



## Arizona Rocks 39

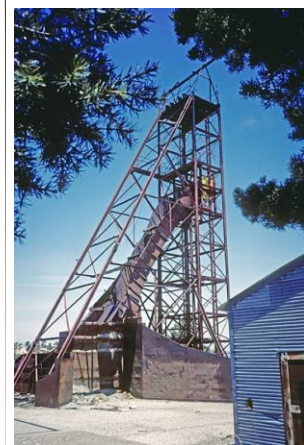
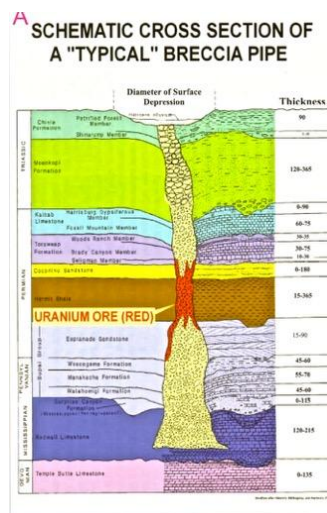
Text and photos by Ray Grant

In the last column, I described grandviewite, from the Grandview mine in the Grand Canyon. The Grandview mine is in a breccia pipe, a unique type of mineral deposit found in Arizona. These deposits are located on the Colorado Plateau in Arizona and a few are in adjoining states. There are thousands of breccia pipes scattered over the Plateau, about eight percent of them are mineralized and perhaps ten percent of those have a real economic value.

These deposits started where large caves had formed in the Redwall Limestone several hundred million years ago. Over time, the layers on top of the caves collapsed into the caves forming the breccia pipe. Later, perhaps 200 million years ago solutions bearing metals found their way into some of the pipes and were able to move through the breccia depositing minerals. Quite a variety of elements were present in these solutions, including antimony, arsenic, cadmium, chromium, cobalt, copper, gallium, germanium, lead, mercury, molybdenum, nickel, selenium, silver, uranium, vanadium, and zinc. The large variety of elements and the subsequent alteration of the primary minerals have led to over 90 different minerals being found in these deposits.

The pipes were originally mined in the 1880s to early 1900s for copper and from the 1950s through the 1980s for uranium. The largest of the uranium mines was the Orphan Mine that was located on the south rim of the Grand Canyon about three miles west of Grand Canyon Village. It was worked from 1953 to 1969 and almost five million pounds of uranium oxide and almost seven million pounds of copper were recovered during the mining.

Currently there is some limited uranium mining of breccia pipes on the Arizona strip. The uranium mining is controversial, and there is a 20 year moratorium on new mine claims and there is a move to have 1.7 million acres set aside as the Grand Canyon National Heritage Monument to stop uranium mining near the Canyon.



Geology of a breccia pipe (from Karen Wenrich and Spenser Titley, 2008) left

Head frame of the Orphan Mine on the South Rim of the Canyon. It was removed a few years ago and now there is only a sign telling about the mine. right