

# LAB: Prokaryotes and Eukaryotes: bacteria (cyanobacteria), and eukaryotic cells

## Laboratory Atlas Chapters 1 and 2

*Use your Lab notebook and make sketches of everything, labeling and noting function. Put a scale to all sketches. This is the BEST way to remember and understand all of this, and do well on lab practical exams.*

This lab is designed to help you better understand the differences between **eukaryotic** and **prokaryotic** cells, with a focus on **cyanobacteria** and plant cells. You will become familiar with general characteristics of the bacteria (and in particular the cyanobacteria), and major eukaryotic cell structures.

Important concepts and terms to know: **Bacteria (prokaryotes)**

1. Know the major differences between prokaryotic and eukaryotic cells including major organelles
2. Know the general sizes of prokaryote vrs. Eukaryote cells: be able to determine if a cell you are looking at is a bacteria cell or a eukaryotic cell
3. Be able to recognize and draw cyanobacteria (and know their living arrangements – eg. colony etc.)
4. Be able to recognize and draw **heterocysts** and **akinetes** in cyanobacterial colonies and know their functions.
5. Be able to recognize some species of cyanobacteria

Important concepts and terms to know: **Eukaryotic cells**

6. Know what cellular differentiation is, and that eukaryotic cells can be very specialized
7. Look at the part of the plant from which you are taking the cells: note spatial arrangement on a tissue level: are the cells from petals?, stems? What is the function of these specialized cells or structures within them and why did you find them there?
8. Draw the cells, and be able to label major organelles (contents of cells)
9. Terms/structures to know and identify, including their **functions** (remember to use your books and other resources to identify these too). Use through focusing to get a 3-D effect to better find them:
  - a. Cell wall
  - b. Protoplast
  - c. Cytoplasm, cytosol
  - d. Major organelles including the nucleus, chloroplasts, mitochondria, plastids, vacuoles
  - e. Cytoplasmic streaming
  - f. Plasmodesmata

## PART I: OBSERVATIONS OF BACTERIA

- Cells minute, average between 1 and 3 micrometers.
- Lack membrane bound organelles including nuclear envelope, mitochondria and chloroplasts.
- Exist as single cells or in characteristic groupings (chains, tetrads . . . etc.)

### The Blue Greens (Cyanobacteria)

- Cells are generally somewhat larger than bacteria - average diameter about 3 micrometers.
- All are photosynthetic and always have chlorophyll a (green) and phycocyanin (blue) in addition to other pigments, but lack chloroplasts.

Since all Blue Greens are photosynthetic, the different species are distinguished primarily on the basis of cell morphology, cell groupings and type of accessory pigments (those present in addition to chlorophyll a and phycocyanin).

- a. Make wet mounts of the various kinds of Blue Greens and note their characteristics under the microscope. Use some of the prepared slides too
- b. Make sketches to show the different cell shapes and groupings and cell size.
- c. Note some filamentous forms have specialized cells along the filaments. These are either akinetes or heterocysts (identify them).
- d. SEARCH: look at, draw, and try and ID some 'wild' cyanobacteria from pond water. Use an understanding of cyanobacteria size to find them.

## PART II: OBSERVATIONS OF EUKARYOTIC CELLS: DRAW and LABEL including SIZE.

This part of the lab will allow you to become familiar with eukaryotic cells and in particular with some plant cell structure and function.

1. Prepare a wet-mount of an *Elodea* leaf (a freshwater aquatic plant) – a great plant to use for looking at *chloroplasts* and *cytoplasmic streaming*. Start at the 10X magnification, use through-focusing. You are looking at photosynthetic **parenchyma** cells (specializing in metabolic activities such as photosynthesis).
  - Find the chloroplasts (green plastids) and watch them begin to move with cytoplasmic streaming. Why the streaming?
  - See the parallel dark lines: intercellular spaces often containing air (*why?*)
  - Smaller mitochondria – find them (at least try!)
  - Find the nucleus (hard – but try)
2. The cell wall and plasmodesmata: look at the slides available for distinguishing plasmodesmata (often endosperm cells of some seeds such as persimmons and dates). Note that the walls are thickened. What is the function of the plasmodesmata?