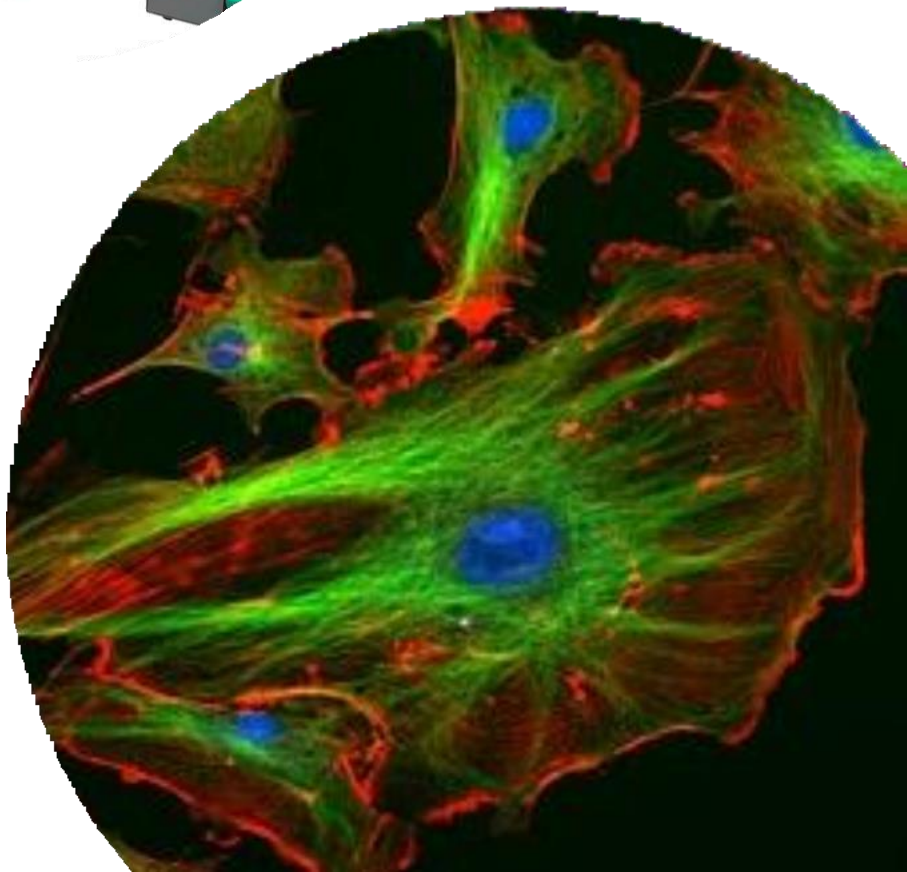
# Phase-Contrast Microscopes:

- Principle: Phase-contrast microscopy enhances the contrast of transparent and semi-transparent specimens by manipulating the phase of light passing through them.
- Uses: Phase-contrast microscopes are valuable for observing living cells and tissues without staining, making them essential in cell biology and microbiology.



# Fluorescence Microscopes:

- Principle: Fluorescence microscopes use specific wavelengths of light to excite fluorescent molecules in a specimen. These molecules emit light of a different wavelength, which is used to create high-contrast images.
- Uses: They are used in cell biology, immunology, and genetics to study fluorescently labeled molecules and structures within cells.

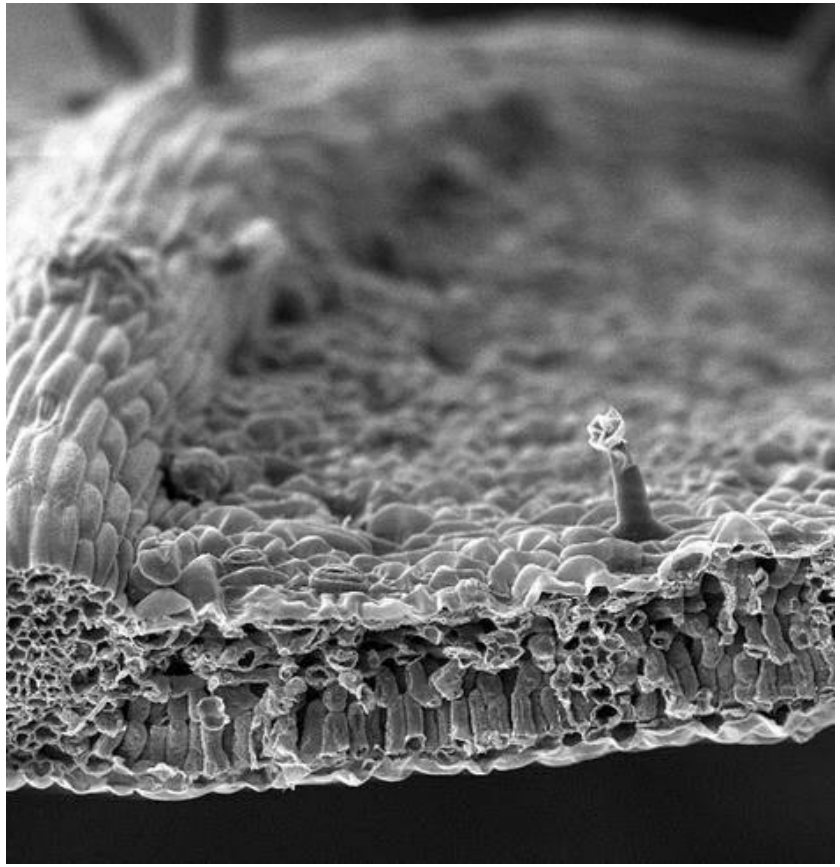


# Electron Microscopes:

- Principle: Electron microscopes use beams of electrons instead of light to image specimens. They have much higher resolution than optical microscopes due to the shorter wavelength of electrons.
- Uses: Electron microscopes are crucial for studying structures at the nanoscale. There are two main types:

1-Transmission Electron Microscope (TEM): Used for imaging thin sections of specimens, providing detailed internal structures.

2-Scanning Electron Microscope (SEM): Used for imaging the surface of specimens in 3D, providing detailed surface morphology.



# How to Use a Microscope

1- Turn the revolving turret (2) so that the lowest power objective lens (eg. 4x) is clicked into position.

2- Place the microscope slide on the stage (6) and fasten it with the stage clips.

3- Look at the objective lens (3) and the stage from the side and turn the focus knob (4) so the stage moves upward. Move it up as far as it will go without letting the objective touch the coverslip.

4- Look through the eyepiece (1) and move the focus knob until the image comes into focus.

5- Adjust the condenser (7) and light intensity for the greatest amount of light.

6- Move the microscope slide around until the sample is in the centre of the field of view (what you see).

7- Use the focus knob (4) to place the sample into focus and readjust the condenser (7) and light intensity for the clearest image (with low power objectives you might need to reduce the light intensity or shut the condenser).

8- When you have a clear image of your sample with the lowest power objective, you can change to the next objective lenses. You might need to readjust the sample into focus and/or readjust the condenser and light intensity. If you cannot focus on your specimen, repeat steps 3 through 5 with the higher power objective lens in place. Do not let the objective lens touch the slide!

9- When finished, lower the stage, click the low power lens into position and remove the slide.

# Thank you