

Minerals and Rocks

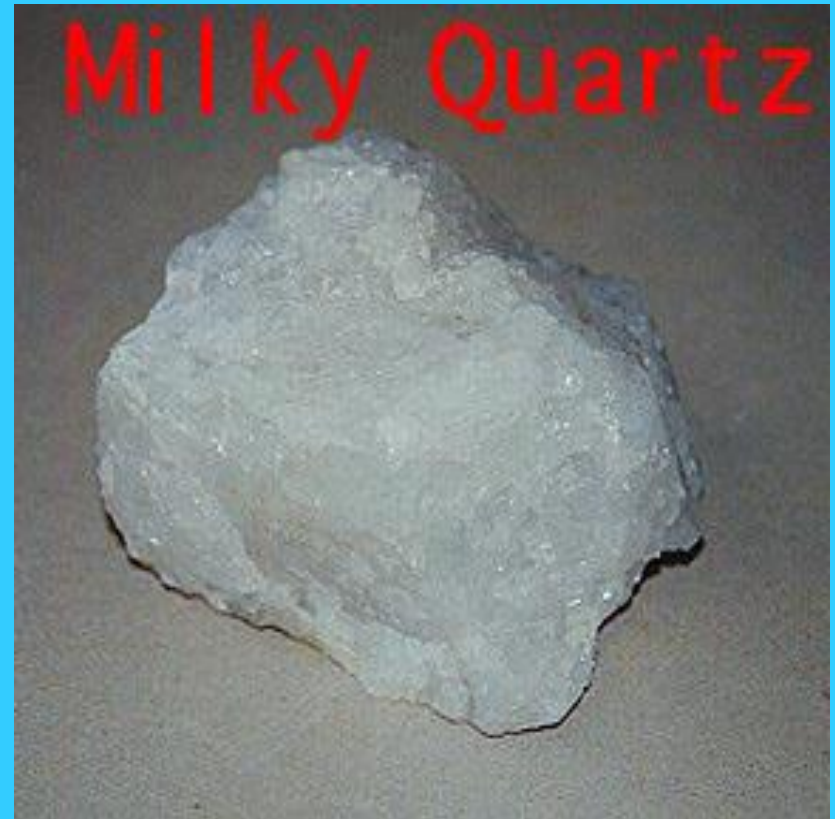
Dr. Michael J. Passow

Earth2Class Workshops for Educators

20 Oct 2001

Mineral and rocks are ...

- Key concepts in any Earth Science program
- Part of the common experience of students everywhere, even in urban settings
- Aesthetically pleasing



<http://volcano.und.nodak.edu/>

Minerals and rocks are economically important resources

Every American Born Will Need ...

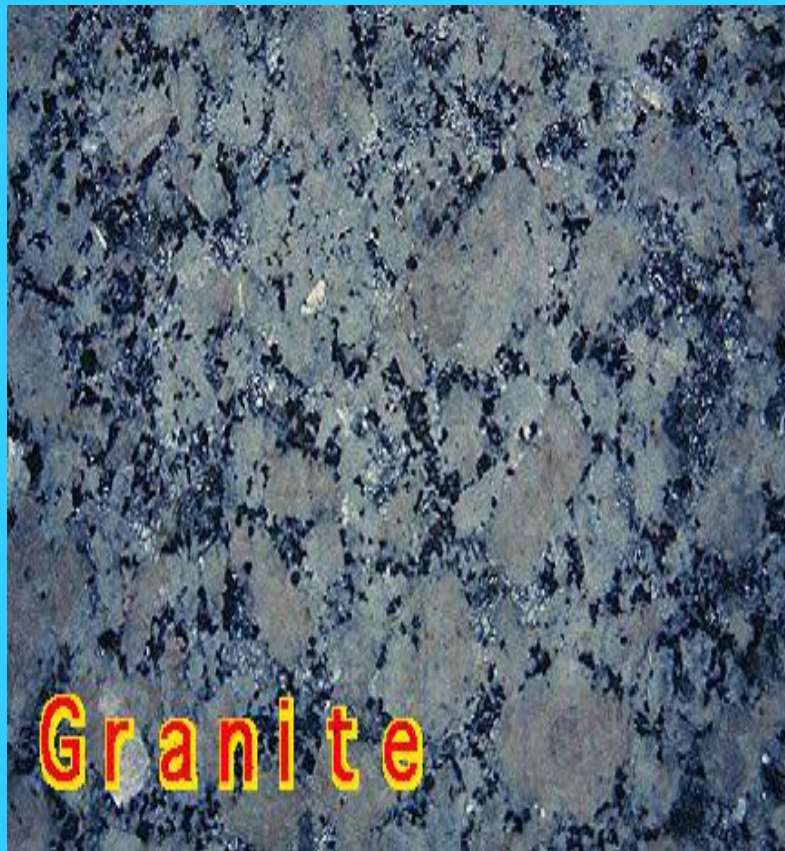


$3\frac{3}{4}$ million pounds of minerals, metals, and fuels in a lifetime

© 2000 Mineral Information Institute Golden, Colorado

<http://www.mii.org/>

Looking at some of the State Standards and Core Concepts about minerals and rocks:



New Jersey Standard 5.10

Investigate materials that make up the earth, including rocks, minerals, soils, and fossils, and how they are formed.

Example from the NYS “Physical Setting/Earth Science”

- 3.1a Minerals have physical properties determined by their chemical composition and crystal structure.
Minerals can be identified by well-defined physical and chemical properties, such as cleavage, fracture, color, density, hardness, streak, luster, crystal shape, and reaction with acid.



<http://mineral.galleries.com/minerals/>

Example from the NYS Intermediate Level Science



- 2.2g Rocks are classified according to their method of formation. The three classes of rocks are sedimentary, metamorphic, and igneous. Most rocks show characteristics that give clues to their formation conditions.

<http://volcano.und.nodak.edu/>

NYS “Earth Science Reference Tables”
now contain:

“Properties of Common Minerals”

<http://www.emsc.nysed.gov/ciai/testing/2001ESRefTable/pg16.pdf>

[Note: You may find it more convenient to go to this link by right-clicking on “Open in New Window” so you can return to this slide in the PowerPoint.]

“Scheme for Igneous Rock
Identification”

“Scheme for Sedimentary
Rock Identification”

“Scheme for Metamorphic
Rock Identification”

<http://www.emsc.nysed.gov/ciai/testing/2001ESRefTable/pg05,6,7.pdf>

These being the “rules and tools,”
what do we really want students
to be able to **know** and **do** about
minerals and rocks?

Some guiding questions:

- What makes minerals and rocks different?
- How do minerals and rocks form?
- Where are minerals and rocks found?
- Can the skills used to identify minerals and rocks be applied to other things?
- In what ways do we use these resources?

Students should have samples available to learn mineral identification

- crystal shape/form
- color
- luster
- streak
- hardness
- cleavage/fracture
- density
- acid test
- chemical composition
- special features

Some minerals they should learn include:

- Quartz
- Feldspars
- Micas
- Calcite
- Pyrite
- Galena
- Magnetite
- Limonite
- Fluorite
- Sulfur
- Olivine
- Hornblende

Some rocks they should learn to identify
by sight include:

- Granite
- Basalt
- Gabbro
- Obsidian
- Pumice
- Sandstone
- Conglomerate/
Breccia
- Limestone
- Shale
- Coal

also

- Slate
- Schist
- Gneiss
- Marble
- Quartzite

You can find some examples of “hands-on” and “on-line” investigations in the resources section for this E2C session.

You can also find examples of review activities created by E2C participants.

Here are some selected examples of the many online resources you can use to develop lessons about minerals and rocks.

- U.S. Geological Survey www.usgs.gov provides many interesting web pages concerning such topics as occurrence, quality, quantity, availability, sustainability, societal needs, technology, economy, environment and public health.

One of the best online sources for information about minerals is the Mineral Information Institute, located in Golden CO. www.mii.org

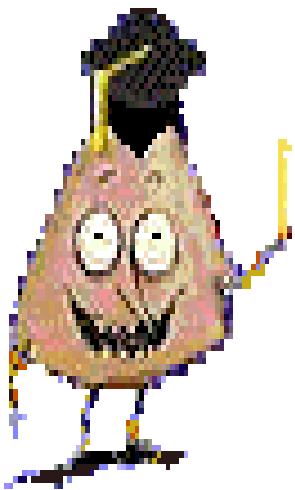
In their “Homework Help for Students,” they provide information about many of the chemical elements.

Here’s an example:

Aluminum: The most abundant metal element in the Earth's crust. Bauxite is the main source of aluminum. Aluminum is used in the United States in packaging (31%), transportation (22%), and building (19%). Guinea and Australia have 46 percent of the world's reserves. Other countries with major reserves include Brazil, Jamaica, and India.

One of the most user-friendly
online web site is
“Volcano World”

<http://volcano.und.nodak.edu/>



Rocks & Minerals Slide Show

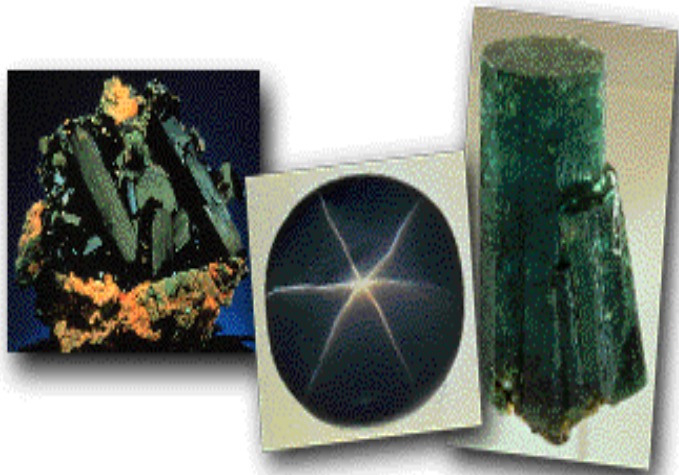
Images and descriptions of a variety of common minerals and rocks can be studied or downloaded, along with examples of teacher-created lessons.

Another good web site for images and information is:

- <http://mineral.galleries.com/minerals>



Museum web sites also provide many valuable resources



Hall of Gems and Minerals

- The American Museum of Natural History
<http://www.amnh.org/>
- Smithsonian Institutions National Museum of Natural History
<http://www.mnh.si.edu/>
- Field Museum of Natural History
<http://www.fmnh.org/>

Assessment

- Many examples of multiple-choice and other standardized test questions are available in previous “Regents Earth Science” exams available online at:

<http://www.emsc.nysed.gov/ciai/assess.html>

Examples of multiple-choice and constructed-response questions that you could use are also available in the Resources section of this Workshop Session.

Obviously, there is much that can be taught to students about rocks and minerals in K – 12 classrooms. Now, let's consider some of investigations conducted by L-DEO research scientists.

Dr. David Walker

is a Lamont petrologist who investigates the crystalline state that characterizes minerals. Last year, he explained the use of technologies to demonstrate that minerals are crystalline by the way they diffract X-rays. The variety of diffraction patterns produced is extremely useful in distinguishing different minerals from each other. His demonstration of diffraction and the theory behind it is presented in the E2C archives.

This year, Dr. Walker will share his
investigations into

Soluble Salts of the Earth:

Nuclear Waste Disposal,

Caves, and

the Evolution of the Core