

# Bay Area Scientists in Schools Presentation Plan

**Lesson Name** Cells and Microscopes!

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**Grade Level** 4 & 5 **Standards Connection(s)** Students know many multicellular organisms have specialized structures to support the transport of materials

**California Science Standards:** Students know many multicellular organisms have specialized structures to support the transport of materials

## Next Generation Science Standards:

4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, and behavior.

<b>Science and Engineering Practices</b>	<b>Disciplinary Core Ideas</b>	<b>Cross-Cutting Concepts</b>
<u>Engaging in an Argument from Evidence</u> -Construct an argument with evidence, data, and/or a model. (4-LS1-1)	<u>LS1.A: Structure and Function</u> Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)	<u>Systems and System Models</u> A system can be described in terms of its components and their interactions. (4-LS1-1)

## Common Core Standards Connections:

ELA/Literacy –

W.4.1: Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)

Mathematics-

4.G.A.3: Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

FOSS Connection: 4<sup>th</sup> Grade Structures of Life; Environments; Living Systems

## Teaser:

Have you ever looked at small things in a microscope or wondered how plants, microbes, and small animals are connected? Get ready to dive into the world of cells and how we can see them! You will look through a microscope at plants and animals and discover all the different shapes, sizes, and colors that cells have. We will teach you how to prepare your own slides, have you draw what you see, and take pictures of some of the slides so you can see them projected and far larger than life.

**Objective:**

Students will be introduced to the idea that all living things have a conserved structure when viewed at a small scale, and they will explore the different shapes, sizes, and colors of cells. Students will learn what a microscope is used for as well as how to use a simple microscope to look at small objects. They will also learn how scientists use microscopes to do research and about the organisms that microscopes allow us to see. At the end of the lesson students should understand that organisms and living systems are made up of cells, and that microscopes allow us to observe the world at a much smaller scale.

**Vocabulary/Definitions:**

- Cell: The smallest unit in all living things
- Microscope: A scientific tool used to look at things very close up
- Multicellular: A living thing that is made up of many cells
- Single-celled: A living thing that is made up of only one cell
- Organism: A living thing (i.e. plant, animal, fungi, bacteria, etc.)
- Tissue: A collection of the same type of cell

**Materials:**

*What will you bring with you?*

- Projector
- Paper microscopes
- pre-made slides
- Materials for making slides: slide components + samples
- Pictures made with other microscopes
- Science Worksheet
- Magnified microscope for MYO Slide Station

*What should students have ready (pencils, paper, scissors)?*

- Regular pencils, coloring pencils

**Classroom Set-up:**

*Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed*

- The classroom will be divided into 6 stations with 4-6 students at each station (usually classrooms already have several clusters or pods of desks and these will serve as our stations). At the start of the lesson, presenters will give an overview at the front of the classroom which will involve writing and defining several terms on a whiteboard or chalkboard. After the introduction, each of the 6 presenters will be in charge of their own station, 2 stations will look at animal cells, 2 stations will look at plant cells, and 2 stations will help students make their own slides to look at. The students will stay seated at their station and presenters will rotate around stations with the different slides and samples. After

every group has completed a station, presenters will give a conclusion at the front of the class and pictures of some of the samples can be projected onto a screen with a projector in the darkened classroom.

## Classroom Visit

### **1. Personal Introduction:**

**\_4\_ Minutes**

Everyone introduces themselves: name, grade (18th?), and what topic they work on. Also say something random or fun like your favorite movie or ice cream flavor. Maybe mention why you like science and are interested in it.

### **Topic Introduction:**

**\_15\_ Minutes**

First, we will introduce kids to the concept of microscopes.

Ask them if they know what we use microscopes for and if they have ever looked through a microscope.

*Define microscope on the board.*

Say that some microscopes have lenses that bend light, and with the right lenses, we can bend light so that little things look bigger. *Use a magnifying glass to show this concept.*

People have been making microscopes and using them to look at small things for a very long time. What they saw was that you could find tiny little living things where before you couldn't see anything, but when they looked at larger things like a plant, they could see that these larger organisms were made up of many smaller pieces. Robert Hooke was a scientist from England who wrote and illustrated a book called *Micrographia* 350 years ago in which he used the word 'cell' to describe these small pieces. *Have a picture with Hooke's original illustration?* Ask students if they know what a cell (perhaps hold up a cell phone?) is, and write a definition on the board.

Next, students will be introduced to the concept of cells, how there are many different types, and how they make up our bodies. This can be done by a second presenter.

Cells make up all organisms which are living things: animals, plants, trees, germs, and us. *Write definition of organism on board.* In our bodies there are usually around 37 trillion cells. One trillion is a number that is 1 followed by twelve zeros but let's give a real example:

*If we laid \$100 bills on a football field so that we completely covered it, and kept doing it until we had one trillion dollars on the field, the entire field would be covered in money to the height of 7 feet. To get 37 trillion dollars on the field, it would be twice as tall as the school.*

With this many cells in your body you can get a sense of how small they really are. However, not all cells do the same thing. *Ask if anyone had been sick recently, had their hair cut, or learned something new in school last week (I hope everyone is*

*raising their hand at that last one!*). Different types of cells in our bodies help us do different things. Cells that help heal wounds and fight off germs are different than ones that grow our hair, and these are again different from ones that help us learn. One single cell can't do any of these things alone and needs to work together with many other cells. A group of cells working together to do something is called a tissue. *Define tissue on the board.* Tissues make up organs like your heart and liver.

Now that you know how small cells are, you know how cool it is that we can see them through microscopes. Today you will be looking through microscopes at different things to see what they look like. Maybe you will even be able to see cells. *Show them the paper microscope and give them an overview of how it works and how to see things in it.*

You will be going between stations looking at different types of cells and even choosing some things that you want to look at under a microscope. For each thing we want to give you a piece of paper so you can draw what you see, and we want you to try to guess what you are looking at.

## **2. Learning Experience(s):** **\_\_\_35\_\_\_ Minutes**

Students remain in groups as themed presenters rotate between 2 sets of 3 stations. Each station should be max 12 min. Presenters have macroscopic objects, images from other microscopes, prepared slides for foldscopes, and materials for making new slides. Each group will be able to use 3-4 foldscopes with the help of the presenter. Students should make observations on their worksheets, including drawing what they see with scales on a provided worksheet. Students will observe and hypothesize what they are observing in their foldscopes, and at the end of the station, presenters tell the students the answers of what they have been looking at. Students should predict features that may become visible during microscopy.

### **Themed Groups**

#### **-Plants**

Scientists will bring slides of different plants and plant parts. Students will use their foldscopes to examine and draw what they see. They can work in groups and discuss what type of plant or part they might be looking at.

#### **-Animals**

Scientists will bring slides of different animals and animal parts. Students will use their foldscopes to examine and draw what they see. They can work in groups and discuss what type of animal or part they might be looking at.

#### **-Make your own slides**

In this group, students will learn how to properly create a slide and will be able to use real microscopes to look at what they made.

-Things available for slides might include:

cloth, paper, fibers, salt or other crystals, leaves, flowers, fruit skins, pond water

### **3. Wrap-up: Sharing Experiences**

**\_5\_Minutes**

During the lesson, volunteers will use their phones to take photos of some of the magnified microscope slides. At the end of the lesson, volunteers will project these photos to the class and ask students to tell us what the pictures are.

They will also show example slides with greater magnification-ex onion; slides from the worksheets

Students talk together about differences and similarities between slides (ex what are differences between plant and animal slides?)

### **4. Connections & Close:**

**\_5\_Minutes**

What are living things made up of?

What is a microscope/how does it work?

What are some other things we could look at under the microscope?

**Total 60 Minutes**

## **Follow-up – After Presentation**

### **Literacy/Reading Connections:**

Have the students write a letter to the scientists explaining what they learned about cells and/or microscopes. Send letters to:

Community Resources for Science  
1611 San Pablo Ave Ste. 10B  
Berkeley, CA 94702

Video: The Wacky History of Cell Theory video on TED-Ed by Lauren Royal-Woods, Hal Lee, and Lisa Thomas

Scientific discovery isn't as simple as one good experiment. The weird and wonderful history of cell theory illuminates the twists and turns that came together to build the foundations of biology. <http://ed.ted.com/lessons/the-wacky-history-of-cell-theory>

**Cells Are Us**, by Fran, Dr. Balkwill, Mic Rolph – “This is a book about the various types of cells that make up the human body. By using lively and expressive language, and by portraying the different cells with colorful and imaginative drawings, the author and artist teach the reader how an individual person is created from just one cell.” <http://www.amazon.com/Cells-Are-Us-Frances-Balkwill/dp/0001963066>

**Science Concepts: Cells**, by Alvin and Virginia Silverstein and Laura Silverstein Nunn- “The book explains cell structure and function, cell division and reproduction, cell specialization, cloning, stem cell research, and cell fusion.”

<http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=13611>

**Cells**, by Discovery Channel Schools.

<http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=13000>

Volunteers will email the microscope pictures taken during class and their descriptions to the teacher.

**Here's what other people have done with foldscopes:**

<http://microcosmos.foldscope.com/>