

VIRTUAL CRYSTALLOGRAPHY:
HOW CAN YOU SEE THAT???

WEB QUEST

Claire L. Godlewski
Grade 6 Science
Oneida Middle School
Schenectady City School District

Virtual Crystallography: How Can You See That??? Web Quest

Subject: Earth Science - Geology-Enrichment

Skills:

Following directions, inferring, organizing, recording data, comparing and contrasting, observing, predicting, manipulating software

Duration: Two 40 minute sessions

Setting: Classroom and/or Computer Lab

NYS Standards Addressed:

Math, Science, and Technology

1-Scientific Inquiry-develop explanations of natural phenomena in a continuing, creative process.

Students will:

- ask "why" questions in attempts to seek greater understanding concerning objects and events they have observed and heard about.
- develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed.

2-Information Systems Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Students will:

- understand and use the more advanced features of word processing.
- model solutions to a range of problems in mathematics, science, and technology using computer simulation software.

3-Mathematics

Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.

Students will:

- visualize, represent, and transform two- and three-dimensional shapes.
- use the coordinate plane to explore geometric ideas.
- use appropriate tools to construct and verify geometric relationships.

4-Science

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Students will:

- observe and describe properties of materials.

5-Technology

Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

Students will:

- find and use mathematical models that behave in the same manner as the processes under investigation.

Key Vocabulary:

crystallography, geology, geologist, crystal symmetry, luster, hardness, color, cleavage, streak, texture, orientation, GADDS, Laue, Scintag Theta-Theta Diffractometer

Materials:

- Computer Lab, or projector for "teacher" computer, with Internet access
- Virtual Crystallography: The Sequel PowerPoint slide show
- Student packet: Virtual Crystallography Expedition Journal: The Journey Continues
- Pen/pencil

Objectives:

Students will utilize the Internet to become familiar with:

- instruments used to explore crystal structure, i. e.; instruments that use X-rays to determine crystal composition, texture, and/or orientation.
- development of these instruments.
- biographical information about the scientists behind the development of these instruments.

Students will also use the information from their quest to prepare and present a PowerPoint slide show to the class.

Method:

Students will use the Virtual Crystallography: The Sequel PowerPoint slide show, the Internet/World Wide Web, and the Virtual Crystallography Expedition Journal: The Journey Continues packet to record their findings.

Procedure:

- (1) Introduce activity and read through Virtual Crystallography: The Journey Continues packet.
- (2) Teacher can either take class to computer lab and have students work independently (or in groups of 2 or 3), or, use a projector with one computer to show the slide show and complete the activity as a class.
- (3) Allow students to complete Expedition Journal.

- (4) Students will, either independently or in small groups, use the information they have recorded in their journals to prepare a PowerPoint slide show/oral presentation to share with the class.

Assessment:

Students must:

- (a) articulate what they have learned during PowerPoint presentation.
- (b) correctly complete the Expedition Journal packet.
- (c) employ correct spelling and grammar throughout the Journal and PowerPoint presentation.

Modifications:

The activity can be completed as a whole class activity using a projector with the computer. Teacher shows and discusses each slide with class as the class completes the Expedition packet together.

Extensions:

- (1) This can be given as an independent or extra-credit study project.
- (2) Students can design their own expedition using links they find on the websites used in the slide show.

Geologist/Geologic Team Members: _____ Science 6
 Date: _____ Period: ____

VIRTUAL CRYSTALLOGRAPHY EXPEDITION JOURNAL

The journey continues...

You are a geologist heading out on an expedition, a "dig".

Yes, you get to play in the dirt...well, not really...but you do get to spend some time in the computer lab using the Internet and the World Wide Web learning to be a "rock hound".

"How do geologists see what's going on inside rocks and minerals?" you ask?

Or, "How did all of these different instruments get invented?"

Good questions!!

And that's what you're going to find out. By the time you're finished with this expedition, you'll be making some predictions about what happens to Earth materials in nature, how geologists "see" what's going on inside rocks and minerals, how these instruments work, how they were developed, and a little about the people who developed, or invented, them.

Use the PowerPoint Virtual Crystallography: The Sequel guide and this Expedition Journal to make your "dig" a success. As you complete your Journal, be sure to use complete sentences and correct spelling when you make your entries.

When you have finished your quest, you will be preparing a PowerPoint slide show of your own using the information you record in your Journal. You will be responsible for preparing six to ten slides for your presentation. Once your slide show is finished, you will use your slide show and Expedition Journal to share your quest with the rest of us in an oral presentation.

Let's get started...Good luck and happy "digging"!

Slide: X-Ray Detection Inside and Out

Click on the button. The URL for this Web site is _____

(1) GADDS stands for _____

This machine can be used to _____

(2) What substance is being analyzed? _____

(3) What is shown about this substance? _____

(4) Name two parts of the diffractometer:

(a) _____

(b) _____

(5) How many types of diffractometers are listed on this Web page?

(6) List at least three facts you learned about x-ray diffraction.

(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

(7) List two links to Web sites about crystallography.

- (a) _____
- (b) _____

Slide: Machines That Look Inside Rocks

(1) Click on the GADDS picture. Summarize a what a GADDS instrument is and how it works.

(2) Click on the Laue picture. Click on the LADI link.
The Laue instrument is mainly used for _____

Describe the picture, be sure to include at least five of the names of the parts of the instrument.

(3) Summarize what a scanning electron microscope is.

(4) Summarize how the scanning electron microscope works.

Slide: Electron Backscatter Diffraction

(1) Click on the EBSD pic button. Describe what you see in the animation.

(2) List three reasons this Web sites says you should purchase the INCA EBSD product.

- (1) _____

- (2) _____

- (3) _____

(3) EBSD stands for _____.



The URL for this Web site is _____

(4) Click on the EBSD Info button.

(5) Name the links under "About EBSD".

(6) Click on the EBSD Demo button. This is a simulation program that demonstrates _____
_____.

(7) Choose from the list of substances and manipulate the crystal. Try several of the choices. Describe what happens.



References

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<http://hkltechnology.com/basics.html>

Tutorials. Retrieved August 12, 2004.

<http://mse.iastate.edu/microscopy/choice.html>

Useful Laue Links. CCP4. Retrieved August 12, 2004.

<http://www.ill.fr/YellowBook/LADI/ladimanual/Links/links.html>