

Exploring Geology on the World-Wide Web – Rocks and Minerals

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INTRODUCTION

This issue's column will discuss some world-wide web resources for learning about the science and hobby of mineralogy, the science of crystallography, and a few topics in igneous and metamorphic petrology and petrography (excluding information about volcanic rocks which were discussed in a previous column).

All of the URL addresses in this article are available as hypertext links from a web page I maintain at:

<http://hercules.geology.uiuc.edu/~schimmri/jge/geology.html>

Note that this address has changed from that given in previous columns. Connecting to the resources below from this single site will save you a substantial amount of typing. Also, due to the lead time between the writing of this article and its publication along with the volatile nature of the world-wide web, URL addresses may change periodically, and the web page will be maintained to reflect any such changes in the resources described below.

MINERAL IMAGES

The following world-wide web sites provide spectacular online images of mineral specimens from around the world.

Fluorescent Minerals

<http://www.users.interport.net/~kenx/indexa.htm>

This site features a fairly large collection of images of fluorescent minerals photographed under ultraviolet light by amateur collector Kenneth Colosky along with a bibliography of books about fluorescent minerals and information about the Fluorescent Mineral Society.

Gallery of Specimen Images

<http://www.rtd.com/~bkeller/rockshop/minimage.html>

This is a very large gallery of exquisite mineral specimen images from around the world, maintained by amateur mineral collector Bob Keller. The images are grouped by the name of the person who collected them, and the mineral's name and locality is given for each specimen.

The Image Gallery

<http://www.theimage.com/>

A commercial web site with a lot of beautiful images of minerals and gemstones along with some useful scientific information about each specimen. Several of the specimen images are available in 3-D and the site also features tutorials on creating high-quality images on the world-wide web.

Iowa Minerals

<http://samuel.igsb.uiowa.edu/htmls/browse/minerals/minerals.htm>

Information and images from the Iowa Geological Survey Bureau about minerals found within the State of Iowa.

Mineral Gallery

<http://www.galleries.com>

While this is a commercial site, it's low-key and features an excellent gallery of mineral images along with extensive information about each specimen. The minerals are grouped by name, class, or other assorted groupings including birthstones, gemstones, minerals mentioned in the Bible, ore minerals, minerals which commonly form twins, and fluorescent minerals. This site is worth a look just to examine the interesting information presented for each mineral.

Smithsonian Institution

<http://galaxy.einet.net/images/gems/gems-icons.html>

Images, with brief text descriptions of spectacular mineral and gemstone specimens from the Smithsonian's National Museum of Natural History in Washington, D.C.

Technical University of Clausthal

<http://www.immr.tu-clausthal.de/labs/mincoll.html>

A collection of mineral images from the museum in the Institute for Mineralogy and Mineral Resources at the Technical University of Clausthal (Institut für Mineralogie und Mineralische Rohstoffe, Technische Universität Clausthal) in Germany. The names and localities for each mineral specimen are given in German.

Paris School of Mines

<http://www.cri.ensmp.fr:80/mineral/>

Information and images of the mineral collections in the Museum of Mineralogy of the School of Mines (Musée de Mineralogie, Ecole des Mines) in Paris,

France. The minerals are listed by the name of the minerals, by country, and by the quality of the images (a useful grouping when you're looking for high-quality images). Many of the pages, including a database of scientific information for 3,700 different minerals, are in French.

MINERAL COLLECTING

The sites listed below feature information about the hobby of mineral collecting (rockhounding) and information about mineral collecting localities around the world.

Bob's Rock Shop

<http://www.rtd.com/~bkeller/rockshop/rockshop.html>

Despite its name, this is not a commercial web site but rather an online magazine by Bob Keller for amateur mineral collectors. If you're interested in mineral collecting, this is the place to see as it features lots of high-quality information and images.

Gemstones

<http://deepcove.com/cig/cig510.html>

A web site for the Canadian Institute of Gemmology that features images and information about gemstones and profiles of some interesting gemstone mining areas around the world.

Gold Prospecting

<http://www.klws.com/gold/g01d.html>

This web site features a large amount of information on gold and gold prospecting by amateur prospector Ken Lane.

Mine Net

<http://www.microserve.net/~doug/>

Mine Net is a web site, maintained by geological consultant Douglas Anderson, which offers a large amount of information for those interested in mining. This site features links to world-wide web resources for mining information around the world and hosts an online forum for discussions about mining and the mining industry.

Mineral Collecting

<http://web.wt.net/~mineral/>

A private web page from two amateur mineral collectors, Bill and Sandy Kelley, who present information about a different mineral collecting locality each month. The site features images of the localities, images of the minerals collected, maps, and general information.

Rock Hounding

<http://www.nb.net/~downs/downsrm.htm>

An informative site by amateur mineral collectors, Sandra and David Downs, for those interested in mineral collecting. This site features a large number of hypertext links to other rock hounding web sites and includes extensive information about many mineral collecting sites in North America.

MINERALOGY AND CRYSTALLOGRAPHY

Following are some resources for learning about the sciences of mineralogy and crystallography on the world-wide web.

Athena

<http://un2sg1.unige.ch/www/athena/mineral/mineral.html>

Athena is a very large and comprehensive mineral database maintained by Pierre Perroud of Geneva, Switzerland. Minerals can be viewed by name or class, and there is a listing of mineral varieties and synonyms. The database may also be searched for elements within the mineral's chemical formula.

Crystal Growing

<http://cc.weber.edu/~czacher/rocks.html>

This web site has a few simple recipes for growing artificial crystals in the classroom.

Crystallography

<http://www.unige.ch/crystal/w3vlc/crystal.index.html>

A large list of resources for learning about the science of crystallography (both organic and inorganic) from the World-Wide Web Virtual Library. A wide range of software for viewing crystal lattices on various platforms is listed at this site.

Explorer Mineralogy

http://unite2.tisl.ukans.edu/Browser/UNITEResource/RNatu ral_Science495.html

A listing of educational resources and lesson plans for teaching K-12 students about minerals is given, including information about growing crystals in the classroom. from the Explorer program at the University of Kansas in Lawrence. There is also a link from this page to the Explorer home page which has additional information about other topics in K-12 science and mathematics education.

Mineral Hardness

<http://www.mcli.dist.maricopa.edu/aaim/linear/L0.html>

A tutorial on Moh's scale of hardness and how to test the hardness of mineral specimens from the Maricopa Center for Learning and Instruction of the Maricopa Community Colleges in Arizona.

Mineralogical Society of America

<http://geology.smith.edu/msa/msa.html>

The official web page for this professional organization for mineralogists features information about the MSA and its publications, including *The American Mineralogist*, information about upcoming mineralogical conferences and short courses, and links to mineralogical resources, including software, on the world-wide web.

Mineralogy Resources

<http://www.udayton.edu/~geology/resminpet.html>

This is a web page listing mineralogy and petrology research resources on the world-wide web and is

maintained by professor Andrea Koziol at the University of Dayton in Ohio.

Online Courses

<http://geology.wisc.edu/online.html>

The Department of Geology and Geophysics of the University of Wisconsin at Madison has several wonderful online courses for learning about mineralogy and crystallography. There are courses entitled "Mineralogy," "Gems and Precious Stones," and "Minerals as a Public Problem" among others. The courses feature a glossary of terms, mineralogical tables, many images of mineral specimens, and crystal structure movies along with a lot of high-quality information. This web site is highly recommended.

XRD

<http://www.geosci.ipfw.indiana.edu/xrd/maindiff.html>

This is the Web Accessible Diffractometer at the Department of Geosciences at Indiana University-Purdue University in Fort Wayne, Indiana. One can learn how minerals are identified by x-ray diffraction, view diffraction patterns for various minerals, and even submit one's own sample for analysis.

IGNEOUS AND METAMORPHIC PETROLOGY

Below are a few assorted resources for learning about igneous and metamorphic petrology on the world-wide web.

Petrographic Workshop

http://pong.igpp.ucla.edu/pet/pet_intro.html

The petrographic Workshop is an interactive database for teaching students petrography at the Department of Earth and Space Sciences at the University of California at Los Angeles. Information is given for a large number of rock-forming minerals along with several images of minerals in thin section under plane-polarized light.

Petrology

<http://www.science.ubc.ca/~geol202/s/geol.html>

Information about a petrology course taught by professor Michelle Lamberson at the University of British Columbia in Vancouver, Canada. This site features high-quality information about igneous, metamorphic, and sedimentary petrology, an excellent online tutorial on optical mineralogy, and images and information about minerals in thin section.

Rob's Granite Page

<http://uts.cc.utexas.edu/~rmr/>

A light-hearted look at everything you ever wanted to know about granites from Robert Reed, a graduate student at the Department of Geological Sciences at the University of Texas in Austin.

Skarns

<http://www.wsu.edu:8080/~meinert/skarnHP.html>

Extensive information about skarns (a type of metamorphic rock) and skarn deposits from Professor

Lawrence Meinert of the Department of Geology at Washington State University in Pullman.

VLGM

<http://www.geol.uni-erlangen.de/vlgm/>

The Very-Low Grade Metamorphism web page features information for researchers interested in low-grade metamorphic processes and rocks.

DISCUSSION

While there are quite a few web sites for those interested in mineral collecting as a hobby, there are not many that present useful information suitable for teaching the science of mineralogy. This should change as instructors continue to place information about their courses on the web. The mineralogy courses at the University of Wisconsin in Madison and the petrology course at the University of British Columbia in Vancouver are excellent examples of what can be accomplished when instructors integrate the world-wide web into their course assignments.

If, however, you're simply looking for mineral images, there are several high-quality sites on the web worth visiting. Some of the images are protected by copyright and permission should be obtained before use. Of particular interest are the many images of thin sections that can be used by instructors without access to a polarizing microscope to teach students about the importance of petrography for identifying minerals in geologic research.

The databases of mineral information, such as those at Athena and the Mineral Gallery, can be used by students to look up information about specific minerals including a mineral's formula, class (sulfide, oxides, silicates, and so on), physical characteristics (specific gravity, hardness, cleavage, and so on), occurrence, and uses. Students may address questions such as "what do the minerals pyrite, galena, sphalerite, and bornite have in common?" (they're all sulfides) or "are the silicate minerals subdivided?" (according to how the silica tetrahedra are linked together). The Mineral Gallery lists ice as a mineral which might lead to a useful discussion on how the word mineral is commonly defined.

The Canadian Institute of Gemmology web site and the course on "Gems and Precious Stones" at the University of Wisconsin at Madison may be useful for teaching mineralogy by examining gemstones. Most students are familiar with gems but may not realize that gems are varieties of minerals. Rubies and sapphires, for example, are varieties of the mineral corundum which, in its common form, is mined for use as an abrasive in common sandpaper.

The Crystal Growing and Explorer Mineralogy web pages both have several recipes for growing crystals in the classroom using common chemicals. Having students grow crystals exhibiting different crystal systems (isometric, triclinic, orthorhombic, and so on) is an ideal introduction to the science of crystallography and an opportunity to talk about atomic chemistry and thermodynamics as they apply to crystal growth from solution.

Partnerships in Geoscience Education Through National Science Foundation Programs

Other excellent resources for learning about crystallography are the many software packages available over the world-wide web that allow the user to interactively view crystal structures and lattices on the computer. Programs are freely available for a wide variety of computer platforms.

The Mine Net web page has a lot of information about acid-mine drainage, an important environmental problem in many areas of the country. This may serve as a useful introduction to discussions on the mining industry versus environmental concerns, the importance of geology in preventing and remediating environmental problems, and the chemical processes involved in acid-mine drainage.

The Web Accessible Diffractometer at the Department of Geosciences of Indiana University-Purdue University in Fort Wayne is an excellent resource for teaching students about x-ray diffraction and how it's used by geologists to identify unknown mineral

specimens. While the site, unfortunately, does not include much information on the theory and technique of x-ray diffraction, it does provide online diffraction patterns for several minerals, and instructors may even submit their own powdered mineral specimens for real-time analysis. The web site also provides an idea for a lab exercise that utilizes the

Finally, the mineral-collecting web sites may be of interest to students in that they may spark an interest in mineralogy, and instructors may find that they're fortunate enough to be located near a mineral-collecting locality suitable for field trips. Bob's Rock Shop, in particular, has a great deal of information about upcoming gem and mineral shows (which may be worth visiting), collecting localities around the country, and several essays about rockhounding.

My next column will focus on resources available on the world-wide web for learning about glaciers and climate change.
