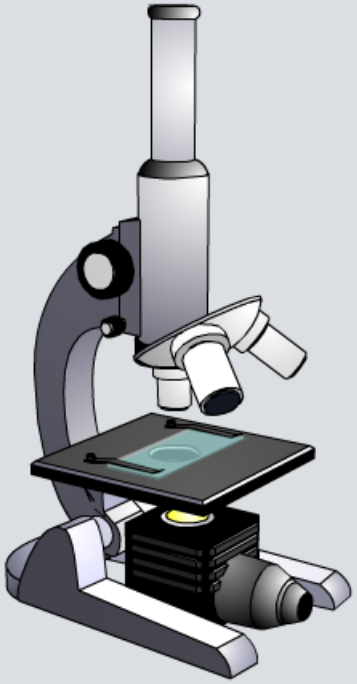
Microscopy

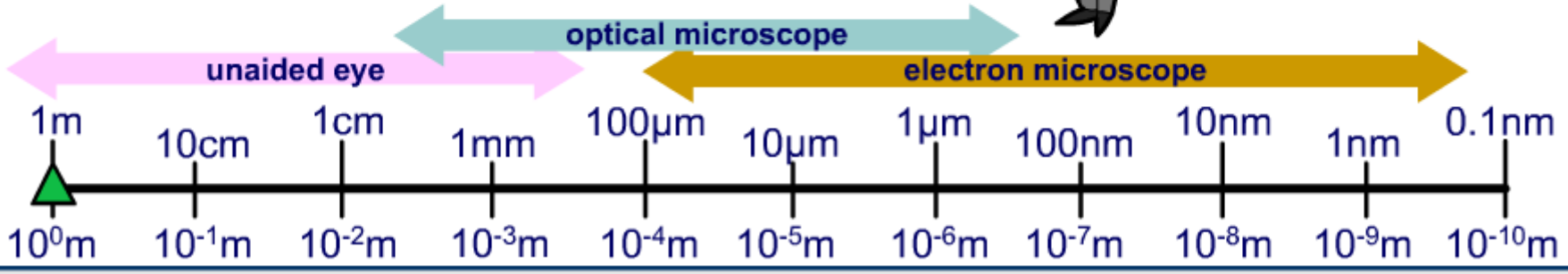


How small is a cell?

The size of biological structures

1 m (10^0 m)
A small child is about 1 m high.

Some adult neurons are over 1 m long.



Light microscopes

Light (or optical) microscopes use lenses to project a magnified image of an object onto the eye.

Magnification is a measure of how many times bigger the image is than the object:

$$\text{magnification} = \frac{\text{size of image}}{\text{actual size of the object}}$$

Light microscopes are limited to a magnification of 1500× by their resolving power (**resolution**). This is a measure of their ability to distinguish between two separate points. A light microscope cannot resolve two points that are closer than half a wavelength of visible light (250 nm).

Electron microscopes

What are electron microscopes?


WM Keck Electron Microscopy Laboratory

An **electron microscope** exposes a specimen to electrons instead of light. Electrons have a much shorter wavelength than light, which means they can produce images of much greater resolution (up to 0.1nm) and magnification (up to 2×10^6) than those of a light microscope.

Click on the buttons to find out more about the two main types of electron microscope.

transmission electron microscope

scanning electron microscope

Preparing a specimen for microscopy

Electron microscopes contain a vacuum, as air particles would interfere with the beam of electrons.

Water boils at room temperature in a vacuum, so the specimen must be dried out completely (dead).

Optical microscopes can be used to view living specimens. Colored dyes (stains) can be used to make specific structures more visible under a light microscope.

Microscope characteristics

Which microscope do these descriptions apply to?

optical microscope	electron microscope

uses a beam of electrons