LUSTER

The luster of a mineral refers to how it reflects light from its surface. When in everyday speech we describe objects as *shiny or dull* or metallic, we are talking about their luster. We might talk about a shiny black car or a dull asphalt road—both are black, but their lusters are very different. Luster depends on how the electrons in the material react to light shining on it.

Surfaces of all solid objects, including minerals show a range from strongly to weakly reflective. The most highly reflective substances are metals, and minerals that resemble them are described as having *metallic luster*. All others have *nonmetallic luster*. Some minerals fall in between and have a *submetallic luster*; magnetite is a familiar example. Because the majority of minerals have nonmetallic luster, this groups is further described by such terms as *vitreous, adamantine* , *greasy*, *dull, pearly, waxy* and *silky*.

Minerals with metallic luster contain elements that have "clouds" of shared electrons, so light is highly reflected off the surface. Pyrite, galena, silver, and gold exhibit metallic lusters.

The elements in non-metallic minerals absorb more and reflect less light. About 70% of all known minerals have vitreous luster, which resembles that of ordinary window glass. Quartz is one of the best examples of this type. Other minerals with vitreous luster include calcite, fluorite, tourmaline, and beryl. Diamond shows adamantine luster when cut, although natural crystals may be affected by solutions in the rocks where they formed and have a greasy luster before cutting. Opal often shows a greasy luster.

Minerals that consist of tiny grains held together, such as clay or chalk, are described as *dull* or *earthy*. Often, the luster of a large clump of grains may be different from the luster of the individual minerals. Dry quartz sand may look dull, although close examination of the tiny grains shows they have vitreous luster. A *pearly* luster is caused by reflection of light from numerous internal cleavage planes. Talc shows a pearly luster because it is translucent so light can penetrate at least a short distance into it.

Lusters described as *waxy* or *resinous* generally result from some surface modification of the mineral. Jade and chalcedony have waxy luster. Amber is an example of a resinous luster. The satin spar variety of gypsum shows a *silky* luster.

An interesting student project involves collecting minerals with different lusters and displaying them, together with explanations for their appearance.

If your physics class is studying optics, you could have students explore deeper into luster and related properties that depend on how light interacts with the atoms. These could include diaphaneity (appearing transparent, translucent, or opaque); refraction; dispersion; fiber optics; and pleochroism (appearing to be different colors when viewed from different directions.)

Adapted from: "Luster" by Earl R. Verbeck, Sterling Hill Mining Museum, Ogdensburg, NJ, USA