Blue, Blue, My Quartz is Blue

I've been fascinated with blue quartz ever since I was youngster who picked up a chunk in the Blue Ridge area of northern Virginia. The color was deep to sky blue, and seemed to change in hue as I tilted it. Like most blue quartz, it was not gemmy and was cross-cut by many fractures stained with iron oxides. It was special to me because there aren't many blue minerals and I had never found one before.

Blue quartz occurs at many localities. One famous localities is in Llano County Texas where it is found as small doubly terminated crystals in a rhyolitic porphyry called, informally, llanoite. The crystals weather loose and can be collected easily. Slabs of this rock studded with blue crystals are cut and polished. Blue quartz is found in Wisconsin, most notably in a diorite exposed by the Dairyland Power Dam near Tony.

The cause of the blue color is reasonably well known. Blue quartz is crowded with tiny grains of minerals such as rutile (TiO_2) or ilmenite ($FeTiO_3$). There may be as many as 2 million of these included crystals per square centimeter, scattered uniformly through the quartz. Even so, because the crystals are so tiny, they make up only about 0.02% of the volume of the quartz. Light entering the quartz is scattered by these tiny particles, the scattering being most pronounced for blue light. The light reflected back to the eye is blue. This effect is also responsible for the blue color of the sky. Light shining through the blue quartz from behind is yellow or red (the complimentary color to the blue), because the back light is not scattered and reflected. This is what occurs in the sky at sunset.

Titanium is also responsible for the color of rose quartz. Here, however, the titanium occurs as the ion Ti^{+4} within the quartz structure, not as grains of other minerals. In this form, the titanium absorbs all colors except the rosy pink one we all know so well.

Artificial blue quartz can be made by including cobalt impurities in quartz grown in the laboratory. Unlike the blue quartz in nature, the artificial crystals are deep royal blue and can be grown in large flawless masses which can be readily faceted.

Natural blue quartz can rarely be used for lapidary purposes, but it is wonderful experience to find it and see what looks like pieces of the clear blue sky embedded in the solid rock.

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References:

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