CAROLINA GEOLOGICAL SOCIETY
Guidebook for 1956 Annual Meeting
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KINGS MOUNTAIN BELT[1]

CAROLINA GEOLOGICAL SOCIETY

FIELD TRIP – OCTOBER 13-14, 1956

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Foote Mineral Company

1.Retyped and formatted from the original with minor corrections, June 1999.

Although our Society has held two previous field trips in this part of the Carolinas, in 1946 and 1953, those trips involved the region west of Kings Mountain. The Kings Mountain belt proper trends north-easterly along the southeast side of the Southern RR. And includes metamorphosed sedimentary and pyroclastic rocks flanked on the northwest and southeast by intrusive quartz monzonites. The monzonite to the southeast is known as the Yorkville "granite", and that to the northwest as the Whiteside "granite" (now divided into the Cherryville and Toluca quartz monzonites), but the field-trip stops are in the older rocks between them.

Stops 1, 6, and 7 were included in the trans- Appalachian field trip of the Geological Society of America in November 1955, and the descriptions used herein are as given in "Guides to Southeastern Geology" covering the field trips of the 1955 annual meeting. The other stops of the present trip are written in the same manner.

The Saturday program will include stops 1, 2, 3, and 4, leaving time to reach Gaffney for the annual dinner at the Hotel Carroll. Stops 5, 6, and 7 will be made on Sunday, leaving plenty of time for travel afterwards.

Stops 3, 4, 5, and 7 are at active mining properties. The operators have been most cooperative in permitting our party to make these stops, but they cannot be responsible for personal injuries. Be careful, and in particular stay away from mine faces containing loose slabs.

The lunch stop on Saturday will be at Henry Knob. Bring your own. On Sunday morning, have your own lunch packed before leaving Gaffney. Cold drinks will be available along the route both days.

STOP 1

Outcrop of "kyanitic quartzite," which was given stratigraphic status by Keith and Sterrett (1931) solely on the basis of kyanite content. Bedding is approximately vertical, but the attitude at this point is obscured by strong joints and by numerous drag folds that pitch steeply south-southwest. Most of the kyanite crystals are less than two inches long and one-quarter inch in breadth, and occur in weakly foliated beds. In parts of these beds, the crystals are oriented parallel to the pitch of the drag folds, but in other parts there is no preferred orientation, and the variation appears to be unsystematic. The crystals are unfractured, and apparently were developed after the beds were contorted. Non-schistose beds are typical quartzite, and for the most part contain no kyanite. Drag folding is seen commonly in slates, phyllites, and other weak rocks, but rarely in pure quartzite unless the quartzite is thin-bedded and contains beds of weaker rocks. It is believed, therefore, that these originally arenaceous sediments contained many shaly beds whose weakness permitted crumpling, and whose clay provided the alumina of the kyanite.

STOP 2

Be careful of the traffic in this narrow cut on Highway 161. The formation exposed is the Battleground schist of which most of the Kings Mountain ridge belt consists. The strike is northeast, and this locality is in the axial zone of a major anticline coextensive with Kings Mountain ridge. The formation consists of fine-grained muscovite (or "sericite") schist in which bedding is well shown. Some layers are quartzose and feldspathic. The beds in the western part of the cut dip uniformly northwest, and cleavage is mostly parallel with bedding, but the structure changes abruptly 425 feet from the eastern end of the cut. At this point, a reverse fault dipping steeply northwest separates the uncontorted beds to the west from contorted beds to the east in which drag folds are apparent in several places upon close examination. The drag folds are best seen in the northeast wall. They pitch gently northeast, are sliced by minor faults, and cleavage cuts the bedding.

STOP 3

The operation of Commercialores Inc. has exposed kyanitic quartzite somewhat similar to that at Stop 1 in a deep open-cut mine. The kyanitic quartzite occurs in fine-grained muscovite schist in many places containing various proportions of kyanite and locally andalusite. The kyanitic quartzite

does not have an even strike trend through the knob, but is confined to irregular lenses of various sizes locally containing knots of randomly-oriented kyanite rarely containing pyrophyllite. The kyanite in the best grade of the rock may average 30 to 35 percent by weight, and is accompanied by pyrite. Unlike the quartzite at Stop 1, that at Henry Knob does not show the sharp restriction of kyanite to well-defined bedding units within the quartzite. This feature has added greatly to the economic outlook at Henry Knob, but it also tends to obscure the origin of the kyanite. L. L. Smith and Roy Newcome, Jr. (1951) believe that the alumina of the kyanite and the sulfur of the pyrite were introduced in hydrothermal solutions derived from the Yorkville "granite." In 1952, D. B. Potter mapped in detail the distribution of the many lenticular bodies of kyanitic quartzite as well as associated rocks, but the map throws little light on origin of the kyanite.

STOP 4

The barite mining property operated by Industrial Minerals Inc. has been by far the most productive among a group that occurs in a narrow stroke zone 25 miles in length, along the east side of Kings Mountain ridge. The property here contains a complex group of lenticular veins consisting of essentially pure barite. As may be seen, these veins range from a few inches to many feet in thickness, and are mostly but not entirely in the plane of fine-grained muscovite schist, which is the enclosing formation. Pyrite, galena, and copper sulfides have been reported in the veins, but these minerals are very scarce. Much of the schist adjacent to the veins contains various proportions of finely disseminated barite and quartz. Both open-pit and underground mining have been carried on. The underground mining has been restricted to the larger veins for the production of pure barite. The open-pit mining has yielded not only pure barite from the veins, but also various grades of the schist for special purposes. On two occasions, calcareous schist and schistose limestone have been found by geologists in dumps from the deeper workings. As barite occurs in calcareous rocks in many parts of the world, a similar association is at least suggested here. Assuming deposition by hydrothermal solutions associated with igneous magma, it appears from several lines of indirect evidence that the Yorkville "granite", rather than the Whiteside or either of its sub-units, is the probable ultimate source.

STOP 5

This new quarry of the Campbell Limestone Company is located one mile south of Grover, in the northwestern of two strike belts of Keith's Gaffney marble. There has been no study of petrology or structure at this locality since the quarry was opened, and a detailed account of what may be expected cannot be given. The pit affords the best opportunity to date, however, for observing the various rock types formed by the metamorphism of a limestone series of variable purity. Most of the stone is well-bedded white to blue-gray crystalline limestone of medium grain. Some beds, however, show the development of micas and hornblende, and such phases on the basis of work near Kings Mountain have been found invariably to contain fine-grained quartz and plagioclase in addition. Such beds are believed to reflect impure silty layers in the original limestone, and some of these units were thick enough to form sharply-layered dark-green amphibolite like that in the mine of Foote Mineral Company at Kings Mountain. It will be seen that the layered structure of such amphibolite is concordant with the thin bedding of the limestone. It is hoped that metamorphic minerals not previously found in the limestone of the Kings Mountain belt may be discovered on this trip.

STOP 6

Massive outcrops of a unique member of the siliceous metasediments, the Draytonville conglomerate of Keith and Sterrett (1931). Their description of the rock as gneissoid because of metamorphism is misleading. In most places it shows little deformation, as at this locality. The pebbles mostly range from one-quarter to three inches in maximum diameter. Three types have been recognized, although a careful study might reveal others. More than ninety percent of them are milky quartz, much finer-grained than vein quartz. Scarcer varieties include black flinty or jasperoidal quartz, and thin-layered light gray quartzite. The matrix of the pebbles here and in most places is dark-gray quartzite, but metashale and phyllitic quartzite also are known. Bedding is evident in parallel planes emphasized by weathering, and in unequal proportions of pebbles in layers parallel to the planes. The conglomerate here strikes N.50 E., and dips 65 NW. Its thickness in this vicinity is 135 feet. Whether all conglomerate that occurs in the siliceous metasediments has the same stratigraphic position is unknown.

STOP 7

The open-pit mine of Foote Mineral Company is in a northeast-trending belt of lithium pegmatites 25 miles long, and is located 7 miles from the southwest end of the belt. The largest known pegmatite in the belt is partly exposed with others in the mine. This pegmatite, the westernmost exposed in the pit, has an outcrop length of 2,250 feet and an original maximum outcrop width of 340 feet. The body has been partly explored by diamond drilling, but structural details may not be given here. Farther east, another body partly exposed in the pit has an outcrop length of 3,250 feet. The pit is worked in 20 ft. benches.

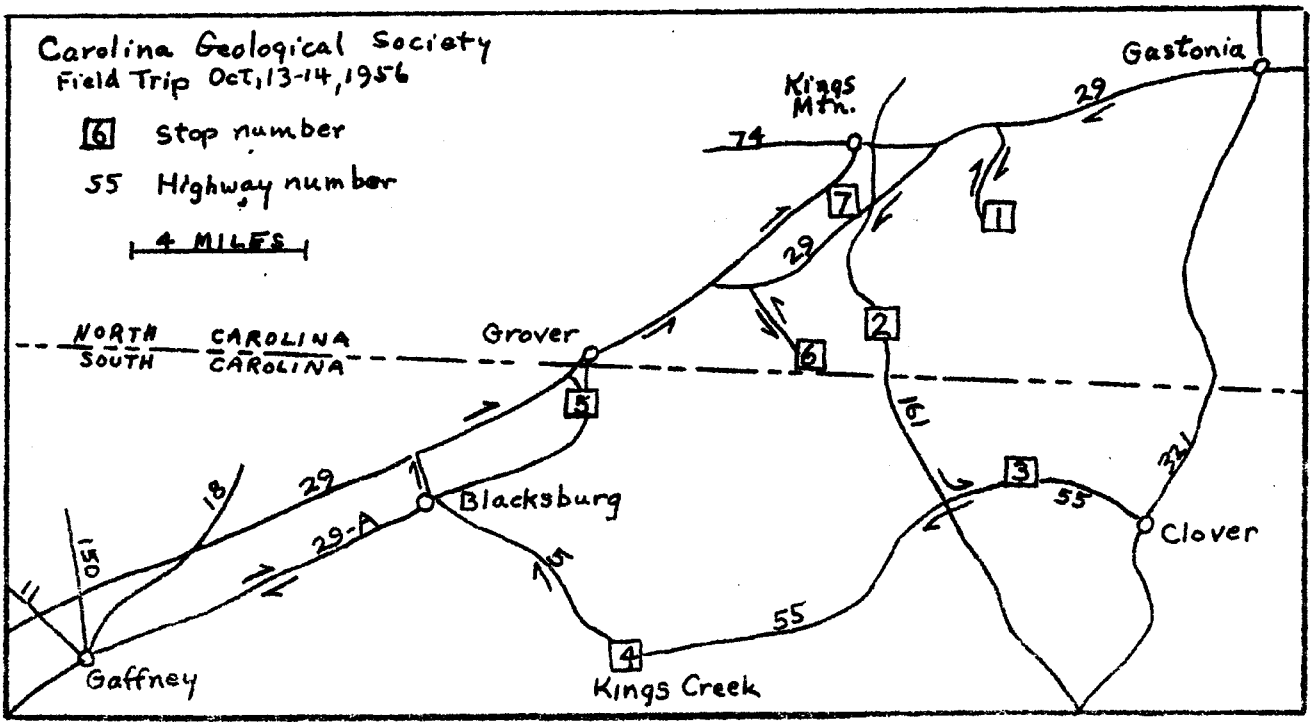
The principal minerals, in order of abundance are, albite, quartz, microcline, and spodumene. The albite and

quartz are fine-grained and unfractured. The microcline and spodumene are mostly coarse-grained and fractured, the fractures being filled with the albite and quartz. Sodic oligoclase and muscovite of small flake size are present but not abundant. Scarce hypogene minerals that are difficult to find include amblygonite, apatite, beryl, cassiterite, columbite-tantalite, and black tourmaline; and a dozen others found mostly in single occurrences. Most of the pegmatite has a pronounced west-dipping layered structure that is emphasized by weathering, and is seen best in natural outcrops. No quartz cores are known in the area and there is no pronounced or persistent mineral zoning.

Most of the wall rock here is thin-layered amphibolite dipping west, which is similar to that in the limestone series at Stop 6. At some but not all contacts, the pegmatites are bounded by a thin schistose selvage of altered amphibolite. This consists of various proportions of brown biotite and violet holmquistite, a finely fibrous amphibole containing lithia. Also in the amphibolite, but not exclusively at contacts with pegmatite, are zones of hydrothermal alteration consisting mostly of chlorite and biotite enveloping residual masses of the amphibolite. These zones contain fractured crystals of black tourmaline and a little pyrite, chalcopyrite, and holmquistite.

Table 1. Geologic Formations in the Kings Mountain Area, North and South Carolina
(Based on the work of Arthur Keith, D. B. Sterrett, T. L. Kesler, W. R. Griffitts, W. C. Overstreet, and D. B. Potter, with provision for possible action by the U.S.G.S. Committee on Geologic Names. Compiled 9/21/56 by T. L. Kesler)

Origin	Age	Formation	Stop No.
Igenous	Triassic	Diabase dike	
	Devonian or late Carboniferous	Yorkville quartz monzonite	
	Devonian (?)	Cherryville quartz monozonite and simple pegmatite	
	Devonian (?)	Lithium pegmatite (complex origin ranging from pre-Cherryville to late Cherryville)	7
	Early Ordovician	Toluca quartz monzonite	
Meta-igneous	Pre-Ordovician (post-metasediments)	Metagabbro and metadiorite (“Roan” types)	
Metasedimentary	Pre-Ordovician (more strongly altered than typical members of the Battleground schist)	Lattimore gneiss and other mica gneisses and schists of “Carolina” and “Bessemer” types.	3, 7
		Amphibolite and hornblendic to biotitic gneisses and schists of “Roan” types, including Shanghai gneiss member of the Lattimore gn.	5, 7
	Pre-Ordovician (least altered of the metasediments; in and adjacent to core of Kings Mountain anticline)	Battleground schist, including quartzite of “Kings Mountain” types.	1, 2, 3, 4
		Gaffney “marble” member of the Battleground schist	5
		Draytonville conglomerate member of the Battleground schist.	6



Stops: (1) Crowders Mtn., (2) Stepps Gap, (3) Henry Knob, (4) Kings Creek, (5) Campbell Quarry, (6) Dixon Gap, (7) Foote Mineral Co. mine.