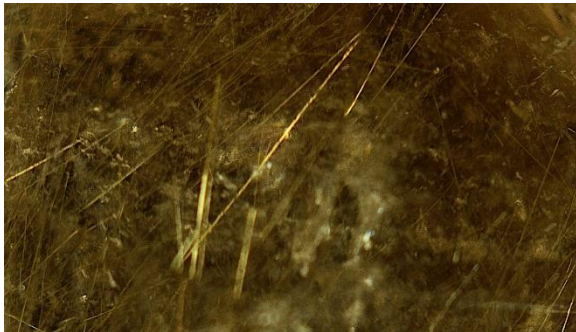


**More About Rocks Ch2: Inclusions**  
**by Larry Schemel and Steve Silva**  
**Retired USGS Research Scientists**

Quartz crystals are often more interesting because they contain metals, such as iron, magnesium, and titanium that impart color, or inclusions, which can be voids with or without liquid or crystals that are encapsulated within the quartz. During the recent club presentation on Herkimer quartz, we saw crystals with voids, some of which contained water and an air bubble. Our focus here is on inclusions that are various minerals that form as the quartz crystal grows. Our next chapter will show a type of inclusion, the phantom, where crystal faces are coated and subsequently enclosed by continued growth of the quartz.



A common inclusion is rutile,  $\text{TiO}_2$ , which grows needle-like crystals. It is amazing how the rutile crystals continue to grow and the quartz encapsulates them. Tourmaline, actinolite, and other minerals can also form inclusions like these.

This second photo is complex in that it shows many discrete crystals, black and red, which are probably hematite,  $\text{Fe}_2\text{O}_3$ , or other iron minerals.



Some of the smaller black crystals show a crude lineation parallel to the terminal faces of the quartz suggesting that they formed on a prior terminal face, then were overgrown. The red crystals seem almost feather-like, are larger than the black ones, and might have been precipitated as the quartz crystal continued to grow. The growth process would require the supply of dissolved iron and silica continuously, relative to the more episodic coating by the small black crystals. Beyond supply, conditions of crystal growth include temperature, pressure, and chemical composition. We often have more questions than answers when we look at crystals with inclusions.

There are many good references that give information about quartz crystals. These include many articles in *Rock and Gem* magazine and web sites such as *The Quartz Page*. One very old book, however, is an entertaining read with great location info. We found our copies on the web.

Dake, et al., 1938. *Quartz Family Minerals. A Handbook for the Mineral Collector*. McGraw-Hill Book Company, Inc. 304pp.