

Geology of Indian Mountain, Rock Run, and Borden Springs Area, Georgia and Alabama: A New Paradigm

November 17-19, 2016

Fieldtrip Leaders:

Randy Kath, Tom Crawford, and Karen Tefend

*Department of Geosciences, University of West Georgia
Carrollton, GA 30118*

The 53rd annual field trip of the Alabama Geological Society will be held on November 17-19, 2016, in Cherokee and Cleburne Counties, Alabama, and Polk and Floyd Counties, Georgia. The focus of this year's trip will be the Paleozoic rocks of the Indian Mountain area and metamorphic rocks in the hanging wall of the Emerson-Talladega fault. This area was visited, in part, during the 1973, 1977, and 1985 Alabama Geological Society field trips. Recent detailed geologic mapping of the Indian Mountain, Cedartown West, Borden Springs, Benedict, and Oak Level USGS 7.5-minute quadrangles is presented here and is the basis for a newly proposed stratigraphic and structural interpretation of the area.

The purpose of our long-term geologic mapping of these quadrangles is to more precisely define areal distribution of lithologic units, major geologic structures, and relationships between igneous, metamorphic, and unmetamorphosed sedimentary rocks of northwest Georgia and northeast Alabama. This detailed geologic mapping has revealed a complex structural relationship between slate of the lower Cambrian Chilhowee Group, rocks previously considered to be middle Ordovician Rockmart Slate, and phyllite along the metamorphic front, in the hanging wall of the Emerson-Talladega Fault. Rockmart Slate was not observed during geologic mapping in the Indian Mountain area.

Lithologic similarities between the Chilhowee slates and Rockmart Slate have led to many different interpretations by previous workers in this area. Based on field criteria developed during mapping, we were able to consistently separate these similar mappable units. To test our field criteria, we combined qualitative x-ray diffraction and geochemical analysis of similar lithologic units. The mineralogy of these rock units, as determined by x-ray powder diffraction (XRD), shows that the Rockmart Slate can be distinguished from the Chilhowee slates based on the presence of calcite and the lack of orthoclase. Slate of the Chilhowee Group contains abundant orthoclase and no carbonate minerals.

Geochemical analysis by inductively coupled plasma–optical emission spectrometry (ICP-OES) shows that the Rockmart Slate is distinguishable from the Chilhowee slates by having elevated CaO, and lower K₂O and MgO. Drill core from Davis Mountain (Alabama Geological Survey wells #90003 & #90001), south of Indian Mountain, and air rotary drill cuttings from Dobbins Mountain, near Cartersville, Georgia, were also analyzed by ICP-OES. Geochemically, the samples from Davis Mountain and Dobbins Mountain are indistinguishable and are considered to be Cambrian-age Chilhowee Group based on both geochemistry and mapping criteria.

Phyllite samples from the hanging wall of the Emerson-Talladega Fault zone were analyzed and compared to the Chilhowee Group slates and the Rockmart Slate. Based on geochemical discrimination diagrams, the Chilhowee Group slates, and not the Rockmart Slate, is the most likely protolith for the Piedmont/Blue Ridge phyllite south of the Emerson-Talladega Fault zone.

The Indian Mountain area, Polk County, Georgia, is one of only two places in Georgia where lowermost Paleozoic rocks occur at the surface; the other area is near Cartersville, Georgia. In both of these areas the

geology is extremely complex. Multiple tectonic events caused complex folding and faulting which juxtaposed similar lithologic units of different ages. All of these events contributed to the creation of mineralized zones and ore bodies that have been mined for more than 130 years in Polk and Bartow Counties, Georgia, and Cherokee and Cleburne Counties, Alabama.

The Georgia-Alabama mining district, centered around Oremont Station, Hematite Crossing, Esom Hill, Tecumseh Furnace and Rock Run (Indian Mountain area), is similar in many ways to the Cartersville, Georgia mining district: 1) both are in rocks of lower Paleozoic age; 2) iron is the dominant mineralizing ore element; 3) major ore bodies occur in the Chilhowee and Shady in the Cartersville District, and in the Chilhowee, Shady, Longview, and Newala in the Georgia-Alabama mining district; and 4) iron deposition accompanied major silicification and brecciation in both districts.

The geologic mapping and analytical work conducted was used as the basis for our proposed conceptual geologic model which could benefit future exploration of these mining districts. Based on this model, the Indian Mountain area is dominated by early large-scale north-south trending structures formed by major east-west transpressional forces. Later, north-south compression pushed metamorphic rocks northward over these earlier structures, creating east-west trending folds and faults. At the same time, unmetamorphosed lower Paleozoic rocks slid northward past schist and metagraywackes of the Piedmont/Blue Ridge along major faults in the Borden Springs area. Both north-south and east-west trending structures in the lower Paleozoic rocks are mineralized.

In addition to iron mineralization in the area, bauxite and kaolinite have been mined in the district. This Al-mineralization is associated with paleo-sinkhole, lacustrine sediments developed on the Shady Dolomite, Longview Dolomite, and Newala Limestone, similar to the Gray Fossil site in northeastern Tennessee. Although fossils have not been found in these ore deposits, we interpret them to be formed as a result of late Miocene to early Pliocene heating of the atmosphere and resultant global deep weathering and sinkhole development in exposed carbonates.

2016 AGS Annual Field Trip Registration Form

Name _____ e-mail _____

Affiliation _____

Mailing Address _____

Daytime Phone _____ Home Phone _____

Enclose check payable to Alabama Geological Society, P. O. Box 866184, Tuscaloosa, AL 35486
For more information on registration contact Will Jackson at 205-247-3548 (wjackson@gsa.state.al.us).

Field Trip Release and Indemnity Agreement
Alabama Geological Society

I, _____, in consideration of the receipt by me of permission from the Alabama Geological Society (“AGS”) to participate in a Field Trip entitled **Geology of Indian Mountain, Rock Run, and Borden Springs area; Georgia and Alabama: a new Paradigm, 2016, 53rd Annual Field Trip of the Alabama Geological Society** to be conducted from **November 17-19, 2016**, and sponsored by the Alabama Geological Society, the receipt of such permission being hereby acknowledged, and being fully aware that the Field Trip may involve hazardous and/or dangerous activities, and/or be in a location in and/or around other hazardous and dangerous conditions, and recognizing and accepting the risks, known and unknown, involved in a Field Trip, hereby release and will indemnify, defend and hold harmless AGS, the agents, officers, servants, and employees of AGS, and the leader or leaders of the Field Trip (collectively referred to as “indemnitees”) of and from any and all liabilities, claims, demands, actions, and causes of action whatsoever arising out of or relating to any loss, damage, or injury, including death, as may be sustained by me, and to any loss, damage, or injury to any property of mine, while involved in any way with the Field Trip, including without limitation traveling to and from the site or sites of the Field Trip (whether by air, water, or land transportation) and at and during all stops and layovers during the Field Trip.

This release and indemnity includes without limitation liabilities, claims, demands, actions, and causes of action to or by third parties as well as to or by me. This release and indemnity includes without limitation liabilities, claims, demands, actions, and causes of action arising out of or relating to any loss, damage, or injury caused in any way by the concurrent or contributory negligence of any indemnitee. This release and indemnity includes without limitation liabilities, claims, demands, actions, and causes of action arising out of or relating to any loss, damage, or injury caused in any way by the sole negligence of any indemnitee. Having made all inquiries deemed by me to be appropriate, I hereby voluntarily assume all risks of loss, damage, or injury, including death, as may be sustained by me or any property of mine while involved in any way with the Field Trip.

In the event the release by me of any indemnitee of any liability, claim, demand, action, or cause of action described herein is determined to be invalid or unenforceable, I agree that my total recovery of damages from the indemnitees, or any of them, both actual and punitive, shall be limited to \$100.00 or the cost of admission to the Field Trip, whichever is less.

In the event any provision of this Release and Indemnity Agreement is determined to be invalid or unenforceable, all other provisions hereof shall continue to be enforceable and shall be interpreted as though said invalid provision had never been contained herein.

This release shall be binding upon my distributees, heirs, next of kin, executors, administrators, and personal representatives.

IN SIGNING THIS RELEASE AND INDEMNITY AGREEMENT, I HEREBY ACKNOWLEDGE AND REPRESENT THAT I HAVE READ THE FOREGOING RELEASE AND INDEMNITY AGREEMENT, UNDERSTAND IT, AND I HAVE SIGNED IT VOLUNTARILY. I UNDERSTAND AND AGREE THAT I WOULD NOT BE ALLOWED TO PARTICIPATE IN THE FIELD TRIP IF THIS RELEASE AND INDEMNITY AGREEMENT WERE NOT SIGNED AND AGREED TO BY ME, AND THAT THE AGREEMENT BY ME TO THE TERMS AND CONDITIONS OF THIS RELEASE AND INDEMNITY AGREEMENT IS AN ESSENTIAL PART OF THE CONSIDERATION FROM ME FOR ME TO BE ALLOWED TO PARTICIPATE IN THE FIELD TRIP.

Dated: _____ (Signature)

_____ (Printed name)