



# OVERVIEW OF THE PREMIUM PACKAGE WITH LEARNING GOALS

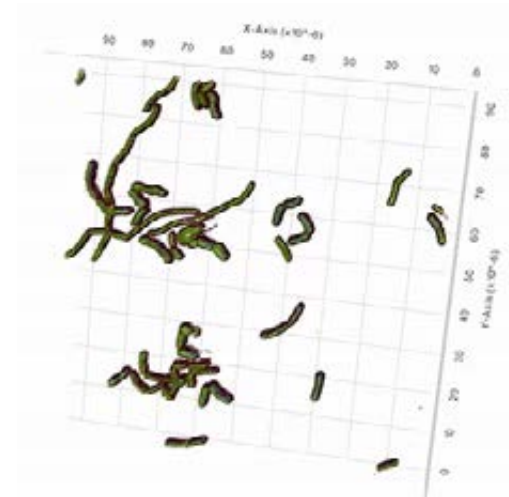
## DISCOVER BACTERIA

Students will observe one of the largest bacteria in the world, the common soil bacterium *Bacillus megaterium*.

Students will observe *E. coli* bacterial growth in an alginate bead.

### LEARNING GOALS

- Investigate prokaryotic cells.
- Analyze 4D datasets and provide conclusive descriptions of the process.
- Draw a graph of growth rate based on data from bacteria colonies at different time points.
- Collect evidence for the cell theory: All living organisms are composed of cells.

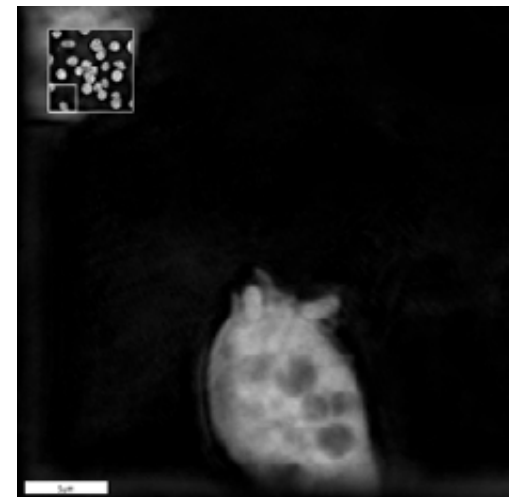


## DISCOVER AMOEBAE

Students will observe *Dictyostelium* moving and hunting for *E. coli* bacteria.

### LEARNING GOALS

- Describe the form and structure of amoebae.
- Distinguish protists from other eukaryotic cells (plants, animals, and fungus).
- Describe how amoebae move and hunt for food.
- Describe the role of amoebae in the environment.
- Analyze 4D datasets and provide conclusive descriptions of the process.
- Collect evidence for the cell theory: All living organisms are composed of cells.

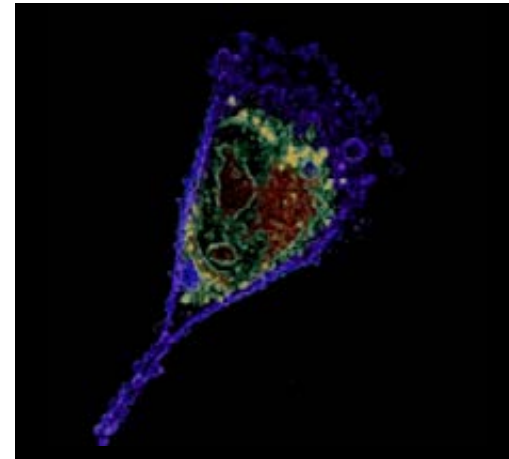


## DISCOVER CELL DEATH

Students will observe melanoma cells undergoing two forms of cell death.

### LEARNING GOALS

- Identify different structures in a eukaryotic (animal) cell: cell membrane, cytoplasm, vesicles, nucleus, nuclear membrane, nucleoli.
- Observe and describe different stages in necrosis.
- Observe and describe different stages in apoptosis.
- Compare and contrast the two different forms of cell death (necrosis and apoptosis).

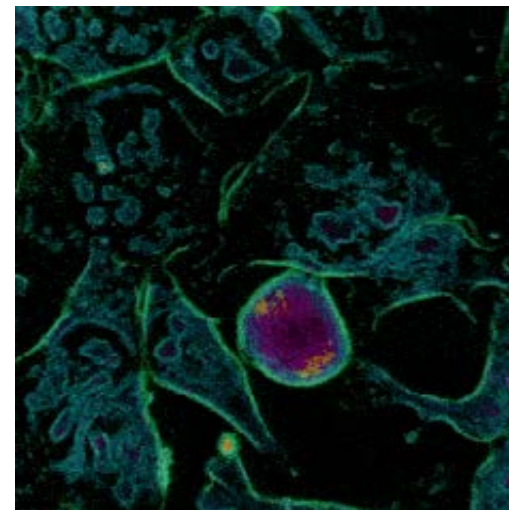


## DISCOVER MITOSIS (MESC)

Students will observe mitosis of mouse embryonic stem cells.

### LEARNING GOALS

- Distinguish different stages of mitosis in onion root cells.
- Analyze 4D datasets and provide conclusive descriptions of the process.
- Determine the duration of each stage of mitosis.
- Understand the capability that stem cells have to self-renew through mitotic division.
- Extrapolate through calculations how long it would take for different animals to form from one initial cell.
- Collect evidence for the cell theory: All living organisms are composed of cells.

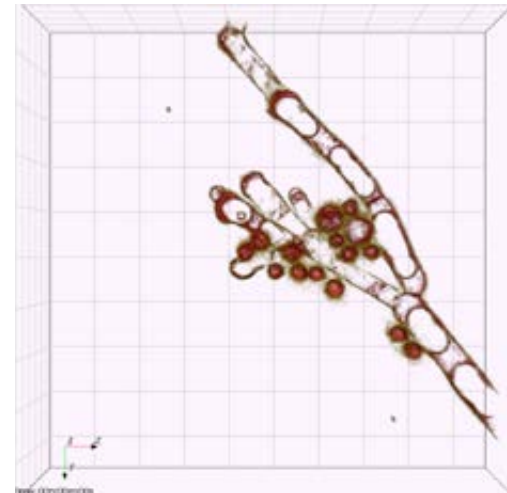


## DISCOVER MOLD

Students will observe different forms of mold.

### LEARNING GOALS

- Describe the form and function of fungi.
- Distinguish different molds from 3D data.
- Describe usages and risks from molds and determine key steps in food safety.
- Describe the use of fungi in food production.
- Collect evidence for the cell theory: All living organisms are composed of cells.

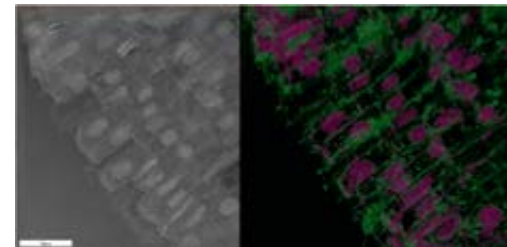


## DISCOVER PLANT CELLS

Students will explore the shape, structure, and function of plant cells (elodea).  
Students will explore protoplasts to understand the function of the cell wall.  
Students will observe stomata imprints from different plant types.

### LEARNING GOALS

- Identify nuclei, chloroplasts, cell membranes, and cell walls.
- Investigate that eukaryotes have a compartmentalized cell structure.
- Describe the form and function of the cell wall of plants.
- Collect evidence for the cell theory: All living organisms are composed of cells.
- Work with unit conversions to understand the size of cells.

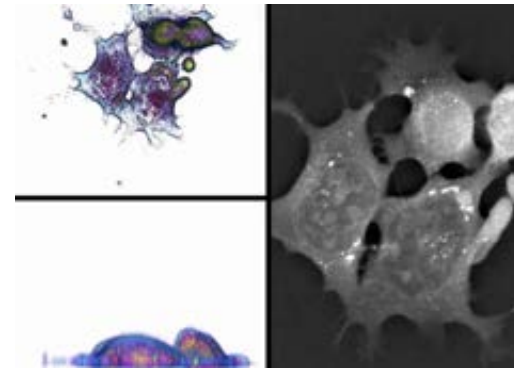


# DISCOVER STEM CELLS

Students observe stem cells and their division.

## LEARNING GOALS

- Understand the capability that stem cells have to self-renew through mitotic division.
- Collect evidence for the cell theory: All living organisms are composed of cells.



Video from data available here:  
<https://vimeo.com/263171441>