THE HUNTERSVILLE CHERT - WEST VIRGINIA'S GEOLOGIC "PROBLEM CHILD"

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ABSTRACT

In 1929, the Devonian Huntersville Chert was proposed as a formal stratigraphic unit by Paul Price, former West Virginia State Geologist. Its age was determined by stratigraphic position – overlying the Lower Devonian Oriskany Sandstone and underlying the Middle Devonian Marcellus Shale – and by its content of "Oriskany age" fossils. Since 2008, we have been mapping the bedrock along the eastern border of WV in proximity to the type locality, the village of Huntersville, WV. Having observed numerous Huntersville outcrops and having conducted petrographic and geochemical investigations of the unit, we have reached conclusions that appear to be at odds with the accepted picture of the Huntersville.

Using stratigraphic position and fossil content to constrain the age of the Huntersville assumes that the generation of the unit follows the rules of depositional superposition as do the units below, above, and laterally adjacent to it. This is a problem because the Huntersville is not a typical sedimentary formation. The contacts between the Huntersville and neighboring units only approximate continuous stratigraphic horizons, not always traceable beyond outcrop. Contacts can best be described as "ragged" or discontinuous with chert sometimes appearing on the "wrong" side of the boundaries of adjacent units. More importantly, silicified relict bedding and fossils from these units (Millboro, Bobs Ridge, Tioga, Needmore, or Oriskany) are often found within what would be called Huntersville.

Some geologists have proposed the chert of the Huntersville is the product of an extensive die-off of siliceous sponges; others have suggested the chert's silica is dissolved windblown quartz silt. Both of these theories ignore the ubiquitous presence of volcanic ash layers -Tioga eruptive event(s) - associated with the Huntersville. We believe the source of the silica for the Huntersville Chert is dissolution of this ash.

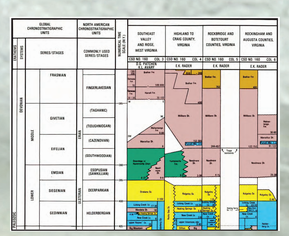
We propose that the Huntersville Chert is primarily of diagenetic origin. It was formed by the silicification of pre-existing sedimentary strata by pore fluids derived from dissolved Devonian volcanic ash. Best described in terms of ore genesis, the Huntersville is a stratiform deposit, probably diachronous over its geographic extent, and possibly significantly younger than Middle Devonian.

THE HUNTERSVILLE CHERT

The Lower to Middle Devonian Huntersville Chert was named for exposures of yellow to grey sandy chert near Huntersville, WV in Pocahontas County overlying the Ridgeley/Oriskany Sandstone and underlying the Marcellus Shale (Price, 1929).

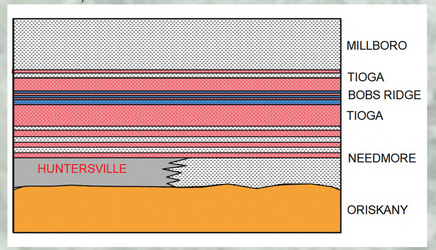
Woodward (1943) refined the unit description to include the presence of glauconitic and phosphatic sandstone, highly silicified black shale, and brittle clay-shale. He also described the contact with the underlying Ridgeley/Oriskany as "unconformable" and pointed out that the Huntersville might "underlie" the Needmore Shale or Marcellus depending on the locality.

Dennison (1960; 1961) extended the Huntersville into Virginia, Pennsylvania, and Maryland. He described the lateral contact between the Needmore Shale (east) and Onondaga Limestone (west) as interfingering making the Huntersville a facies equivalent of these two units. He also established the Bobs Ridge Sandstone as a formal member of the Huntersville.

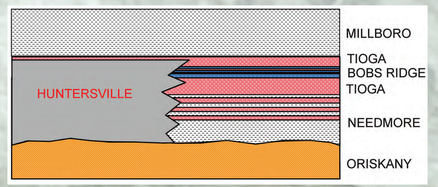


Early-Middle Devonian stratigraphy for east-central West Virginia and western Virginia (Patchen and others, 1984).

Map of West Virginia showing the approximate extent of Huntersville Chert (Dennison, 1960; 1961).



Based on the original definition of the Huntersville and subsequent literature, the authors started mapping in eastern West Virginia with this cross-sectional stratigraphic model of the Huntersville interval.

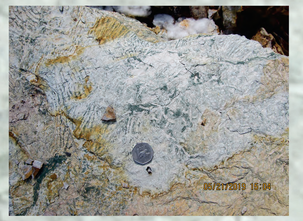


After several visits to the Cove Hill Quarry (see outcrop panorama at top of poster), the authors revised their original stratigraphic model after noting the Huntersville in close "association" with units other than the Needmore.

Panoramic view of the Cove Hill Quarry in Pocahontas County, West Virginia. Chert attributable to the Huntersville occurs in the interval between the Needmore and the Millboro.

CONNECTION TO THE TIOGA ASH

At the Cove Hill Quarry (see panorama above), a connection between the Huntersville Chert and the occurrence of Tioga Ash became apparent.



Tioga Ash mixed with glauconitic sand of the Bobs Ridge by marine bioturbation (*"Zoophycus"* sp.) suggesting the Ash was deposited in sea water. Both sediments have been silicified to form the Huntersville. Coin is 3 cm in diameter.

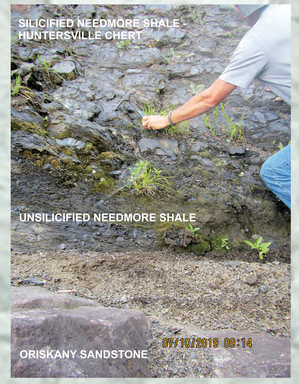
Tioga Ash interbedded with glauconitic sand of the Bobs Ridge. Top surface shows entrances of numerous marine trace fossils (*Arenicolites* sp.) lined with limonite. Sediments have been silicified to form the Huntersville. Rock hammer for scale.

Bioturbated (*Zoophycus* sp.) Tioga Ash silicified to form the Huntersville. Coin is 3 cm in diameter.

SILICIFICATION OF OTHER FORMATIONS

All stratigraphic units between the Oriskany Sandstone and the Millboro have been observed to be locally partially or completely silicified into Huntersville Chert.

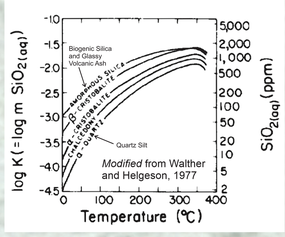
Shallow dipping bedding surface in the uppermost Oriskany Sandstone. Irregular appearance due to silicification of the Oriskany to form a sandy chert - Huntersville.



Outcrop at Wytheville, Virginia showing silicified Needmore Shale - Huntersville Chert; unsilicified Needmore Shale; and Oriskany Sandstone.

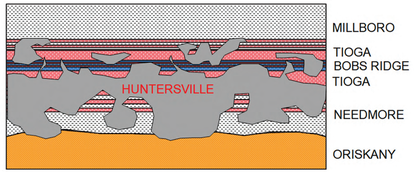
SOURCE OF THE SILICA

Speculations on the silica that generated the Huntersville Chert have included dissolution of sponge spicules, devitrification of volcanic ash, and dissolution of windblown silt.



Solubility of polymorphs of silica. Amorphous forms like hyaline sponge spicules and glassy volcanic ash are the most soluble. Stable forms such as quartz silt are the least soluble. The association of Tioga Ash and Huntersville Chert suggest that the Ash is the probable source of silica for the Huntersville.

CONCLUSIONS



The authors propose this cross-sectional model of the Huntersville interval based on our mapping efforts in eastern West Virginia.

1. The Huntersville is not the product of physical or biological depositional sedimentary processes. Instead, the Huntersville is the product of diagenetic processes (silicification) and is more properly an approximately *stratiform* (Canavan,1973) chemostratigraphic unit superimposed on preexisting sedimentary units ranging from the uppermost Oriskany Sandstone to the lowermost Millboro Shale.

2. Because the Huntersville is not a "normal" sedimentary deposit, it cannot be a facies equivalent of other sedimentary units (Onondaga Limestone or Needmore Shale) even though all of these units lie in approximately the same stratigraphic position.

3. The occurrence of the Huntersville in proximity to ashfall layers of the Tioga Ash suggests that the source of silica for the Huntersville is devitrification of the Tioga.

4. Because the Huntersville has been superimposed on pre-existing sedimentary units, the Huntersville is younger than these units.

5. It is probable that the Huntersville is diachronous over its geographic range.

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