**Information on Rocks and Minerals in the Washington School Collection of Minerals and Rocks (Brown Boxes)**

***Minerals***

1. **Microcline or Orthoclase**

Orthoclase is a [feldspar mineral](http://geology.com/minerals/feldspar.shtml). It is one of the most abundant rock-forming [minerals](http://geology.com/minerals/) of the continental crust. Orthoclase is most widely known as the pink feldspar found in many [granites](http://geology.com/rocks/granite.shtml).

Orthoclase has several commercial uses. It is a raw material used in the production of glass, ceramic tile, porcelain, dinnerware, bathroom fixtures, and other ceramics. It is used as an abrasive in scouring powders and polishing compounds. It is also cut as a [gemstone](http://geology.com/gemstones/).

1. **Plagioclase or Feldspar**

Feldspar is the name of a large group of rock-forming silicate [minerals](http://geology.com/minerals/) that make up over 50% of Earth’s crust. They are found in [igneous](http://geology.com/rocks/igneous-rocks.shtml), [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), and [sedimentary](http://geology.com/rocks/sedimentary-rocks.shtml) rocks in all parts of the world. Feldspar minerals have very similar structures, chemical compositions, and physical properties. As igneous rocks are weathered and metamorphosed, their feldspar minerals become components of sediments, sedimentary rocks, and metamorphic rocks.

Feldspar minerals have many uses in industry. They are used to manufacture a wide variety of glass and ceramic products. They are also widely used as fillers in paints, plastics and rubber. Several popular [gemstones](http://geology.com/gemstones/) are feldspar minerals. These include moonstone, [sunstone](http://geology.com/gemstones/sunstone/), [labradorite](http://geology.com/gemstones/labradorite/), [amazonite](http://geology.com/gemstones/amazonite/) and [spectrolite](http://geology.com/gemstones/labradorite/).

*Minerals, continued*

1. **Quartz Crystal or Pure Crystalline Silica**

Quartz is a chemical compound consisting of one part silicon and two parts oxygen. It is silicon dioxide (SiO2). It is the most abundant [mineral](http://geology.com/minerals/) found at Earth's surface, and its unique properties make it one of the most useful natural substances. Quartz crystal is transparent and has a fracture that produces curved surfaces.

One of the most amazing properties of quartz is the ability of its crystals to vibrate at a precise frequencies. These frequencies are so precise that quartz crystals can be used to make extremely accurate time-keeping instruments and equipment that can transmit radio and television signals with precise and stable frequencies.

The tiny devices used for these purposes are known as “crystal oscillators.” The first crystal oscillators were developed in the 1920s, and just twenty years later, tens of millions of them were needed each year to supply the military during World War II. Today, billions of quartz crystals are used to make oscillators for watches, clocks, radios, televisions, electronic games, computers, cell phones, electronic meters, and GPS equipment.

A wide variety of uses have also been developed for optical-grade quartz crystals. They are used to make specialized lenses, windows and filters used in lasers, microscopes, telescopes, electronic sensors, and scientific instruments. The material of beach sand is now the material of the world’s most advanced electronic devices.

1. **Milky Quartz**

Quartz is a chemical compound consisting of one part silicon and two parts oxygen. It is silicon dioxide (SiO2). It is the most abundant [mineral](http://geology.com/minerals/) found at Earth's surface, and its unique properties make it one of the most useful natural substances. Milky Quartz is a milky white translucent to opaque variety of crystalline quartz of somewhat greasy luster. It has profuse minute cavities containing water or liquid carbon dioxide. This mineral occurs commonly in igneous, metamorphic, and sedimentary rocks, and can be frequently found in mineral veins with metal ores. Famous finds include a crystal weighing 13 metric tons from Siberia. Milky quartz is common in the Alps. It is often used in jewelry making.

*Minerals, continued*

1. **Muscovite**

Muscovite is the most common mineral of the mica family. It is an important rock-forming mineral present in [igneous](http://geology.com/rocks/igneous-rocks.shtml), [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), and [sedimentary rocks](http://geology.com/rocks/sedimentary-rocks.shtml). Like other micas, it readily cleaves into thin transparent sheets. Muscovite sheets have a pearly to vitreous luster on their surface. If they are held up to the light, they are transparent and nearly colorless, but most have a slight brown, yellow, green, or rose-color tint.

The ability of muscovite to split into thin transparent sheets - sometimes up to several feet across - gave it an early use as window panes. Sheet muscovite is an excellent insulator, and that makes it suitable for manufacturing specialized parts for electrical equipment. Scrap, flake, and ground muscovite are used as fillers and extenders in a variety of paints, surface treatments, and manufactured products. The pearlescent luster of muscovite makes it an important ingredient that adds "glitter" to paints, ceramic glazes, and cosmetics.

1. **Hornblende or Amphibole**

Hornblende is a field and classroom name used for a group of dark-colored amphibole minerals found in many types of [igneous](http://geology.com/rocks/igneous-rocks.shtml) and [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml) rocks. The mineral hornblende has very few uses. Its primary use might be as a mineral specimen. However, hornblende is the most abundant mineral in a rock known as [amphibolite](http://geology.com/rocks/amphibolite.shtml) which has a large number of uses. It is crushed and used for highway construction and as railroad ballast. It is cut for use as dimension stone. The highest quality pieces are cut, polished, and sold under the name "black granite" for use as building facing, floor tiles, countertops, and other architectural uses.

1. **Calcite or Carbonate of Lime**

Calcite is a rock-forming mineral with a chemical formula of CaCO3. It is extremely common and found throughout the world in [sedimentary](http://geology.com/rocks/sedimentary-rocks.shtml), [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), and [igneous](http://geology.com/rocks/igneous-rocks.shtml) rocks. Some geologists consider it to be a "ubiquitous mineral" - one that is found everywhere.

Calcite is the principal constituent of [limestone](http://geology.com/rocks/limestone.shtml) and [marble](http://geology.com/rocks/marble.shtml). These rocks are extremely common and make up a significant portion of Earth's crust. They serve as one of the largest carbon repositories on our planet.

The properties of calcite make it one of the most widely used minerals. It is used as a construction material, abrasive, agricultural soil treatment, construction aggregate, pigment, pharmaceutical and more. It has more uses than almost any other mineral.

*Minerals, continued*

1. **Garnet**

Garnet is the name used for a large group of rock-forming [minerals](http://geology.com/minerals/). These minerals share a common crystal structure and are found throughout the world in [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), [igneous](http://geology.com/rocks/igneous-rocks.shtml), and [sedimentary rocks](http://geology.com/rocks/sedimentary-rocks.shtml). In the United States, the major industrial uses of garnet are waterjet cutting (35%), abrasive blasting media (30%), water filtration granules (20%), and abrasive powders (10%). Clear varieties are used as semi-precious gem stones.

*Ores of Metals*

1. **Lead Ore (Galena)**

Galena is a lead sulfide mineral with a chemical composition of PbS. It is the world's primary ore of [lead](http://geology.com/usgs/lead/) and is mined from a large number of deposits in many countries. Galena is very easy to identify. Freshly broken pieces exhibit perfect cleavage in three directions that intersect at 90 degrees. It has a distinct silver color and a bright metallic luster. Galena is a very important mineral because it serves as an ore for most of the world's lead production. It is also a significant ore of silver. The number one use of lead today is in the lead-acid batteries that are used to start automobiles.

1. **Zinc Ore or Sphalerite**

Sphalerite is a zinc sulfide [mineral](http://geology.com/minerals/). It is found in [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), [igneous](http://geology.com/rocks/igneous-rocks.shtml), and [sedimentary rocks](http://geology.com/rocks/sedimentary-rocks.shtml) in many parts of the world. Sphalerite is the most commonly encountered zinc mineral and the world's most important ore of [zinc](http://geology.com/usgs/uses-of-zinc/). One of the most distinctive properties of sphalerite is its cleavage. It has six directions of perfect cleavage with faces that exhibit a resinous to adamantine luster. Specimens that display this distinctive cleavage are easy to identify.

*Ores of Metals, continued*

1. **Copper Ore or Chalcopyrite**

Chalcopyrite is a brass-yellow [mineral](http://geology.com/minerals/). It occurs in most sulfide mineral deposits throughout the world and has been the most important ore of [copper](http://geology.com/minerals/copper.shtml) for thousands of years.

The surface of chalcopyrite loses its metallic luster and brass-yellow color upon weathering. It tarnishes to a dull, gray-green color, but in the presence of acids the tarnish can develop a red to blue to purple iridescence.

Pyrite is hard enough that it cannot be scratched with a nail, but chalcopyrite is easily scratched with a nail.

The name "fool's gold" is most often associated with pyrite because it is more common and more often confused with gold. Chalcopyrite is also confused with gold, so the name "fool's gold" is also applied and appropriate.

1. **Iron Ore (Hematite)**

Hematite is one of the most abundant [minerals](http://geology.com/minerals/) on Earth's surface and in the shallow crust. It is an iron oxide. It is a common rock-forming mineral found in [sedimentary](http://geology.com/rocks/sedimentary-rocks.shtml), [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), and [igneous](http://geology.com/rocks/igneous-rocks.shtml) rocks at locations throughout the world. Hematite is an important [ore of iron](http://geology.com/rocks/iron-ore.shtml). Even though hematite has a highly variable appearance, it always produces a reddish streak.

1. **Iron Ore (Magnetite)**

Magnetite is a very common iron oxide [mineral](http://geology.com/minerals/) that is found in [igneous](http://geology.com/rocks/igneous-rocks.shtml), [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), and [sedimentary](http://geology.com/rocks/sedimentary-rocks.shtml) [rocks](http://geology.com/rocks/). It is the most commonly mined ore of iron. It is also the [mineral](http://geology.com/minerals/what-is-a-mineral.shtml) with the highest iron content (72.4%).

Magnetite is very easy to identify. It is one of just a few minerals that are attracted to a common magnet. It is a black, opaque, submetallic to metallic mineral. It is the most strongly magnetic mineral found in nature.

*Ores of Metals, continued*

1. **Iron Ore (Limonite)**

Before modern mineral analysis, the name "limonite" was given to many of the yellowish to yellowish brown iron oxides produced during the weathering of iron-bearing rocks or deposited as bog, lake, and shallow marine sediments.

Researchers who studied "limonite" discovered that it is amorphous and has a variable composition. It often contains significant amounts of iron oxide [minerals](http://geology.com/minerals/) such as goethite and [hematite](http://geology.com/minerals/hematite.shtml). This research revealed that the material called "limonite" does not meet the [definition of a mineral](http://geology.com/minerals/what-is-a-mineral.shtml). Instead, limonite is a [mineraloid](http://geology.com/minerals/mineraloids/) composed mainly of hydrous iron oxides that are often found in intimate associations with iron minerals.

Today the word "limonite" is used as a field and classroom term for these materials because they cannot be identified in hand specimens and their identity is unknown without laboratory testing. Limonite is one of the most important pigments for creating paints in the yellow to brown color range known as ocher.

1. **Aluminum Ore (Bauxite)**

Bauxite is not a [mineral](http://geology.com/minerals/what-is-a-mineral.shtml). It is a [rock](http://geology.com/rocks/) formed from a laterite soil that has been severely leached of silica and other soluble materials in a wet tropical or subtropical climate. It is the primary ore of aluminum. Almost all of the aluminum that has ever been produced has been extracted from bauxite. Most of the world’s mined bauxite comes from Australia.

*Useful Minerals*

1. **Pyrite**

Pyrite is a brass-yellow mineral with a bright metallic luster. It has a chemical composition of iron disulfide and is the most common sulfide mineral. It forms at high and low temperatures and occurs, usually in small quantities, in [igneous](http://geology.com/rocks/igneous-rocks.shtml), [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml), and [sedimentary rocks](http://geology.com/rocks/sedimentary-rocks.shtml) worldwide.

The name "pyrite" is after the Greek "pyr" meaning "fire." This name was given because pyrite can be used to create the sparks needed for starting a fire if it is struck against metal or another hard material. Pieces of pyrite have also been used as a spark-producing material in flintlock firearms.

Pyrite has a nickname that has become famous - "Fool's Gold." The mineral's gold color, metallic luster, and high specific gravity often cause it to be mistaken for gold by inexperienced prospectors. However, pyrite is often associated with [gold](http://geology.com/minerals/gold.shtml). The two minerals often form together, and in some deposits pyrite contains enough included [gold](http://geology.com/usgs/gold/) to warrant mining.

1. **Halite**

Halite is the mineral name for the substance that everyone knows as "salt." Its chemical name is sodium chloride, and a rock composed primarily of halite is known as "rock salt. Halite is mainly a sedimentary mineral that usually forms in arid climates where ocean water evaporates. However, many inland lakes such as the Great Salt Lake of North America and the Dead Sea between Jordan and Israel are also locations where halite is forming today. Over geologic time, several enormous salt deposits have been formed when repeated episodes of seawater evaporation occurred in restricted basins. Some of these deposits are thousands of feet thick. When buried deeply they can erupt to form [salt domes](http://geology.com/stories/13/salt-domes/).

Salt has many uses. Most of the salt produced is crushed and used in the winter on roads to control the accumulation of snow and ice. Significant amounts of salt are also used by the chemical industry. Salt is an essential nutrient for humans and most animals, and it is also a favorite seasoning for many types of food.

*Useful Minerals, continued*

1. **Graphite**

Graphite is a naturally-occurring form of crystalline carbon. It is a native element mineral found in [metamorphic](http://geology.com/rocks/metamorphic-rocks.shtml) and [igneous rocks](http://geology.com/rocks/igneous-rocks.shtml). Graphite is a [mineral](http://geology.com/minerals/) of extremes. It is extremely soft, cleaves with very light pressure, and has a very low specific gravity. In contrast, it is extremely resistant to heat and nearly inert in contact with almost any other material. These extreme properties give it a wide range of uses in metallurgy and manufacturing. Graphite and [diamond](http://geology.com/minerals/diamond.shtml) are the two mineral forms of carbon. Diamond forms in the mantle under extreme heat and pressure. Most graphite found near Earth's surface was formed within the crust at lower temperatures and pressures. Graphite and diamond share the same composition but have very different structures. Graphite is commonly used as the “lead” in pencils

1. **Talc**

Most people are familiar with the mineral talc. It can be crushed into a white powder that is widely known as "talcum powder." This powder has the ability to absorb moisture, absorb oils, absorb odor, serve as a lubricant, and produce an astringent effect with human skin. These properties make talcum powder an important ingredient in many baby powders, foot powders, first aid powders, and a variety of cosmetics. Talc is usually green, white, gray, brown, or colorless. It is a translucent mineral with a pearly luster. It is the softest known mineral and is assigned a hardness of 1 on the [Mohs Hardness scale](http://geology.com/minerals/mohs-hardness-scale.shtml).

1. **Gypsum**

Gypsum is an evaporite mineral most commonly found in layered sedimentary deposits. Gypsum is the most common sulfate [mineral](http://geology.com/minerals/). Gypsum is used in the manufacture of wallboard, cement, plaster of Paris, and portland cement.

*Igneous Rocks*

1. **Obsidian**

Obsidian is an [igneous rock](http://geology.com/rocks/igneous-rocks.shtml) that forms when molten rock material cools so rapidly that atoms are unable to arrange themselves into a crystalline structure. It is an amorphous material known as a "[mineraloid](http://geology.com/minerals/mineraloids/)." The result is a volcanic glass with a smooth uniform texture that breaks with a conchoidal fracture. Obsidian is confined to areas of geologically recent volcanic activity Black is the most common color of obsidian. However, it can also be brown, tan, or green.

1. **Rhyolite**

Rhyolite is an extrusive [igneous rock](http://geology.com/rocks/igneous-rocks.shtml) with a very high silica content. It is usually pink or gray in color with grains so small that they are difficult to observe without a [hand lens](http://geology.com/store/hand-lens/). Rhyolite usually forms in continental or continent-margin [volcanic eruptions](http://geology.com/volcanoes/types-of-volcanic-eruptions/) where granitic magma reaches the surface.

1. **Biotite-Granite**

Granite is a light-colored [igneous rock](http://geology.com/rocks/igneous-rocks.shtml) with grains large enough to be visible with the unaided eye. It forms from the slow crystallization of magma below Earth's surface. Granite is composed mainly of quartz and [feldspar](http://geology.com/minerals/feldspar.shtml) with minor amounts of mica, amphiboles, and other minerals. This mineral composition usually gives granite a red, pink, gray, or white color with dark mineral grains visible throughout the rock.

1. **Hornblende Syenite**

Similar to granite but contains very little quartz

1. **Basalt**

Basalt is a dark-colored, fine-grained, [igneous rock](http://geology.com/rocks/igneous-rocks.shtml) composed mainly of [plagioclase](http://geology.com/minerals/plagioclase.shtml) and pyroxene minerals. It

Basalt underlies more of Earth's surface than any other rock type. Most areas within Earth's ocean basins are underlain by basalt. Although basalt is much less common on continents, lava flows and flood basalts underlie several percent of Earth's land surface.

*Igneous Rocks, continued*

1. **Gabbro**

Gabbro is a coarse-grained, dark-colored, intrusive [igneous rock](http://geology.com/rocks/igneous-rocks.shtml). It is usually black or dark green in color and composed mainly of the minerals plagioclase and augite. It is the most abundant [rock](http://geology.com/rocks/) in the deep oceanic crust. Gabbro has a variety of uses in the construction industry. It is used for everything from crushed stone base materials at construction sites to polished stone counter tops and floor tiles.

*Sedimentary Rocks*

1. **Chert**

Chert is a microcrystalline or cryptocrystalline [sedimentary rock](http://geology.com/rocks/sedimentary-rocks.shtml) material composed of silicon dioxide. Early people took advantage of how chert breaks and used it to fashion cutting tools and weapons. The name "[flint](http://geology.com/rocks/flint.shtml)" is also used for this material.

1. **Gravel**

Gravel” is a natural material that consists of water-transported particles of rock that are larger than two millimeters in diameter and usually have a rounded shape as a result of their water transport.

1. **Conglomerate**

Conglomerate is a clastic [sedimentary rock](http://geology.com/rocks/sedimentary-rocks.shtml) that contains large (greater than two millimeters in diameter) rounded clasts. The space between the clasts is generally filled with smaller particles and/or a chemical cement that binds the rock together. Conglomerate can have a variety of compositions. As a clastic sedimentary rock, it can contain clasts of any rock material or weathering product that is washed downstream or down current. The rounded clasts of conglomerate can be mineral particles such as quartz, or they can be sedimentary, metamorphic, or igneous rock fragments. The matrix that binds the large clasts together can be a mixture of sand, mud, and chemical cement.

*Sedimentary Rocks, continued*

1. **Red Sandstone**

Sandstone is a sedimentary rock composed of sand-size grains of mineral, rock, or organic material. It also contains a cementing material that binds the sand grains together and may contain a matrix of silt- or clay-size particles that occupy the spaces between the sand grains.

Sandstone is one of the most common types of sedimentary rock and is found in sedimentary basins throughout the world. It is often mined for use as a construction material or as a raw material used in manufacturing. In the subsurface, sandstone often serves as an aquifer for groundwater or as a reservoir for oil and natural gas.

1. **Argillaceous Sandstone**

To a geologist, the word "sand" in sandstone refers to the particle size of the grains in the rock rather than the material of which it is composed. Sand-size particles range in size from 1/16 millimeter to 2 millimeters in diameter. Sandstones are rocks composed primarily of sand-size grains. The grains of sand in a sandstone are usually particles of mineral, rock, or organic material that have been reduced to "sand" size by weathering and transported to their depositional site by the action of moving water, wind, or ice.

1. **Argillaceous Shale**

Shale is a fine-grained [sedimentary rock](http://geology.com/rocks/sedimentary-rocks.shtml) that forms from the compaction of silt and clay-size mineral particles that we commonly call "mud." This composition places shale in a category of sedimentary rocks known as "mudstones." Shale is distinguished from other mudstones because it is fissile and laminated. "Laminated" means that the rock is made up of many thin layers. "Fissile" means that the rock readily splits into thin pieces along the laminations. Everyone has contact with products made from shale. If you live in a brick house, drive on a brick road, live in a house with a tile roof, or keep plants in "terra cotta" pots, you have daily contact with items that were probably made from shale.

Many years ago these same items were made from natural clay. However, heavy use depleted most of the small clay deposits. Needing a new source of raw materials, manufacturers soon discovered that mixing finely ground shale with water would produce a clay that often had similar or superior properties. Today, most items that were once produced from natural clay have been replaced by almost identical items made from clay manufactured by mixing finely ground shale with water.

*Sedimentary Rocks, continued*

1. **Shell Limestone**

Limestone is a [sedimentary rock](http://geology.com/rocks/sedimentary-rocks.shtml) composed primarily of calcium carbonate in the form of the mineral [calcite](http://geology.com/minerals/calcite.shtml). It most commonly forms in clear, warm, shallow marine waters. It is usually an organic sedimentary rock that forms from the accumulation of shell, coral, algal, and fecal debris. It can also be a chemical sedimentary rock formed by the precipitation of calcium carbonate from lake or ocean water. Shell limestone contains seashell fragments cemented together by recrystallized calcium carbonate.

1. **Dolomitic Limestone**

Dolomite, also known as "dolostone" and "dolomite rock," is a [sedimentary rock](http://geology.com/rocks/sedimentary-rocks.shtml) composed primarily of the mineral [dolomite](http://geology.com/minerals/dolomite.shtml). Dolomite is found in sedimentary basins worldwide. It is thought to form by the postdepositional alteration of lime mud and [limestone](http://geology.com/rocks/limestone.shtml) by magnesium-rich groundwater. Dolomite is often crushed and used as an aggregate in construction projects. It can be kiln-fired in the manufacture of cement. Its hardness makes it a superior construction material. Its lower solubility makes it resistant to the acid content of rain and soil.

1. **Bituminous Coal**

Coal is an organic [sedimentary rock](http://geology.com/rocks/sedimentary-rocks.shtml) that forms from the accumulation and preservation of plant materials, usually in a swamp environment. Coal is a combustible rock and, along with [oil and natural gas](http://geology.com/oil-and-gas/), it is one of the three most important fossil fuels. Coal has a wide range of uses; the most important use is for the [generation of electricity](http://geology.com/articles/history-of-energy-use/). Bituminous is the most abundant rank of coal. It accounts for about 50% of the coal produced in the United States.

*Metamorphic Rocks*

1. **Gneiss**

Gneiss is a foliated [metamorphic rock](http://geology.com/rocks/metamorphic-rocks.shtml) identified by its bands and lenses of varying composition. It is this banded appearance and texture - rather than composition - that define a gneiss. Gneiss usually does not split along planes of weakness like most other metamorphic rocks. This allows contractors to use gneiss as a [crushed stone](http://geology.com/articles/crushed-stone/) in road construction, building site preparation, and landscaping projects.

Some gneiss is durable enough to perform well as a dimension stone. These rocks are sawn or sheared into blocks and slabs used in a variety of building, paving, and curbing projects.

Some gneiss accepts a bright polish and is attractive enough for use as an architectural stone. Beautiful floor tiles, facing stone, stair treads, window sills, countertops, and cemetery monuments are often made from polished gneiss.

1. **Mica-Schist**

Schist is a foliated [metamorphic rock](http://geology.com/rocks/metamorphic-rocks.shtml) made up of plate-shaped mineral grains that are large enough to see with an unaided eye. To become schist, a shale must be metamorphosed in steps through [slate](http://geology.com/rocks/slate.shtml) and then through [phyllite](http://geology.com/rocks/phyllite.shtml). If the schist is metamorphosed further, it might become a granular rock known as [gneiss](http://geology.com/rocks/gneiss.shtml).

A rock does not need a specific mineral composition to be called “schist.” It only needs to contain enough platy metamorphic minerals in alignment to exhibit distinct foliation. This texture allows the rock to be broken into thin slabs along the alignment direction of the platy mineral grains. This type of breakage is known as schistosity.

1. **Quartzite**

Quartzite is a nonfoliated [metamorphic rock](http://geology.com/rocks/metamorphic-rocks.shtml) composed almost entirely of [quartz](http://geology.com/minerals/quartz.shtml). It forms when a quartz-rich [sandstone](http://geology.com/rocks/sandstone.shtml) is altered by the heat, pressure, and chemical activity of metamorphism. These conditions recrystallize the sand grains and the silica cement that binds them together. The result is a network of interlocking quartz grains of incredible strength.

The interlocking crystalline structure of quartzite makes it a hard, tough, durable rock. It is so tough that it breaks through the quartz grains rather than breaking along the boundaries between them. This is a characteristic that separates true quartzite from sandstone.

*Metamorphic Rocks, continued*

1. **Slate**

Slate is a fine-grained, foliated [metamorphic rock](http://geology.com/rocks/metamorphic-rocks.shtml) that is created by the alteration of [shale](http://geology.com/rocks/shale.shtml) or mudstone by low-grade regional metamorphism. It is popular for a wide variety of uses such as roofing, flooring, and flagging because of its durability and attractive appearance. Slate is composed mainly of clay minerals or micas, depending upon the degree of metamorphism to which it has been subjected. The original clay minerals in shale alter to micas with increasing levels of heat and pressure. Slate can also contain abundant [quartz](http://geology.com/minerals/quartz.shtml) and small amounts of [feldspar](http://geology.com/minerals/feldspar.shtml), [calcite](http://geology.com/minerals/calcite.shtml), [pyrite](http://geology.com/minerals/pyrite.shtml), [hematite](http://geology.com/minerals/hematite.shtml), and other minerals.

1. **White Marble**

Marble is a [metamorphic rock](http://geology.com/rocks/metamorphic-rocks.shtml) that forms when [limestone](http://geology.com/rocks/limestone.shtml) is subjected to the heat and pressure of metamorphism. It is composed primarily of the mineral [calcite](http://geology.com/minerals/calcite.shtml) and usually contains other minerals, such as clay minerals, micas, [quartz](http://geology.com/minerals/quartz.shtml), [pyrite](http://geology.com/minerals/pyrite.shtml), iron oxides, and [graphite](http://geology.com/minerals/graphite.shtml). Under the conditions of metamorphism, the calcite in the limestone recrystallizes to form a rock that is a mass of interlocking calcite crystals.

Most marble is made into either [crushed stone](http://geology.com/articles/crushed-stone/) or dimension stone. Crushed stone is used as an aggregate in highways, railroad beds, building foundations, and other types of construction.