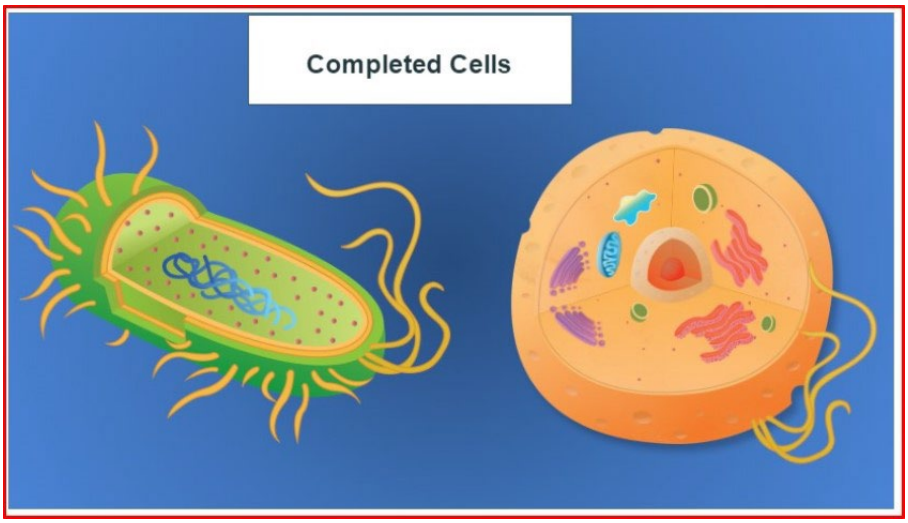
Exercise 1: Modeling Prokaryotic and Eukaryotic Cells

Data Table 1: Prokaryotic and Eukaryotic Features

Structure	Function
Nucleus	Contains the genetic material of the cell.
Golgi Apparatus	Secretion of cell products into and outside of the cell.
Rough Endoplasmic Reticulum	Protein synthesis and transport within the cell.
Mitochondrion	Metabolize glucose to produce ATP, and energy form used by the cell during respiration.
Nucleoid	Provides the genetic code for the organism.
Ribosome	The site of protein biosynthesis.
Lysosome	Contains digestive enzymes used from breaking down damaged or foreign materials within the cell.
Pilli	Adherence or to transfer genetic material.
Smooth Endoplasmic Reticulum	Lipid synthesis and transport within the cell.
Flagellum	Cellular movement.
Vacuole	Storage of nutrients, water, and wastes in the cell.

Photo 1: Prokaryotic and Eukaryotic Cell Models



Question 1

What are the four common structures of all living cells? How did these structures differ between prokaryotic and eukaryotic cell models in Photo 1?

All living cells contain cytoplasm, a cell membrane, ribosomes, and genetic material. In prokaryotes, the genetic material is found on a circular chromosome in the nucleoid region of the cell. In eukaryotes, the genetic material is contained within the nucleus, a double-membrane bound organelle. The models were similar in the other three characteristics, with each having a cell membrane, cytoplasm, and ribosomes.

Question 2

List the structures from Data Table 1 that are membrane bound organelles. Are these structures found in both types of modeled cells? Explain your answer by applying the definitions for eukaryotic and prokaryotic cells.

The following structures in Data Table 1 are membrane bound organelles:

1. Nucleus

2. Golgi apparatus

3. Rough endoplasmic reticulum

4. Mitochondrion

5. Lysosome

6. Smooth endoplasmic reticulum

7. Vacuole

These structures are unique to eukaryotic cells. By definition, prokaryotic cells lack a nucleus and other membrane-bound structures within the cytoplasm.

Exercise 2: Modeling Prokaryotic and Eukaryotic Cells

Data Table 2: Examination of Prokaryotes and Eukaryotes

Slide	Prokaryote or Eukaryote	Magnification	Comments
Spirogyra	Eukaryote	600x	Students will complete if unable to identify one or more structures.
Human Epithelial Cells	*Eukaryote*	*600 x*	Students will complete if unable to identify one or more structures.
Amoeba	Eukaryote	150x	Students will complete if unable to identify one or more structures.
Onion Root Tip	Eukaryote	600x	Students will complete if unable to identify one or more structures.
Bacteria Smear	Prokaryote	600x	Students will complete if unable to identify one or more structures.
Mixed Prokaryote and Eukaryote		600x	Students will complete if unable to identify one or more structures.

Photo 2: *Spirogyra*

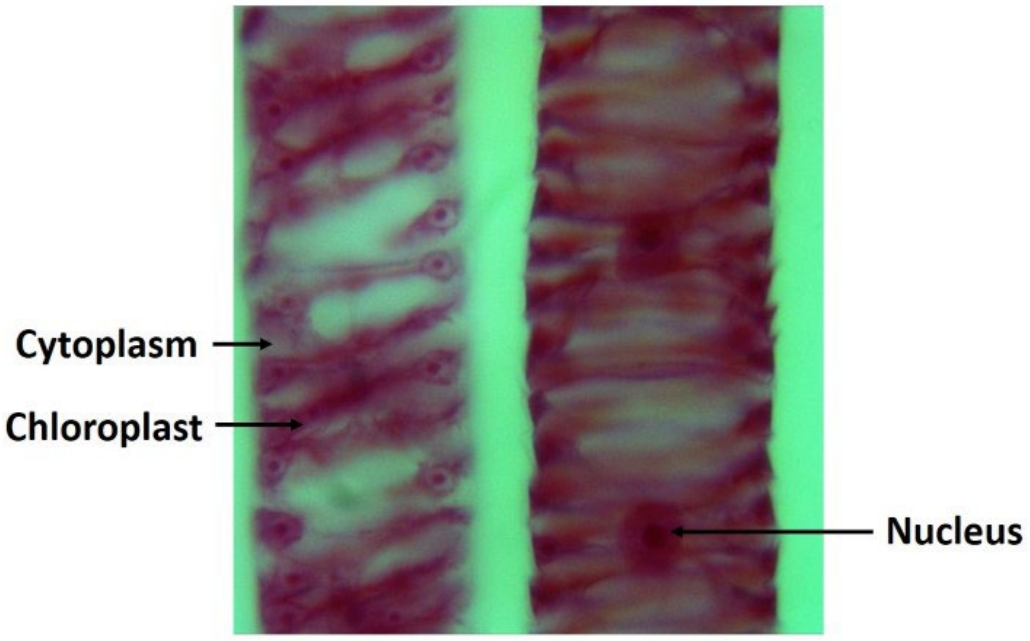


Photo 3: Human Epithelial Cells

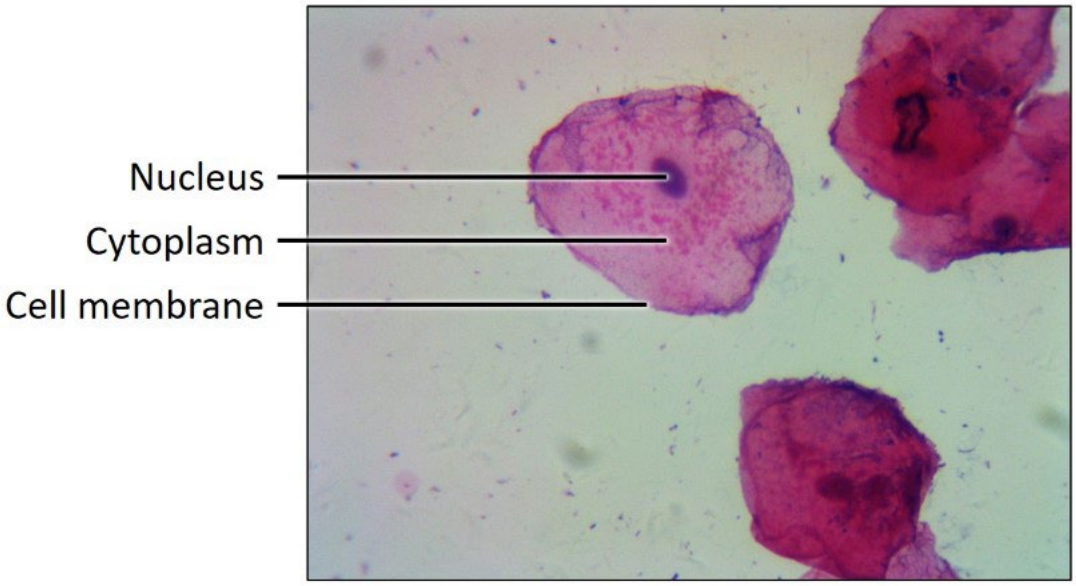


Photo 4: *Amoeba*

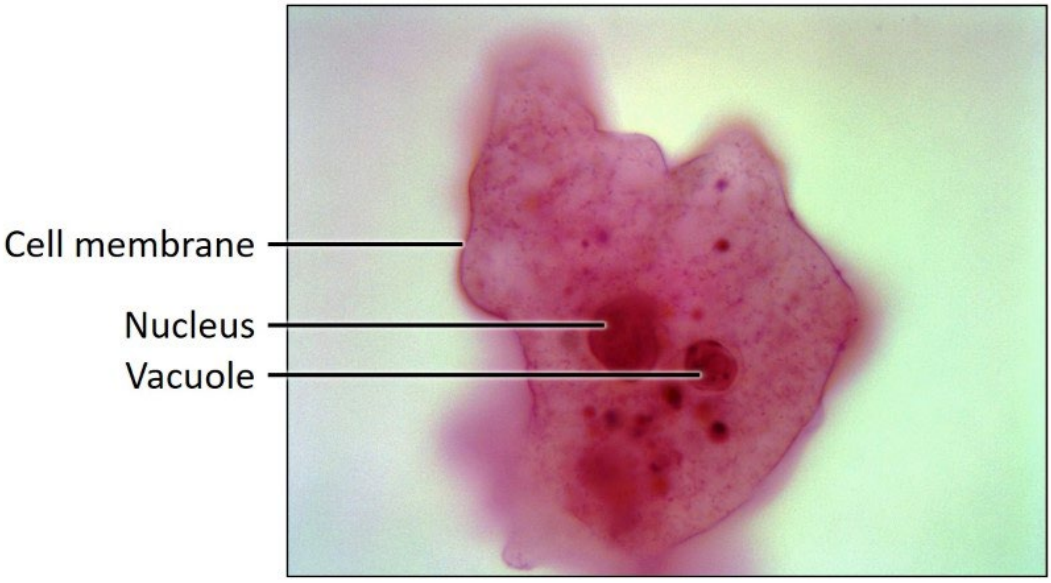


Photo 5: Onion Root Tip

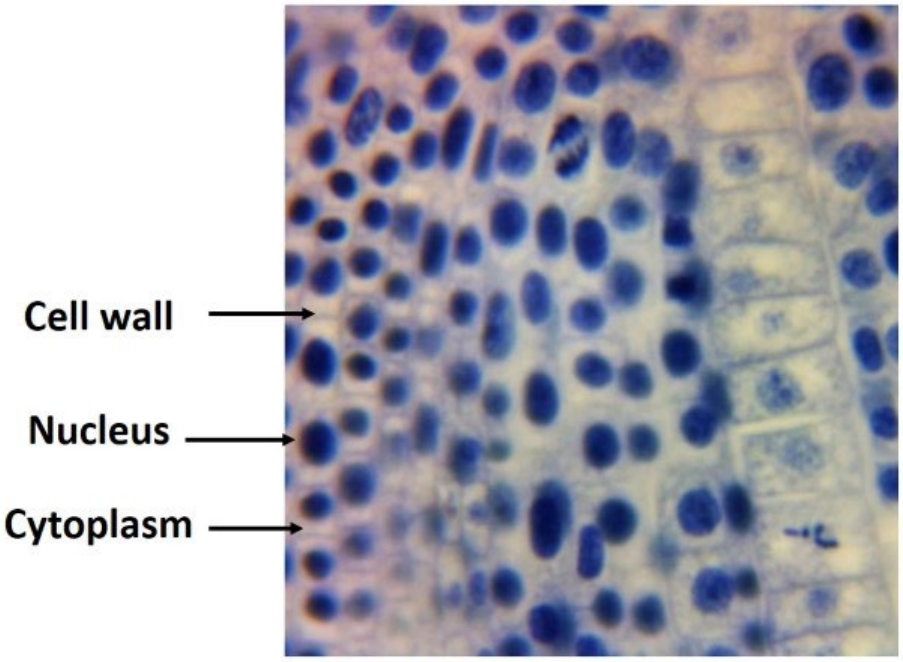


Photo 6: Bacteria Smear

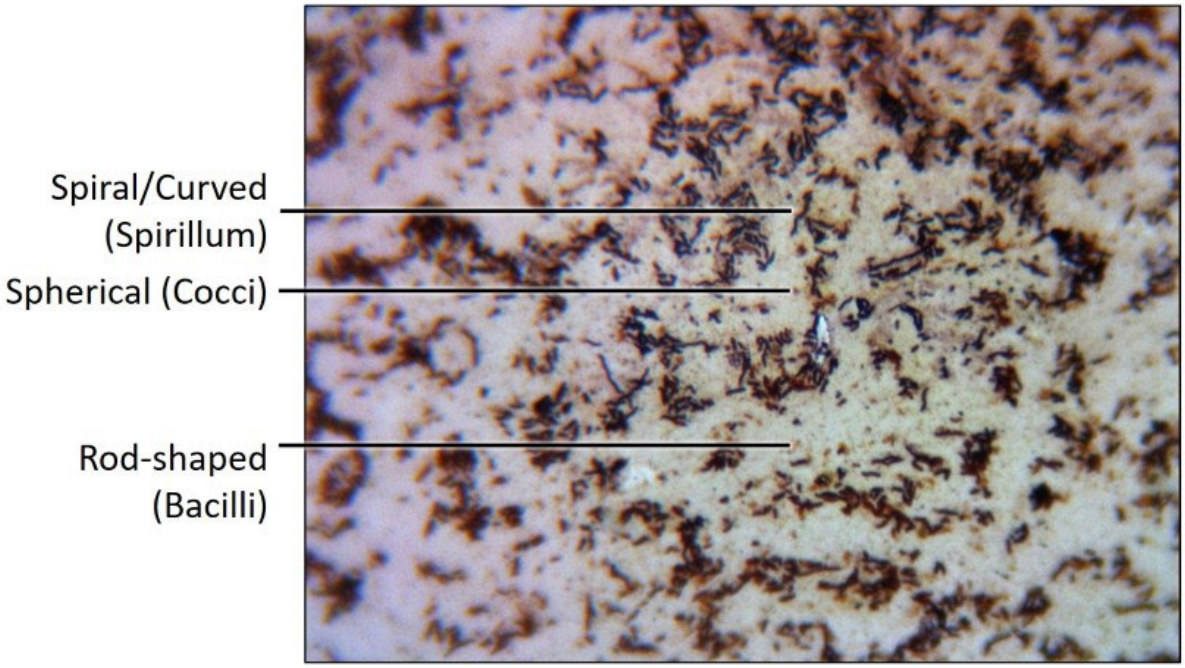
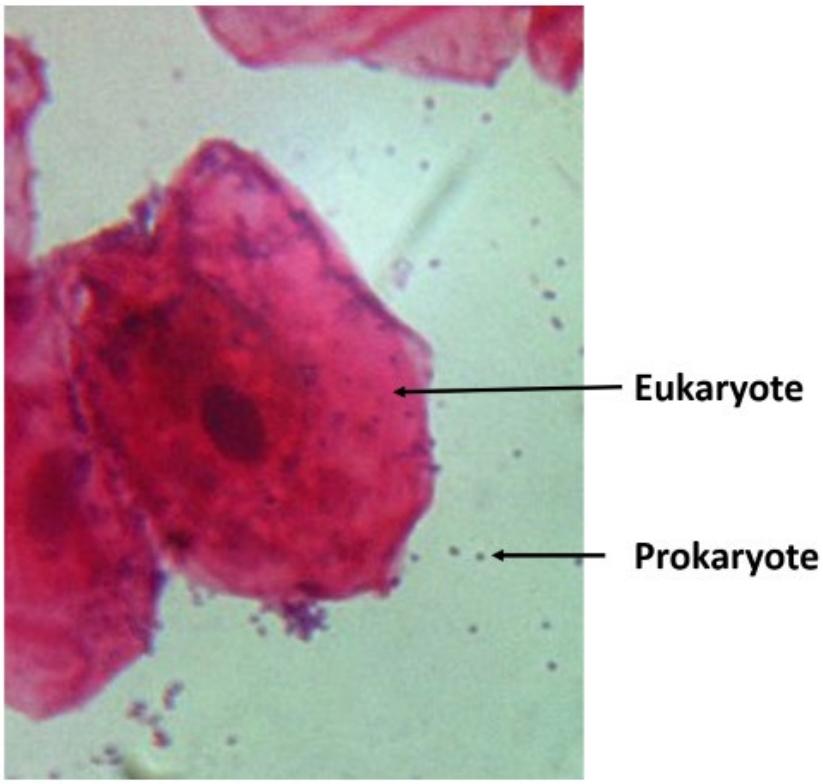


Photo 7: Mixed Prokaryote and Eukaryote



Question 1

Describe the characteristics of the Mixed Prokaryote and Eukaryote slide that allowed you to identify the prokaryotes and the eukaryotes. Reference Photo 7 in your answer.

The eukaryotes stood out as they clearly contained a nucleus, which appeared as a dark oval structure in the center of the red stained cells in Photo 7 . The prokaryotes were much smaller and could only be identified by the spherical shapes of the purple stained cells. These cells appeared to be surrounding the eukaryotic cells.

Question 2

How many cellular structures did you observe when viewing the Bacteria Smear slide? Explain how the size of the bacteria affects the ability to view specific structures.

The only distinguishable feature of the Bacteria Smear slide was the identification of the bacteria shape. A bacterium is the smallest cell type of those viewed with a size of approximately 1 μm. In contrast, the eukaryotic cells of Spirogyra, Amoeba, onion root tip, and human epithelium were approximately 10-100 times larger than the bacteria. The small size makes it too difficult to see the individual features of the bacteria.

Question 3

Chloroplasts were only examined and labeled in the Spirogyra slide. Relate the function of these organelles to explain why they were not present in the onion root tip slide.

Chloroplasts are double-membrane organelles that capture the energy from sunlight and produce glucose via photosynthesis. The onion root tip cells lacked these organelles because they occur underground where sunlight is absent.

Extension Question

Anthropogenic biomes and ecosystems result from human settlements, agriculture, and animal husbandry practices. One example is cropland ecosystems consisting of hundreds of acres of a single plant species. Apply your knowledge of natural biomes and ecosystem sampling to predict how habitat diversity and biotic interactions in a cropland ecosystem would compare to a natural ecosystem in a nearby area.

The cropland ecosystem should have lower habitat diversity than a natural ecosystem since all the plants are the same species. This would result in the same food and shelter resources being available to all organisms in the ecosystem. Because the resources are identical within the ecosystem, the numbers of biotic interactions in the area would also be reduced. The entire system would become a uniform habitat compared to natural ecosystems that consist of many habitats and biotic interactions between species.