Exploring Geology on the World-Wide Web – Economic Geology

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INTRODUCTION

You might think that the state of knowledge in geology is governed solely by our curiosity about the inner workings of the Earth. But the origin of geology as a scientific study was also forged by the need for the raw materials necessarv for manufacturing and energy production, as well as the desire for precious metals and gems. The history and development of every industrialized nation is intricately tied to its supply of natural resources. Economic geology, therefore, is one of the oldest and most basic fields of geologic study.

The economic aspects of precious metals and gems, as well as water resources, were covered in previous columns, and are treated only briefly here. Previous topics of this column and their corresponding hypertext links are available from the web page listed below. All of the URL addresses in the current article will be available on the publication date of the ***next*** issue of the journal. Please visit: **http://www.geo.utexas.edu/bexton/jge/jge.htm**

PROFESSIONAL ORGANIZATIONS

Society of Economic Geologists
http://www.mines.utah.edu/~wmgg/SEG.html

Information on the activities and publications of this international organization, maintained by Erich Petersen at the University of Utah.

American Association of Petroleum Geologists
http://www.aapg.org

Home page for one of the largest professional organizations concerned with petroleum, natural gas, and mineral resources.

The Society for Mining, Metallurgy, and Exploration
http://www.smenet.org

Information on accredited minerals-related degree programs, as well as career information, publications, and workshops.

GSA Coal Geology Division
http://www.mysite.com/coalgeology/

The Geological Society of America's Coal Geology Division web site, maintained by Thomas Demchuk.

ENERGY LINKS

U.S. Department of Energy – EIA
http://www.eia.doe.gov/

Home page for the Energy Information Administration, with access to hundreds of technical publications (mostly PDF or HTML files) relating to energy production.

U.S. Department of Energy – ESTEEM
http://www.sandia.gov/ESTEEM

Educational site for the ESTEEM program (Education in Science, Technology, Energy, Engineering, and Math). Select the gas station on the clickable map to learn more about fossil fuel-related technologies.

USGS Mineral Resources Program
http://minerals.er.usgs.gov/

Current statistical information on the occurrence, quality, quantity, and availability of mineral resources in the United States.

Earth and Mineral Science Learning Resources
http://www.ems.psu.edu/Resources/Resources.html

Free multimedia lecture modules on various Earth Science topics, including "Energy and Fuels." Each subject contains numerous images, animations and models. The original set of materials was created to enhance courses offered at Penn State University. Instructions for downloading and installing these items are included.

Center for Renewable Energy and Sustainable Technology
http://solstice.crest.org/social/eerg

Comprehensive list of organizations that provide free or low-cost energy-related educational materials for students and teachers. Compiled by the National Energy Information Center.

National Energy Foundation
http://www.nefl.org/

A nonprofit educational organization providing a wide variety of energy, environmental, and mineral resource education materials for kindergarten through grade 12. Although most are for sale (materials can be purchased in single issues or in bulk), they provide a free packet of materials related to natural gas to current K-12 classroom teachers.

FOSSIL FUELS – COAL

Kentucky Geological Survey – Coal Research Section
http://www.uky.edu/KGS/coal/webcoal/coalweb.htm

General information on coal geology, with more specific references and details about the coal-bearing strata in Kentucky. This page is directed to students and teachers, as well as employees of the coal industry. Includes an online discussion forum called Coal Education Webchat.

Kentucky Coal Association
http://www.coaleducation.org/

United Mine Workers of America
http://www.access.digex.net/~miner/colminrs.html

"What Coal Miners Do" is an extensive set of pages presented by the United Mine Workers of America, a labor union that represents coal miners and other workers throughout the United States and Canada.

Information on the American Coal Industry
http://www.history.ohio-state.edu/projects/Coal/CoalContents.htm

A very nice site with interesting information and photographs of coal mining at the turn-of-the-century. Includes personal stories.

Kennecott Energy
http://www.kenergy.com/coalinfo/coalinfo.html

Commercial site with helpful articles on coal mining and processing.

Cool Science – Coal Country Interactive Game
http://www.fetc.doe.govieducation/coalcountry.html

Simple but effective interactive tutorial for elementary and possibly middle school students, produced by the U.S. Department of Interior Bureau of Mines. File size is 6 Mb, and may take thirty minutes to download.

FOSSIL FUELS – OIL AND NATURAL GAS

sci.geo.petroleum Internet Resources
http://www.slb.com/petr.dir

A most impressive list of links to petroleum related sites, grouped by various categories. Web site hosted by Schlumberger.

Australian Institute for Petroleum
http://www.aip.com.au/

The Education section of this site contains several good resources for download, including fact sheets covering various aspects and issues of the petroleum industry for secondary students, and a nice publication called The *Big Book of Oil and Gas* designed for use at the elementary level.

Shell Oil UK – Quest Game
http://www.shell.co.uMquest/index.html

Meet the Fossil Family! A fun, interactive game for younger children, with simple lessons about how fossils become fuel. Requires Shockwave Plug-in.

Oil and Gas Links
http://members.aol.com/moodygeo/oil/oillinks.htm

Another long list of links for oil and gas-related sites. Provided by Moody's World Energy Group, publishers of *Global Energy Outlook.*

MINING AND ORE DEPOSITS

National Mining Association – Mineral Education
http://www.nma.org/education.html

Online educational resources, including well-written summary articles such as "What Mining Means to Americans" and "Forty Common Minerals and Their Uses."

MineNet
http://www.microserve.net/~doug/

MineNet is a self-proclaimed "gateway to the mining industry," with a substantial list of links to government agencies, universities, societies, and other mining information sources. Maintained by Doug Anderson.

British Columbia & Yukon Chamber of Mines
http://www.bc-mining-house.com/

Prospecting in Canada is serious business! An outstanding collection of electronic exhibits and resources for mining enthusiasts, including course notes for an online "Prospecting School".

South Africa Chamber of Mines
http://www.bullion.org.za/

A comprehensive resource of mining information and production statistics, with particular emphasis on South Africa. Also includes exceptional educational resources on gold, diamonds, platinum, and coal, as well as some nice mining pictures.

Mining History Network
http://www.ex.ac.uk/~RBurt/MinHistNet/

Contains mining history bibliographies, and a comprehensive list of links to mining research and historical societies around the world. Site maintained by Roger Burt at the University of Exeter.

Uranium Information Centre
http://www.uic.com.au/index.htm

Everything you always wanted to know about uranium, and more.

WISE Uranium Project
http://antenna.nllwise/uranium/

This interesting site covers the health and environmental impacts of uranium mining and milling. Site maintained by the World Information Service on Energy, an international network of safe energy activists.

Nuclear Energy Institute
http://www.nei.org/pressrm/facts/infob28.htm

Press release on the processes involved in mining uranium and turning it into nuclear fuel.

Prospect or Suspect –
Uranium Mining in Australia
http://science.org.au/nova/002/002key.htm

Easy to read information on uranium mining from the Australian Academy of Science web site. Also includes several student activities.

Arizona Mining Association
http://www.azcu.org/mainmenu.html

Check out the section "Copper: Mine to Market," which nicely illustrates the process of copper ore production.

Virtual Copper Mine Tour
http://www.mc.maricopa.edu/academic/phy_sci/Geology/copper/

Photographs and descriptions of copper mining at the Bagdad open pit mine in western Arizona, provided by John Hernlund at Mesa Community College.

Treasure of the Sierra Madre
http://www-glg.asu.edu/~sreynolds/sierra_cobre/index.htm

Here's a fun and innovative virtual online activity in which students integrate geology, chemistry, and economics to explore for mineral deposits, namely copper. Each team is given a budget, and can purchase maps, reports, well logs, etc. Background information and all necessary student handouts are provided. Teacher resources are obtained by contacting the author, Stephen Reynolds at Arizona State University.

Skarns and Skarn Deposits
http://www.wsu.edu:8080/~meinert/skarnHP.html

Just what *is* a skarn? You'll find out here on Larry Meinert's web site!

Geology Project Homepage – University of Nevada
http://www.unr.edu/sb204/geology/geologyl.html

Online K-12 resources covering the history of copper mining, copper mining in Nevada, modern copper mining, and copper trade and industry. Also includes copper extraction experiments to perform in the classroom.

Iron Mining Association of Minnesota
http://www.taconite.org/

Interesting geologic and economic information about iron mining in the state of Minnesota.

PRECIOUS METALS AND GEMS

Gold Institute
http://www.goldinstitute.com/

A slick commercial website with lots of useful information on gold.

The Discovery of Gold in California
http://www.sfmuseum.org/hist2/gold.html

Early writings and photographs about the California Gold Rush, from an exhibit at the Museum of the City of San Francisco.

The American Experience – Gold Fever
http://www.pbs.org/wgbh/pages/amex/gold/

Teachers guide to the PBS television special "Gold Fever," which tells the personal stories of prospectors in Canada's Klondike region. A complete transcript of the program is also available.

Alberta Diamonds
http://www.albertadiamonds.com/s/DiamondLinks.asp

This commercial site has a good list of links relating to both geologic and economic aspects of the diamond industry.

Diamonds in the Northwest Territories
http://www.ssimicro.com/~graemeda/diamonds/index.html

Since the initial discovery of diamonds on the Lac de Gras property in the fall of 1991, over 100 kimberlite pipes have been discovered. Sounds like a "diamond rush" to me!

NONMETAL RESOURCES

Natural Aggregate – A Primer
http://webserver.cr.usgs.gov/frirp/nat_ag_primer/sld001.html

Interesting information about aggregate (gravel and crushed stone), a lesser-known but economically important geologic resource. Easy to follow slide-show fbrmat.

Kansas Geological Survey – Sand, Gravel, and Crushed Stone
http://www.kgs.ukans.edu/Publications/pic6/pic6_1.html

Public Information Circular on the production and use of sand, gravel, and crushed stone in Kansas. Very concise, with nice photos, facts, and figures.

Rogers Group Online – Rockology 101
http://www.rogersgroupinc.com/rockology/rockology.htm

Commercial site with good information about the production of crushed stone, asphalt, and sand.

Potash and Phosphate Institute
http:Nwww.agriculture.com/ppi/kfacts.htm
http://www.agriculture.com/ppi/pfacts.htm

Learn about these two important minerals, which are used in the production of fertilizers and soaps.

About Salt
http://www.geocities.com/-salt/

Interesting research by David Bloch into the history and importance of salt. Lots of fascinating trivia, too.

COURSE INFORMATION

University of Illinois at Urbana-Champaign
http://vci.cso.uiuc.eddcourses/GEOL105d

An exceptional supporting site for the course *Geology* 105 - *Geology of Natural Energy Resources* taught *by* C. John Mann at the University of Illinois. Includes lecture notes with graphics, review files, and a hot list to several pertinent links.

University of Michigan
http://www-personal.umich.edu/~skesler/ book4.htm

Chapter outlines and related links for the textbook *Resources, Economics and the Environment* by Stephen Kesler at the University of Michigan.

University of Minnesota
http:l/geolab.geo.umn.edu/courses/3005/

Lecture notes for the course *Geo* 3005 – *Earth Resources* taught by E. Calvin Alexander, Jr. and Feng Sheng Hu at the University of Minnesota.

Portland State University
http:/lwww.geol.pdx.edu/Courses/G455/Index.htm

Lecture notes for the course *Minerals in World Affairs* taught by Michael Cummings at Portland State University.

University of Wisconsin
http://www.geology.wisc.edu/~pbrown/
http://www.geology.wisc.edu/~macheyne/g410/home.html

These two excellent sites are the collected efforts of Philip Brown at the University of Wisconsin. The first contains a great Quicktime VR panoramic movie of the Flambeau/Ladysmith copper mine.

MISCELLANEOUS

Geothermal Education Office
http://geothermal.marin.org/

Very useful information and educational resources related to geothermal energy. Web site supported in part by the U.S. Department of Energy.

CNN Financial News – Commodities Prices
http://cnnfn.com/markets/commodities.html

Track the current prices of all your favorite commodities!

SUMMARY

I read once that every American born will use about 3.5 million pounds of minerals, metals, and fuels in a lifetime! Most of us probably take this fact for granted. If you spend a little time browsing the sites above, however, you'll become intimately aware of the significance economic geology has played in our lives. The number of links related to economic geology is immense, and it was difficult to weed out those with hidden political or philosophical agendas from those with useful educational content. You'll have to judge for yourself if I succeeded or not.

As you or your students research individual commodities, keep in mind how they were developed and used *historically*. Many of Earth's natural resources are available in limited supply, or in unique or isolated locations. The effects of natural resource exploration and extraction on local and global scales often stand in stark contrast to each other, and it would be a mistake for us to separate the technological and geological aspects of the process with their effects on society.

WEB TIP OF THE MONTH

Most web browsers allow you to **bookmark** your favorite sites, so that you can visit them over and over again with just the click of the mouse. In Netscape, for example, you can add bookmarks to a series of user-defined file folders. Many software packages are now distributed with pre-installed folders, complete with links to a variety of interesting sites. If your bookmarks become too long, however, accessing them through a lengthy list of folders and subfolders can be a bit cumbersome.

To simplify the process of accessing your bookmarks, open your bookmark file (which is saved as a .html file on your computer) from within your web browser. To do this, either type in the complete filename on the location input line, or select Open File/ Page and then Browse from the File menu. Once opened, the bookmark file will appear as a normal hyperlinked page, rather than a series of folders. At this point you have several choices. First, you might want to designate the bookmark file as your home page in the Preferences file. Second, you could save the open bookmark file as its own bookmark. Yes, this sounds redundant, but it looks quite different. Another option is to open a second browser window (if you are running Windows, you might as well make good use of the ability to do several things at once, right?) While you are surfing the Internet, have your bookmark file selected in one of the two windows, where it will serve as a convenient "index" frame.