FIELD TRIP NO. 4 Corundum Hill, North Carolina[1]

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Field Trip Guides: Lawrence T. Larson, Frank G. Lesure, and Robert H. Carpenter

This guide describes in very abbreviated form some of the geology of the areas through which the trip will pass and gives slightly more detailed descriptions of Cowee Creek, the Terrell Bryson pegmatite, and Corundum Hill (Fig. 1).

Members of the field trip will assemble at 7:30 A.M. at the Civic Auditorium. Buses will leave at 7:40 A.M. Please try to be on time--we have a long way to drive.

MILEAGE	DESCRIPTION AND COMMENTS
0.0	Gatlinburg Civic Auditorium.
0.6	Leave Gatlinburg--travel on U.S. 441 East for next 1.6 miles along approximate trace of Gatlinburg-Huskey Gap fault (concealed).
0.9	Exposed on right is the Precambrian Elkmont Sandstone (p€e)(basal part of the Great Smoky Group) which consists of interbedded medium- to fine-grained feldspathic sandstone and gray fine-grained, argillaceous sandstone and slate. This formation in Bald Top Ridge, 7 miles east of Gatlinburg, is about 3000 feet thick (Hadley and Goldsmith, 1963, p. 49-50).

[1] Publication authorized by the Director, U.S. Geological Survey.

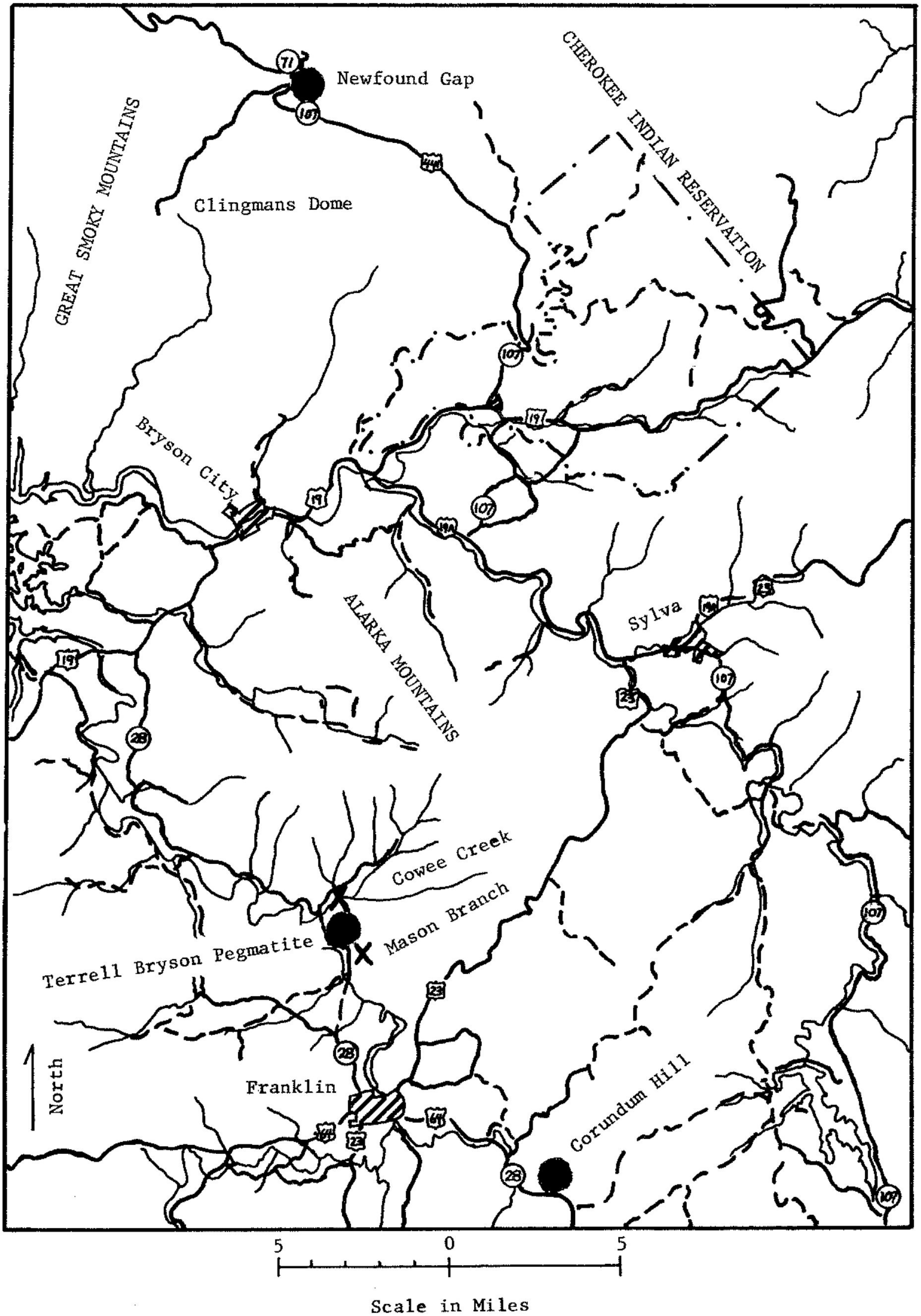


Fig. 1 Location Map for Corundum Hill Trip

On left, east of the Huskey Gap fault, the Precambrian Roaring Fork Sandstone (p€rf) is exposed. The Roaring Fork is a formation in the Snowbird Group (basal part of the Ocoee Series) and is about 7000 feet thick in its type area. Typically, it is a moderately metamorphosed medium- and fine-grained feldspathic sandstone and metasiltstone with lesser amounts of slate and phyllite. Lateral and vertical lithologic variations are common (Hadley and Goldsmith, 1963, p. 31-34).

2.2 Great Smoky National Park Headquarters.

2.4 Intersection U.S. 441 and Tenn. 73--bear left and continue on U.S. 441.

6.0 U.S. 441 follows West Prong of the Little Pigeon River. Hills on both sides of road composed of Precambrian Thunderhead Sandstone (p€t). The Thunderhead Sandstone overlies the Elkmont Sandstone and consists very largely of medium- to coarse-grained feldspathic sandstone interbedded with arkose pebble conglomerate, finer grained feldspathic sandstone, argillaceous metasandstone, and dark-gray slate (Hadley and Goldsmith, 1963, p. 50-58). Thick graded beds of conglomerate, granule-bearing sandstone, medium-grained sandstone, and fine-grained argillaceous sandstone are characteristic of the Thunderhead. The maximum thickness of this rock unit is about 12,000 feet. Hadley and Goldsmith (1963) describe a partial section of the Thunderhead taken along this road near the Chimneys Campground.

6.8 View of Chimney tops to front right. They are capped by the Anakeesta Formation (p€a), although the Thunderhead Sandstone is present near the peaks on the north side along the footwall of the Mingus fault.

7.2 Chimney Tops Campground. Continue in p€t for next 4.5 miles, after which we pass through the Precambrian Anakeesta Formation (p€a) for about 0.3 miles and cross the Mingus fault.

9.5 First tunnel. Thunderhead Sandstone with interbedded slate and argillaceous sandstone exposed in portal.

12.0 Approximate location of Mingus fault, a steep reverse fault which cuts across the north limb of Mt. Mingus (to right ahead). Mt. Mingus is an anticline of Thunderhead Sandstone on the upthrown side of the Mingus fault. South of the Mingus fault, Thunderhead Sandstone is exposed for approximately 0.8 mile.

12.8 Anakeesta Formation exposed in roadcuts until Newfound Gap (one small slice of p€t) where U.S. 441 and the Clingmans Dome road intersect. The Anakeesta Formation makes up the upper part of the Great Smoky Group in this area and intertongues with the Thunderhead Sandstone. The Anakeesta Formation is much more lithologically heterogeneous than other rock units of the Ocoee Series and consists of arkosic conglomerate, graywacke, fine- to coarse-grained feldspathic sandstone, gray chlorite slate and argillite, carbonaceous slate and phyllite, and dark dolomite. Beds in the Anakeesta commonly show slaty cleavage and are often rumpled. Along the north side of the highway the Anakeesta dips generally 40°-45° SE., but local folds (most of which plunge ENE. 25° to 50°) are common.

15.8-.9 At about this location--just before the U.S. 441-Clingmans Dome road intersection--the Anakeesta Formation is overturned and dips 35° to 50° SE.

16.0 STOP 1 Newfound Gap--elevation 5000 feet (Fig. 1). At the intersection of U.S. 441 and Clingmans Dome road the Anakeesta Formation dips 50° SE. Immediately south of the intersection, Thunderhead Sandstone is exposed. The Appalachian Trail crosses Newfound Gap from southwest to northeast. Overlook to east gives view of several ridges and peaks (4000 to 4500 feet in elevation). For the first 8 to 8½ miles, peaks are largely underlain by Thunderhead Sandstone. To the northeast is Mt. Kephart (5500 feet) and the Sawteeth which are capped by the Anakeesta Formation. The Oconaluftee fault, striking approximately N. 80° W., is shown topographically by the straight upper part of the Oconaluftee River, and this segment of U.S. 441, in general, follows along the southwest side of the fault trace. Structural displacement along this fault is on the order of ½ to 1 mile, most of the displacement apparently being right lateral strike slip (Hadley and Goldsmith, 1963, p. 83). Rocks adjacent to the fault along the highway south of Newfound Gap are fractured and sheared. Minor faults are common.

NOTE:-At the time of road log preparation, a new road leading southeast from Newfound Gap was under construction. Whether this road will be open at the time of the trip is uncertain. Road log follows old road, but geologically there is only minor difference.

26.5 Smokemont Ranger Station and Campground. From 16.0 to 26.5 miles we have descended about 2800 feet along the Oconaluftee River, the course of which has, in general, followed the trace of the Oconaluftee fault. Rocks exposed on both sides of the valley are units of the Thunderhead Sandstone.

29.4 Cross the Greenbrier fault. Greenbrier fault at this location brings plutonic basement rocks on the east-southeast into contact with the Thunderhead Sandstone.

29.8 Oconaluftee Ranger Station and Museum. Along the right side (west) of the road are plutonic rocks of the Ravensford body (p€g) (Hadley and Goldsmith, 1963, p. 16). The major rock type is a fine- to medium-grained, strongly lineated oligoclase-quartz-biotite gneiss containing abundant knots of white plagioclase. Minor constituents are muscovite, epidote, and sphene. Accessary minerals are apatite, zircon, magnetite-ilmenite, pyrite, carbonate.

Inclusions of metasediments, amphibolite, and biotite schist are common.

30.5 Intersection of U.S. 441 and Blue Ridge Parkway (to east or left).

31.2 Enter Cherokee Indian Reservation.

NOTE:-Because of possible change in road route mileage from Newfound Gap to Cherokee, mileage measurements will begin again with 0.0 at the intersection of U.S. 441 and U.S. 19

0.0 Intersection of U.S. 441 and U.S. 19. Turn right on U.S. 19. Intersection is approximate location of trace of Greenbrier fault. From 0.0 to 0.3 miles, the road crosses saprolite of the basement complex.

1.8 Saprolite of the Carolina Gneiss of former usage--a layered, quartzose, muscovitic and biotitic gneiss--is exposed near Birdtown, and the rocks from this point to the vicinity of Ela at 6.9 miles are part of the plutonic granite gneiss basement complex. Hadley and Goldsmith (1963) term this the Ela Dome and consider it a mantled gneiss dome arranged en echelon with the Ravensford anticline. The dome at Ela is about 5½ miles long northeast-southwest and 1½ miles wide and is surrounded by the Thunderhead Sandstone.

7.2 Cross Tuckasegee River.

10.3 Bryson City (downtown) (Fig. 1). Bryson City is in the east-central part of a dome of granite gneiss similar to that at Ela. The Bryson City dome is about 6½ miles long by 2 miles wide, the long dimension trending north-northeast, more or less parallel to and en echelon with the Ravensford and Ela structures. As mapped by Cameron (1951) the Bryson City dome consists principally of fine- to coarse-grained, equigranular to markedly inequigranular, leucocratic to mesocratic, granitic to granodioritic gneisses surrounded on the northern half by a thin selvage or facies of border gneiss composed of markedly foliated microcline and composite quartz-feldspar-biotite gneiss containing numerous prophyroblasts and augen of quartz-feldspar. Included within the major gneiss body are linear bodies of metaperidotite (especially in the southwest corner), inclusions of metasediments, small roughly elliptical to elongate bodies of metagabbro and quartz monzonite, and numerous quartz-microcline-perthite, sodic plagioclase, biotite-muscovite, zoned to homogeneous pegmatites. The locations of 144 of the more than 150 known pegmatites in and about the Bryson City dome are given in Cameron (1951). A majority are found in and adjacent to the thin border facies on the northwest limb of the dome. Maps, descriptions, and a classification of the pegmatites of major economic importance are also given in Cameron (1951). The mineral of principal economic interest was feldspar, and the period of major production was the middle to late 1940's.

11.5 Saprolite of granite gneiss overlain by high terrace gravels in roadcut.

14.0 Alarka Creek. Outcropping of migmatitic granite gneiss.

15.0 We have passed out of the basement gneisses and into metasediments of the upper Precambrian Ocoee Series, represented here and for the next 7 miles largely by the Great Smoky Group consisting of graywackes and conglomerates in thick graded beds with interbedded slate.

16.0 Junction of U.S. 19 and N.C. 28. Turn left onto N.C. 28.

18.1 Big Horseshoe Bend of the Little Tennessee River on right below.

20.1 Ocoee metasediments.

20.6 Meanders of the Little Tennessee River on right below.

22.0 Rocks in this area are deformed, slaty to micaceous Ocoee metasediments which were mapped by Keith (1907) as Nantahala Slate. These are now considered to be most probably slates derived from thick argillaceous units in the Great Smoky Group. These rocks contain abundant disseminated iron oxides, pyrite, and pyrrhotite and have been prospected for gossan iron deposits.

25.2 Entering area underlain by rocks of uncertain identity (Ocoee Series or Carolina(?) Gneiss of former usage) but of a higher metamorphic rank than the Ocoee metasediments we have traveled over since Bryson City.

29.0 Brick-red to yellow-brown saprolite characteristic of hornblende gneiss mapped by Keith (1907) as Roan Gneiss. Rock consists largely of varying amounts of quartz, feldspar, hornblende, biotite, chlorite, and garnet. Although the gneiss body at this locale is throught to be originally of igneous origin, many hornblende gneiss bodies (particularly to the north) in North Carolina which were originally considered igneous when mapped by Keith are now thought to represent original impure carbonate sediments.

29.8 On the right across the Little Tennessee River is the site where the Council House of Cowee, chief of the Middle Cherokees, stood. This Cherokee Indian town was destroyed during the Revolutionary War. Rocks in this area are mapped by the North Carolina Department of Conservation and Development as mica schist, and in this particular locale are a sillimanite biotite garnet schist containing numerous small pegmatites.

30.7 Several tons of kaolin clay were produced and shipped from this area to the Wedgwood Potteries of Great Britain by T. Griffiths in 1767. Believed to be earliest recorded commercial kaolin shipment in U.S.

30.7-30.8 Wests Mill Post Office-Cowee Creek (Fig. 1). If times permits, a short detour will be taken up Cowee Creek and Caler Fork to the Cowee Ruby "mines."

STOP (if time permits) Turn left off N.C. 28 at Wests Mill and take road (1341) up right hand (southeast) side of Cowee Creek and bear right (1342) into Caler Fork at 1.3 miles up Cowee Creek.

0.4-0.5 Abandoned pegmatite prospect on right almost concealed by vegetation.

0.9 View of Alarka Mountains ahead up valley.

2.7 First ruby "mines." Jacobs tourist diggings--note sluices and the loose gravels that have been prepared for screening by bulldozing.

2.8-2.9 Gibson and Holbrook No. 2 ruby "mines."

3.1 View across Caler Fork of the Shepherd Knob mica mine (above creek level).

Mine described and mapped by Olson (1946) as a sheet mica, scrap mica, kaolin mine producing from an irregular pegmatite body 150 or more feet thick, composed of quartz, microcline, plagioclase, muscovite, and biotite (at surface, feldspar is altered to kaolin). The pegmatite is crudely zoned and is enclosed in gray, faintly foliated mica gneiss.

3.2 Shuler ruby "mine."

3.6 Hornblende gneiss exposure. Rock of this type is probably the source rock for rubies (see below).

3.7 "In situ" Hill, on left of road, where rubies are reported by Pratt and Lewis (1905) to have been found in place in fresh rock.

Description of Cowee Creek

G. F. Kunz (1907) relates that ruby corundum occasionally of true gem quality from Cowee Valley was first reported in the literature in 1893. The rubies are found as small, flat to tabular, red to pinkish-red hexagonal crystals associated in the valley gravels with quartz, pyrope, nongem corundum, gahnite, hypersthene, cordierite, kyanite, sillimanite, biotite, hornblende, staurolite, rutile, ilmenite, chromite, zircon, gold, pyrite, chalcopyrite, pyrrhotite, sphalerite, sperrylite, monazite, cyrtolite, and anthophyllite (Heinrich, 1950). The rubies have been mined commercially and, more recently, as a tourist attraction from alluvial gravels 2 to 10 feet thick, which at the start of mining in this area were overlain by several feet of finer soil and valley fill. Underlying the ruby-bearing gravels is saprolite up to 35 feet thick which passes into amphibolite, garnet amphibolite, and hornblende gneiss (Kunz, 1907).

Cut gem specimens from diggings in this valley are in the Tiffany-Lea collection at the U.S. National Museum and in the collections of the American Museum of Natural History.

31.8 Terrell Bryson pegmatite workings to left above road (Olson, 1946, No. 279) (Fig. 1).

STOP 2 This operation has been inactive since 1962, but mineral specimens may be collected from dumps and from wall rocks exposed in the surface cut.

The pegmatite is on the southwest flank of Mason Mountain. The host rock is largely quartz-biotite-feldspar gneiss showing flow structure and containing a few disseminated rhodolite crystals. Host rocks appear to strike roughly east-west and dip about 70° N.

The pegmatite is an irregular to tabular body which pinches and swells from 2 to about 7 feet thick and which trends N. 80° W. at the 100-foot level (N. 65° W. at surface) and dips about 75° SW. The body is zoned with a very thin (less than ½ inch) fine-grained quartz-feldspar-mica border zone; a plagioclase-perthite, quartz, muscovite wall zone; and a white milky quartz core 1 to 5 feet thick. Accessory and trace amounts of tourmaline, apatite, garnet, sulfides, and other minerals are found within the wall zone rocks. Kaolin and halloysite may be found in the host rocks exposed in the opencut. This pegmatite is a good example of the mica pegmatite bodies in the Franklin-Sylva pegmatite district. Age determinations on muscovite and biotite from pegmatites similar to this one range from 250 to 500 million years (Deuser and Herzog, 1962).

32.4 Masons Branch (on the left county road 1332) (Fig.1).

This is the type locality for rhodolite garnet first described by Hidden and Pratt in 1898. This attractive garnet is reported to be 1 part almandine and 2 parts pyrope. The distinctive pale pink to lavender color has made it a favorite with mineral collectors. The locality has been described most recently by Heinrich (1950).

33.0 Iotla-Bradley pegmatite--to right across the Little Tennessee River. This pegmatite is described by Olson (1946) as a large, irregular, poorly zoned body more than 800 feet long and 200 feet wide consisting of kaolinized feldspar, muscovite, quartz, and biotite. Kaolin and scrap mica, as well as small amounts of sheet mica have been produced from this mine since 1905. The largest mica book from this mine was 3 feet in diameter and 4 feet thick.

37.5 Intersection of N.C. 28 with U.S. Highways 23, 441, and 64. Center of Franklin, North Carolina. Continue on N.C. 28 and U.S. 64.

38.4 Nikwasi Indian Mound on left. Mound marks site of Cherokee town of that name where Sir Alexander Cumming entered into a treaty with the Cherokee Nation in 1730.

38.6 U.S. 64 and N.C. 28 turn right (east). Remain on U.S. 64 and N.C. 28.

44.5 Foundations of old Corundum Mill.

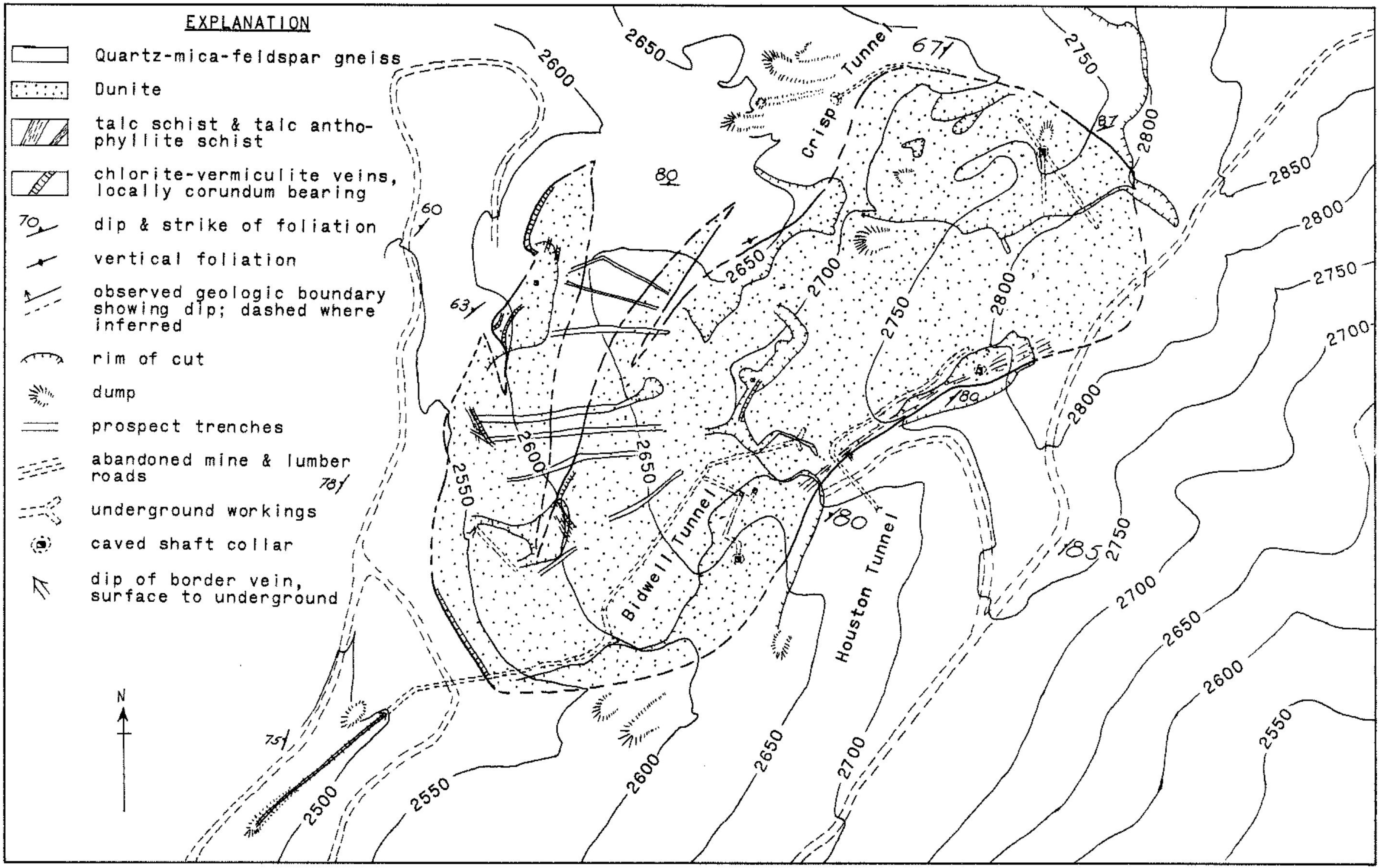
45.5 Corundum Hill entrance (Fig. 1). Bus will park at

STOP 3	or near entrance and party will be transported up hill in pickups and jeeps (we hope).
0.2-0.4	Saprolite derived from muscovite-quartz-biotite-feldspar schist with minor hornblende.
0.7	Old mine dumps and start of Bidwell adit. Party will disembark here and continue on foot for tour and collecting about Corundum Hill.

NOTE:-PLEASE be careful of your footing and pay particular attention to rocks which may overhang where you are pounding. Many ledges are loose and therefore unsafe. PLEASE try and keep the party together.

Corundum Hill Description

Corundum Hill, also known as Cullasagee mine, Cullasaja mine, Jenks mine, or Lucas mine, is essentially an outcropping of slightly to highly altered dunite, some 10 acres in area, rising to a height of about 2875 feet, with local relief of 300-400 feet (Fig. 2). The Corundum Hill property was discovered in 1870 by Hiram Crisp and first worked principally in an effort to obtain gem stones in 1871 to 1873 by Col. C. W. Jenks. The mine was reopened in 1878 and operated until about 1900 by Dr. S. F. Lucas for the Hampden Emery and Corundum Company. Production during this time is reported to have been 200 to 300 tons of cleaned corundum per year. In 1900 the property was purchased by the International Emery



0 100 200 300 400 500 600

Scale in feet

Contour Interval 50 feet.

Fig.2 GEOLOGICAL MAP AND PROJECTED WORKINGS, CORUNDUM HILL MINE

Macon County, North Carolina

Adapted from Preliminary Mineral Investigations Maps. U.S. Geological Survey; Geology by J.B. Hadley and J. Freedman, May 1945; Topography by U.S. Bureau of Mines, 1945.

and Corundum Company, but their operations, if any, were negligible. In 1914 the property was repurchased by the Hampden Emery and Corundum Company, and operated for about 4 years. All the operations after that of Col. Jenks were devoted to abrasive-grade corundum. Exploration drilling within the last 5 years has been done by Harbison-Walker Refractories Company in an effort to evaluate the property as a source of refractory olivine. Recently the property has been re-opened by Mr. J. Brinkman of Franklin, North Carolina, as a locality for the serious rock and gem collector.

Numerous gem stones from 1 to 3 carats in weight and ranging in color from yellow to pale blue to dark blue to red have been placed in the collections of the U.S. National Museum, Washington, D.C. The largest crystal obtained from this deposit, and supposedly the largest corundum crystal known, was a steep to somewhat irregular hexagonal grayish-blue pyramid, weighing 312 pounds (Kunz, 1907). This crystal was given by Col. Jenks to C. O. Shepard for the collections at Amherst College. Other fine gem stones obtained from this locale are found in numerour private collections and in the British Museum of Natural History, London.

The Corundum Hill dunite is an elliptical body, roughly 350 feet wide and 1,100 feet long, that is enclosed in mica-feldspar schist and hornblende gneiss. See Figure 2. The long dimension of the dunite mass trends northeast parallel to the regional strike of the gneiss. The contact between gneiss and dunite is nearly concordant in some places and dips to the northwest. At the south end of the body however, the contact is discordant and dips steeply to the north and northeast. At many places along the contact and within veins in the dunite, a coarsely crystalline chlorite schist and/or talcose-vermiculite zone has been developed. The corundum, as well as most of the other minerals of specimen interest, is concentrated in the contact zones or in veins leading into the dunite from the contact zone on the south, west, and north sides of the dunite body. The contact zone or vein on the south side of the property (Bidwell tunnel or adit, Stanfield mine, etc.) which is, at this time, very poorly exposed, is described by Pratt and Lewis (1905) as follows:

> Adjacent to the country rock the "contact vein" material is a soft, decomposed chlorite schist containing disseminated fine- to medium-grained (sand) corundum. The next inward zone is coarsely crystalline somewhat harder chlorite containing more and often more coarsely crystalline corundum. Inwards from this zone is a narrow discontinuous zone of barren chlorite and fibrous talc and/or

anthophyllite(?), and immediately adjacent to the dunite is a zone a foot or more wide of fibrous talcose material.

Contact zones elsewhere about the deposit are much the same. East-west or east-northeast striking veins completely enclosed in dunite are numerous. Most of these show a symmetrical banding of the rock types (exclusive of the outermost) described above. Minerals which may be found either in the cuts along the contact zone which we will visit or in the altered dunite immediately adjacent to these cuts include corundum, talc, anthophyllite(?), tremolite, vermiculite(?), chlorite, olivine, magnetite, chromite, hypersthene, hornblende, brown spinel, nickel silicates, and probably several others. The Corundum Hill dunite body is one of a series of dunite bodies that intrude the metamorphic rocks of the Blue Ridge in Georgia and North Carolina. The age of the dunite is not adequately established. It is certainly younger than the lower Precambrian metamorphic rocks and older than the lower to middle Paleozoic mica pegmatites that cut similar dunite bodies near Sylva and Spruce Pine.

RETURN TO BUS

Leave Corundum Hill and reverse direction on U.S. 64 and N.C. 28.

52.3 Intersection of U.S. 64, N.C. 28 and U.S. 23, 441.

Turn right on U.S. 23 and drive to Dillsboro, North Carolina.

55.5 Road on left leads to an area dotted with quartz-mica-feldspar pegmatites (Olson, et al, 1946).

STOP (if time permits Travel down this road to left 0.1 mile and then turn into mine road which after 0.3 mile stops at the Buoy No. 1 pegmatite. This pegmatite, which has been worked as recently as 1962, is a zoned muscovite-quartz-feldspar body with a large quartz core; the pegmatite is enclosed in quartz-feldspar-biotite-hornblende gneiss containing minor garnet.

59.5 Jackson County line. Again we are in an area in which Olson, et al (1946) have located numerous quartz-mica-feldspar pegmatites.

60.5 View of the Plott Balsam Mountains ahead. We are now in the Alarka Mountains.

64.9 Metasediments. Amphibolites, quartz-feldspar gneisses, etc. Mapped as Carolina Gneiss by Keith (1907).

67.1 N.C. 116 to right. Continue on U.S. 23.

69.7 Intersection of U.S. 23/441 and 19A. Turn left on 441 and 19A.

70.6 At approximately this location we pass out of the mica gneiss and schist area through which we have been traveling (Precambrian (mgm) on the North Carolina Geologic Map, Stuckey and Conrad, 1958) and most of which Keith (1907) mapped as Carolina Gneiss, and travel into metasediments of much lower rank. In particular, we come into the Ocoee Series-Great Smoky Group near mile 70.8 and continue on these rocks for the rest of the trip to and past Cherokee, North Carolina. For much of this distance we will be traveling parallel to the course of the Tuckasegee River.

73.8 Quartzites, arkoses, etc. of Ocoee Group--on right.

77.6 Intersection of U.S. 19A and U.S. 441. Stay to right on U.S. 441.

81.1 Enter Cherokee Indian Reservation.

82.1 Junction with U.S. 19. Stay on U.S. 441 and return to Gatlinburg.

(See first part of trip road log)

We hope you have had an enjoyable trip.

LTL and FGL

List of Selected References for Corundum Hill Trip

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