# *Pre-Cambrian BIF (Banded Iron Formation) near Jerome, Arizona: Worldwide Significance*

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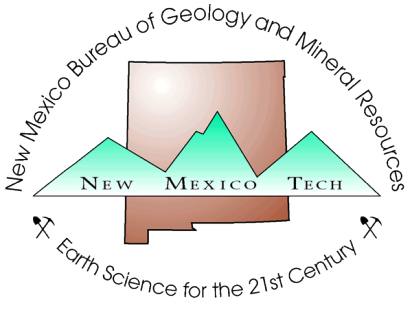
The annual New Mexico Mineral Symposium provides a forum for both professionals and amateurs interested in mineralogy. The meeting allows all to share their cumulative knowledge of mineral occurrences and provides stimulus for mineralogical studies and new mineral discoveries. In addition, the informal atmosphere encourages intimate discussions among all interested in mineralogy and associated fields.

The symposium is organized each year by the Mineral Museum at the New Mexico Bureau of Geology & Mineral Resources.




*Abstracts from all prior symposiums are also available:* https://geoinfo.nmt.edu/museum/nmms/abstracts

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# Pre-Cambrian BIF (Banded Iron Formation) near Jerome, Arizona: Worldwide Significance

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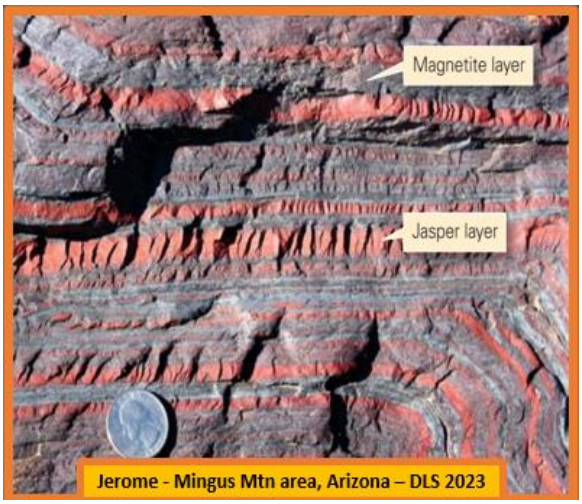
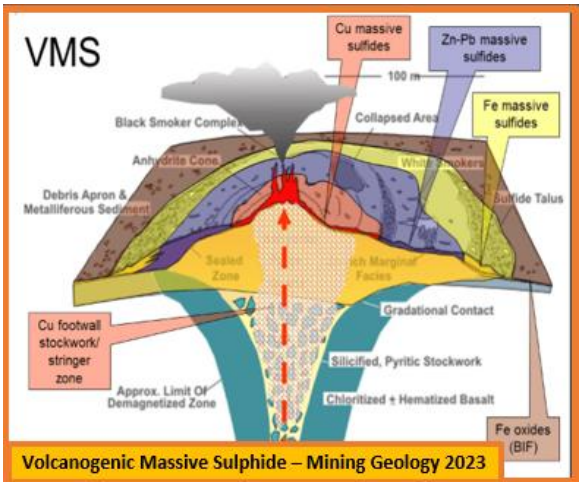
BIF (Banded Iron Formation) are layers of iron-rich sediment, either red or black, from the presence of hematite ($Fe_2O_3$) or magnetite ($Fe_3O_4$). BIF is the world's major supplier of iron ore for steel production. That market is valued at over $500 billion per year. The geologic age is Pre-Cambrian ranging from 3.5 Billion to 1.9 Billion years ago.



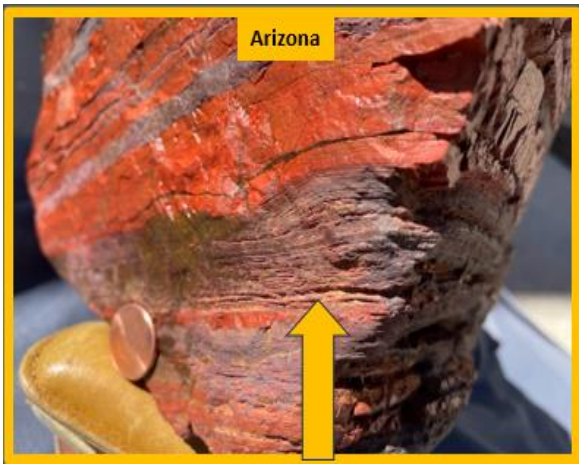

Banded Iron Formations were deposited in ancient oceanic waters by dissolved iron (Fe) flowing in from continental rivers and combining with oxygen ($O_2$), released by photosynthesis of Cyanobacteria (commonly called blue-green algae). Photosynthesis is the process by which organisms use sunlight to produce food from carbon dioxide ($CO_2$) and water ($H_2O$). The combination resulted in the precipitation of black magnetite or red hematite. As atmospheric oxygen levels fell, the rocks deposited left red hematite-pigmented silica /chert layers. These red and black layers were repeated in repetitions thru 4 billion years.

If the total geologic time column of 4.6 Billion years is normalized to a 24 hour day; the Pre-Cambrian portion amounts to 21.3 hours out of 24. The remainder of the geologic column is 2.7 hours. Human existence is equivalent to only a few minutes of geologic time. Banded iron formations, along with blue-green algae stromatolites are prominent throughout the Pre-Cambrian. Today, blue-green algae stromatolites have limited physical presence in nature.




Banded iron formations are found worldwide, with major deposits in the U.S. (Minnesota – Mesabi Range), Canada, Brazil, Russia, South Africa, and India. The most prominent are the Northwest Australia deposits in the Pilbara region. Some of the Australia banded iron deposits contain "Tiger Eye." The distinctive yellow bands are related to metamorphic asbestos. The Arizona region surrounding Jerome and Mingus Mountain of Yavapai County houses some BIF collecting areas, which are the focus of this presentation.

The Jerome and Mingus Mountain BIF occurred along an oceanic rift zone, quite similar to the Mid-Atlantic rift spreading center which crosses Iceland with active eruptions today. But in the case of Jerome/Mingus Mountain the volcanic eruptions were under several thousand feet of ocean water. The BIF formed on the periphery of the active eruption sites. Commercial minerals found at Jerome include copper, gold, silver, and chalcopyrite. All of these collectable minerals are included in the formation of VMS (Volcanic Massive Sulphides) along with the Banded Iron Formation magnetite and hematite colored silica/cherts.




The Jerome/Mingus Mountain BIF area of Yavapai County, Arizona, covers over 200,000 acres of aerial extent and is part of the Prescott National Forest. The rugged and heavily forested area is 4-wheel drive country. Happy collecting!