

Tavi Belser
Instructor: Theodros Tadese
Date: Sept. 27, 2026

Title

The Compound Microscope

Objective

Find the optical and mechanical parts of the compound microscope, while also becoming familiar with the proper use and care of the microscope. As well as apply these optical techniques to

Introduction

The compound light microscope is an important tool in cellular biology because it allows observation of microscopic specimens beyond the human eye. Using a dual-lens system, the compound microscope provides a wide range of magnifications. Proper microscopy technique requires a clear understanding of its optical and mechanical components, including coarse and fine adjustments, the stage, and the iris diaphragm. Microscopy is critical for evaluating fundamental differences in cell structure across domains of life. Cells are categorized into two main structural types: prokaryotes and eukaryotes.

Prokaryotic organisms, like bacteria, are the simplest life forms structurally; they lack nuclei and membrane-bound internal organelles. Eukaryotic cells, however, are structurally more complex; they are defined by a membrane-bound nucleus as well as specialized membrane-bound organelles. With eukaryotes, different structural adaptations further separates animal and plant cells. Animal cells have an outer plasma membrane, granular cytoplasm, and a prominent nucleus. Plant cells, however, have a rigid cellulose cell wall, large fluid-filled central vacuoles, and chloroplasts capable of photosynthesis. Staining techniques with reagents like methylene blue and iodine selectively enhance contrast, making cellular boundaries and nuclei more visible under illumination.

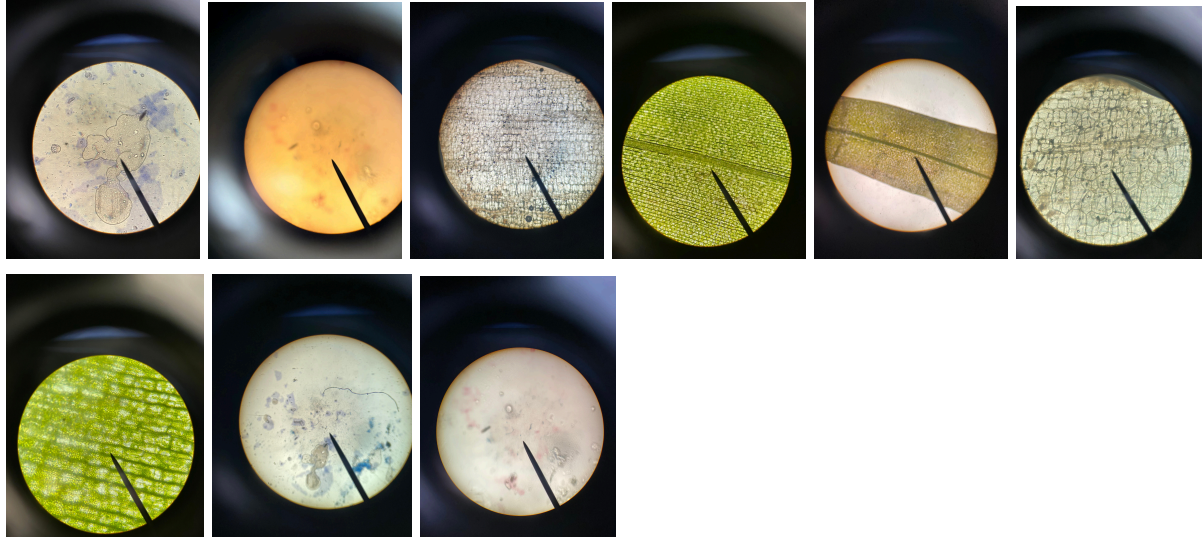
Materials

- ★ Compound Microscope
- ★ *Rhodospirillum rubrum* slides
- ★ *Anabaena* or *Nostoc* slides
- ★ Toothpicks/razor blades
- ★ Methylene blue dye
- ★ Water
- ★ Onion
- ★ Beaker of disinfectant

Results

In the prokaryotic specimens, we saw no membrane-bound internal structures. *Rhodospirillum rubrum* appeared as spiral-shaped, snake-like chains; *Nostoc*/*Anabaena* formed chains of larger cells, showing granular cytoplasm without a nucleus. However, eukaryote specimens had clear

intracellular compartmentalization. The cells swabbed from the cheek show a visible plasma membrane, granular cytoplasm, and a distinct central nucleus. Plant specimens had distinct rigid boundaries; the onion stained with iodine showed defined, rectangular cells with thick cell walls, granular cytoplasm, a distinct central vacuole space, and a nucleolus. The Elodea leaf showed green, spherical chloroplasts distributed along the cell boundaries around the vacuole, with cyclosis moving the chloroplasts along the cell boundaries.



Discussion

The observations shown above demonstrate the fundamental distinctions between prokaryotic and eukaryotic cells, and further show the adaptations that separate animal and plant cells. The lack of membrane-bound nuclei and organelles in *Rhodospirillum rubrum* and *Anabaena/Nostoc* follows the defined structure of prokaryotes. The cheek cells, onion cells, and Elodea leaf cells showed clear compartmentalization, along with distinct membrane-bound nuclei. Staining with methylene blue and iodine enhanced the contrast of nucleic acids and cell membranes. The presence of rigid cell walls in both onion and Elodea cells also highlights plant-specific structural adaptations that animal cells lack.