Exploring the Cell

Modern scientists still use microscopes to explore the cell.

Light microscopes

The resolution (detail) of images made with light microscopes is limited because light scatters as it passes through matter.

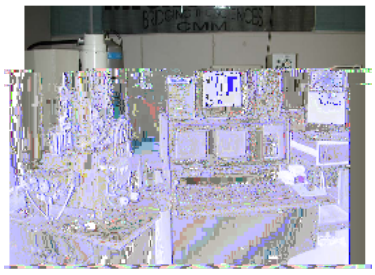
Electron Microscopes

These are capable of revealing details as much as 1000 times smaller than those visible in light microscopes.

1. **Transmission Electron Microscopes (TEMs)**

Beams of electrons can only pass through thin samples so cells and tissues must be cut into ultra thin slices before they can be examined.

2. **Scanning Electron Microscopes (SEMs)**



A pencil-like beam of electrons is scanned over the surfaces of a specimen. Specimens do not have to be cut into thin slices. These microscopes produce 3D images of cells.

Electron microscopy can only be used to visualize non-living, preserved cells and tissues since samples must be placed in a vacuum in order to be studied.

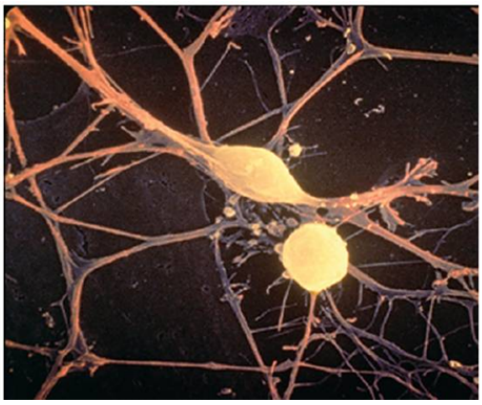
Scanning Probe Microscopes

These microscopes produce images by tracing the surfaces of samples with a fine probe.

Researchers have used scanning probe microscopes to image DNA molecules.

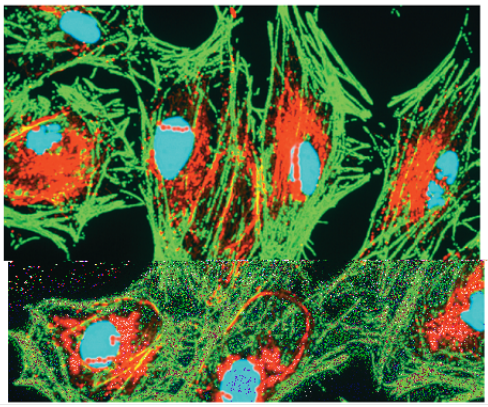
Variety of Micrographs - Page 172

Scanning Electron Micrograph of Neurons



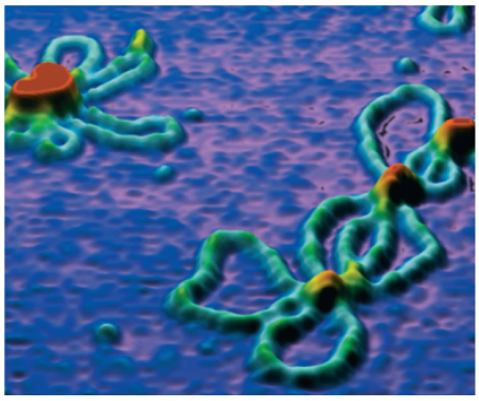
8900X

Confocal Light Micrograph of HeLa Cells



500X

Scanning Probe Micrograph of DNA



320 000X

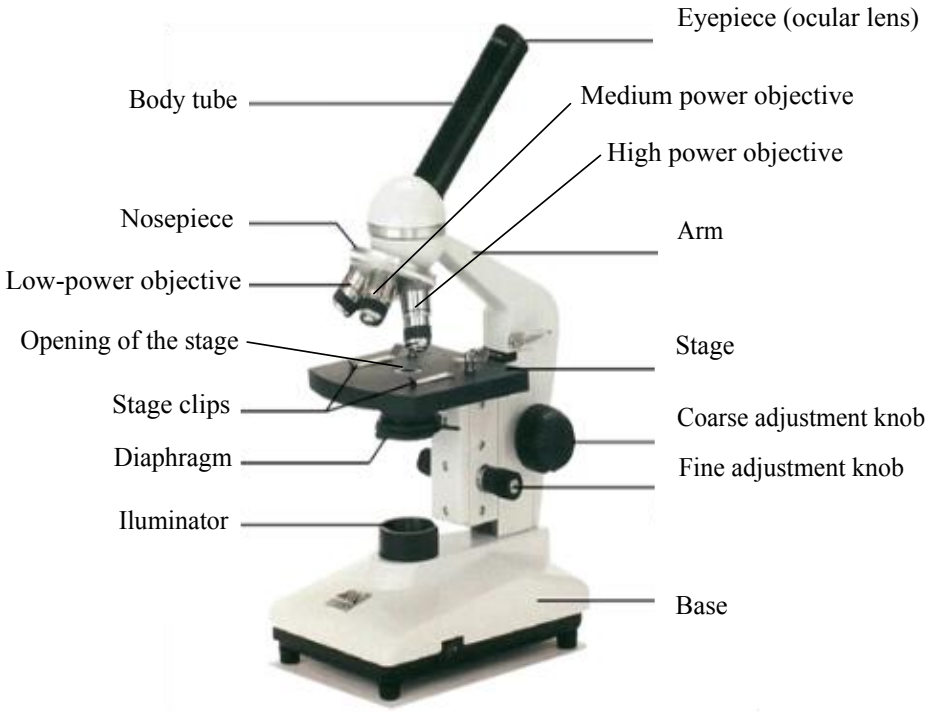
Use of the Microscope

Appendix D

Page 1070

Use of the Microscope

Appendix D
page 1070



Study the parts and functions of the microscope.

Calculating the Magnification of a Microscope

Total Magnification = magnification of eyepiece x magnification of objective lens

ie/ eyepiece 10x
low 4x

Total Magn. = 10 x 4 = 40

40x

As magnification increases, the size of the image increases. However, because less of the image can be seen, the field of view decreases.

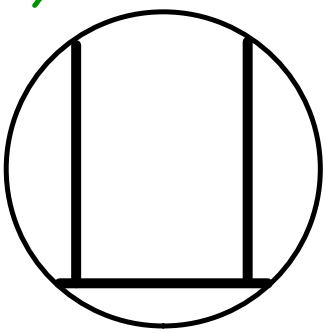
Low c1 x 10 40 ✓
10 x 10 100
medium
high 40 x 10 400

Measuring the Field of View on Lowest Power

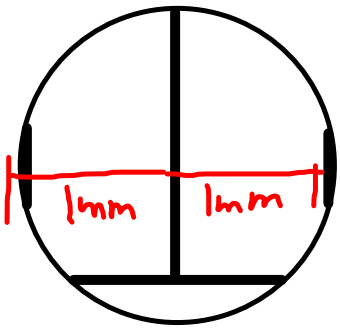
Place a clear plastic ruler with mm markings on top of the stage of your microscope. Looking through the lowest power objective, focus your image. Count how many divisions of the ruler fit across the diameter of the field of view. Multiply the number of divisions by 1000 to obtain the field of view in micrometers (µm). Note: 1 mm = 1000 µm.

µ Greek letter mu

µ SI prefix micro



At 40x, the lines of the ruler are clearly visible. In order to accurately measure the field of view, one line should be moved to the edge of the field of view.



2mm x 1000 = 2000 µm

* 1 cm = 10 000 µm

Attachments

Two_Types_of_Cells__Prokaryotic_and_Eukaryotic.asf

Bacteria.asf