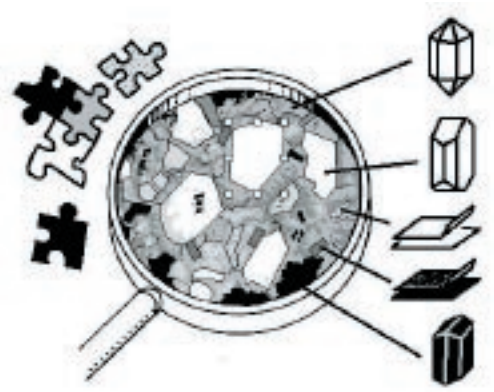
# I Struck Gold(?) at the Library



**Is that gold in the floors and stairs of the library?** Walking across the polished stone floor of the W.T. Young Library at the University of Kentucky in Lexington, you may catch the shiny glint of gold. Don't get too excited: *it's not gold.* This is the mineral *pyrite.* Pyrite has a gold to brassy color and a metallic luster (shine or reflection), which makes it look like gold. In fact, pyrite is known as "fool's gold." Pyrite and gold are both minerals. Minerals are naturally occurring inorganic (not living) solids that have a distinctive chemical structure and are characterized by distinctive physical properties such as crystal structure, hardness, luster (shine or reflection), cleavage (fracture or the way they break), streak, and specific gravity (relative density). Pyrite ($FeS_2$) is always composed of the elements iron (Fe) and sulfur (S). It forms cube-shaped crystals (isometric structure), has a hardness of 2.5 (you could scratch it with a penny but not a fingernail), has a specific gravity of 5 (which means it is five times heavier than water), and has a brown to black streak when scratched across a ceramic streak plate. When you streak-test pyrite you may be able to smell the sulfur, which will smell like rotten eggs, but remember: you don't want to scratch or test the minerals in the library floor! Trust us, it's pyrite, not gold. Real *gold* is composed of the element gold (Au). Gold has a similar color, hardness (2.5), and luster as pyrite, but it is much more malleable (bendable), and is much denser, with a specific gravity of 19.3. Gold also won't smell like rotten eggs when tested for streak because it doesn't contain any sulfur. The unusual shapes in which the pyrite occurs in the library floor are fossils in the limestone. In some fossils you also may see sparkling white crystals. If you examine these crystals with a magnifying glass, you can see that some crystals have six sides capped by small pyramids. This is a characteristic crystal structure of the mineral *quartz.*

**How are rocks and minerals different?** Rocks are naturally occurring inorganic solids composed of one or more minerals. They do not have a distinctive chemical structure as minerals do, and have variable physical properties. Rocks are first characterized based on the manner in which they form: sedimentary, metamorphic, and igneous. For example, limestone is a sedimentary rock formed from very fine carbonate ($CaCO_3$) sediment and natural mineral cements. The composition of the cements (for example, the minerals pyrite and quartz seen in the library fossil fillings) does not change the characterization of the rock as a limestone. Granite is another type of rock. Granite is commonly used as an ornamental stone for floors and walls in offices and public buildings, countertops in homes, even headstones at cemeteries. At the W.T. Young Library, the sidewalks immediately outside the library entrances are made of granite, as are some tables. Granite is an igneous rock. Igneous rocks are formed from molten material that cools into a solid rock inside the earth or at the earth's surface. The granite at the library is speckled clear, white, gray, and black. Each of the colors represents a different mineral, which, in combination, form the rock granite. Can you see how the different minerals interlock like pieces of a puzzle to form the rock? Quartz is the most common mineral in granite and is clear to blue-gray or white. The larger, black specks are the mineral horneblende. Small, thin, sheet-like, reflective minerals are different types of micas. Silver micas are called muscovite. Brown-black micas are biotite. The feldspars in the library limestone are white, orthoclase feldspars. In other granites, feldspars with a slightly different composition may be pink. Different feldspars and micas can change the appearance and composition of granite, but the rock is still called granite.



**To learn about the rocks and minerals, visit displays at the Kentucky Geological Survey and Department of Geological Sciences at the University of Kentucky. Also see "Rocks and Minerals of Kentucky" at www.uky.edu/kgs or the book by Warren H. Anderson (1994, Kentucky Geological Survey, ser. 11, Special Publication 20, 82 p.).**

Handout by Stephen F. Greb and Warren H. Anderson (Kentucky Geological Survey) and Kathy Trundle (Kentucky Department of Education, University of Kentucky). Created in 1999. Modified and posted on the KGS Web site (www.uky.edu/kgs) in 2005.

# Useful Rocks and Minerals at the Library

The W.T. Young Library is constructed from rocks and minerals, even parts you don't see or wouldn't think about. Some of these rocks and minerals were even used in the construction of your home!

**Rocks and sediments:**
*Clay* is used to make bricks and as coatings on pages in some of the books in the library.
*Coal* is burned to make electricity for the library's lighting, computers, and televisions.
*Granite* is used as ornamental stone in sidewalks at the entrances to the library.
*Limestone* is used for aggregate and cement in the library foundation and sidewalks; as an ornamental stone in floors, stairs, and walls of the library; and as an ingredient of asphalt in the library's driveways and parking lots.
*Sand* is an ingredient of cement and asphalt. Quartz-rich sands are used to make window glass and mirrors.
*Shale (claystone)* is used to make bricks.

**Minerals:**
*Barite* is used as a whitener in pages of some of the books in the library.
*Bauxite* is the mineral ore that *aluminum* is extracted from. Aluminum is used in window frames, some structural materials, some tables and chairs, and the computers throughout the library.
*Calcite* is the natural cement in the ornamental limestone in the floors and stairs of the library.
*Cassiterite* is the mineral we get *tin* from. Tin is used in solder for construction and in enamel for paints.
*Chert (a variety of quartz)* is one of the types of pebbles in the concrete sidewalks leading to the library.
*Copper* is used for electrical cables and wiring in light switches and bulbs, computers, phones, televisions, video-CD and DVD machines, batteries for electrical devices, as well as in some plumbing. Copper is also mixed with zinc to make brass, and iron to make bronze, which are used in metal castings, lamp fixtures, and other construction materials in the library.

*Feldspar* is in the granite in the library. It also is used in making glass, ceramics, enamel, and paper.
*Fluorite* is used in steel-making, and to make hydrofluoric acid, which is used to make ceramics like the tiles in the bathrooms. Beautiful examples of fluorite can be seen at the Kentucky Geological Survey near the library.
*Galena* is a source of *lead.* Lead is used in picture tubes in television sets in the audio-visual room, and in glass-making.
*Garneirite, pentlandite,* and *laterite* soils are sources of *nickel.* Nickel is used in computers and light bulbs and in batteries for some electrical devices.
*Gold* is used for circuit boards in computers.
*Gypsum* is used for wall board, plaster, and filler for pages in books.
*Halite* is the mineral we get *salt* from. Salt is used in the cafeteria, but also in fire extinguishers.
*Hematite* is an ore from which *iron* is extracted. Iron is used to make railings, benches, doors, grates, and in steel supports, bolts, washers, nails, and screws used in construction of the library.

*Kaolinite* is a clay mineral used to make ceramics (like the toilets), as well as a coating on paper in some of the magazines and books in the library.
*Magnetite* is an ore from which *iron* is extracted. Iron is used to make railings, benches, doors, grates, and in steel supports, bolts, washers, nails, and screws used in construction of the library.
*Pyrite* is a mineral in the limestone floors of the library. It is also a source of the element *sulfur,* which is used to make *sulfuric acids.* Sulfuric acids are used to make many manufactured goods and in steel-making.
*Platinum* minerals are used in electric circuits.
*Quartz* is a mineral in the limestone floors of the library. It is also used in electronic equipment such as clocks.
*Silver* is used to make mirrors in the bathrooms and is a component of many electrical devices.
*Sphalerite* is the ore from which *zinc* is extracted. Zinc is used as a protective coating on steel beams, in water and gas valves, and in light bulbs.
*Spodumene* is a mineral source for the element *lithium,* which is used in batteries for phones, smoke detectors, and other electrical devices, as well as for making glass and ceramics.
*Stibnite* is one of the mineral ores that *antimony* is extracted from. Antimony is used in solder to bind metals together, and in sheet metal and pipes.
*Scheelite* is a source of *tungsten.* Tungsten is used in light-bulb filaments and steel-making.
*Wulfenite* is a source of *molybdenum,* used in steel-making and as a filament support in light bulbs.

*Underlined* sediments, rocks, and minerals can be found in Kentucky.

Mineral uses are based on information from the National Mining Association (www.nma.org) and Mineral Information Institute (www.mii.org). For information on Kentucky minerals, see the KGS Web site (www.uky.edu/kgs).

**Connections to Kentucky Program of Studies and Core Content for Assessment**
Grades Primary–4, Earth/Space Science, Properties of Earth Materials. Grades 5–7, Earth/Space Science, Structure of the Earth System—Lithosphere, Hydrosphere, Atmosphere. Grade 8, Earth/Space Science.