

CAROLINA GEOLOGICAL SOCIETY

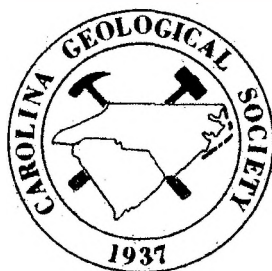
NOVEMBER 13-14, 1971

Field Trip Guidebook

**Stratigraphy and Structure
of the
Murphy Belt, North Carolina**

by

W. Robert Power
Joseph T. Forrest



Raleigh
1971



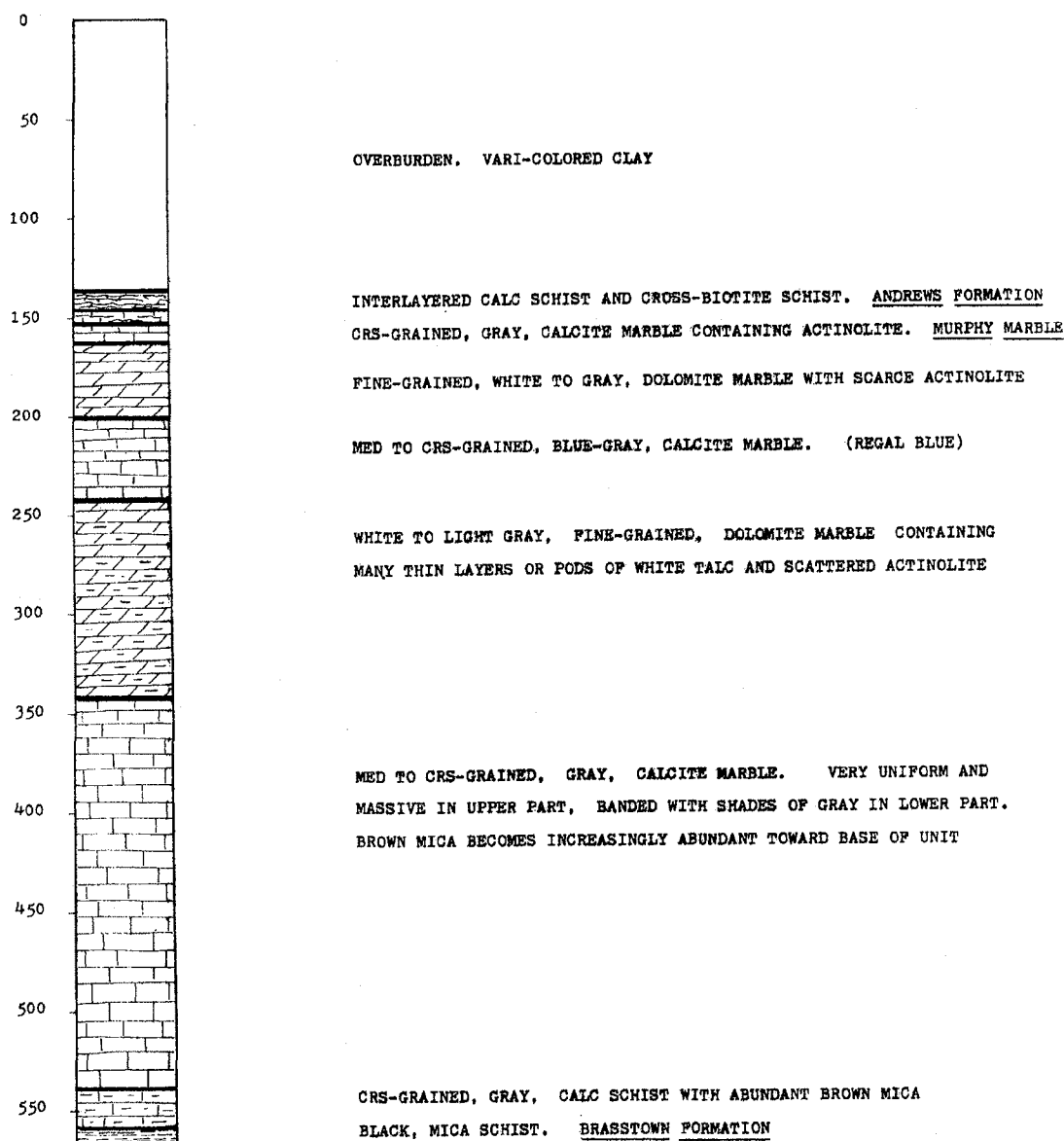


Figure 3. Section through Murphy Marble from core drilled about one mile north of Regal, NC.

distinctive lithologies of the Nantahala and Brasstown formations. We, therefore, treat it as a separate formation, the Tusquitee quartzite.

The Tusquitee formation occurs in two outcrop belts that extend southwestward nearly to Ellijay (LaForge and Phalen, 1913), but it is not recognized in the Tate quadrangle. Power, and Reade (1962, p. 12) suggested that a few thin quartzite beds at the top of the Nantahala formation at Whitestone, Georgia, may represent the Tusquitee formation, but these thin layers are no more than what is typical throughout the Nantahala formation near Murphy. The disappearance of the Tusquitee formation southward is further confirmation of

facies changes in the Nantahala formation suggested earlier.

Brasstown Formation

The Brasstown formation is a thick sequence of gray to dark gray, thin-bedded schist and micaceous quartzite. Individual layers commonly range in thickness from about 0.5 to 5 cm. The schist typically contains randomly oriented porphyroblasts of biotite in a fine-grained matrix. These rocks have been called "cross-biotite schists." Many layers and lenses of calc-silicate granofels (so-called "pseudodiorite") contain porphyroblasts of hornblende and garnet in a quartz, feldspar matrix. These are lighter in color than the bulk of

the rock. In outcrop the formation has a pronounced banded appearance that is typical and distinctive. Black, graphitic argillite near the base of the formation strongly resembles Nantahala argillites and would be included with that formation were it not for the Tusquitee quartzite which is more mappable. The bulk of the Brasstown formation differs from the Nantahala in that graphite is scarce or absent, quartz is less abundant, the apparent grain size in fresh exposure is greater, and the banding or layering is slightly thicker.

The Brasstown formation occurs in two sub-parallel outcrop belts that are continuous southwestward to the Tate quadrangle. Near Jasper, Georgia, the formation is quarried extensively for flagstone. It consists of alternating layers of micaceous quartzite and mica schist. The rock splits easily along the schist layers leaving slabs of micaceous quartzite 2 to 10 cm. thick. Quantitative data are absent, but the quartz content and thickness of individual layers appears to increase slightly to the southwest from the Murphy quadrangle.

Keith (1907) named the Brasstown and another unit, the Valletown formation which he placed stratigraphically between the Brasstown and the Murphy marble. Hurst (1955) found no valid distinction between the units and lumped all rocks between the Tusquitee formation and the Murphy marble together as the Brasstown formation. Fairley (1965) followed the usage of Hurst and we concur. Actually, rocks mapped as Valletown by Keith are included not only in the Brasstown of our usage, but also in the Murphy marble in the center of the syncline. In order to account for this position, Keith (1907) proposed a large thrust fault. We find no evidence for this fault. We find rocks in the center of the syncline different from the Brasstown formation as herein defined and believe them to be younger than the Murphy marble in agreement with Hurst (1955). Thus, some rocks that Keith mapped as Brasstown and Valletown formation are included in our Mineral Bluff formation.

Murphy Marble

The Murphy marble is the most distinctive unit in the belt. It consists of calcareous marble and dolomite with varying amounts of impurities. It is quarried for dimension stone and crushed stone in both North Carolina and Georgia. It has been studied more than any other unit because of its economic importance.

Figure 3 is the log of a core drilled across the marble at the now defunct Universal Materials Company, about two miles northeast of Murphy and in the southwestern corner of the Marble quadrangle.

Talc occurs in the marble at several places and is mined by the Hitchcock Corporation a few miles south of Murphy. The marble crops out discontinuously from Ballground, Georgia, to Topton, North Carolina. Two outcrop belts are distinguished throughout most of the area. In North Carolina the western belt is more or less continuous from the Georgia

border to Topton (Van Horn, 1948). The eastern belt crops out discontinuously from the border to Peachtree, but has not been found further north. In Georgia both belts are recognized as far south as Blue Ridge (LaForge and Phalen, 1913). From Blue Ridge to Tate outcrops become scarce and discontinuous and two distinct belts cannot be recognized. At Tate the marble is thickest and most studied, but the structure is extremely complex (see Fairley, 1965).

The marble changes little in character throughout the belt. Both calcite and dolomite marble occur at both ends, but whereas the dolomite marble appears to lie on top of the calcite in North Carolina, the reverse appears to be true at Tate (Reade, 1965). Common accessory minerals include graphite, biotite, amphibole, talc, and pyrite.

Andrews Formation

The Andrews formation is a thin calcareous schist that overlies the Murphy marble. It was so named by Keith (1907, p. 5) and we agree with his definition and limitations. Hurst (1965, p. 53) re-defined the formation so as to include a thick overlying sequence of pelitic schist. The redefinition was based upon what we believe to be a faulty correlation of overlying quartzites and so we return to Keith's original definition.

In the Murphy quadrangle the Andrews formation consists of alternating layers of marble and cross-biotite schist. The layers are paper thin to several feet thick. The color is greenish gray to dark blue-gray. The marble layers are generally impure containing abundant micas. Some are dolomitic. Accessory pyrite is ubiquitous.

Fresh exposures are rare, but the formation weathers to a distinctive varicolored saprolite. Brown iron ores occur abundantly as lenses and concretions in the weathered residue as was noted also by Keith who stated, "The feature which makes this (Andrews) schist of particular importance is the development therein of deposits of brown hematite," (1907, p. 5). The contact between Andrews and the Murphy marble is gradational.

The Andrews formation occurs in parallel outcrop belts on both sides of the syncline. On the west limb it is immediately overlain by the Nottely quartzite, but the Nottely is absent on the east limb and the Andrews is overlain by pelitic schists of the Mineral Bluff formation.

The Andrews formation as herein defined has not been recognized in published work south of the Murphy quadrangle. LaForge and Phalen (1913, p. 7) thought that limonite-bearing clay occurring between the Murphy marble and Nottely quartzite represented the Andrews, but was too narrow to show on their map. Graham (1967) also found limonite between the marble and overlying schist.

Hurst re-defined the Andrews formation to include all of a "metasedimentary sequence 1400-1800 feet thick (that) lies between the Murphy marble and the Nottely quartzite,"

(1955, p. 53). This thick pelitic sequence does not exist between the Murphy and Nottely on the west limb of the syncline. There is a thick pelitic sequence between the Murphy marble and a second quartzite on the east limb. Hurst correlated this second quartzite with the Nottely quartzite, we think, erroneously. This correlation is the key to what we consider a misuse of the name "Andrews" since 1955 and will be discussed in detail later.

Hurst described a "calcareous schist containing nodes and thin lenses or beds of limonite" at the base of his re-defined Andrews formation (1955, p. 54). This calcareous schist represents the Andrews formation as defined by Keith (1907).

Power and Meade (1962) correlated a pelitic unit with the Andrews, an interpretation we now think in error. Fairley, following Hurst, used the name Andrews for overlying pelitic schists and introduced a new name, the Marble Hill hornblende schist for "calc-schists and biotite-hornblende schists (that) lie between the Murphy marble and the garnet-mica schists of the Andrews formation," (1965, p. 30). We contend that the Marble Hill hornblende schist is the true lithologic correlative of the Andrews formation as defined by Keith. The pelitic schists are younger and belong to the Mineral Bluff formation.

Nottely Quartzite

The Nottely quartzite is an orthoquartzite that immediately overlies the Andrews formation on the west side of the syncline only. It is thin to medium-bedded, medium grained, and contains abundant cross-bedding. The cross-bedding

shows the top of the formation to be east confirming the synclinal nature of the major structure.

The Nottely quartzite forms a nearly continuous outcrop belt from near Tomotla in the Marble quadrangle southwestward to the Mineral Bluff quadrangle. It has not been recognized south of the Mineral Bluff quadrangle. Hurst (1955, p. 54) found a second quartzite parallel to and approximately 1500 feet southeast of the one described above. He correlated the two in a syncline. In so doing he was forced to hypothesize a major fault on the west flank of the syncline because a thick pelitic sequence intervenes between the eastern quartzite and the eastern outcrop of Murphy marble in the Mineral Bluff quadrangle, but no corresponding schist intervenes on the west. Figure 4, shows Hurst's interpretation of the structure and an alternative that we favor, namely that the eastern quartzite is a separate, stratigraphically higher unit.

Arguments in favor of our hypothesis are as follows:

1. The overlying pelitic unit contains many thin discontinuous quartzite units as shown by Van Horn (1948) and current mapping by Forrest.
2. A quartzite parallel to the Nottely and about 2200 feet southeast in the Murphy quadrangle contains cross-bedding that shows the same facing as the Nottely as defined above.
3. Although Hurst found facing criteria in the western quartzite of the Mineral Bluff quadrangle, his map shows none in the eastern quartzite.
4. If Hurst's structural interpretation is correct then the fault which cut out the pelitic "Andrews" on the west

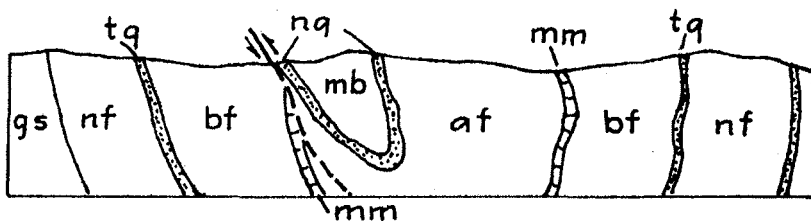


Figure 4a. Cross section across Murphy Marble Belt in Mineral Bluff quadrangle, after Hurst (1955).

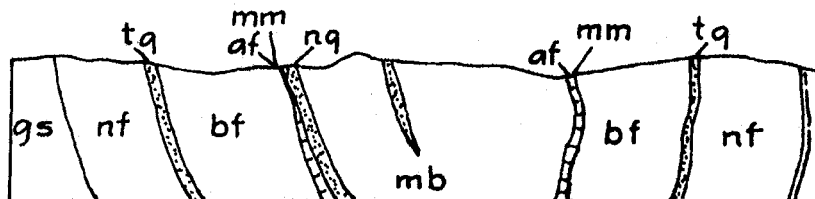


Figure 4b. Alternative interpretation of structure in Mineral Bluff quadrangle favored by authors of this report.

gs, Great Smoky grp.; nf, Nantahala fm.; tq, Tusquitee fm.; bf, Brasstown fm.; mm, Murphy marble; af, Andrews fm.; mb, Mineral Bluff fm.