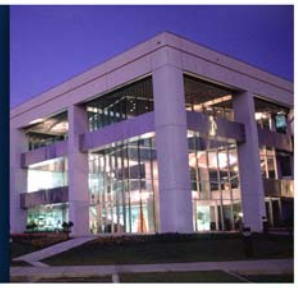
Classroom Visit Pre/Post Materials



The National High Magnetic Field Laboratory

Center for Integrating Research and Learning

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The National High Magnetic Field Laboratory

What is the NHMFL?

- The National High Magnetic Field Laboratory is a working science research laboratory utilizing state-of-the-art high magnetic field research systems. It is a world leader in magnet-related research and technology.

- The laboratory is one of nine in the world and the only one in North and South America. It was established in 1990 by the National Science Foundation and the State of Florida and is operated by the Florida State University, the University of Florida, and Los Alamos National Laboratory.
- The NHMFL brings together distinguished scientists and technicians from many disciplines including physics, chemistry, biology, geology, engineering, and materials science.
- Research at the NHMFL has implications and applications in medicine, energy, communications, electronics, the environment, transportation, and materials research and development.
- The laboratory is committed to enhancing science education with extensive educational programming at all levels.

How will your students benefit from the visit and the suggested activities?

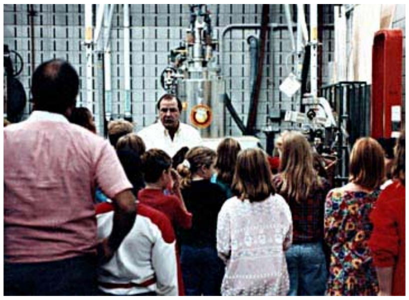
- Students will hear firsthand about what is done at a science research laboratory.
- Students will learn about diverse career opportunities in science and scientific research.

Pre-Visit Activities

The suggested pre-visit activities introduce students to basic ideas about the topic and the processes of science. Activities are correlated to the Sunshine State Standards and also include reading and writing extensions.

Post-Visit Activities

The suggested post-visit activities are designed to reinforce and expand upon what was learned by your students during the visit. The activities encourage students to analyze their ideas and spark further interest in science.



The NHMFL Education Website

You and your students are encouraged to visit the NHMFL education Website before and after your visit:

http://education.magnet.fsu.edu

Pre-Outreach Activity: What Do We Already Know?

Teacher Background:

A simple, yet effective learning strategy, a K-W-L chart, can be used to help students clarify their ideas. The chart itself is divided into three columns:

K What we **K**now	**W** What we **W**ant to know	**L** What we **L**earned

Materials:

- Chart Paper
- Markers

Activity Instructions:

1. Facilitate the creation of the chart by brainstorming with the class and listing everything that the class knows about optics and lenses. Be sure to list any misconceptions that the students may have.

2. Next list everything that the class wants to know about optics and lenses. You may need to provide prompts such as:

> *If optics experts were here, what questions would you ask them?*
>
> *If you were a scientist, what would you like to discover about lenses?*

3. Keep the chart accessible so that you and the students can enter ideas, new information, and new questions at any time. The class can return to the K-W-L chart after completing the activities. As students discover the answers to their questions, list the answers in the L column of the chart

4. K-W-L charts are useful in identifying misconceptions that students have about optics and lenses. Using students' misconceptions can be an effective method for teaching science. Once the misconceptions are identified, have students design a way to test their ideas, reflect on what they observe, and refine the original conclusion.

5. Periodically, return to the K-W-L chart during the activities and after your visit to check off items from the W column and to add to the L column. Students may want to add items to the W column to further their explorations.

Standards:

Grades 3-5: SC.C.2.2.1, SC.H.2.2.1
Grades 6-8: LA.C.1.3.1, SC.H.1.3.5, SC.H.2.3.1

NAME______________________

TOPIC______________________

TEACHER______________________

WHAT DO YOU **K**NOW	WHAT DO YOU **W**ANT TO KNOW	WHAT HAVE YOU **L**EARNED?

K W L

Pre-Outreach Activity: What is Science?

Teacher Background:

The scientific method is the way scientists conduct their research. After making observations, scientists will try to explain what it is that they are seeing. Their initial explanation is an educated guess, called a hypothesis.

When the results of the experiment support the hypothesis, it is retested by replicating the experiment. If the results of the experiment do not support the original hypothesis, the hypothesis is adjusted and the experiment is redesigned.

If the experiment can be replicated then the hypothesis becomes a scientific theory until additional evidence causes it to be revised.

Jane Goodall reaches out to a chimp in the jungles of Gombe.

Materials:

- Reference materials containing an account of how Jane Goodall first conducted research on chimpanzees
- Paper and pencils
- Art supplies

Activity Instructions:

Have students read the student page on Jane Goodall. Discuss what it means to do science, as well as the processes and tools Goodall used in her research.

Students work in pairs. Give each pair a piece of string one meter in length. Take the students outside and have each pair make a circle on the ground with their string. Have students make observations about what they see in their circles. Let them use magnifying glasses to further explore. When finished, have each group report on what they discovered as they made their observations.

Standards:

Grades K-2: LA.A.1.1.2, LA.A.1.1.3, LA.A.1.1.4, LA.A.2.1.3, LA.C.1.1.1, SC.D.1.1.1, SC.A.1.1.2, SC.H.1.1.1, SC.H.1.1.4, SC.H.1.1.5, SC.H.3.1.1, SS.A.1.1.2, SS.A.5.1.1
Grades 3-5: LA.A.1.2.4, LA.A.2.2.5, SC.H.1.2.2, SC.H.1.2.3, SC.H.3.2.2, SS.A.1.2.1, SS.A.6.2.3
Grades 6-8: MA.C.3.3.1, LA.A.1.3.2, LA.A.1.3.3, LA.A.2.3.1, LA.A.2.3.5, LA.C.1.3.1, LA.C.1.3.4, LA.C.3.3.2, LA.C.3.3.3, SC.A.1.3.1, SC.F.1.3.7, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.6, SC.H.3.3.5

Jane Goodall: Scientist

In the summer of 1960, Jane Goodall arrived on the shores of Lake Tanganyika. For the next six months this would be her home as she followed the chimpanzees of Gombe National Park in what is now Tanzania. She set out to learn about the chimpanzees, but soon discovered that the task at hand was more difficult than she imagined. The chimpanzees were afraid of her, and even when she tried to spy on them from across the valley, they vanished at the slightest hint of her presence. Goodall felt the project was doomed from the start, but instead of giving up, she persisted and continued to observe the chimps at any chance she got.

After several months of venturing into the forest following the families of chimps that she was studying, she finally felt the chimpanzees becoming more accepting of her presence. She no longer had to hide, but still maintained a safe distance from the animals. Her first direct encounter with a chimpanzee was with the one she named David Greybeard. He went to her camp to eat the bananas and fruit from an oil nut palm she had set out for him. The next time David returned to her camp he brought other chimps. She then began to know the whole family of chimps. Once Goodall had developed a close connection with the group of chimps, she got to learn about their community and could further study the interactions between them. She would watch the chimps eat and play, and discover the social system the chimps have. For example, she saw how a mother and child chimp stay together untill the child is around the age of 8. Goodall also found that the chimps do not fight often and if they do they makeup right away with a kiss or a pat on the back.

Four months into her field study, Goodall made discoveries that would set the foundations for further study of the chimpanzees. She studied the way they walked and found that sometimes they walked flat-footed like humans, but mostly they walked on their knuckles. Another important discovery was that chimps communicate through language. The chimps cannot talk like humans, but they do communicate through sound. They have many different calls that they use when calling each other. Goodall found at least 34 different calls that she could identify. She also watched the chimps eat. These observations led to her biggest discovery. She noticed one male was taking a branch, stripping it of leaves, sticking it into a termite mound and waiting. Momentarily he would pull out the stick and eat the termites that had crawled onto the stick. This was the first evidence of any animal creating and using a tool.

Jane Goodall is the world's most visible expert on the subject of chimpanzees. After she finished her initial 6 month study, she would go on to stay in Gombe for the next 24 years studying and observing the primates firsthand. This field study would become the longest continuous study of any animal culture in history, and continues to this day. When Goodall left Africa she established the Jane Goodall Institute for Wildlife Research, Education and Conservation to provide help for the research on chimpanzees. Since leaving, she has also written many books including some written for children. Goodall has received many awards for her studies on chimpanzees.

Pre-Outreach Activity: What are Crystals?

Teacher Background:

What is a crystal? Crystals are solids that form when there is a regular repeated pattern of molecules. In some solids, the arrangement of the atoms and molecules can be random throughout the material. In crystals, however, a collection of atoms is repeated in exactly the same arrangement over and over throughout the entire material.

Because of their repetitive nature, crystals can take on strange and interesting shapes naturally. When we grow crystals in the laboratory or in the classroom the atoms and molecules are separated into an individual collection of atoms, and as the water evaporates, they fall naturally into their appropriate place in the repetitive structure.

When making crystals in the classroom, you first need to create a saturated solution. When you reach the point that no more solute (the substance that you are trying to dissolve) will dissolve (regardless of what you do to the solution), then you have made a saturated solution. For example, when adding sugar to water you can increase the amount of solute (sugar) the water (solvent) will hold by stirring and heating the solution.

Below are some tips for making crystals and diagnosing some problems that students may experience when doing the activity for the first time.

Materials:

- Water (tap, distilled or filtered)
- Slides
- Baby food jars, clear film canisters, or other container
- Copper sulfate ($CuSO_4$), Epsom salts ($MgSO_4$), or table salt (NaCl).
- Droppers or straws
- Teaspoon (a teaspoon holds 5 ml of liquid)
- Field Microscopes

Activity Instructions:

If you are making a copper sulfate solution, you will:

1. Place 10 ml (2 tsp) of warm water in a jar, or pill bottle.
2. Add 7g (1 tsp) of copper sulfate to the water.
3. Shake or stir until the copper sulfate is dissolved.
4. Take a dropper, or a straw, and put one or two drops of the liquid in the center of a slide.
5. Place the slide where it will not be disturbed.
6. You will examine the slide tomorrow.

Use the same steps to make crystals using Epsom salt, or table salt.

Standards:

Grades 3-5: SC.A.1.2.1, SC.A.1.2.2, SC.A.1.2.4, SC.A.1.2.5, SC.A.2.2.1, SC.D.1.2.1, SC.H.1.2.1, SC.H.1.2.2, SC.H.1.2.3
Grades 6-8: SC.A.1.3.1, SC.A.1.3.4, SC.A.1.3.5, SC.A.2.3.2, SC.H.2.3.1,

FCAT Sample Practice Questions

1. Duncan is growing crystals to see under his microscope. He is tired of looking at the same crystals all the time and wants to try to grow crystals faster. He knows that all experiments change only one variable.

Which of the following variables will **not** affect Duncan's experiment?

- **A** The microscope he uses to look at the crystals
- **B** The temperature of the water
- **C** The amount of powder he adds
- **D** The type of powder he adds

2. Duncan wants to check to see how fast his crystals are growing. Which of the following charts would be most useful in determining the growth rate?

F

Time	Size
Tuesday	1.2 cm
Friday	1.7 cm
Sunday	1.7 cm

G

Time	Size
Tuesday 8:30	1.1
Tuesday 1:00	1.3
Tuesday 8:00	1.3

H

Time	Size
Morning	.99 cm
Afternoon	1.1 cm
Evening	1.2 cm

I

Time	Size
Tuesday 1:00 PM	1.3 cm
Friday 1:30 PM	1.7 cm
Monday 1:00 PM	1.9 cm

Notes

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