



NSDL/NSTA Web Seminar:

Small Creatures Under the Microscope: Part Two

—The Exploratorium



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



<http://nsdl.org>



# 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



<http://nsdl.org>



# Screenshot

The screenshot displays the Eluminate Live web seminar interface. The main window is titled "Whiteboard - Main Room (Scaled 105%)". The whiteboard content features the NSTA logo in blue and red, followed by the text "WEB SEMINARS" in large red letters, and "LIVE INTERACTIVE LEARNING @ YOUR DESKTOP" in black. A computer mouse icon is positioned to the right of the text. The interface includes a "Participants" list on the left showing "Flavio Mendez (Moderator)" and "Leia Fitzwilliam (Me)". Below the list is a "Chat" window with a message from the moderator: "Joined on August 24, 2007 at 4:14 PM Moderator: This is the chat window." The bottom of the interface shows audio controls for "Microphone" and "Speaker". A status bar at the bottom right indicates "In session for 4 minutes."



We would like to know more  
about you...

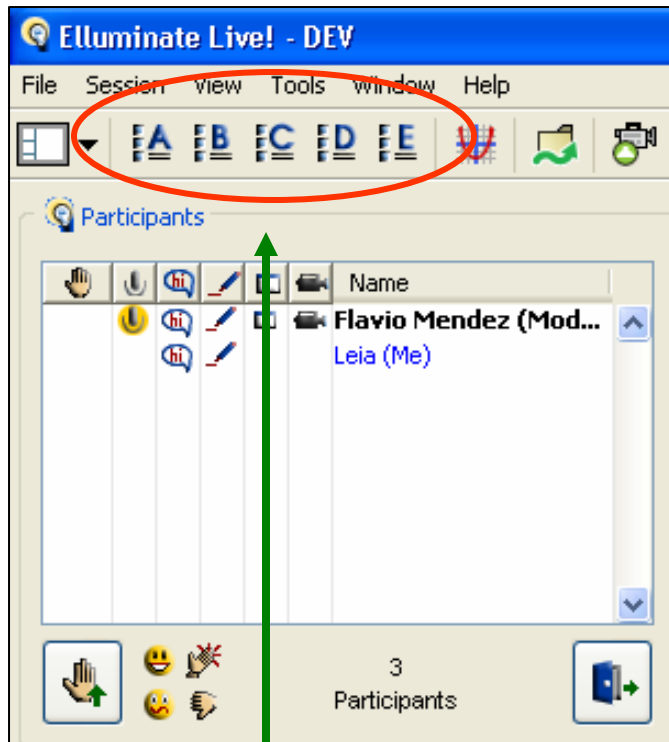


<http://nsdl.org>





# How many NSTA web seminars have you attended?



A. 1-3

B. 4-5

C. More than 5

D. More than 10

E. This is my first web seminar

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



# Where are you now?



Note:  
Alaska & Hawaii  
Not to scale  
[www.50states.com](http://www.50states.com)



<http://nsdl.org>





# 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



<http://nsdl.org>



[www.exploratorium.edu](http://www.exploratorium.edu)





# Microscope Imaging Station at the Exploratorium



# 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



# Where do you teach? Stamp your answer!



<http://nsdl.org>







[www.exploratorium.edu/imaging\\_station](http://www.exploratorium.edu/imaging_station)

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**MICROSCOPE IMAGING STATION**

Life through the lens

Home Features Gallery Activities About

**Stem cells**  
Cells with potential

► Full Story



<http://nsdl.org>





[www.exploratorium.edu/imaging\\_station](http://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*.

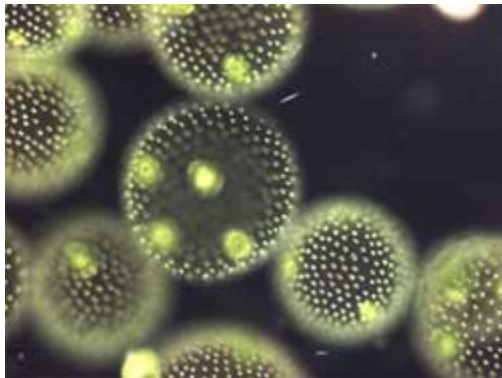
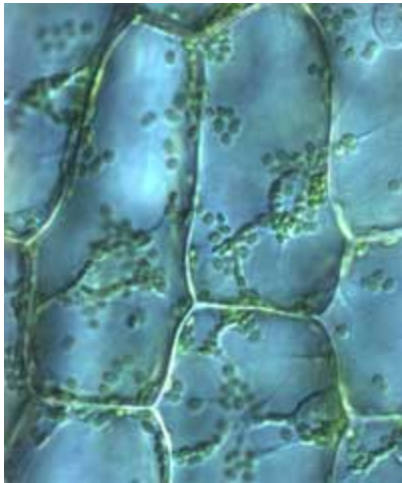


<http://nsdl.org>





[www.exploratorium.edu/imaging\\_station](http://www.exploratorium.edu/imaging_station)



Images & movies available in the gallery



<http://nsdl.org>







Let's pause for  
questions from  
the audience....



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# MICROSCOPE IMAGING STATION

Life through the lens



Home Features Gallery Activities About

## Features

**Sea Urchins**  
Insight into genes, reproduction, and cancer

► Full Story

**Blood**  
The body's vital defense force



<http://nsdl.org>



# It's Time to Play: Name That Model Organism!



1.
2.
3.

[www.exploratorium.edu/imaging\\_station/activities/classroom/classroom.php](http://www.exploratorium.edu/imaging_station/activities/classroom/classroom.php)



A screenshot of the Exploratorium Microscope Imaging Station website. The page has a dark background with orange and white text. At the top left, it says "exploratorium" and "MICROSCOPE IMAGING STATION". To the right of this is a large orange circular image with the text "Life through the lens". Below this is a navigation bar with "Home", "Features", "Gallery", "Activities", and "About". On the left side, there is a sidebar with "Activities" and "Classroom Explorations" listed. The main content area is titled "Classroom Explorations" and features two activity cards. The first card is titled "Characteristics of Living Things" and includes a list of topics: "Observation" and "Traits of life". It also has a description: "Hones observation and critical thinking skills through analysis of video clips of cells and organisms." and a "Go" button. The second card is titled "What's the Size of What You See?" and includes a list of topics: "Microscopy" and "Math in science". It has a description: "Uses images and a scale bar to provide experience calculating the size of microscopic specimens." and a small image of microscopic specimens.



<http://nsdl.org>

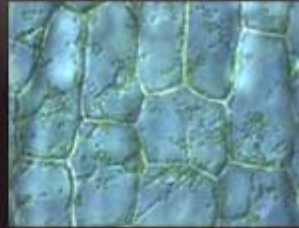




### Elodea Explorations

- Cell biology
- Math in science

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

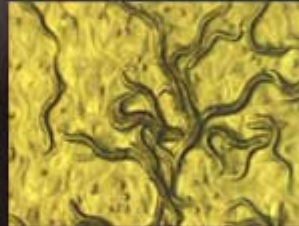


► Go

### 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.*





### Genetic Crosses

- Genetics
- Inheritance patterns

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

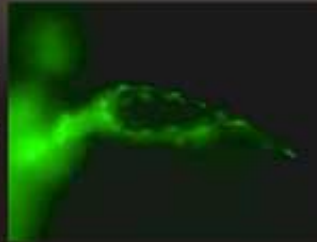


► Go

### 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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# MICROSCOPE IMAGING STATION

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.

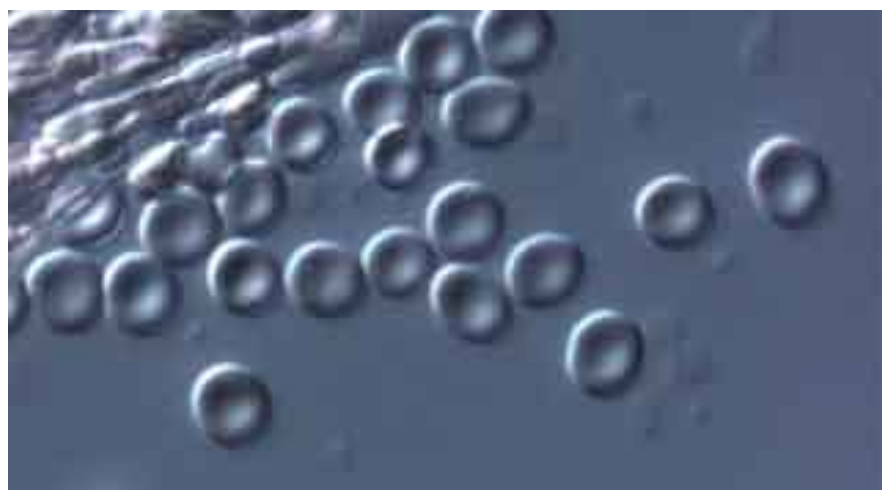
## Related Activity

► ***Elodea Explorations***



## Poll Question!

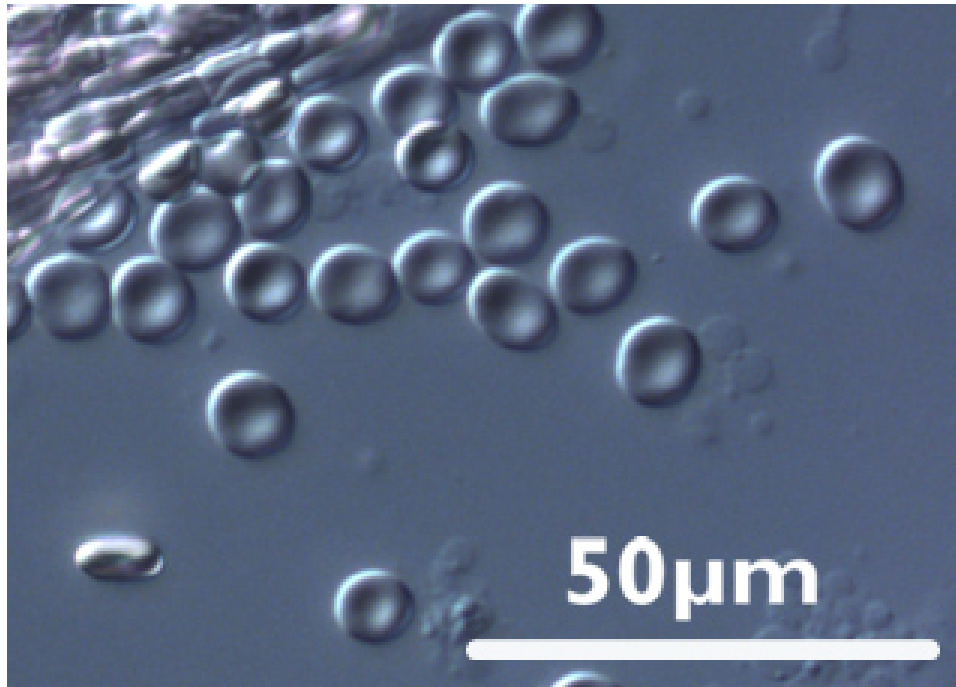
What is the diameter of an individual red blood cell?



- A. 1mm?
- B. 0.008 mm?
- C. 0.01 mm?



What is the diameter of an individual red blood cell?



A. 1mm

**B. 0.008 mm**

C. 0.01 mm



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 "50 $\mu$ m," 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:

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

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











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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# MICROSCOPE IMAGING STATION

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: 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 folder for each fly species in





X





$x^+y$

X



$x^w x^w$



<http://nsdl.org>





# 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

The screenshot shows the Exploratorium website homepage. At the top left is the logo "exploratorium® the museum of science, art and human perception". To the right is a search bar with a "GO" button and a "SiteMap" link. Below the logo is a navigation menu with buttons for "EXPLORE", "EDUCATE", "VISIT", "PARTNER", and "SHOP". The date "Thursday, February 21st, 2008" is displayed. The main content area features a large banner for "Science of Gardening" with the text "ARE YOU AN ACCIDENTAL SCIENTIST?". Below the banner is a description: "Discover the science behind the stuff you do every day. Check out our award-winning Accidental Scientist series: Gardening, Music, and Cooking." To the left of the banner is a graphic of a window with the text "Play with our online exhibits such as Trapezoidal Window." Below the banner are several featured articles: "EXTREMOPHILES IN KAMCHATKA" (Follow scientists looking for life in the hot springs of the Russian Far East), "GLOBAL CLIMATE CHANGE" (Discover how researchers study climate change and examine the latest scientific data), "TEN COOL SITES" (See what's cool this month! Browse), "EXPLORATOPIA ACTIVITIES" (Family-friendly activities from the Exploratorium's newest book!), "ICE STORIES" (Check out the latest dispatches from scientists in Antarctica), and "MICROSCOPE IMAGING STATION" (See living mouse stem cells at the Microscope Imaging Station!). On the right side, there are three sections: "WEBCASTS" (5/23/2008 TIME TBA Ice Stories: Live from the Arctic, 6/27/2008 12:00 PM PDT Iron Science Teacher, See All Webcasts), "WHAT'S NEW?" (At the Museum, Search our new Digital Library, Second Life, New Roof Cam, New Blogs), and "GET INVOLVED" (Become a Member, Make a Donation, Volunteer!). At the bottom right, there is a "GET INFO" section (Hours & Admissions, Events Calendar, Press Office, Museum Rentals, Children's Science Classes).



http://nsdl.org







# Exploratorium Teacher Institute

[www.exploratorium.edu/ti](http://www.exploratorium.edu/ti)

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## teacher institute

**OUR MISSION**  
The Exploratorium Teacher Institute (TI) has been a professional home for middle and high school science teachers for over twenty years. [\(TI brochure in PDF\)](#)

The TI offers a rich mix of hands-on activities based on Exploratorium exhibits, content-based discussions, classroom materials, web-based teaching resources, and machine shop experiences.

We offer Summer Institutes and district-wide in-services for both new and experienced teachers. Our growing family of alumni may also attend a variety of Saturday workshops. All program participants are provided with stipends for attending our institutes and workshops.

**ALUMNI RESOURCES**  
This is a password protected area for [Alumni](#) of Teacher Institute Programs.

Problems? Email [kdrachler@exploratorium.edu](mailto:kdrachler@exploratorium.edu)

**NEWS**  
**TI Summer Institute 2008 Applications are on-line.** Application deadline is April 1st. Notifications are sent back to you soon after. To find out more about the institute and get an application, [click here](#).

**Want to know more about the Teacher Institute's Summer Institute for educators?** Then listen to our podcasts! Whether you're a teacher interested in applying to our Classic Summer Institute or you've already been accepted into it, you'll find detailed descriptions of the summer experience in these audio programs.

**Full Version:** 26 minutes, 9.2 MB  
**"Lite" Version:** 11 minutes, 3.9 MB

**The Teacher Institute 21st Anniversary party.** See the pictures by clicking [here](#).

**Teacher Institute Conference Sessions**  
Information and session hand-outs can be

**TEACHER INSTITUTE**  
**ALUMNI LOGIN**  
classic summer institute  
new teacher program  
learning studio

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**THANK  
YOU!**



<http://nsdl.org>



## SNEAK PREVIEW:

Next seminar in the NSDL series on April 1<sup>st</sup>:



<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?*



<http://nsdl.org>







<http://prisms.mmsa.org>



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

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



<http://nsdl.org>





**PRISMS**  
Phenomena and Representations for the Instruction of Science in Middle Schools

PRISMS Home | **Biological Structure and Function** | Review

search  go

Home  
Browse  
Astronomy  
Biological Structure and Function  
Earth  
Ecology  
Energy, Force, and Motion  
Matter  
About PRISMS  
Contact Us

**Field of sea urchin embryos dividing**

- Resource Copyright Owner: © Exploratorium
- Type of Resource: video/quicktime (Phenomenon)
- Learning Goal: Cells repeatedly divide to make more cells for growth and repair.

**Detailed Review**

**Description**

The phenomenon is cell division of multiple sea urchin embryos, as shown during a 4 hour time lapse video. The process of cell division is shown repeatedly, so that clusters of multiple cells are present at the end of the video.

**Content alignment**

The resource addresses the actual substance of the learning goal rather than just the topic.

**Explanation**

The resource shows the process of cell division repeatedly, so that clusters of multiple cells are present at the end of the video. The text below the video states, "A field of sea urchin embryos (*Lytechinus pictus*) that were fertilized at the same time divide in near-synchrony." This explains why the cell clusters are dividing in the same time.

**Scope**



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?



<http://nsdl.org>



Go to <http://nsdl.org> and click on the K-12 audience page to:

- 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://nsdl.org>





<http://www.lluminate.com>

# The NSTA Learning Center



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& Opportunities](#)

[Professional  
Development Tools](#)

[Education  
Administrator](#)

## Welcome to Your Professional Development

The Learning Center is NSTA's e-professional development portal to help you address your classroom needs and busy schedule. You can gain access to more than 2,600 different resources that cater to your preference for learning. Over 700 hundred resources, such as journal articles, science objects and web seminars are available **for free**. A suite of practical tools such as My Library, My Transcript, and My Professional Development Plan and Portfolio tool help you organize, personalize, and document your growth over time.



## Login

E-mail:

Password:

**LOGIN**

- [I'm an NSTA member and I don't have a password](#)
- [Lost password? Recover it here.](#)
- [Register now](#)

## Explore Learning Opportunities

[See all FREE Resources](#)

Search

**Go**

[Advanced Search](#)

### By Subject

- [Earth & Space Science](#)
- [Life Science](#)
- [Physical Science](#)

### By Grade Level

- [Elementary](#)
- [Middle School](#)
- [High School](#)
- [College](#)

### By State Standards

Find resources based on their correlation to your state standards.

Coming Soon!



### Do-It-Yourself Learning

Learn at your own pace online with these 1-2 or 6-10 hour interactive activities.



### Live Online Seminars & Classes

Learn online from certified instructors with your colleagues. 1-2 hour seminars, week and month long courses are available. Earn state

## Featured PD Opportunity

**POLAR SCIENCE, GLOBAL  
DISCOVERIES: IPY  
RESEARCH UPDATE**

NSTA Symposium  
National Conference  
Boston, MA  
March 27-30, 2008

[Learn More](#)

Underwritten in part by NSF, NASA,  
and NOAA

<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