Tools of the trade

Section 1.4

Microscope

Enlarges an object that can't be studied using the naked eye

- Types
  - Light microscope (LM) – uses light and lens to magnify an object
  - Electron microscope (EM) – uses electrons and magnets to magnify an object

Microscope

- History
  - LM was invented in the late 1600's, followed by a huge increase in the # of living organisms
  - EM was invented in the 1930's, allowed for greater detail of the structures of organisms, CELLS, and even the atom

Light Microscope

- Function – Uses glass lenses that focus light passing through an object, commonly used by scientists and the general public
- Benefit – Inexpensive, can be used to view living organisms
- Drawback –
  - relatively small magnification power, max 2000 times real size
  - Poor resolution (the ability to see small details)

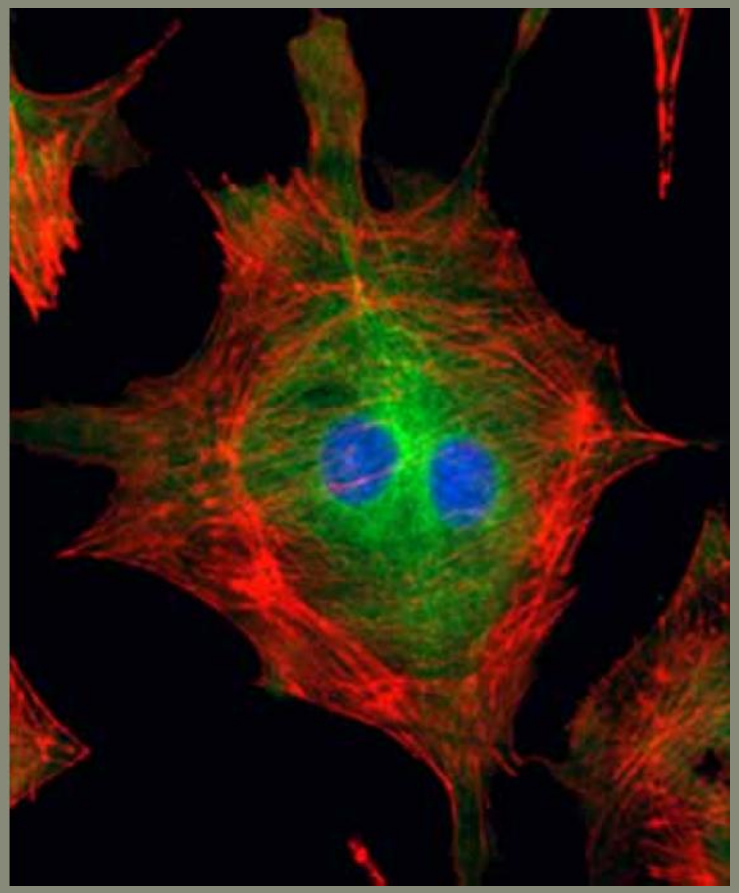
Human Cheek Cell with LM

- You can see "stuff" inside but cannot make out details.
- More magnification doesn't help.

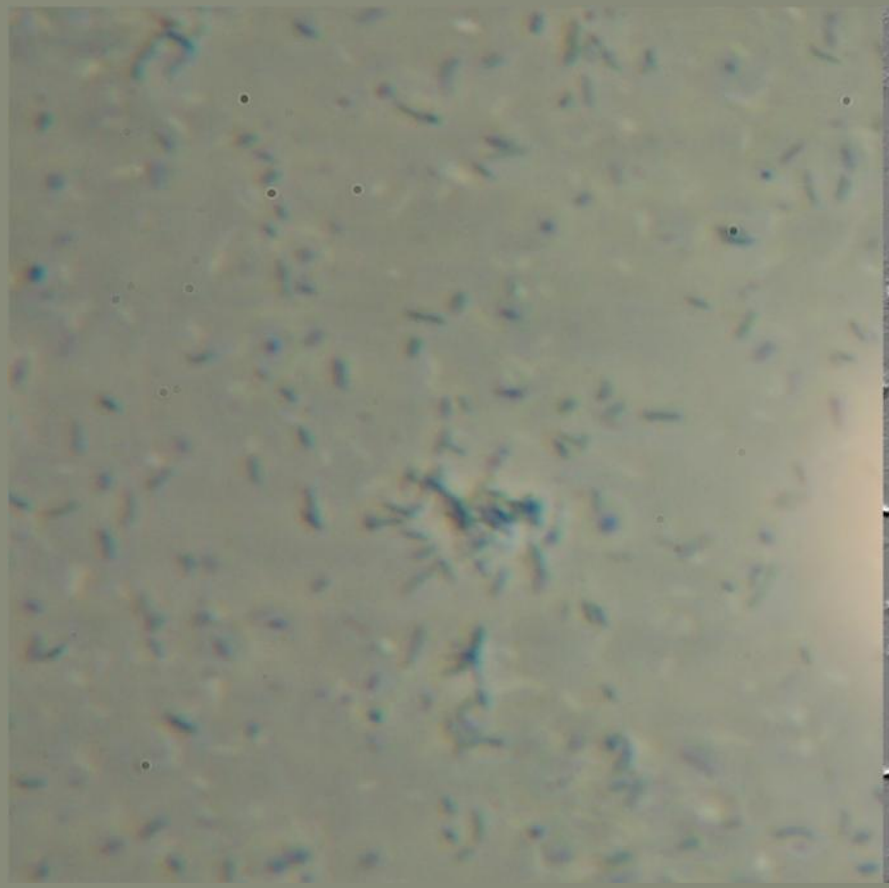
There are different tricks to push the usefulness of light microscopes farther.

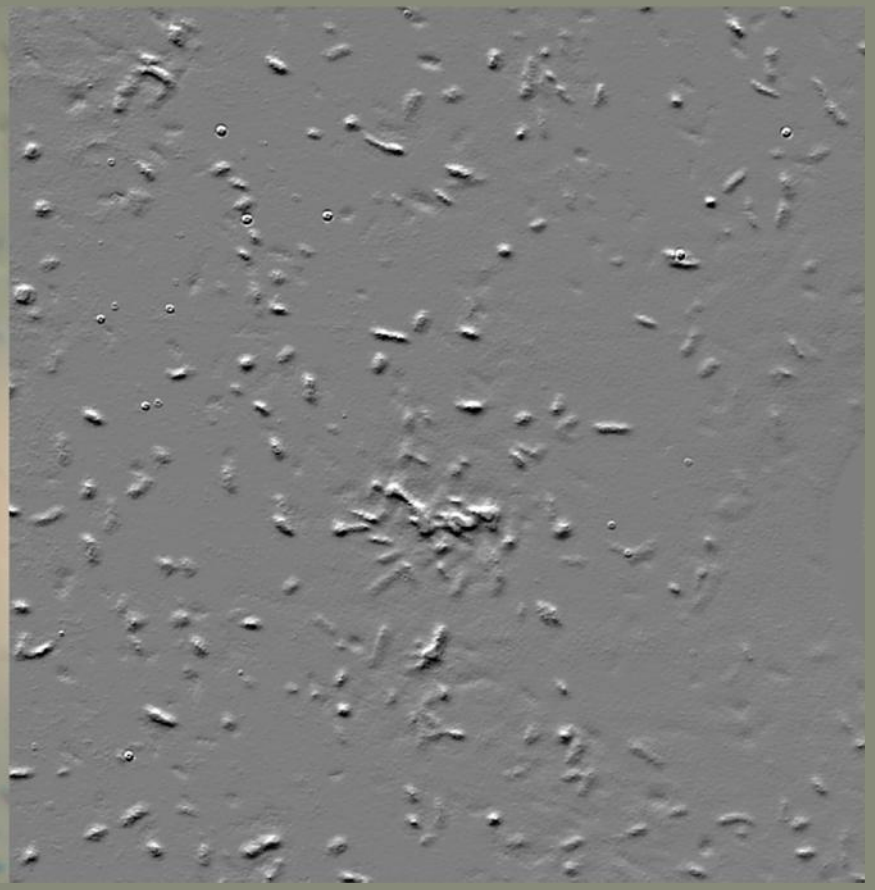
- Addition of florescent molecules to certain cell parts that glow under black light.
- This cell has protein fibers glowing red and green.
- The nucleus is glowing blue.

- Why are their TWO nucleii??



Computer enhancement can be useful to bring out more details or highlight edges, but resolution can't get better.





- Bacteria barely visible

Same image, enhanced

Electron Microscope

- Function - Uses beams of electrons to view objects in a vacuum
- Benefit – much larger magnification and resolution (2500X more than a LM)
- Drawback – samples are killed before viewing
- Types
  - **Transmission electron microscope (TEM) views**
  - **Scanning electron microscope (SEM)**

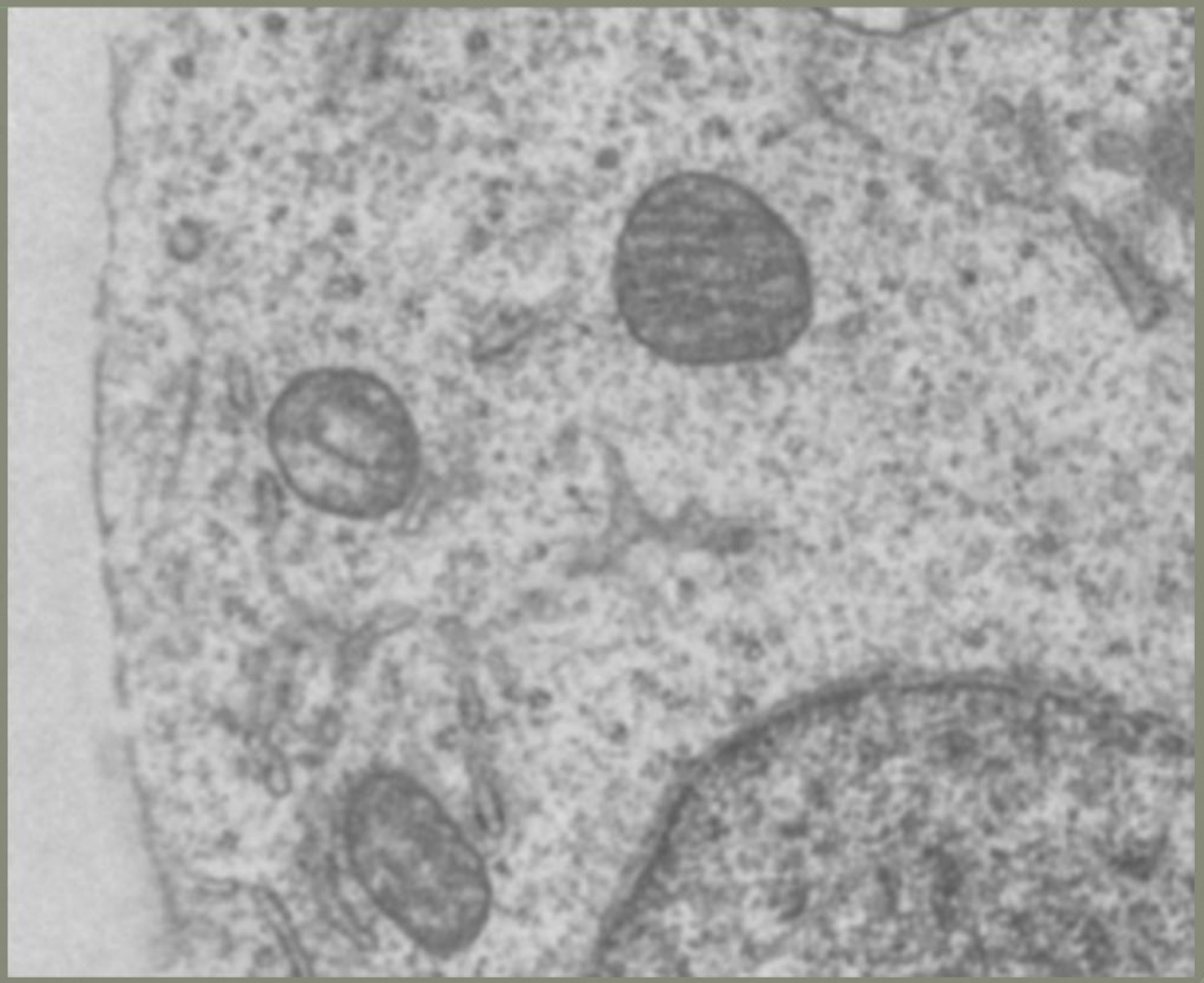
- Types of Electron Scope
  - **Transmission electron microscope (TEM) views the interior of cells well.**

Transmission Electron

Here you can see individual organelles inside of a yeast cell.

Increased resolution = more detail

- This is a close-up of the far left of that cell. (I actually took these on the TEM at UD)



Scanning electron microscope (SEM)

- Here is a yeast cell imaged with a SEM. You only see the surface but you see it's texture and shape.