

EARTH CONNECTIONS

Resources For Teaching Earth Science



NATURAL RESOURCES AND YOUR HOLIDAY TREE

This holiday season, the last thing on our minds is the natural resources that bring pleasure to the season. The lights, decorations, greeting cards, and wrapping paper add to the excitement of the holidays. Have you ever thought about the raw materials that bring this image together? The majority of these raw materials were furnished by the mining and petroleum industries.

Although many of us drive to the forest to cut an evergreen tree, most of them are grown on tree farms. Like all crops, they are grown with fertilizers. About half of the world's production of sulfur and more than 90 percent of the phosphates and potash go into fertilizers, of which the sapling trees receive a share. Surface and ground water resources are also needed.

Strands of tiny lights add to the list of minerals that bring holiday cheer. The wires are made of copper; the insulation and wall plugs are formed by the combination of petrochemicals with pumice, limestone, marble, vermiculite, silica, feldspar, or trona. The glass bulbs contain feldspar, silica, clay, nepheline syenite, and trona; filaments in the bulbs are made of thin conductive strips of tungsten metal, which comes from the minerals scheelite and wolframite.

The glittering ornaments are made from a variety of materials. Plastic ornaments contain petrochemicals; ceramic and glass ornaments and candlesticks are made of ingredients similar to light bulbs and also contain borates and metals such as iron, copper, and lead. The ornament hangers and tree stands also are typically a metal alloy containing iron or aluminum. Colorful paints and glazes used to decorate the ornaments are based on petrochemicals, mica, or clay and are pigmented with ingredients such as lithium from spodumene, titanium from rutile, manganese from pyrolusite, and rare-earth elements from uncommon minerals. The wrapping papers and woods that the paints are applied to commonly contain clay as an additive or filler. And what about the resources that go into the gifts, or the electricity to light the icicle lights on the eaves?

TEACHER INSTRUCTIONS: Discuss or read the information above with students. For an introduction in classification, list the holiday items 1–12 on the board and have students organize the items into various categories that the items may contain: petrochemicals; metals; non-metals; wood (or containing carbon); etc.

QUIZ

Listed below are some items often associated with a holiday tree and some raw materials that are used to make these items. In the blanks write the letters of some of the raw materials used to make each item on the tree. Raw materials may be used more than once for the Holiday Tree Items. Refer to the Key for some possible answers.

HOLIDAY TREE ITEMS

- | | |
|---------------------------|----------------------------|
| 1. Star _____ | 7. Ceramic ornaments _____ |
| 2. Tree _____ | 8. Plastic ornaments _____ |
| 3. Ornament hangers _____ | 9. Electricity _____ |
| 4. Electrical wire _____ | 10. Glass ornaments _____ |
| 5. Light bulbs _____ | 11. Paint _____ |
| 6. Wire insulation _____ | 12. Tree stand _____ |

RAW MATERIALS

- | | | | |
|-------------------------------------|----------------|----------------------|------------------------|
| a. sulfur | g. potash | n. pumice | u. rare-earth elements |
| b. trona | h. iron | o. nepheline syenite | v. tungsten |
| c. lead | i. silica | p. limestone | w. wood |
| d. mica | j. vermiculite | q. copper | x. feldspar |
| e. petrochemicals, oil, natural gas | k. clays | r. phosphates | y. coal |
| f. aluminum | l. silver | s. lithium | z. water |
| | m. manganese | t. titanium | |

ESSENTIAL ACADEMIC LEARNING REQUIREMENTS

Science 1.1 The student will use properties to identify and categorize items into mineral components.

Science 1.2 The student will be able to recognize the components and structure of holiday items and the interconnections within and among them.

GRADE LEVELS

Grades 6–10

SUBJECTS

Earth science

CONCEPTS

Ordinary items are made from minerals

SKILLS

Analyzing, classifying and categorizing, interpreting

OBJECTIVES

Students will categorize products that contain particular minerals

TIME NEEDED

30–45 minutes

THE REAL OBJECT OF EDUCATION IS TO HAVE A MAN IN THE CONDITION OF CONTINUALLY ASKING QUESTIONS.

Bishop Creighton

Lesson created by
Dr. V. T. McClellmore
and Doug Jones

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Lite Geology, Winter 1992, a
publication of the New Mexico
Bureau of Mines and Mineral
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Earth Connections No. 7

KEY

1. Star: f, l, q
2. Tree: a, g, r, w, z
3. Ornament hangers: f, h
4. Electrical wire: q
5. Light bulbs: x, i, k, o, b, v
6. Wire insulation: e, n, p, w, j, x, b
7. Ceramic ornaments: x, i, k, o, b, h, q, c
8. Plastic ornaments: e
9. Electricity: e, y, z
10. Glass ornaments: x, i, o, b, h, q, c
11. Paint: e, d, k, s, t, m, u
12. Tree stand: h, f

EARTH CONNECTIONS GOES SOLO

Beginning with the next issue, Earth Connections will be online as a separate publication. A new issue will be available each March, June, September, and December.

WEB SITES FOR INFORMATION ABOUT MINERALS

The Mineral Gallery [<http://mineral.galleries.com/minerals/byname.htm>]*—A growing collection of mineral descriptions, images, and specimens. Descriptions include searchable mineralogical data, plus other information of interest to students and rockhounds.*

Mineralogy Database [<http://webmineral.com/>]*—Contains information on more than 4,255 mineral species.*

Mineral Information Institute [<http://www.mii.org/>]*—Educational materials about mining and the role minerals play in our everyday lives, including free downloadable teachers' packets.*

The Franklin Institute Online Hotlist, Earth Science Resources [<http://www.fi.edu/tfi/hotlists/geology.html>]*—Links to web pages on geologic topics, including rocks and minerals.*

Washington Geology [<http://www.wa.gov/dnr/htdocs/ger/washgeol.htm>]*—The first issue of each year is the "mining issue," discussing the mining industry in Washington during the previous year.*

Women in Mining [<http://www.womeninmining.org/>]*—Lessons, games, and activities to teach kids about minerals and mining.*

National Mining Association [http://www.nma.org/about_us/publications/pub_minerals_uses.asp]*—40 Common Minerals*

and their Uses is available as a PDF file online. Several other booklets are available free or for a small fee.

Northwest Mining Association [<http://www.nwma.org/education.asp>]*—Information on the uses and value of minerals and mining to our society and the industry's commitment to environmental responsibility. *Mighty Minerals* is a teaching unit for the 4th grade classroom focusing on some of the basic characteristics of metallic and nonmetallic minerals. Lesson plans focus on specific facts, applications, and current issues related to each mineral and can be downloaded for classroom use.*

National Science Teachers Association [<http://www.nsta.org/conventions/>]*—At area conventions of the National Science Teachers Association, the Society for Mining, Metallurgy, and Exploration, in cooperation with other organizations involved in the minerals industry, hosts exhibits that distribute free mineral samples and classroom teaching aids to approximately 1500 teachers at each convention.*

USGS Mineral Surveys [<http://minerals.usgs.gov/minerals/>]*—Production information and uses of each mineral mined in the U.S.—statistics on the worldwide supply, demand, and flow of minerals and materials essential to the U.S. economy, national security, and the protection of the environment. (Adult level: Teachers will need to show students the charts that indicate the uses to which each mineral is made.)*

MORE RESOURCES FOR TEACHERS

GEOLOGY OF NATIONAL PARKS

National Parks are not only beautiful places to view wildlife and magnificent panoramas, they also contain some of the most spectacular geologic features in our country. The National Park Service has developed a website where teachers can explore the geology of several national parks where geologic features are especially well developed. Go to <http://www2.nature.nps.gov/grd/edu/>.

The website features a variety of resources. For example, one link is devoted to videos of parks, such as Mount Rainier, Grand Canyon, and Yellowstone. Another link contains a list and descriptions of recent books on the geology of national parks. Elsewhere, teachers can find PowerPoint presentations describing various geologic concepts and curricula on paleontology and the evolution of life on Earth.

Many exercises are rated by grade level; teachers can quickly determine if the curriculum is appropriate for their students. Also, there are some hands-on activities that illustrate geologic processes clearly and cheaply.

from NDGS Newsletter, vol. 29, no. 1, p. 19

BECOME A VIRTUAL SEISMOLOGIST

Whether you are a student, or someone who feels seismology-deprived, you will want to check out California State University's virtual courseware "Earthquake" at <http://www.sciencecourseware.com/eec/Earthquake/>. Funded by the National Science Foundation (NSF), "Earthquake" features virtual labs on using seismic waves to locate an earthquake's epicenter and determine its Richter magnitude. You will use maps and seismograms to record observations in a scientific journal. At the end, you take a quiz, and if you successfully complete it, you will receive a Certificate of Completion as a Virtual Seismologist. The virtual experience is a fun and educational way to pass an afternoon.

from Geotimes, August 2002, p. 38

FREE GUIDES TO GEOSCIENCE CAREERS/EDUCATION

The Guide to Geoscience Careers and Employers is available online at <http://guide.agiweb.org/employer/index.html>. The Guide is an up-to-date publication containing information on all aspects of geoscience employment opportunities as well as listings of major geoscience employers.

The Guide to Geoscience Departments can be found at <http://guide.agiweb.org/ggd/index.html>. It presents detailed information on almost 200 geoscience departments in the U.S. and Canada, both public and private.

ATLAS OF EARTH MYSTERIES

Edited by Philip Whitfield, this Rand McNally publication is a "vivid reminder of natural powers in all their amazing diversity....proffers new theories to explain the age-old enigmas....reveals that many of the awkward facts, unidentifiable happenings, and incomprehensible events that haunt our daily lives and form a web of unexplained phenomenon are peculiar to our planet. This fascinating, beautifully illustrated compendium focuses on the most bizarre and wondrous mysteries of planet Earth. Each is admirably furnished with an in-depth, broad-based and multidisciplinary scrutiny involving geography, geology, meteorology, biology, and other natural sciences." [quotes from book sleeve]

GUIDE TO NISQUALLY NATIONAL WILDLIFE REFUGE

The Nisqually National Wildlife Refuge (Olympia, Wash.) has a new *Educator's Guide to Nisqually National Wildlife Refuge* available for loan to teachers. Contact Jennifer Taylor, environmental education coordinator, at (360) 753-9467.

PROJECT ASTRO/SEATTLE

Project ASTRO pairs grade 3–12 teachers with volunteer amateur and professional astronomers and earth scientists with the goal of building long-lasting partnerships to improve science education in schools. Over the course of the school year, each scientist visits his/her class at least five times, developing a relationship with the students, assisting the teacher, and/or leading astronomy/earth science activities. These activities may include hands-on science, question-and-answer sessions, evening star parties for students and their families, or large class projects such as building a telescope or a school sundial. There are currently 59 partnerships (involving approximately 2650 students) in schools throughout the Puget Sound region.

Although based at the University of Washington, Project ASTRO is substantially aided by its consortium, with representatives from the Pacific Science Center, the Museum of Flight, the UW Astronomy Department, the Seattle Astronomical Society, the Washington State NASA Space Grant Office, local school districts, community colleges, and teachers.

Project ASTRO was founded in 1993 by the Astronomical Society of the Pacific (ASP) in San Francisco with a grant from the National Science Foundation (NSF). In 1997, UW Astronomy Professor Woodruff Sullivan received a NSF grant to start Project ASTRO in Seattle. There are ten Project ASTRO sites across the country.

Teacher and scientist partners attend a mandatory two-day professional development training workshop, receive a 700-page curriculum guide and classroom resource materials for hands-on activities, develop strategies for working together in and out of the classroom, network with fellow teachers/astronomers, and obtain information about other learning opportunities in the region.

Project ASTRO also hosts educational events throughout the school year, including Museum of Flight workshops, Pacific Science Center events, University of Washington events, Astronomical Society Star Parties, and a spring networking and evaluation workshop. Additional project support includes the ASTROGRAM newsletter (quarterly) and an e-mail discussion listserv (subscribed newsgroup).

Applications for the 2003/04 school year are available starting February 28. Applications are due May 1, 2003. Applicants will be notified of selection by about June 1, 2003. (Selection of partners is based on having a partner astronomer available in your region and teacher enthusiasm for hands-on science.) For more information, go to the UW website at <http://www.astro.washington.edu/projAstroBio/>.

To request an application, contact Linda Khandro at linkak@astro.washington.edu or (206) 543-9541. Specify if you would like a teacher or science partner application.

For general information on Project Astro nationwide, visit their website at <http://www.astrosociety.org/>.

NASA EDUCATOR RESOURCE CENTER

Educators will find various materials to support K–12 science and mathematics teaching at the NASA Educator Resource Center in Johnson Hall, Room 401, on the University of Washington campus in Seattle. These include curriculum packets, education briefs, posters, lithographs, bookmarks, videotapes, slides, and books. Some materials are free (curriculum packets, poster, lithographs, bookmarks) while others can be borrowed (books, slides) for a one-month period or copied (videotapes). Videotape copies are \$5 each. Free materials that are mailed will be charged a fee for postage only. Educators are encouraged to visit the ERC personally to see what is available. (The center is open Monday–Friday, 9:00 am–5:00 pm.) If that is not possible, contact Dr. Julie Lutz (206) 543-0214 or e-mail to nasaerc@u.washington.edu to discuss specific needs.

EARTH SCIENCE WEEK

Although Earth Science week (October 13–19, 2002) has come and gone, the website <http://www.earthsciweek.org/> still has plenty of geoscience activities and free materials.

The Division of Geology and Earth Resources Earth Science Week website is <http://www.wa.gov/dnr/htdocs/ger/esweek/index.html>.

AMERICAN GEOLOGICAL INSTITUTE

AGI Professional Development includes curriculum leadership institutes, teacher enhancement workshops, and web-based teacher enhancement. Curriculum materials are available for all grade levels. Summer workshops are held in the eastern U.S. See <http://www.agiweb.org> for member societies and general information, and for earth science resources, see <http://www.earthscienceworld.org/>.

EARTH SYSTEM SCIENCE EDUCATION ALLIANCE

ESSEA has created a national professional development program aimed at improving the knowledge, skills, and resources of earth systems science educators. This professional development program offers state-of-the-art, online courses to promote understanding of Earth Systems Science, to encourage communication and cooperation among teachers, and to facilitate the use of exceptional classroom materials. Earn graduate or continuing-education credit. The three available ESS courses (for teachers of grades K–4, 5–8, 9–12) use an innovative instructional design model. Delivered over the Internet, they feature participant-centered, knowledge-building virtual communities, the optimal method for teaching and learning. For more information, go to http://www.tsge.utexas.edu/lists/teachers/links/ii/42/link_01.html. ■