NSTA WEB SEMINARS

LIVE INTERACTIVE LEARNING @ YOUR DESKTOP

NSDL/NSTA Web Seminar:

Small Creatures Under the Microscope: Part Two

—The Exploratorium

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Tuesday, March 11, 2008

6:30 p.m. to 8:00 p.m. Eastern time

Agenda:

1. Introductions
2. Tech-help info
3. Web Seminar tools
4. Presentation
5. Evaluation
6. Chat with the presenters

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Supporting the NSDL Presenting Team is…

For additional Tech-help call:

Elluminate Support,

1-866-388-8674 (Option 2)

Jeff Layman
Tech Support,
NSTA
jlayman@nsta.org
703-312-9384

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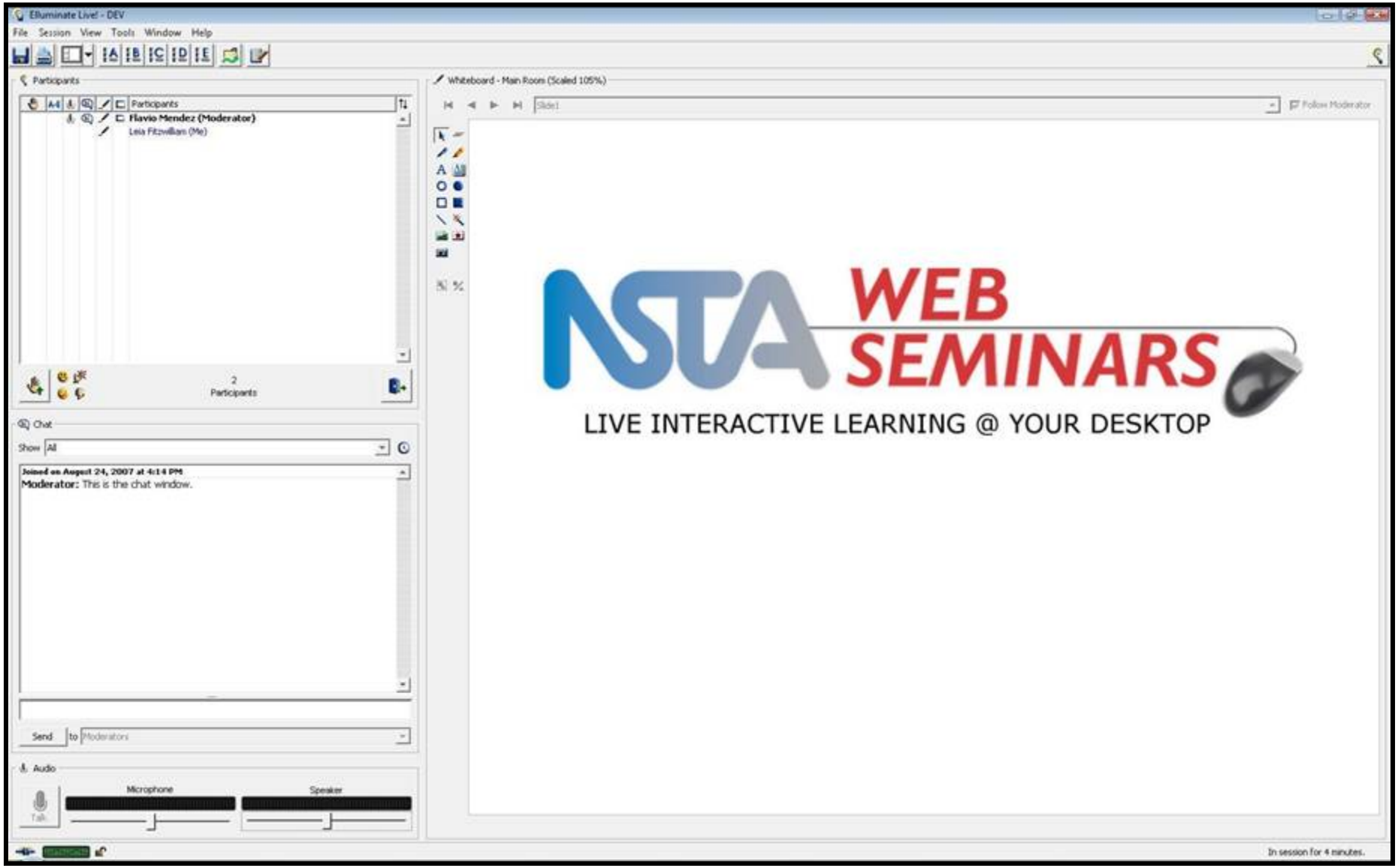
Screenshot


Elluminate Live! - DEV
File Session View Tools Window Help
Participants
Participants
Flavio Mendez (Moderator)
Leia Fitzwilliam (Me)
2
Participants
Chat
Show All
Joined on August 24, 2007 at 4:14 PM
Moderator: This is the chat window.
Send to Moderators
Audio
Microphone
Speaker
Talk
Whiteboard - Main Room (Scaled 105%)
Slide1
Follow Moderator
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In session for 4 minutes.

We would like to know more about you…

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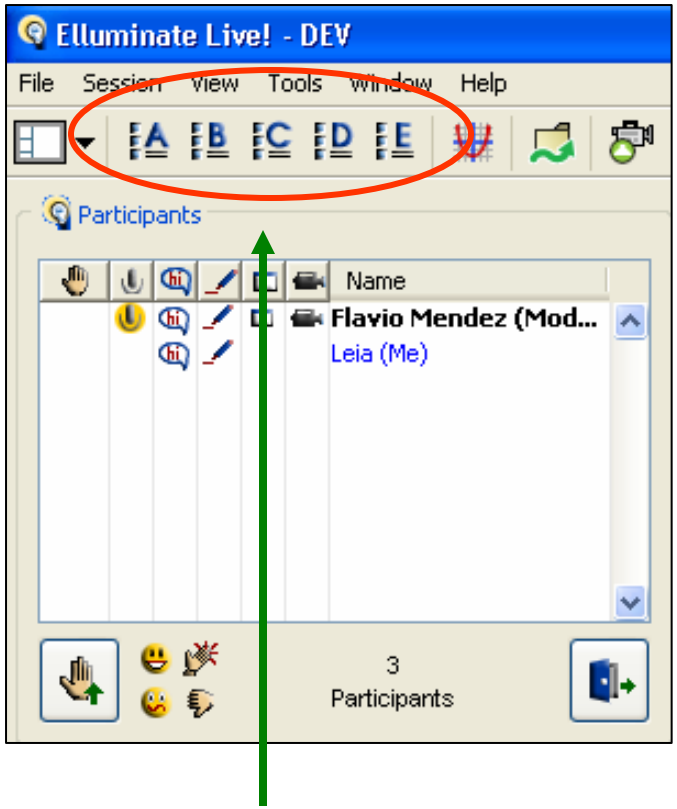
How many NSTA web seminars have you attended?



Use the letters A-E located at the top left of your actual screen to answer the poll

A. 1-3

B. 4-5

C. More than 5

D. More than 10

E. This is my first web seminar

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Where are you now?

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What grade level do you teach?

A. Elementary School, K-5.

B. Middle School, 6-8.

C. High School, 9-12.

D. I teach undergrad and/or grad students.

E. I am an Informal Educator.

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Today's NSDL Experts

Dr. Kristina Yu, Microscopist and Staff Scientist, Exploratorium

Dr. Karen Kalumuck, Biologist and Educator with the Exploratorium Teacher Institute

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Microscope Imaging Station at the Exploratorium

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The MIS Website - *a digital resource for microscopic images and classroom explorations*

1. Features of the MIS website:
   - an overview of contents & types of images
2. Classroom Explorations
   - an overview of the activities and features
3. Examples of Classroom Explorations
   - What's the Size of What You See?
   - Genetic Crosses

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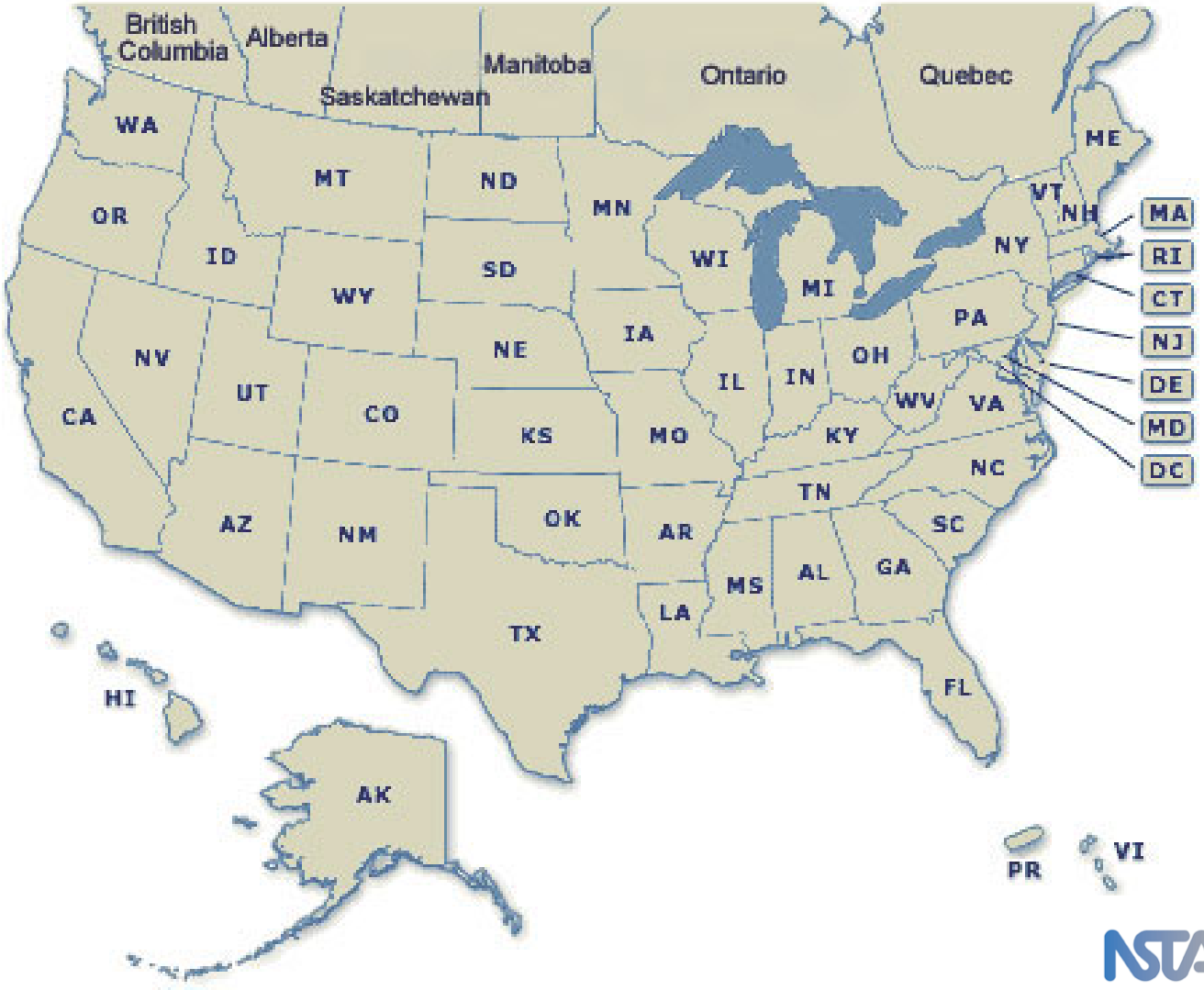
Where do you teach? Stamp your answer!



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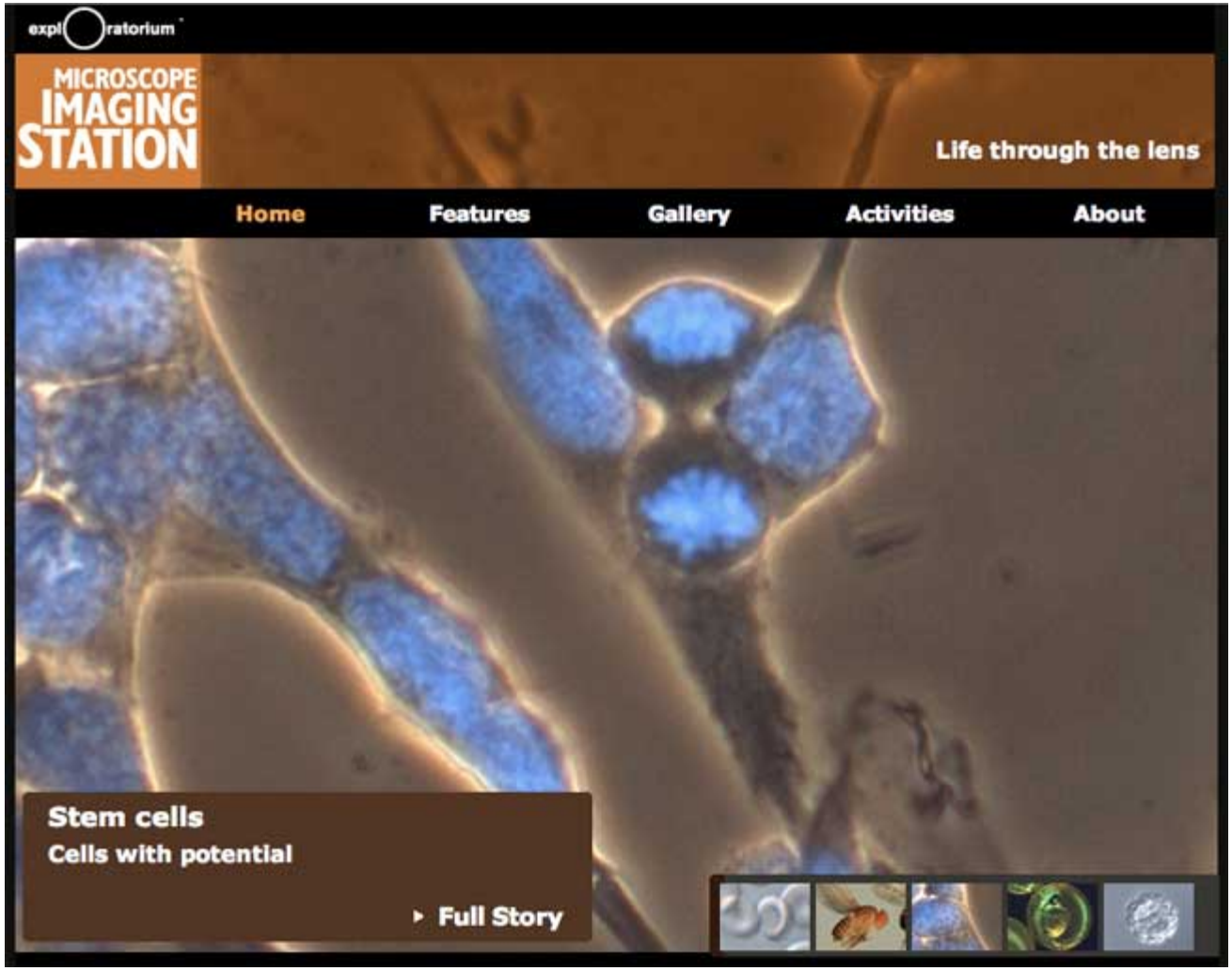
www.exploratorium.edu/imaging_station



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www.exploratorium.edu/imaging_station

Features: Articles about researchers & their work, multimedia related to the story

Gallery : A collection of still images and movies highlighting organisms and cells used in biomedical research.

Activities: Image-based classroom explorations developed and tested by the *Exploratorium Teacher Institute*.

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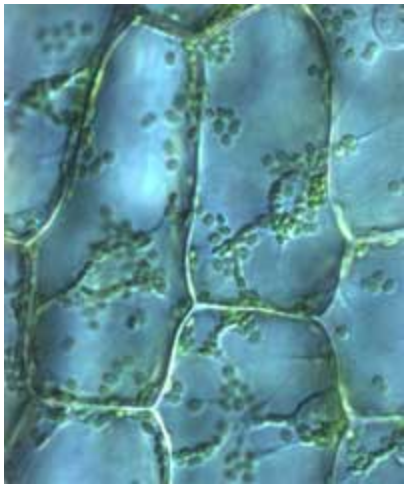

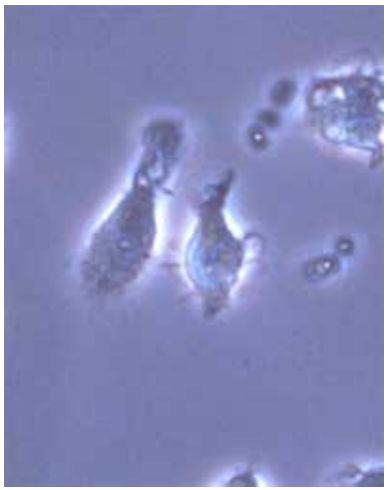
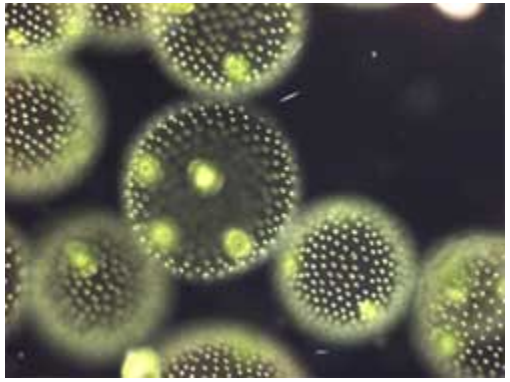

Images & movies available in the gallery

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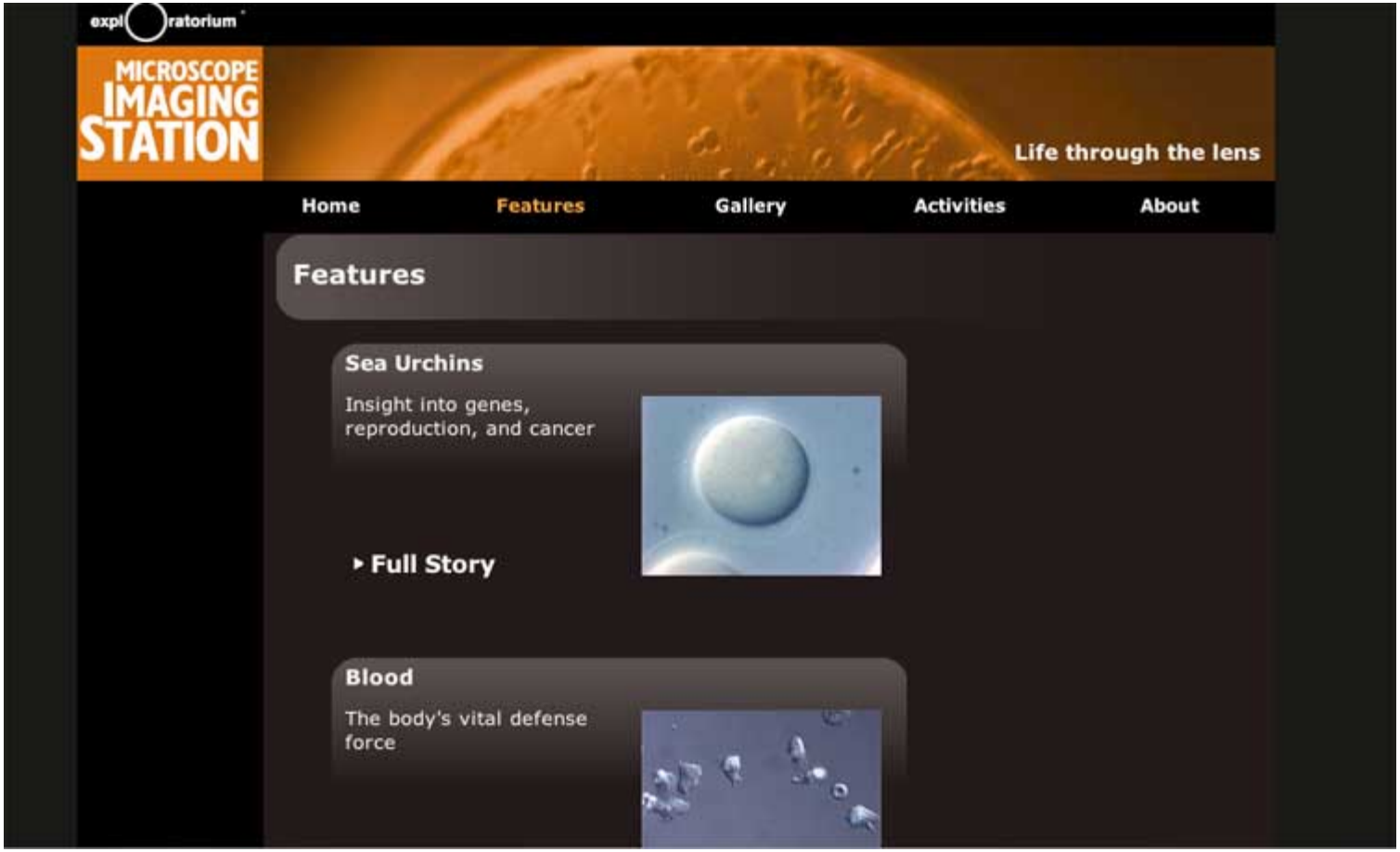
Let’s pause for questions from the audience….



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It’s Time to Play: Name That Model Organism!

1.
2.
3.

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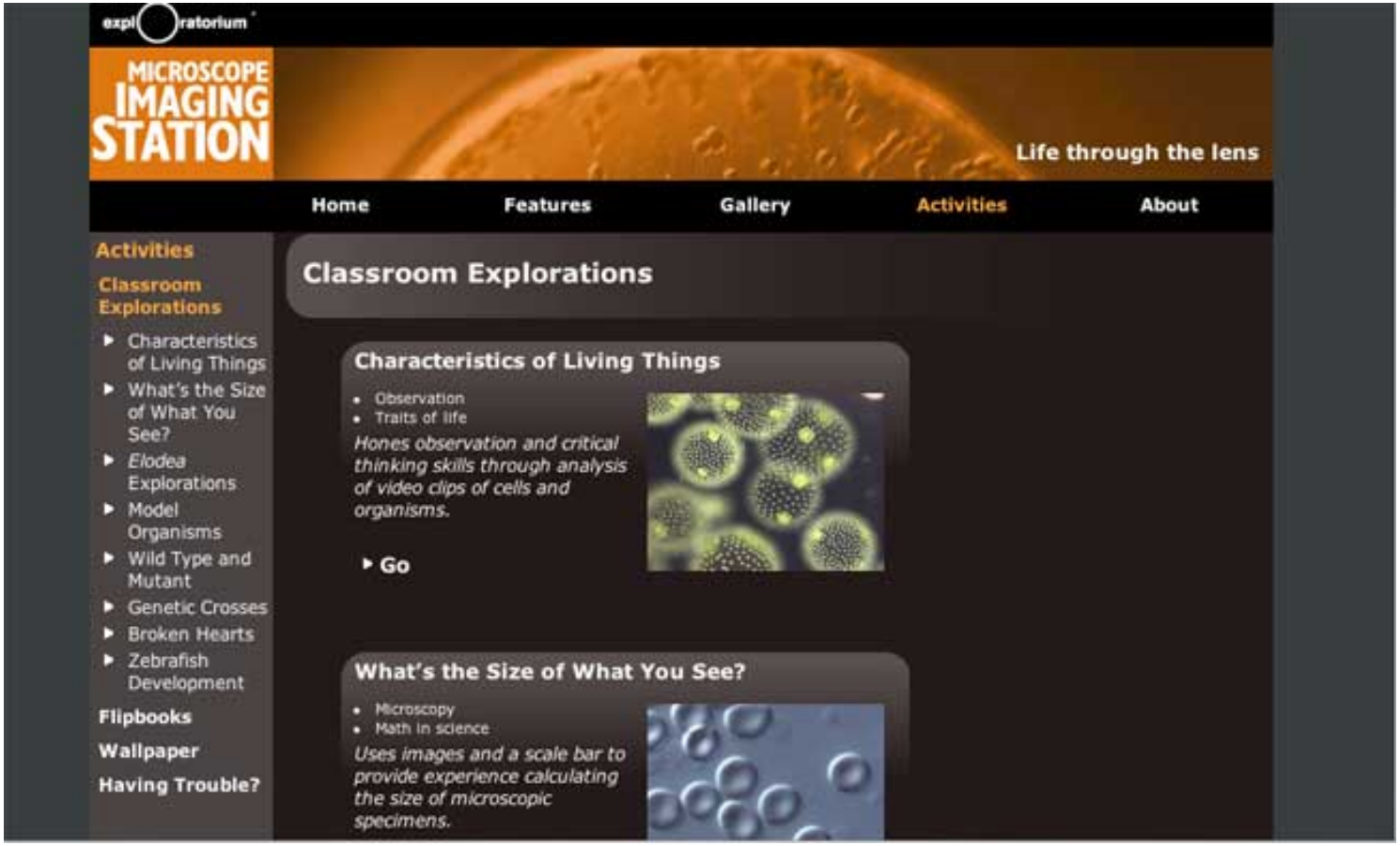
www.exploratorium.edu/imaging_station/activities/classroom/classroom.php



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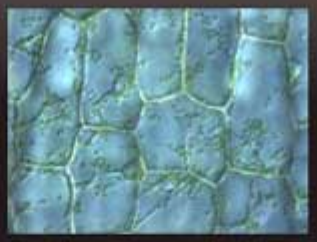
Elodea Explorations

- Cell biology
- Math in science

Develops principles of plant cell structure, function, and size with videos and still images.

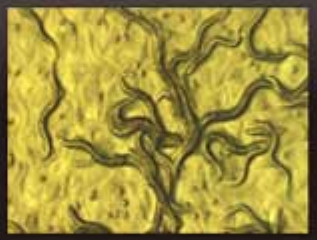


▸ Go

Model Organisms

- Research tools

Presents model organisms and information about research in which these organisms are used.



▸ Go

Wild Type and Mutant

- Genetics

Presents genetic terminology and fruit fly genetics by comparing wild-type and mutant flies.

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Genetic Crosses

- Genetics
- Inheritance patterns

Uses fly cutouts and Punnett squares as tools for predicting the products of genetic crosses.

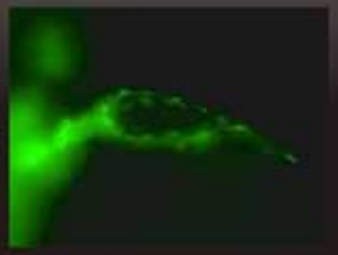
▸ Go

Broken Hearts

- Physiology (heart)
- Genetics

Compares human and zebrafish hearts and shows how mutant zebrafish help unlock mysteries of human physiology.

▸ Go



Zebrafish Development

- Developmental biology
- Mitosis

Uses videos and still images to show how a baby zebrafish develops from a single cell.

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Life through the lens

Home | Features | Gallery | Activities | About

Activities

Classroom Explorations

- Characteristics of Living Things
- What's the Size of What You See?
- *Elodea* Explorations
- Model Organisms
- Wild Type and Mutant
- Genetic Crosses
- Broken Hearts
- Zebrafish Development

Flipbooks

Wallpaper

Having Trouble?

Classroom Explorations: What's the Size of What You See?

Objectives

- To calculate the size of microscopic specimens using a scale bar.
- To determine the field diameters for different objective lenses in a compound microscope, and to use this number to calculate the size of microscopic specimens.

Getting Started

- Project the **image of red blood cells**. How large are the cells? Can students tell?
- Turn on the scale bar, and explain that scale bars are often superimposed on images to help the viewer understand the size of what they see.

▸Link to Student Pages

Materials & Equipment

- a computer and projector
- a tech center (if available)
- **student pages with sample answers**
- **image of red blood cells**
- **image of *Volvox globator***
- **image of sea urchin sperm**
- **sea urchin embryo cell division movie**

Materials Per Pair

- compound microscope
- prepared microscope slides or slides and specimens

Procedure

Part One: Using scale bars

1. Have students read the first problem on the student pages. Ask several students how many red blood cells they think would fit, end to end, along the scale bar in the image. Take the average of their estimates (which should be about six cells), and tell them to use this number for the denominator of the fraction in the equation. Then have them calculate the diameter of one red blood cell (which is about 0.008 mm) by dividing the length of the scale bar by the number of cells.

   The remaining images may be projected for the entire class, or students can work independently, following the links and instructions on the student pages.

2. Project the **image of *Volvox globator***, and give students time to read about and briefly discuss this organism if it's unfamiliar to them. Then turn on the scale bar, and have them do the second problem.
3. Project the **image of sea urchin sperm**, turn on the scale bar, and have students do the third problem.
4. Open the **sea urchin embryo cell division** page. Play the movie (you'll need to replay it several times), and turn on the scale bar beneath the image. Have students do the fourth problem. Tell students that they should use the external membrane as the embryonic boundary for their calculations. (In the video, a single fertilized egg completes two rounds of cell division, becoming

- clear metric ruler with millimeter divisions

Group Size

- pairs & entire class

Preparation

- Preview the images and movie listed under Materials & Equipment.
- Download the student pages and provide them to the class. If you don't have a tech center, print and duplicate the student pages.
- You can make extra rulers by placing clear rulers on a copy machine, copying them onto an overhead transparency, and cutting the transparency into strips.

Alternative Approach

- Students may follow the links and instructions on the student pages to complete Part One independently.

What's Going On?

The magnifying power of most ocular lenses on student microscopes is 10X. Objective lens magnifying power may vary depending on the brand of microscope. In general, most student compound microscopes are equipped with low power (4X), medium power (10X), and high power (40X) objective lenses. The higher the magnification, the longer the barrel of the objective lens.

Total magnification

The total magnification of the image that reaches the eye through the microscope ocular is the product of both the ocular magnification and the objective magnification. Using the example above, the total magnification of low power is 40X, medium power is 100X, and high power is 400X.

Field diameter

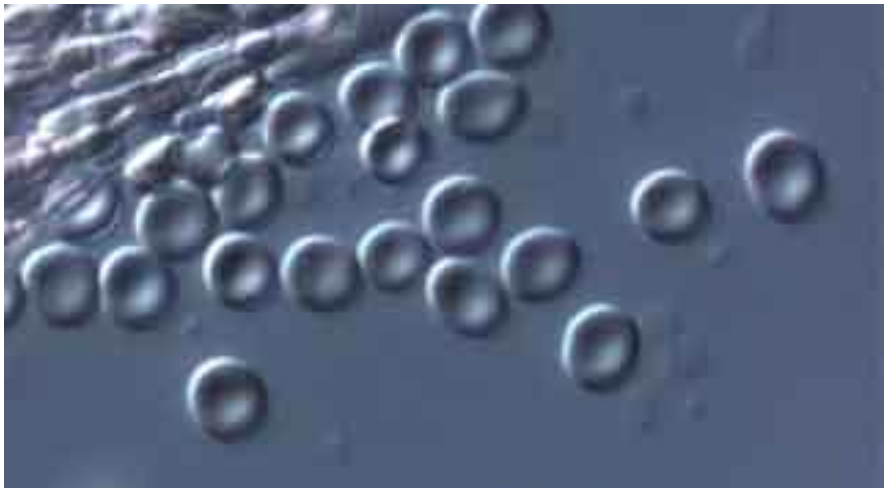
Field diameter is determined by the number of millimeters observed to fit across the diameter of the field of vision. The lower the magnification is, the larger the field of view. The field of view can vary significantly based on the brand of microscope. For example, the field diameter of a "typical" 10X objective (100X total magnification) can vary from about 1.0 millimeter to 2.0 millimeters. As the magnification increases, the amount of surface area in the image decreases: Magnification and field diameter are inversely related. Students can easily see this by looking at the ruler with different objectives, and they can now apply their knowledge to determine the size of genuine specimens.

Related Activity

▸ ***Elodea* Explorations**

Poll Question!

What is the diameter of an individual red blood cell?



A. 1mm?

B. 0.008 mm?

C. 0.01 mm?

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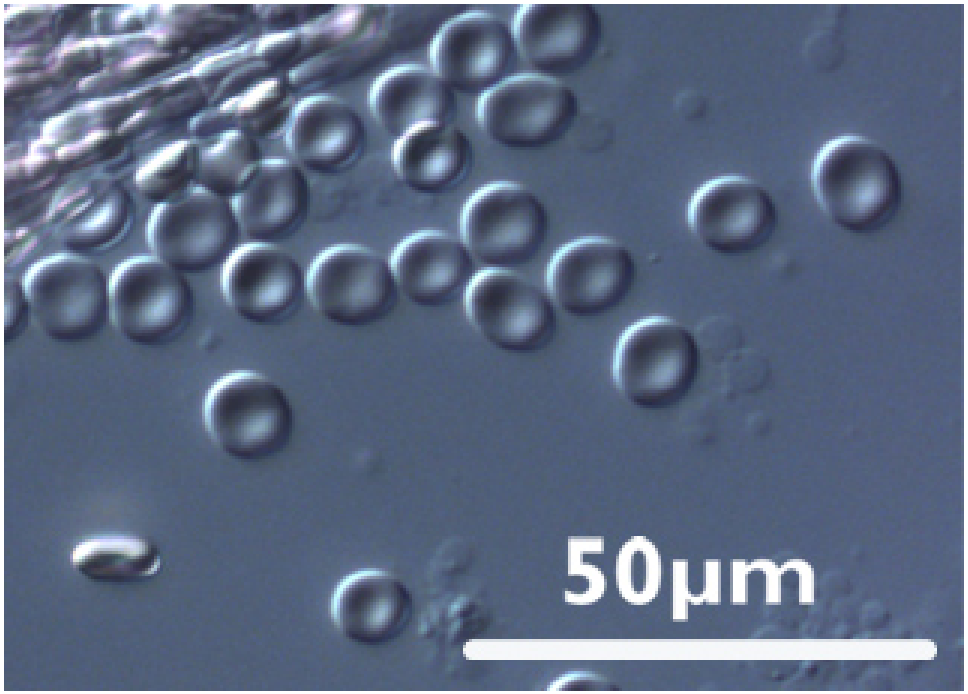
What is the diameter of an individual red blood cell?



A. 1mm

B. 0.008 mm

C. 0.01 mm

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Name _____ Date _____

What's the Size of What You See?

In this activity, you'll learn how to use scale bars on images and movies, and find out how to calculate the size of specimens you examine with your compound microscope.

Part One: Using scale bars

1. Determining the size of a red blood cell

Observe the image of red blood cells. Notice that the scale bar says "50μm," which is 50 micrometers or 0.05 mm. Estimate how many blood cells could fit end to end along the scale bar. Now, use the equation below to calculate the size of an individual blood cell:

$$\frac{\text{0.05 mm (length of scale bar)}}{\text{number of cells that fit along scale bar}} = \_\_\_\_\_ \text{ mm (diameter of 1 cell)}$$

Your calculations:

Diameter of one red blood cell: _____ (Don't forget the size unit!)

Let’s pause for questions from the audience….

Which of these is the wild type? Stamp your answer

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Name _____ Date _____

Meet some mutant fruit flies

- Fill in the first three columns of the table as your teacher shows you images of mutant flies and wild-type flies. Your teacher will help you with the last three columns.

Fly		Description of eyes	Description of wings	Description of body color	Phenotype	Inheritance pattern of mutation	Possible genotypes
A		round, red	straight, long, rounded at ends	brown	wild-type	N/A	+/+, or +/? for recessive mutations
B							
C							
D							
E							
F							

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- Model Organisms
- Wild Type and Mutant
- Genetic Crosses
- Broken Hearts
- Zebrafish Development

Flipbooks

Wallpaper

Having Trouble?

Classroom Explorations: Genetic Crosses

Objectives

- To understand genetic inheritance patterns in the fruit fly.
- To use Punnett squares to predict the results of genetic crosses and determine the genotypes of the parent flies in a particular cross.

Getting Started

- You may wish to familiarize students with *Drosophila melanogaster* by doing the activity **Wild Type and Mutant**, which uses *Drosophila* images to introduce students to genetic inheritance. (Even if you don't do this activity with your students, you might want to read the section called "Primer on *Drosophila* Notation." The notation, which is also

▸Link to Student Pages

Materials & Equipment

- a computer and projector
- **images of fruit flies** (zip file) or **individual images**
- **student pages with sample answers**
- ***Drosophila* pupae development video** (optional)

Group Size

- small groups

Preparation

- Download the images of fruit flies. There's a separate

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X

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X

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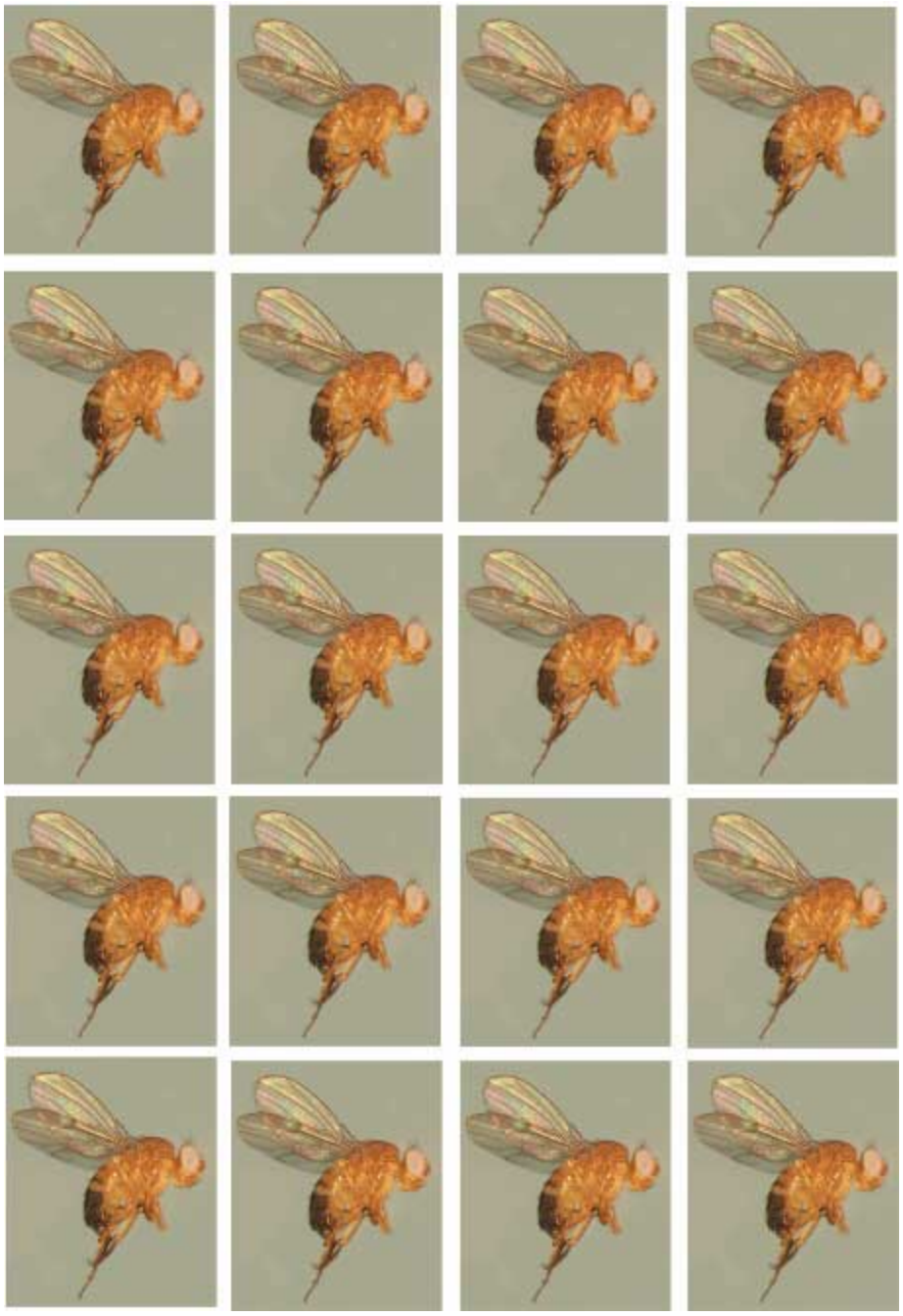

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Poll question!

How have you experienced the Exploratorium?

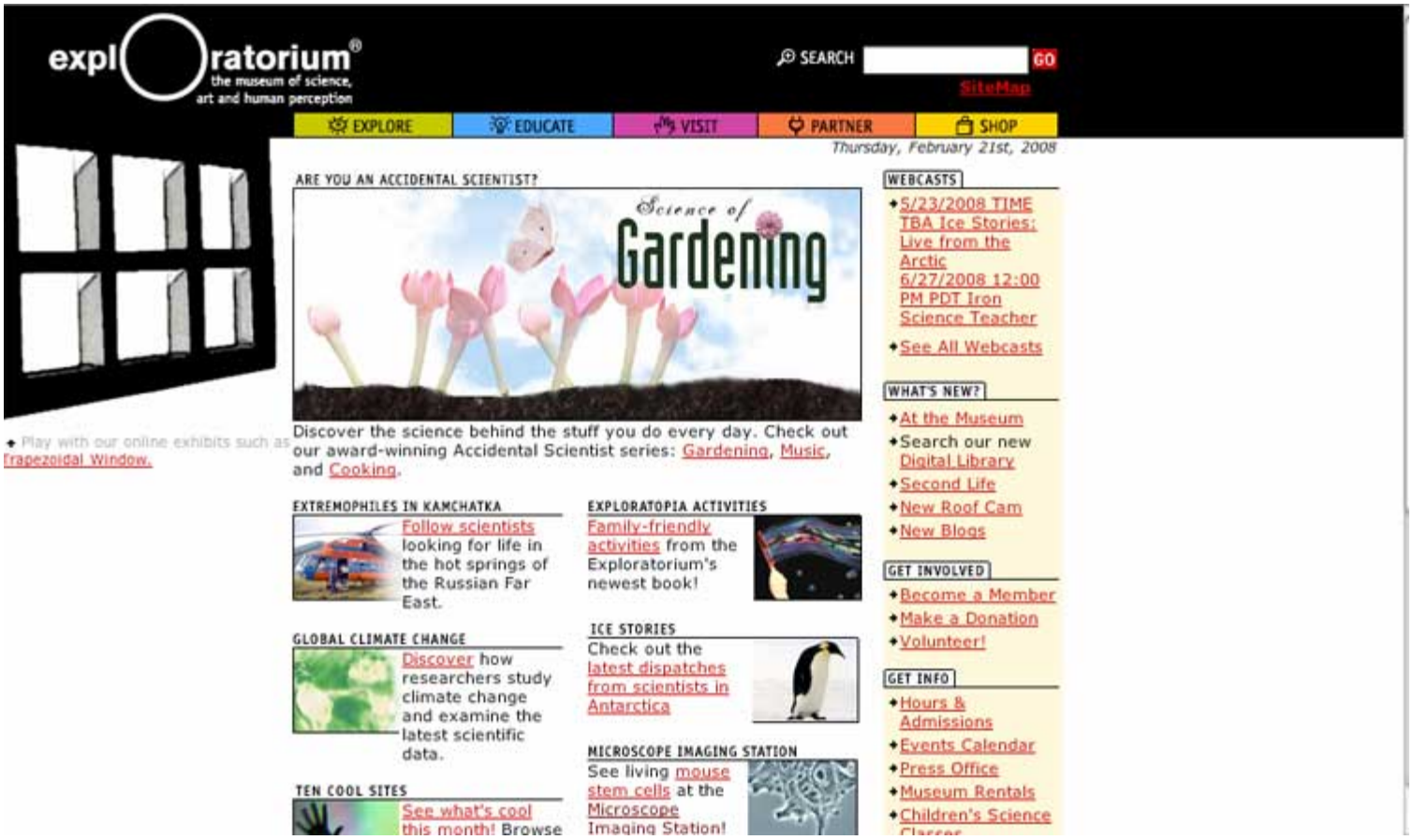
A) Visited the museum

B) Attended a Teacher Institute at the museum or at a conference

C) Use the Exploratorium website

D) This is my first experience!

www.exploratorium.edu



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Exploratorium Teacher Institute

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http://nsdl.org **http://exploratorium.edu**

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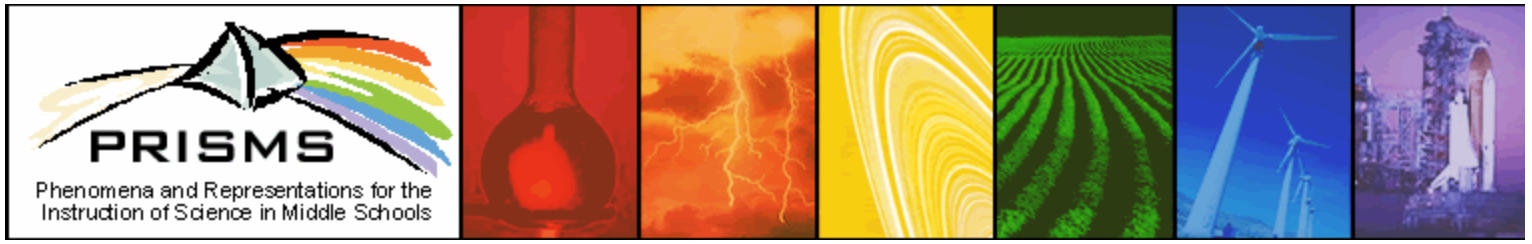
THANK YOU!

SNEAK PREVIEW:

Next seminar in the NSDL series on April 1st:



http://prisms.mmsa.org

It's Alive—Life Science Resources for the Middle School Classroom

What do I look for when choosing online resources for more effective teaching of learning goals?

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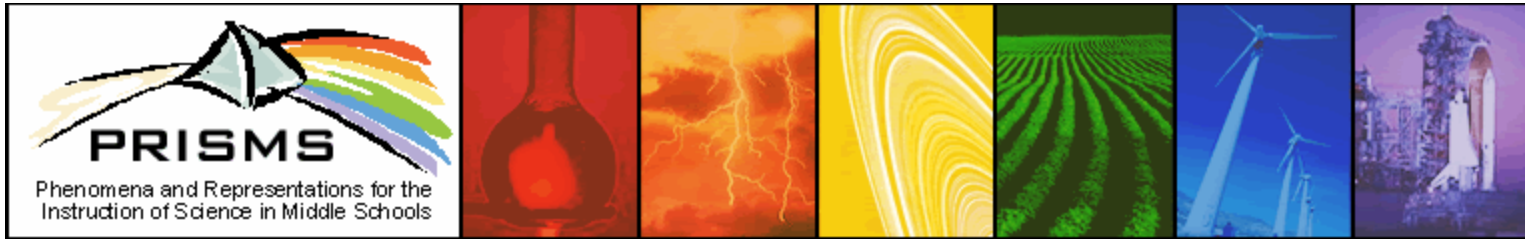

A collection of online resources in science reviewed by experts, including middle school science teachers:

- Description
- Content alignment
- Quality of instructional support
- Additional notes

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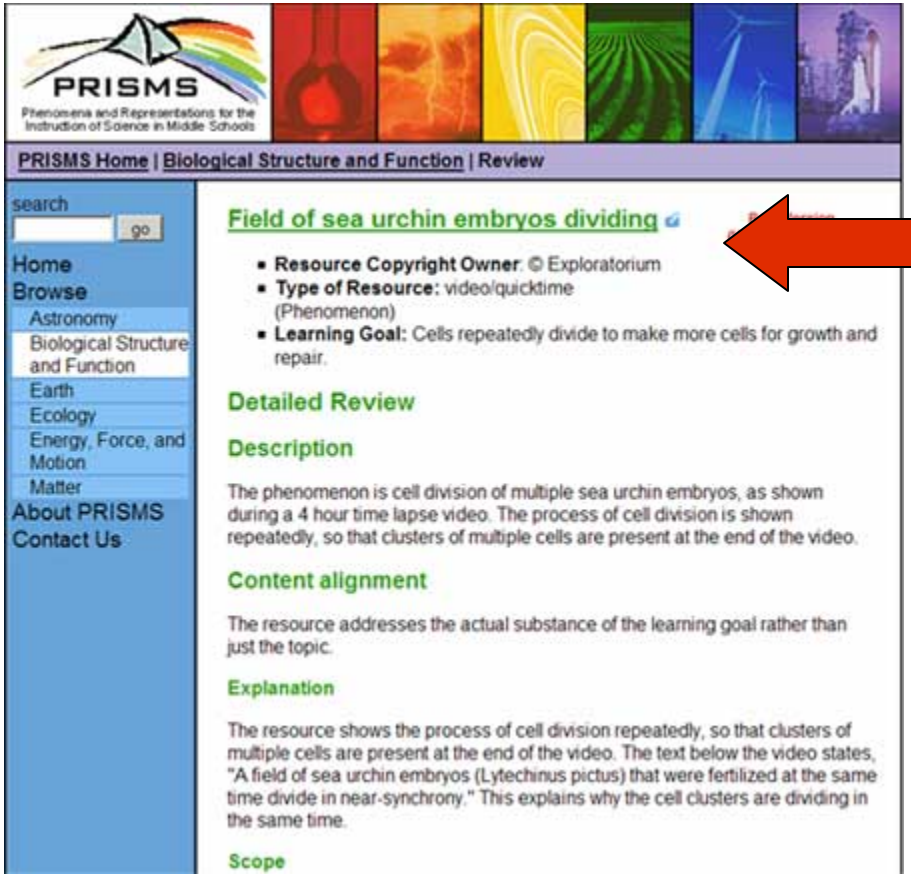

Phenomenon:
Sea urchin embryo cell division
Learning goal:
Cells repeatedly divide to make more cells for growth and repair

Is the relationship between the phenomenon and the learning goal made clear?

Is the phenomenon likely to be comprehensible to students?

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- Download our Seminar Resource List
- Utilize our blog featuring our presenters for the Seminar Series sharing their insights on careers in science and science education:

  http://expertvoices.nsdl.org/2007fall-nsta-sems/

http://www.elluminate.com

http://learningcenter.nsta.org

National Science Teachers Association

Gerry Wheeler, Executive Director

Frank Owens, Associate Executive Director
Conferences and Programs

Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars

Flavio Mendez, Director

Danielle Troiano, Project Coordinator

Jeff Layman, Technical Coordinator

• How to Maximize Your NSTA Conference Experience

March 12, 2008

• NSDL: It's Alive--Using Online Life Science Resources in Middle School Classrooms

April 1, 2008

http://learningcenter.nsta.org

Web Seminar Evaluation:

Click on the URL located on the Chat Window