

Science on a Sphere: Attack of the Giant Cell

LESSON #: 6

TITLE: Gel Cells: Modeling the Difference between Plant & Animal Cells

OVERVIEW: Students make 3-D models of typical plant and animal cells.

KEY CONCEPTS: Plant and animals cells contain many of the same organelles and have similar structures, with some key differences (rigid cell wall, chloroplasts, etc). These differences are very important for the lifestyles of plants and animals.

GRADE LEVEL: 7

BENCHMARK(S):

SC 7.4.2 Describe the basic structure & function of various types of cells.

TEACHER BACKGROUND:

The **cell** is the structural and functional unit of all living organisms, and is sometimes called the “building block of life.” Some organisms, such as bacteria, are unicellular (consist of a single cell). Other organisms, such as humans, are multicellular. (Humans have an estimated 100 trillion or 10^{14} cells; a typical cell size is 10 μm ; a typical cell mass is 1 nanogram.) The largest known cell is an ostrich egg. For comparison, 10 μm , (ten micrometers also called “microns”) is equal to 1/100 millimeters. So, if you stacked up 100 typical cells it would only be one milometer! Check that out on you ruler. And it would take one million of these typical cells to equal one gram; one gram is about what a thumbtack weighs.

The cell theory, first developed in 1839 by Matthias Jakob Schleiden and Theodor Schwann, states that all organisms are composed of one or more cells. All cells come from preexisting cells. Vital functions of an organism occur within cells, and all cells contain the hereditary information necessary for regulating cell functions and for transmitting information to the next generation of cells.

The word *cell* comes from the Latin *cellula*, a small room. The name was chosen by Robert Hooke when he compared the cork cells he saw to the small rooms monks lived in.

Each cell is at least somewhat self-contained and self-maintaining: it can take in nutrients, convert these nutrients into energy, carry out specialized functions, and reproduce as necessary. Each cell stores its own set of instructions for carrying out each of these activities.

Plants and animals cells share many characteristics, but there are a few very important differences. These differences are reflected in the very different lifestyles of these two

types of organisms. Remember the food web; plants are primary producers and animals are consumers. Plants have chloroplasts that allow them to make food from sunlight and air. Animals do not have chloroplasts; therefore, they must eat plants and other animals to survive.

Another obvious difference is that most animals can move about while plants are normally sessile; that is, they are fixed to the ground by their roots. That is because plants have rigid cell walls. It helps them stand up and have structure, but it keeps them from moving. Animals don't have these, instead they have a skeleton of many bones connected by movable muscles and ligaments.

The students' exercises will cover many of the basic organelles, but there are others too.

DURATION: 45 minutes

VOCABULARY: (see attached worksheet)

cell

organelle

plasma membrane

vacuole

chloroplast

nucleus

smooth endoplasmic reticulum & rough endoplasmic reticulum

mitochondrion (pl: mitochondria)

Golgi complex

plasmodesma

cytosol

MATERIALS NEEDED:

For "gel cells" make enough so each student can make a plant & an animal cell.

Common objects to make into plant and animal cells. For example:

Rigid cell wall= small plastic, see-through box (try Daiei. Longs)

Plasma membrane = small plastic zipper bag, for plants it can be cut to fit rigid cell wall box

Vacuole= small water balloon

Chloroplast=flat, green marbles (see Ben Franklin; FloraDec)

Nucleus= large marble or small rubber ball (see squishy ones at Price Busters sometimes)

Smooth endoplasmic reticulum (ER) = smooth stain ribbon

Ribosomes & rough endoplasmic reticulum (ER) = ribbon with side loops

Mitochondrion = small plastic beads

Golgi complex = spongy hair rollers cut into discs (longs)

Plasmodesma = small wooden spools (craft store)

Lysosomes = small marbles or large beads

Cytosol = clear hair gel or green for plants yellow for animals (about 3–4 oz for each cell)

GLUE necessary to attach plasmodesma (spool)

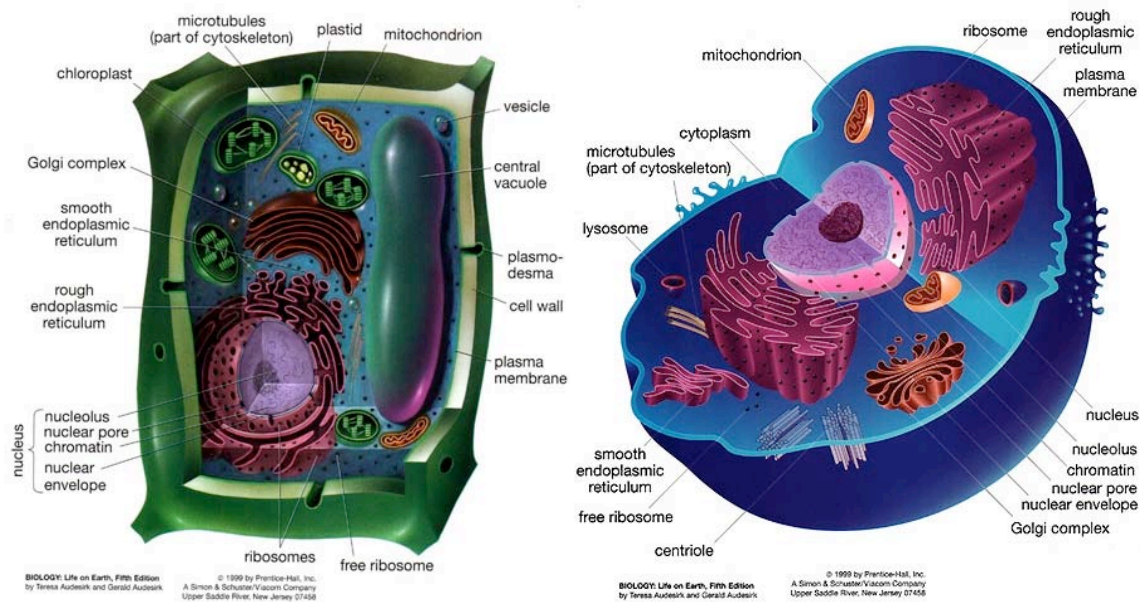
PROCEDURE:

Gel Cells:

Prepare or have students bring in materials to make plant & animal cells. See attached sheet that lists the most important organelles found in the average cell.

Explain cells and their contents (organelles, like our bodies have organs). They are building blocks of animals & plants. Where did word cell come from (looked like monk's cells), discovered as microscopes were invented & improved in the 1800's.

Point out some of the major differences, such as the fact that plants have **RIGID CELL WALLS**, **CHLOROPLASTS**, and **PLASMODESMA**. These organelle help plants stand up (they don't have bones), make food



(they can photosynthesize, or make food from sun & air, unlike animals), and the plasmodesma helps the cells exchange things through the rigid cell walls. Show pictures of animal & plant cells included on the CD.

Have materials laid out in containers or bags with labels, give student the sheet of cell features and have them make one plant & one animal cell, make sure they circle each organelle as they add it. Have some glue on hand so they can glue the plasmodesma onto the outside of their plant cell.

When they are done have them line up & have an adult squeeze in the gel (cytosol). As they come up check the contents of their cell to make sure they have the right stuff. Ask each student about one of the organelles. What is it and what does it do? If they don't know, send them back to find out before giving them the gel.

When they are all finished, go over the organelles, and reasons that there are differences between plant & animals.

RESOURCES:

Web:

<http://sun.menloschool.org/~cweaver/cells/>

http://www.cellsalive.com/cells/cell_model.htm

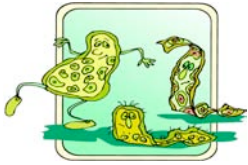
<http://www.sciencenetlinks.com/lessons.cfm?BenchmarkID=11&DocID=101>

<http://www.enchantedlearning.com/subjects/animals/cell/jello/index.shtml>

<http://www.enchantedlearning.com/subjects/biology/cells/plantanimalcellvenn.shtml>

Print:

Keller, Rebecca (2005) *Real Science—4—kids, Biology Level 1*. Gravitas Publications, Albuquerque.



The Major Features of **Plant** and **Animal** Cells: **CIRCLE** each as you add it to your **Cell**

Plant		Job	Animal	
Rigid cell wall	1	Give the plant structure and protects the cell both physically & chemically.		
Plasma membrane	1	Keep cell contents “together” Act as “ gatekeeper ” to allow (or not allow) things into & out of the cell (air, water, nutrients)	Plasma membrane	1
Vacuole	1	Storage space , often filled with water . Sometimes larger in plants, smaller in animals	Vacuole	1
Chloroplast	5	Takes in sunlight and manufacture food ; contain the green chlorophyll		
Nucleus	1	“ Brains ” of the cell. Stores genetic information (DNA); “tells” the cell when to divide	Nucleus	1
Smooth endoplasmic reticulum (E.R.)	1	Transfers materials within the cell & between cells (smooth E.R. has NO ribosomes)	Smooth endoplasmic reticulum (E.R.)	1
Ribosomes & rough endoplasmic reticulum (E.R.)	1	Ribosomes make proteins . The rough E.R. transfers materials within the cell & between cells	Ribosomes & rough endoplasmic reticulum (E.R.)	1
Mitochondrion	1	Powerhouse of the cell; Transform sugars into energy for the cell to use	Mitochondrion	1
Golgi complex	1	Stores , “ packages ” and distributes proteins and lipids	Golgi complex	1
Plasmodesma	1	Tube-like structure linking one cell wall to another in plants		
		The wrecking crew of a cell ; they break down or digest old organelles, etc.	Lysosome	1
Cytosol	fill	The “ soup ” that all the other organelles float in	Cytosol	fill