

## **Malachite** [Cu<sub>2</sub>CO<sub>3</sub>(OH)<sub>2</sub>]

Malachite is a bright to dark green copper carbonate. Typically forming “grape” clusters and fibrous or stalagmitic masses, malachite is discovered in fractures and crevices deep underground where the water table and hydrothermal fluids provide the means for chemical precipitation. Large quantities of malachite have been mined in Russia, Zambia, Mexico and, most notably, in parts of Arizona due to large quantities of limestone, which provide the carbonate and copper components that are needed to form malachite. <sup>B7</sup>



**Malachite** <sup>B7</sup>

## **Malachite (Stalactites)** [Cu<sub>2</sub>CO<sub>3</sub>(OH)<sub>2</sub>]

Possibly one of the earliest and most significant ores of copper, malachite has been used as a pigment for wall paintings in Egypt dating back to 3000 B.C. Malachite exists in many different habits (massive, botryoidal, stalactitic, fibrous, etc.), and occurs in altered (oxidized) zones of copper deposits. Malachite is referred to as a secondary mineral because it forms when water containing CO<sub>2</sub> or dissolved carbonate seeps through copper ores and dissolves copper and carbonate minerals, such as calcite. Copper and carbonate-bearing water precipitates malachite where cavities are encountered. Most malachite stalactite specimens have a central channel or core, with radiating, fibrous malachite crystals growing outward. Band width and color are related to the amount of dissolved copper and carbonate in the water. <sup>PK37</sup>



**Malachite** PK37



**Malachite** B57



**Malachite on Chrysocolla** OR1



**"Copper Caviar"** B45

## Malachite and Azurite $[\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2]$

Azurite and Malachite, two closely related copper ores, are very much “two peas in a pod” in the geological world. Often found with one another, azurite and malachite differ only by the ratio of copper to carbonate in their chemical composition. Azurite is a secondary mineral, forming in the upper oxidized portion of copper deposits. Malachite occurs when less copper is available to form azurite in the oxidized deposit. Therefore, malachite has a lower copper to carbonate ratio than azurite. The stunning “copper caviar” specimen, shown on the top left, exhibits both copper ores, highlighting how minute differences in composition can change the mineral completely. B45



**Malachite** B16



**Malachite** G12